IJRVET
International Journal for Research in Vocational Education and Training

Yearbook 2019

Editors
Michael Gessler (Germany), Karen Evans (United Kingdom), Johanna Lasonen (USA), Margaret Malloch (Australia) and Martin Mulder (Netherlands)
How to Cite

IJRVET Editorial Office
University of Bremen
Institute Technology and Education (ITB)
Am Fallturm 1, 28359 Bremen, Germany

IJRVET Publisher
VETNET European Research Network in Vocational Education and Training, a network of EERA European Educational Research Association
IRNVET International Research Network in Vocational Education and Training, a network of WERA World Education Research Association
CINTERFOR Centro Interamericano para el Desarrollo del Conocimiento en la Formación Profesional, a technical service of ILO International Labour Organization

Print
Kindle Direct Publishing (KDP)
an Amazon.com Company

ISSN: 2197–8638 (Print) ISSN: 2197–8646 (Online)
Acknowledgement

We warmly thank Dr. Susanne Peters for the conscientious management of the IJRVET editorial office. We also would like to sincerely thank Pekka Kämäräinen, Christine Siemer and Karen Trost for their continuous support in the IJRVET editorial office. Last but not least we cordially thank the reviewers for their evaluations and suggestions for improving the quality of the articles.
## CONTENTS

### VOLUME 6, ISSUE 1

**Attracting women into male-dominated trades: Views of young women in Australia**  
Karen Struthers, Glenda Strachan  
1

**Transition to company-based vocational training in Germany by young people from a migrant background – the influence of region of origin and generation status**  
Ursula Beicht, Günter Walden  
20

**What students who perform in “secondary roles” can learn from scenario training in vocational education**  
David Sjöberg, Staffan Karp, Oscar Rantatalo  
46

**Exploring visual languages across vocational professions**  
Alessia Eletta Coppi, Alberto Cattaneo, Jean-Luc Gurtner  
68

**Book review: Teachers and teaching in vocational and professional education**  
Joy Papier  
97

### VOLUME 6, ISSUE 2

**Training marketing by German companies – which training place characteristics are communicated?**  
Margit Ebbinghaus  
102

**Large scale studies of holistic professional competence in vocational education and training (VET): The case of Norway**  
Leif Christian Lahn, Hæge Nore  
132

**Dropout prevention in Secondary VET from different learning spaces: A social discussion experience**  
Francesca Salvà, Carme Pinya, Nuria Álvarez, Aina Calvo  
153

**Analysing training needs of TVET teachers in South Africa: An empirical study**  
Bernd Zinn, Kevin Raisch, Jennifer Reimann  
174

**Book Review: India. International Handbook of Vocational Education and Training**  
Uma Gengaiah  
198
Skills and employment under automation: Active adaptation at the local level
Odd Bjørn Ure, Tom Skauge

Job satisfaction, work engagement, and turnover intention of CTE health science teachers
Kathleen A. Park, Karen R. Johnson

Identifying teachers’ competencies in Finnish vocational education
Annukka Tapani, Arto O. Salonen

Cross–country comparison of engagement in apprenticeships: A conceptual analysis for individuals and firms
Maia Chankseliani, Aizuddin Mohamed Anuar

The function and institutional embeddedness of Polytechnics in the Indian education system
Sebastian Schneider, Matthias Pilz
Attracting women into male-dominated trades: Views of young women in Australia

Karen Struthers*1, Glenda Strachan2

1School of Human Services and Social Work, Griffith University, 4122 Logan, Australia
2Department of Employment Relations and Human Resources Griffith University, 4122 Brisbane, Australia.

Received: 30.11.2018; Accepted: 21.01.2019; Published: 30.04.2019

Abstract

Context: The persistent low female participation in male-dominated trades and VET courses is not attracting a high level of public attention and policy action. There are determined, albeit ad hoc actions by advocates to raise awareness of the economic and social benefits that can result from increased female participation in the male-dominated trades. Despite these efforts gender segregation of the trades remains resistant to change.

Approach: To better understand the barriers limiting female participation in the male-dominated trades from the perspective of young women, this PhD study features interviews with female secondary students in four secondary schools in Queensland, Australia, and interviews with VET, school and industry stakeholders. The three primary research questions are: 1) What is the extent of gender segregation in VET and typically male-dominated trades in Australia, and how does this compare internationally? 2) Why do very few female students choose male-dominated trades as their job pathway? 3) What can be done, particularly in the education and training sectors, to increase female interest in, and take-up of, the male-dominated trades?

Findings: The results of this research showed that the composition of trade-qualified females in male-dominated trades is persistently low at 2-3%. The views of young women affirmed the evidence showing system-wide barriers limit female interest in male-dominated VET trade courses and trade careers. Most influential is that gender stereotypes of work are
set by Year 10 and that female enrolment in Maths (a pre-requisite for male-dominated careers) is low; these trades are seen as “jobs for the boys who don’t do academic,” and the fear of intimidation and harassment deters young women. Low enrolment of female students in male-dominated VET trade courses indicates that this entrenched occupational segregation of the trades will remain resistant to change for some time to come.

**Conclusion:** The findings indicate that ad hoc responses to overcome gender segregation of the trades is not effective. Influenced by systems theory and a social ecological model (SEM) of change, the researchers promote the need for sustained, nation-wide awareness and action involving VET and school sectors, industry, government and trade unions to attract more women into male-dominated trades.

**Keywords:** Vocational education and training, non-traditional occupations, women in trades, VET

## 1 Introduction

The construction, electro-technology, manufacturing and auto and related trades in many advanced industrial nations are dominated by trade-qualified men. Despite the determined efforts of feminist advocates, researchers and unionists, the gender composition of male-dominated trades is resistant to change, and this is an international phenomena. It can be difficult to accurately measure female participation in VET and the trades in Australia as VET enrolment data and trade composition data is not routinely disaggregated or publicly reported by gender. Research effort is generally required to comprehensively analyse gender differences in this data (economicSecurity4Women, 2014; Struthers, 2016). Despite these challenges of data reporting and collection, available research and evidence shows extremely low levels of female participation in male-dominated trades in many countries, with examples being:

- 2% of qualified trade workers in male-dominated trades in Australia are women (Australian Bureau of Statistics, 2014; Struthers, 2016).

- 4.5% of skilled trade workers in Canada are women (Statistics Canada cited Smith, J, 2017, p.1).

- Young women (25 years and under) account for only 1% of those working in the construction sector in Europe (Liebus, 2016).
– In India it is estimated that up to 30 per cent of construction workers are women, yet they are predominantly unskilled workers or head-load carriers — women comprise 1.4% of technical officers (Patel & Pitroda, 2016, pp.17-19).

– 3% of electricians and 2.1% of carpenters are women in the US (US Census Bureau cited in Toppin, 2018, p.70).

This is consistent with international trends (Blau, Brummond, & Yung-Hsu Liu, 2013; International Labour Organisation, 2016). The available evidence shows that the main pipeline to male-dominated trade apprenticeships and traineeships— that is, VET courses—are overwhelmingly male (NCVER, 2014; 2015). VET in Schools (VETiS which is nationally accredited VET programs that enable students to complete their secondary school certificates) also features significant gender inequalities. The gender gap in enrolments in VETiS programs in Australia has been increasing over the past 10 years, with 17000 more male students enrolled than female students (Misko, Korbel & Blomberg 2017, p.24). While the great majority of VETiS students do not end up in trade occupations, of those who do, males are over six times more likely than females to enter the trades (Misko, Korbel & Bloomberg, 2017, p.11).

There is concern about the low status, relatively low enrolments and completions and lack of understanding of trades and VET generally in Australia (Dommers., Myconos., Swain., Yung, & Clarke, 2017). Young people are often encouraged to aspire to the perceived higher status career pathways that a University education is seen as providing (Sikora & Pokropek, 2012; Gore et al., 2017). Misconceptions and low status of VET and the trades, low and declining enrolments are also reported to be growing in European nations (Bridgford, 2016; Hoffman & Schwartz, 2015). It is reported that in Switzerland, Germany, Austria, Denmark and Norway upper secondary school student participation in VET systems is declining from internationally high benchmarks of between 30 and 70 percent of students (Hoffman & Schwartz, 2015, p.18).

Male-dominated trades are generally higher paid than the female-dominated trades and can offer opportunities for enhanced economic security for women (Struthers, 2016). Women are breaking through the ‘glass ceiling’ in pursuit of male-dominated professional courses and careers in areas such as law, medicine, accounting, and management roles (Blau et al., 2013; Workplace Gender Equality Agency, 2018), but no similar progress exists in the blue-collar occupations including, trades (Blau et al., 2013). Evidence continues to reveal that deeply embedded gender stereotypes and cultural, industrial and economic barriers inhibit the entry of women into male-dominated VET courses that lead to trade qualifications (economicSecurity4Women, 2014; Human Rights Commission, 2013; Trade Union Congress, 2013). Fundamentally unless young women themselves see low female participation in male-dominated trades as a problem, little is likely to change. Ground-breaking research on apprenticeships in the UK over a decade ago showed that strategies to counter barriers to
Young women’s views on male-dominated trades

non-traditional apprenticeships had largely failed and as young people show little concern about the segregation of trades (Fuller, Beck & Unwin, 2005).

1.1 Purpose of the Research

This research explores the barriers that limit female participation in the male-dominated trades—with a focus on the views of young women. The aim is to formulate strategies that can be enduring and effective in increasing female participation in male-dominated VET trade courses and trade careers. This paper draws selectively from the research findings to promote strategies that target the VET system.

1.2 Research Questions

This research, including the literature review addressed the following questions:

1. What is the extent of gender segregation in vocational education and training (VET) and typically male-dominated trades in Australia, and how does this compare internationally?

2. Why do very few female students choose male-dominated trades as their job pathway?

3. What can be done, particularly in the education and training sectors, to increase female interest in, and take-up of, the male-dominated trades?

2 Why Increased Female Interest and Participation in the Male-dominated Trades Matters?

Gender segregation of the trades matters to industry, the economy and women. Low female workforce participation rates, and the segregation of women into existing female-dominated industries contributes to labour market rigidity, suboptimal productivity, and economic inefficiency due to the lack of utilisation of the skills of women (Human Rights Commission, 2013; Toohey, Boak & Borkin, 2014), and increased labour costs due to skills shortages (Minerals Council of Australia, 2013). The benefits that could accrue from increased representation of women in male-dominated industries are stated by Toohey et al., (2014) as:

Accessing the talent of highly educated and skilled labour already resident in Australia should help lift aggregate productivity, contain wage growth, assist in lowering the future strains on the pension system and importantly help engender a more diverse workplace and a fairer society (p. 9).
Similarly in advocating for more women and less discrimination in the European construction industry, Liebus (2016) stated that: “…promoting gender equality is not only a driver for economic growth but also a fundamental value of the European Union” (p.1). In developing and advocating A European Quality Framework for Apprenticeships, the Confederate Syndicate European Trade Union and Union Learn with the TUC (Bridgford, 2016) recommended that the framework feature equal opportunities for all in recognition of the under-representation of women and ethnic minorities in male-dominated trades. This union/industry alliance reported on the challenges that result from declining apprenticeship numbers across Europe and under-representation of young women and young people from ethnic minorities. Skills shortages are evident or are projected in many trade areas in Australia and overseas. Attracting and retaining underutilised sources of talent, including women, are recognised strategies to address skills shortages (Minerals Council of Australia, 2013; Toohey et al., 2014). In asking who is going to build the ‘Trump’ wall given construction skills shortages in the US, Toppin (2018, p.73) argued that trades and trade training need to be viewed not as “menial, but meaningful” to increase the supply of building trade workers — particularly more women and people of non-Anglo cultures. To enhance the economic opportunities for young women, improved access to education, higher remuneration for feminised work, and pathways into higher paid male-dominated occupations, including trades, are all worthy of attention. The experience of young women is that far too many exist on the fringes of the labour market where they are underemployed, in low paid, or insecure work (ILO, 2016). The focus on the views of young people in this is research is guided by evidence indicating that interventions that actively inform and engage young people as agents of change not simply targets for change can be effective (United Nations Development Program, [UNDP, 2018). Elevating awareness of the male-dominated trades among young women and translating the findings of this research into strategies for the VET sector, schools, industry and government was a priority of this research from the outset.

3 Theoretical Framework

In acknowledging that inequality in the labour force is primarily a function of the unequal access to capital, and resources and other oppressive forces that are at the foundation of all communities (Acker, 2011; Walby, 1986), feminist scholars argue that gender-based occupational segregation is a product of the long-standing impact of male-dominated culture and organisations; the dual role for women as workers and primary carers, the lack of affordable child care and choice that many women experience (Adkins, 1994; Walby, 1986). The persistent division of work along gender lines continues to be reinforced in the labour market, education and training sectors by the pervasive influence of gender role stereotyping in popular media and culture (Gadassi & Gati, 2009; Sikora & Pokropek, 2012; Smith, S.L., Choueiti,
Young women's views on male-dominated trades

Prescott., & Pieper, 2012). Gender essentialist views, which see women as being innately more competent than men in services, nurturance and social interaction, and men as being more adept at problem-solving, analytical skills and complex abstract reasoning than women (Charles & Grusky, 2004) are embedded in Western culture. This serves to deter women from careers in the male-dominated trades. The influence of gender has been considered influential in the career aspirations and pathways of young people with gender differences in subject and career choice forming by year 10 among secondary school students (Rogers & Creed, 2011; Sikora & Pokropek, 2012). Gender stereotypes continue to have a profound influence on the confidence and the self-efficacy young people have in relation to careers and the pursuit of Maths. Maths is considered a pre-requisite for non-traditional careers, yet fewer female students than males pursue to a high level in school (Gore et al., 2017; Sikora & Pokropek, 2012).

International and Australian studies have reported that career options presented to female students are narrow and discourage the pursuit of non-traditional subject and occupational choices (Fuller et al., 2005; International Labour Organization, 2009; Shewring, 2009). In Australia there has been substantial public attention and policy action to promote science, technology, maths and engineering for both boys and girls. Maths and science are pre-requisite subjects for entry into male-dominated trades courses. In Australia it is reported that: “Despite numerous government-led initiatives to balance gendered participation in the STEM workforce, the gender disparity has remained a persistent trend over many years” (Spearman & Watt, 2013, p.125). It is recognised that children develop a gender schema of appropriate masculine and feminine behaviours that they learn and that if girls valued and were encouraged in to male-dominated STEM subjects and careers at an early age, “…their self-efficacy for these subjects will improve” (Spearman & Watt, 2013, p.178).

Systems theory (Friedman & Allen, 2011) is applied in this research as an organising framework to analyse the structural and individual level factors that interact and serve as barriers that limit female participation in the trades. Within a systems approach, the Social Ecological Model (SEM) (UNICEF, 2015) provides five levels to target — individual, interpersonal, community, organisational and policy/enabling environment—to identify and analyse the multi-level factors that contribute to public issues. As a systems approach, SEM (UNICEF, 2015) provides the framework for the discussion and action arising from this research.

Making the Case for Change

The need to tackle gender-segregation of the trades has been raised over many years (Shewring, 2009; Human Rights Commission, 2013; economicSecurity4Women, 2014; Wright & Conley, 2018). It has not yet captured the sustained, high level attention that “troublesome” issues attract. Agenda-building theory Cobb and Elder (cited in Maddaleno & Beinhauer, 2005) explains how public interest in issues can be generated, particularly through evidence
and media, to mount pressure and elicit action from decision-makers. Social problems attract public action and policy change when they are considered "troublesome and in need of repair" (Loseke, 2003, p.14 cited in Wanna., Butcher., & Freyens, 2010, p.64). To be successful in "claims-making" on decision makers—activists must be persistent, provide evidence that a social problem exists, and evidence that economic benefits that can be derived from addressing it (Loseke, 2003, cited in Wanna, et al., 2010, p. 64). To date action has been wide-ranging but not sustained and organised. Diversity management in industry tends to be relied upon as a panacea to reduce occupational segregation. The critical diversity management studies claim that it can be driven more by business-led than equity or social justice goals and that it has limited capacity to tackle occupational segregation (Healy, 2015; Knights & Omanovic, 2016; Sharp., Franzway., Mills, & Gill, 2012; Strachan., French & Burgess, 2010).

This research is motivated by a desire to strengthen the claim that the removal of structural barriers contributing to gender segregation of the trades requires renewed, high-level action and collaboration among VET, school, industry, trade union and government sectors.

4 Research Design and Methods

This article focusses on two areas of inquiry from the research: (1) the quantitative data collection to determine the extent of gender segregation of the trades and VET courses and (2) the qualitative data is selectively analysed to draw out the issues most relevant to the VET sector.

Quantitative Data Collection: Women in male-dominated trades in Australia

In order to determine the extent of gender segregation of the trades in Australia the Australian Bureau of Statistics (ABS) labour force trade composition data from 1994 to 2014, and the National Centre for Vocational Education Research (NCVER) vocational education course data sets were analysed. As both sources of data do not routinely disaggregate the enrolment and completion data by qualities such as gender or cultural background, the gender data reporting was manually extracted. The male-dominated electro-technology, automotive, mining, manufacturing and construction industries were selected for analysis. This lack of detailed and routine gender disaggregation of trades and trade course data is in itself problematic. It serves to mask, rather than expose the inequality.

Qualitative Data Collection

Focus group interviews of one hour duration were conducted with 68 secondary students aged 15–18 years at four schools in geographically disperse, but primarily working class areas of Queensland, Australia in 2013 and 2014. Female and male students were invited by staff,
but only four boys in total participated. To complement and give context to the views of students, seventeen staff were also interviewed individually or in small groups at these schools. In addition, eleven career advisers, vocational educators and industry representatives from a number of regions across Australia were interviewed to provide their views on barriers and opportunities to the take-up of male-dominated trades by women. Ethics clearance was granted by Griffith University on November 11, 2013 (GU ref No./35/13HREC).

The specific questions in the interview schedules canvassed the views of participants on why so few female students pursue male-dominated trade courses and careers; how female students perceive the trades; whether the low female participation is a concern for them, and what action, if any, can be taken to increase female entry into male–dominated trades. This narrative data was subject to thematic analysis to identify both common and disparate themes. Four themes are selected from the qualitative analysis for discussion in this article. They are selected on the basis that they capture factors that both contribute to, and can overcome, low female participation in male-dominated trades and they are relevant to the VET sector.

5 Research Findings

Quantitative Data — Persistent Low Female Participation

The results of the data analysis show the pattern of low female participation in the male-dominated trades has been consistent over the past two decades at 2% or less, with little sign that increasing numbers of women are in the supply pipeline to these trades.

Table 1: Females Employed in Selected Trade Occupations: Australia, 1994–2014

<table>
<thead>
<tr>
<th>Occupation</th>
<th>1994</th>
<th>2004</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td></td>
<td>females</td>
<td>total</td>
<td>females</td>
</tr>
<tr>
<td>Automotive and Engineering Trade Workers</td>
<td>3,455</td>
<td>(1.1)</td>
<td>4,055</td>
</tr>
<tr>
<td>Construction Trade Workers</td>
<td>2,380</td>
<td>(1.7)</td>
<td>1,665</td>
</tr>
<tr>
<td>Electro-technology, Telecommunications Trade Workers</td>
<td>2,200</td>
<td>(1.6)</td>
<td>2,673</td>
</tr>
</tbody>
</table>
The actual number of female trade workers in 1994 in automotive and engineering (3,455) and construction (2,380) was higher than those in 2014 (2,069 and 1,529 respectively). The data analysis of vocational courses indicates that the pipeline for females to the trades is severely blocked. The manual disaggregation by gender of National Centre for Vocational Education Research (NCVER, 2014) data for the period 2000–2014 showed that the number of female students enrolled in school-based and post-school male-dominated trade courses is very low. The school-based manufacturing and automotive courses showed higher enrolments of females (13% and 6.8% respectively) than other courses, and some growth since 2006.

Table 2: Apprentices and Trainees within Selected Major Industry Skills Councils: Australia, 2004-2014

<table>
<thead>
<tr>
<th>Major Skills Council</th>
<th>2004</th>
<th></th>
<th>2014</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of males</td>
<td>No. of females</td>
<td>% females</td>
<td>No. of males</td>
</tr>
<tr>
<td>Construction and Property Services</td>
<td>45,368</td>
<td>7,607</td>
<td>14.36</td>
<td>64,382</td>
</tr>
<tr>
<td>E-Oz Energy</td>
<td>22,417</td>
<td>264</td>
<td>1.2</td>
<td>43,393</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>41,128</td>
<td>3,909</td>
<td>8.6</td>
<td>58,543</td>
</tr>
<tr>
<td>Auto Skills Australia</td>
<td>39,787</td>
<td>1,699</td>
<td>4.1</td>
<td>38,981</td>
</tr>
<tr>
<td>Community Services and Health</td>
<td>3,213</td>
<td>21,233</td>
<td>86</td>
<td>4,805</td>
</tr>
</tbody>
</table>
Young women’s views on male-dominated trades

Source: Extracted from NCVER Apprentices and Trainees Collection, March 2014. Retrieved September 6, 2014 from VOCSTATS via registered log-in (cited Struthers, 2016). https://www.ncver.edu.au/wps/portal/vetdataportal/data/menu/vocstats. Source table did not include percentages. These have been calculated manually. Note: Administrative collection on apprentices and trainees. Sourced by NCVER from state training authorities via Australian Apprenticeship Centres. I take responsibility that the information obtained from VOCSTATS is appropriate for its intended use.

Qualitative Data — “we feel intimidated.”

Most of the young women in this research indicated that they would feel intimidated in mostly male trade courses. Very few said they or their peers intend to pursue VET courses or careers in male-dominated trades. The young women as well as the VET, school and industry stakeholders described a common public view that “trades are not as good as uni.” They acknowledged that schools, parents and the community can discourage young women from pursuing trades by giving higher status to academic careers over VET and trades. Four major themes emerged from the interviews that showed the scale of the barriers that limit female enrolment in male-dominated VET trade courses and apprenticeships. These are discussed below:

The powerful influence of gender stereotypes on careers. The students recognised that gender stereotypes and other barriers deter female participation in trades in construction, the auto-industry, electro-technology manufacturing and other male-dominated industries. Comments like: “trades are jobs for the boys who don’t do academic” were common at each school. Students raised the roles played by media, popular culture and people around them in determining what professions are mostly women’s or men’s work. Their comments were consistent with the literature showing that gender stereotypes significantly impact male and female students’ career decision-making and limit choices (Sikora & Pokropek, 2012; Gadassi & Gati, 2009).

The lack of information about VET and male-dominated trade courses. Female students showed a lack of knowledge of male-dominated VET courses and trades, and few had handled trade tools. One student suggested that: “More girls would do it [male-dominated trades] if we knew more about it—if we had a lot more exposure to it to find out what it’s really like.” A number of students expressed interest in knowing more about the trades and having mentors. The exceptions were cases where the female students worked alongside a “tradie dad” or family member who encouraged them to use tools and undertake a trade career, giving them confidence in their trade skills and identity. The students’ reported that staff at their school were generally helpful in providing career information and opportunities, but it was apparent from the limited knowledge that students had of the male-dominated trades that
few students in the groups were seeking out external sources of information or experiences of these trades.

**Intimidation and harassment.** Students generally agreed that a wide range of opportunities are available to them, yet many female students said that they “cop flak” or they would feel intimidated for pursing a male-dominated VET pathway. This was expressed in a student comment as: “Only one or two girls do it, and you feel intimidated.” At each of the four secondary schools participating in this research, the number of female students enrolled in VETiS courses, such as construction, ranged from one to five out of classes that comprised up to 25 students. Another student raised the self-esteem and confidence of female students:

> Girls under-estimate themselves . . . It is stereotyped as a female thing to be in an office, or hairdressing . . . girls don’t think they can do it [the male-dominated trades]. If they walk into class full of males, they will feel intimidated.

**Incongruence with female identity.** For some female students the male-dominated trades were incongruent with their own feminine identity or sense of their capabilities. Some female students expressed a fear of being harassed or labelled gay if they pursue male-dominated VETiS courses. This was expressed by one student as: “If you go into those trades, you lose some of your femininity . . . that’s important to girls . . . you get called butch or a tomboy.” Another female student expressed a more confident view of herself and the capabilities of girls, saying: “They [boys] are more scared we are going to show them up. They are already competing against each other, let alone a girl in the room.” The protection of female identity and hetero-normative view of sexuality and identity was pronounced in this group with the fear of being lesbian or butch acting as a deterrent to male-dominated trades. In exploring issues for women of non-conforming sexual identity in her research, Wright (2011, p.182) exposed the intimidation and other challenges these women face being “one of the lads” in a male-dominated industry.

**VET, education and industry stakeholder views**

VET and school educators, career advisors and industry personnel—were also interviewed to provide contemporary context, and validation of the student views, on what programs and support is available for students to pursue non-traditional career pathways. The stakeholders acknowledged that “only a handful” of female students schools pursue male-dominate VET courses in construction, mechanics and other male-dominated trade areas. They expressed concern that parents and the community generally hold University courses and professional careers in high esteem relative to trades and VET courses. Like the students, they also said that trades continue to be seen as jobs for boys, and that girls are at risk of intimidation and harassment if they pursue a male-dominated trade. Consistent with research, several adults suggested that female students are weighing up how well they may achieve in a non-traditio-
nal role (their self-efficacy), whether they can do it, and how it would affect their self-identity (Rogers & Creed, 2011). Comments included:

- “Trades are seen as an under-qualification...the exception is parents who have trade experience.”

- “Trades, that’s seen as being for kids who aren’t academic...but in fact you have got to be smart to do a trade” and “It’s a hands-on job, doesn’t mean you don’t use your head.”

- “Gender stereotypes are still there...you constantly have to open their eyes, alert them to possibilities...stereotypes are set by Year 10, and mostly girls would not even consider a trade.”

- “Year 8 boys and girls are segregated straight up—boys primarily into [industrial learning technologies] and girls into [home learning technologies].”

The views of adult stakeholders affirmed the research findings (Sikora & Pokropek, 2012) that gender stereotypes of work are set by Year 10 and that Maths is an essential subject choice for the pursuit of a male-dominated career. The significance of Science Technology Engineering Mathematics (STEM) as a prerequisite for male-dominated VET courses and trades was raised by adult stakeholders, but the students showed little understanding of this requirement. School-based educators and career advisors expressed the limited capacity they have to overcome the influence of media and popular culture in determining what are acceptable male and female behaviours, identities and career aspirations. In addition, school staff indicated that most schools have limited career advice staff and dedicated VET advisors to organise “try-a-trade” days, trade work advice and opportunities for male or female students. The staff who seek to encourage non-traditional course and career choices for students through events, industry mentors and work experience, indicated that much of their own (not paid work) time is allocated to these tasks. It was instructive to hear industry representatives cite the need for national industry strategies, early careers learning, advertising and programs that influence and excite female students and women about the possibilities male-dominated trades offer. These stakeholders were active in, or aware of the benefits of systemic strategies, with high level co-ordination and collaboration. They recommended that collaboration, with government, VET, schools and industry support was needed to generate positive change.
6 Discussion: Action for Change in VET and Beyond

This research affirmed that many barriers deter female students from pursuing VET courses in male-dominates trades and trade careers. There were encouraging signs that if the young women knew more about male-dominated trades, and if they could feel less intimidated by gender stereotypes, they may well be more likely to consider pursuing VET courses and careers in male-dominated trades. While gender stereotyping of careers remains so pervasive, the pool of female students who are interested in pursuing a VET course or career in male-dominated trades, will remain extremely small. The entrenched low female composition of the male-dominated trade sectors at around 2%, and low numbers in the training 'pipeline', indicate that an expanded pool of female trade-qualified workers is a long way from being realised. Gender-essentialist views that distinguish careers as primarily male or female continue to act as barriers to girls having interest in careers in electro-technology, automotive, construction and other trades that are deemed typically male (Sikora & Pokropek, 2012). There is a place for increased partnerships between the VET sector, schools and industry to inform, excite and ultimately engage more female students in school and post-school VET courses that lead to qualifications in male-dominated trades. No specific sector or organisation is assuming responsibility for action to reduce gender segregation of the male-dominated trades. No one sector, including the VET sector, will be effective acting in an adhoc, isolated manner. In drawing on agenda-building theory Cobb and Elder (cited in Maddaleno & Beinhauer, 2005) to build momentum for change on this issue, ongoing evidence of the benefits that result from having a higher proportion of women in male-dominated trades and ongoing advocacy are needed. Expanding the pathways for girls into male-dominated trades is worthy of nation-wide attention. Priorities in a nation-wide strategies could include:

- More systemic action across industry, unions, VET and school sectors, career advice and government that is sustained and resourced (economicSecurity4Women 2014; Shewring, 2009; Struthers, 2016; Wright, 2011, 2014). This could usefully include industry and VET strategies with aspirational targets, such as increasing female participation in male-dominated VET courses and trades by ten percent in ten years.

- More gender aware education, training policies and early years career interventions that elevate the importance of STEM subjects for female students, encouraging more to pursue male-dominated occupations, including trades (National Union of Teachers, 2012; Sikora & Poropek, 2012).

- Active promotion of equal opportunity and diversity strategies in male-dominated trade sectors that are driven by economic and social justice objectives.
- Expansion of advertising campaigns, mentoring and school-based trade work experience that can engage young women in male-dominated trades.

- Reporting of gender disaggregated data on trade courses and apprenticeships to monitor progress (economicSecurity4Women, 2014).

The SEM model is instructive in showing the multi-sector action that is required by activists and “claims-makers” in VET, schools, unions and industry to increase female participation in the male-dominated VET courses and trades. It is adapted in this article to provide some impetus for strategy and action in and beyond the VET and school sectors.

Table 3: Women into Trades — A Multi-Sector Strategy. The Social Ecological Model as applied to gender segregation of the trades.

<table>
<thead>
<tr>
<th>SEM level</th>
<th>Areas for analysis and action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>Provide more non-gendered career information, Try-a-Trade and related experiences for female students. Begin in early years of education.</td>
</tr>
<tr>
<td>Interpersonal</td>
<td>Foster more student peer support systems that encourage and reward female students in male-dominated VET courses.</td>
</tr>
<tr>
<td>Community</td>
<td>More VET and school partnerships that inform and encourage female participation in male-dominated VET trade courses. Promote positive role models, positive views of VET and male-dominated trades and media that is gender inclusive.</td>
</tr>
<tr>
<td>Organisational</td>
<td>Establish a multi-sector national industry strategy, with leadership and accountability (from VET and school sectors, trade unions, industry leaders and government) to promote economic benefits of increased female enrolment in male-dominated trade courses and apprenticeships. Government to improve awareness and accountability by routinely collecting and reporting on gender disaggregated VET enrolment and trade composition data.</td>
</tr>
<tr>
<td>Policy/enabling environment</td>
<td>Local, state, national laws, policies and plans to promote gender equality, diversity and inclusion in schools, VET and trades. Consider application of female enrolment targets in male-dominated VET courses and trade careers; public procurement policies to promote industry employment of women in male-dominated trades and workforce composition reporting requirements (and penalties for non-compliance) on industry</td>
</tr>
</tbody>
</table>
It is critical that further research continues to illuminate and elevate the issues associated with gender segregation of VET trade courses and the trade careers. It is particularly important that the perspectives and experiences of young people continue to guide policy and action. A limitation of this research is that with a relatively small sample of students, the results cannot be generalised to a wider population of young people. Youth surveys or interviews with a much larger population may be beneficial in gaining a wider, more representative, sample and in engaging more young people on the issue of low female representation in the trades.

7 Conclusion — A Role for VET and Young People

Importantly the VET sector can play a leadership role in elevating and responding to the challenge of increasing female participation in male-dominated trades. Ultimately little change will occur unless young women break through misconceptions of the trades and become aware that careers in male-dominated trades can be rewarding and impact positively on their economic security. The goal is for young people—from all socio-demographic, academic and cultural backgrounds and gender—to have full opportunities for economic security and job satisfaction. Collaboration between VET, industry, schools and trade unions is needed to develop targeted strategies aimed at increasing female participation in the male-dominated trades. In future young people need to be free to choose from the full range of careers, and not the gendered range that has been cultivated in books, media screens, toys, and magazines.

References

Australian Bureau of Statistics (2014) Australian Bureau of Statistics Employed persons (STE08) by Occupation (ANZCO occupation) and Sex, August 1991 onwards. Labour Force, Australia, De-
Young women’s views on male-dominated trades
Struthers, Strachan


Biographical notes

Dr Karen Struthers is a Research Fellow (casual), School of Human Services and Social Work, Griffith University, Queensland, Australia. Dr Struther’s research interests focus on occupational segregation and young people as agents of change.

Professor Glenda Strachan is Professor Emeritus in the Department of Employment Relations and Human Resources Griffith University, Brisbane, Australia. Her research interests centre on contemporary and historical workplace change especially issues relating to women's working experience. The impact of organisational and national employment policies, especially EEO and diversity management, is a focus of her work and she has published widely in journals. She is co-author of Managing Diversity in Australia: Theory and Practice, published in 2010 and co-editor of Gender and the Professions: International and Comparative Perspectives, Routledge 2018.
Transition to company-based vocational training in Germany by young people from a migrant background – the influence of region of origin and generation status

Ursula Beicht†, Günter Walden†

†Federal Institute for Vocational Education and Training, 53175 Bonn, Germany

Received: 01.12.2018; Accepted: 04.01.2019; Published: 30.04.2019

Abstract

Context: For young people with a migrant background in Germany transition from school to company-based vocational training is much more difficult than for non-migrants. This remains true, when data is controlled for the lower performance of young migrants in general education. In this paper we investigate if and how far the chances of transition to company-based vocational training and the acquisition of different school leaving certificates depend from the migration generation and the region of origin of young migrants. The question is, if disadvantages of young migrants diminish with a longer stay of their family in Germany and if this is also the case for the different groups of regions of origin (Southern Europe, East Europe, Turkey, other Middle East and North Africa, Other regions).

Approach: We conduct multivariate analyses on the basis of data from the German Educational Panel Study (NEPS). Our analyses relate to young people who left a general education school after Year 9 in the summer of 2011 or Year 10 in the summer of 2012. Our database comprises information provided by a total of 5,952 school leavers.

Findings: For all four origin groups worse chances in comparison to non-migrants were detected. But there are differences in the disadvantages of opportunity between the various groups. They acquire more often lower school qualifications than their counterparts not from a migrant background and also have worse chances than the latter of successfully pro-

*Corresponding author: beicht@bibb.de

ISSN: 2197-8646
http://www.ijrvet.net
gressing to company-based vocational education and training. This applies even if other important influencing factors such as social origin are taken into account. Young people from a Turkish or Arab background have the lowest chances in general education and vocational training. As generation status rises disadvantages diminish for all origin groups, but with different magnitudes. A clear upwards-directed integration can be observed solely for the East European origin group.

**Conclusion:** The results of our analyses signalise a clear need for action on the part of German policy makers and German society to reduce the educational disadvantages suffered by young migrants and to develop an effective support mechanism. Integration is rarely achieved in the short term. It is a long-term task which frequently extends over several generations.

**Keywords:** Access to education and training, ethnicity, migrants, educationally disadvantaged, transition from secondary to further education and training, school leavers, quantitative research, vocational education and training, VET

### 1 Introduction

Migrants and their descendants represent growing proportions of the population in many Western countries. The greatest possible educational success is of crucial significance to the integration of migrants into highly developed Western societies. When comparing the educational success of migrants and their descendants with that of the indigenous population, numerous investigations looking at various countries have arrived at the conclusion that the outcomes achieved by persons from a migrant background are poorer in average terms. Examples of countries for which such studies have been conducted include France, Switzerland, the Netherlands and Germany (e.g. Azzolini & Barone, 2013; Heath, Rothon, & Kilpi, 2008; Jackson, Jonsson, & Rudolph, 2012; Phalet, Deboosere, & Bastiaenssen, 2007). Nevertheless, such a finding does not apply consistently to all Western host countries that have formed an object of consideration in this regard. In the USA, children of migrants often enjoy advantages over children with no migrant background in the school system (e.g. Chiswick & Deb-Burman, 2003; Ryakov, 2009). A similar circumstance pertains in Canada (Picot & Hou, 2011).

If we look at the countries of origin of migrants, major differences in educational success can be identified between individual origin groups (e.g. Algan, Dustmann, Glitz, & Manning, 2009; Domingues Dos Santos & Wolff, 2011; Dustmann, Frattini, & Lanzara, 2012). Alongside country of origin, relevant studies also often identify the generation status of migrants as an important influencing factor for educational success. The tendency is for disadvantages
in the educational system to fall off in the second immigration generation as opposed to the first (Algan et al., 2009; Azzolini & Barone, 2013).

If we consider besides the general education system vocational education and training, migrants are also often at a disadvantage compared to the population with no migrant background (Tjaden, 2013). The dominant role within the German VET system is played by dual training, where the learning venues are the company and the vocational school. This is the most significant vocational education and training sector in the country, and the awarding of training places is usually decided by the companies. For this reason, the system is frequently referred to as “company-based training”. More than half of all young people pass through this training system. To this extent, it plays a prominent part in the integration of young migrants into German society.

In Germany, no formal minimum requirements regarding the level of school qualification to be achieved are stipulated for entry to company-based training. For this reason, young people aspiring to enter dual training hold very different types of school leaving qualifications. These range from no certificate at all to a higher education entrance qualification. However, most of those interested in pursuing training hold a school leaving certificate at lower secondary level. A distinction in this regard needs to be drawn between the basic lower secondary, the qualifying lower secondary and the intermediate secondary school leaving certificate, which represents a further and higher level compared to the two other versions of the lower secondary school leaving certificate. The chances of making a successful transition to company-based vocational education and training depend significantly on the level of school qualification achieved. The transition from school to vocational education and training does not always run smoothly, particularly for young people with lower levels of prior school learning.

Many existing studies show that young migrants in Germany have significantly more difficulties than young people not from a migrant background in entering vocational training upon completion of general schooling (for a summary, see Beicht & Walden, 2017b). The school qualifications of migrants are an important reason for this. Germany is one of the countries in which young people from a migrant background achieve significantly worse average outcomes in general schooling than the non-migrants. This is borne out by several investigations (Kristen et al., 2011; OECD, 2018b). The aim of the present paper is to expand the status of research relating to the transition from school to VET by young people from a migrant background in Germany. We address the issue of the significance that can be accorded to the influencing factors of “region of origin” and “generation status” with regard to successful transition to company-based training. These are aspects that have been identified as important in international comparative terms.

In 2015, as many as 29% of young people in Germany aged between 15 and 20 were from a migrant background. Young migrants in Germany represent a highly heterogeneous group.
Particularly high proportions of this body of persons are formed by descendants of so-called “guest workers” originally recruited from southern Europe and Turkey and by young people from “late resettler” families (immigrants of German descent from the successor states of the former Soviet Union and other eastern European countries). In addition to this, increasing numbers of persons of Arab or African origin have been arriving in Germany over recent years. Because immigration began over 50 years ago, young people who immigrated themselves find themselves alongside second or third generation descendants of immigrants in the educational system as they attempt to make the transition from school to VET or to the world of work. A large majority of young migrants has already got German citizenship.

We will begin below by looking at existing research results relating to the significance of region of origin and generation status for educational success and transition to company-based training before moving on to specify the issue at hand and formulate hypotheses. The fundamental data and the methodological approach adopted will then be explained, and the results will be presented. The paper ends with a summary and conclusions.

2 State of research

2.1 Reasons for differences in educational success between the non-migrants and migrants and between various origin groups

The introduction has already indicated that young people with a migrant background are more likely than non-migrants to exhibit poor educational outcomes. At the same time, there are also substantial differences between individual origin groups. In Germany, lower average levels of educational success are recorded for all origin groups when compared to non-migrants (Algan et al., 2009), but average performance by migrants from a Turkish background is worse than that of other origin groups (Algan et al., 2009). But young people of eastern European origin are most likely to progress to VET. Younsters from a Turkish or Arab background are the group least likely to achieve this progression (Beicht & Walden, 2014).

Why are there such major differences between individual origin groups amongst migrants? At first reasons for differences in educational success between migrants and non-migrants and between various origin groups could be connected with the characteristics of particular individuals and groups. One explanation has its basis in the social position which migrants (or their ancestors) occupied in their respective countries of origin. Individual origin groups may differ with regard to the structure of original social positions. Existing investigations show a positive correlation between the social position of migrants in the country of origin and the educational success achieved in the host country (Feliciano, 2005, 2006; Ichou, 2014).

Chiswick indicates that unequal levels of educational success may possibly be explained by different educational preferences of various groups that have come about for cultural, reli-
gious and historical reasons, and by the fact that migrants often have a lower average socio-economic status and are thus over-represented in disadvantaged groups of persons (Chiswick 1988, cited here from Domingues Dos Santos & Wolff, 2011). Many investigations show that migrants frequently achieve lower incomes or a lesser social status than persons not from a migrant background (e.g. Chiswick & Miller, 2009). Social origin continues to exert a formidable influence on educational success in Germany, and migrants are more likely to come from parental homes which have a lower social status. The higher the social class, the better educational success is likely to be in general terms (e.g. Ditton, 2008). With regard to the transition to company-based training in Germany, the main influence of social origin is revealed in the general school qualification achieved (e.g. Beicht & Walden, 2015a).

The classical distinction between primary and secondary effects of origin drawn by Bou-don (1974) lends itself to a consideration of individual or group-related factors to explain the lower educational chances of migrants. Primary effects of origin designate the impacts of the parental home on educational success of children. Secondary effects of origin are considered to be variances in educational decisions made by different origin groups where the educational status of the children is equal.

Primary effects of a migrant background initially relate above all to mastery of the language of the host country (Heath et al., 2008). Primary effects are mainly reflected in the educational success of migrants in general schooling. Educational qualifications obtained at school may have a major influence on the chances of making the transition to vocational education and training. At the transition to company-based training, primary effects of origin represent the different resources available to applicants for a training place. The resources that young people from a migrant background have at their disposal are worse in overall terms. This circumstance, and their lower school qualifications in particular, play a considerable role in explaining differences vis-à-vis non-migrants (e.g. Beicht & Walden, 2014; Hunkler, 2014). However, even if for school qualification and further resources possessed by the young people are controlled, the indication is still that migrants have lower chances of making the transition to company-based training (Beicht & Walden, 2014; Eberhard, 2012).

It is likely that secondary effects of origin are also significant to the different chances of migrants and non-migrants at the transition to vocational education and training. Secondary effects of origin relate to differences in educational decisions and occupational preferences between young people whose school qualifications are the same. Numerous investigations conducted have indicated that migrants in Germany display a slightly lower level of interest in company-based vocational education and training than non-migrants (Beicht & Walden, 2017a). It is possibly the case that migrant families are unable to assess the value of a dual training qualification correctly because they are usually unlikely to be familiar with such a training system in their countries of origin. Although migrants generally have high educational aspirations (e.g. Ichou & Vallet, 2013; Jackson et al., 2012), in Germany these tend to
relate to general educational qualifications and courses of higher education study rather than being directed towards vocational education and training (Becker, 2011).

There are probably also differences in the occupational preferences of migrants and non-migrants. Existing studies show that migrants are significantly more likely than non-migrants to aspire to service occupations with higher social prestige but in which the prospects of obtaining a training place in Germany are generally lower than in manufacturing occupations (Beicht & Walden, 2015b). Nevertheless, there is also evidence that chances of progression to company-based training for migrants are also lower if the varying occupational preferences are taken into account (Beicht & Walden, 2015b).

Alongside the individual or group-related factors stated, reasons which need to be sought in external conditions may also play a role in terms of the differences in educational success. One particular aspect to be addressed in this regard is possible discrimination in the host country. The probability of this may, however, also be different for individual origin groups (e.g. Chiswick, 1988). With regard to the transition to company-based training, the specific focus is on the recruitment behaviour of companies, which are autonomous in respect of their decisions on selection of trainees. In this case, a distinction needs to be drawn between statistical discrimination (Spence, 1973; Thurow, 1979) on the basis of the signal effect created by the lower level of prior learning of migrants seeking to enter training and other forms of discrimination. It is also possible, for example, that existing xenophobic and racist attitudes within the population exert an impact on the recruitment behaviour of companies. Basing their work on the critical race theory approach developed in the USA, Chadderton and Wischmann (2014) emphasise the significance of racism, including for school and apprentice training in Germany and England.

2.2 Reasons for differences in educational success by generation status of the migrants

To which extent is educational success affected by the circumstance of whether persons are immigrants themselves as opposed to a situation where they or their parents were actually born in the host country? Studies from many countries show that educational success for migrants often increases in line with rising generation status (e.g. Dustmann et al., 2012; OECD, 2018a). The expectation that integration will become closer as a longer period of time is spent in the host country is in accordance with so-called classical assimilation theories, such as those formulated by Glazer and Moynihan (1963) and Gordon (1964). As Brown and Bean (2006) explain, classical assimilation theories assume that the process of adaptation to the host society will increasingly progress over the course of time as convergence to the norms and modes of behaviour in the host country takes place. Particular consideration in this regard is accorded to mastery of the language of the host country (e.g. Esser, 2006). Alba and Nee (2003) emphasize the role of institutions in their „new assimilation theory“.
In some works relating to the assimilation theory doubt is cast on classical assimilation theory pursuing the idea of segmented assimilation (e.g. Portes & Zhou, 1993). The latter theory states that there may be three different longer-term development routes for immigrants in the host country. One possible pathway continues to be adaptation to the new society within the meaning of classical assimilation theories. A second possibility is viewed as being socialisation to the lower strata or sub-milieus of the host country. The outcome in this case is a perpetuation of economic decline (Portes & Zhou, 1993). The third route of development in the host country is the achievement of economic success whilst continuing to retain a separate cultural identity and to experience clear segregation from other population groups in the host society (Portes & Zhou, 1993). Portes and Zhou give examples for the USA for all the assimilation pathways stated.

Investigations conducted in Germany show that most origin groups continue along an upwards route if comparisons are made of educational success in general schooling across various migration generations (e.g. Diehl & Granato, 2018). There are, however, indications of patterns of downwards assimilation for young people from a Turkish background (Segeritz, Walter, & Stanat, 2010). An available study on the influence of generation status on the chances of progression to company-based training for migrants comes to the conclusion that a higher generation status improves opportunities for such progression (Beicht & Walden, 2017a). This investigation does not, however, differentiate migrants according to various countries of origin.

3 Questions and hypotheses

With regard to the transition to company-based training, we investigate the extent to which the chances of progression for young people from a migrant background are determined by their region of origin and generation status. We investigate a group of young people who left the general school system after Year 9 or after Year 10, usually having achieved a basic lower secondary, a qualifying lower secondary or an intermediate secondary school leaving certificate. The first question investigated is the extent to which acquisition of a general school leaving qualification – the central factor influencing transition to company-based training – depends on migrant background, various regions of origin and migration generation. We then move on to look at the main issue addressed by the present paper. This is the extent to which influences of a migrant background, migrants’ region of origin and migration generations on progression to company-based training can be identified. Hypothesis 1a: Young people from a migrant background are likely to display lower levels of success in the school system than young people not from a migrant background even if we control for other cause variables.
We adopt the following assumptions with regard to acquisition of a general school leaving qualification.

- Hypothesis 1b: The chances of acquiring higher school qualifications for the group of migrants as a whole should improve in accordance with the principle of upwards assimilation if the family of the young person has spent a longer time in Germany or as the number of migration generations increases.

- Hypothesis 1c: With regard to regional origin, results from other investigations lead us to expect that results will be poorer for young people from the Turkish or Arab region in particular. By way of contrast, results for the other origin groups should not differ significantly.

- Hypothesis 1d: School educational opportunities should improve in all origin groups of migrants as generation status rises.

We make the following assumptions with regard to the transition to company-based vocational education and training.

- Hypothesis 2a: Even if school leaving qualifications and further relevant influencing factors are taken into account, it is likely that lower chances of making the transition to company-based training will be revealed for young people from a migrant background as compared to young people not from a migrant background.

- Hypothesis 2b: We once again assume that classical assimilation theory will be the most probable route of development for migrants in Germany and expect that any reservations regarding company-based training will reduce as the number of migration generations increases, thus leading to a subsequent improvement in chances of achieving transition.

- Hypothesis 2c: Indications already in place (Beicht & Walden, 2014, p. 200) lead us to expect worse chances of progression for young people from all regional origin groups, although opportunities will be poorer for young people from a Turkish or Arab background in particular.

- Hypothesis 2d: Increasing generation status should exert a positive effect on transition to company-based training in all origin groups.
4 Database and methodological approach

We conduct our analyses on the basis of data from the German Educational Panel Study (NEPS) (Blossfeld, Roßbach, & Maurice, 2011). We used the partial NEPS study “Year 9 start cohort”, which collected and continues to collect information on the education and training pathways pursued by young people from Year 9 of general schooling onwards.

Our analyses relate to young people who left a mainstream school after Year 9 in the summer of 2011 or after Year 10 in the summer of 2012. Our database comprises information provided by a total of 5,952 school leavers.

We use regression analyses to investigate the hypotheses formulated in the previous section regarding influence of migrant background of young people on acquisition of school qualifications and on transition to company-based training. The relevant regression models are each calculated four times for this purpose, i.e. using four different variables for migrant background. A brief explanation of these is provided below. In the case of the first variable “migration status”, differentiation is only made on the basis of existence or non-existence of a migrant background. The second variable “generation status” contains four gradations of immigration generation for the group of persons from a migrant background. The 1st generation comprises young people who were born abroad rather than in Germany. The 2nd generation encompasses young people born in Germany whose parents immigrated to Germany. A further differentiation is made as to whether both father and mother were born abroad (Generation 2a) or whether this applies in respect of one parent only (Generation 2b). The 3rd migration generation covers young people whose parents were born in Germany but whose grandparents include at least one person who emigrated from abroad. In the case of the third variable “regional origin”, four regional origins are differentiated for young people with a migrant background. These are southern Europe, eastern Europe/former Soviet Union, Turkey/other Middle East/North Africa and other regions.

Finally, a fourth variable is also considered by dividing the regional origin groups once more by generation status, although Generations 2a and 2b are conflated in this instance. Because sample sizes are too small (fewer than 30), no statements can be made regarding young people from the 3rd generation who originate from Turkey, other Middle East regions or North Africa. All migration variables are based on the migration generation status variables and group of origin variables generated by the NEPS and made available in a scientific use file (SUF) (Olczyk, Will, & Kristen, 2016).

Multinomial logistic regression models (Models A1 to A4) were calculated to test the hypotheses relating to acquisition of school qualifications. The level of school leaving quali-
fication achieved by the young people when leaving the general school system after Year 9 or Year 10 forms the dependent variable. Alongside the respective migration variables, the social origin of the young people, gender and region of residence (western or eastern Germany) have also been included as independent variables. The function of the latter is merely to act as control variables. Social origin of the young people is taken into account via school education of the parents and occupational status of the father (or of the mother if no information is available for the father)².

Investigation of the hypotheses relating to successful transition to company-based training takes place on the basis of binary logistical regressions. Only school leavers who expressed an explicit interest in dual vocational education and training are included in the analyses. Successful transition is deemed to have occurred if young people commenced company-based VET within a relatively short period of time after leaving school in the summer of 2011 or 2012. The cut-off point in this regard is March of the respective subsequent year. All other cases are categorised as unsuccessful transitions. We began by calculating models (Models B1.1 to B4.1) in which social origin of the young people, school qualifications, gender, region of residence, a variable relating to the mathematical competence of the young persons³ and a variable which contains an indicator of the training market situation in the region of residence in the year of leaving school were included as control variables.

Because we know from existing investigations that occupational interests of young people also exert a major influence on successful transition to dual training (Beicht and Walden 2015b, 2017a), we conducted the regression analyses another time using three supplementary variables relating to occupations forming an object of application by the young people (Models B1.2 to B4.2). Firstly, account was taken of the type of these occupations. A distinction was drawn between production and service occupations in this regard. Secondly, we formed a variable which expresses whether the young people were in possession of a school qualification which was a match for the requirements level of the occupations or whether the qualification tended to be too low or too high in this respect. We further included an indicator of the training market situation in the respective occupations. These variables also exclusively fulfil the function of control variables.

Some individual independent variables taken into account in the regression models exhibit a relatively high proportion of missing values. This applies in particular to information regarding the socio-economic status of the father or mother. For this reason, data was supplemented by multiple imputation⁵.

---
² The occupational status of the father or of the mother is mapped using the International Socio-economic Index of Occupational Status (ISEI-08), which is already included as a variable in the NEPS data.
³ In the NEPS, weighted maximum likelihood estimates (WLE) were calculated as estimators of competence. These are available in the SUF.
⁴ In the NEPS surveys, precise information was collected for a maximum of two occupations.
⁵ Analyses including the multiple imputations were conducted using the statistical software Stata (Impute missing values using chained equations). 20 imputations were carried out (m = 20).
The particular characteristics of the sample need to be taken into account when conducting regression analyses on the basis of data from the partial NEPS study “Year 9 start cohort”. It is a disproportionately stratified cluster sample. We therefore used the statistical software Stata to weight the dataset and to take the clustering of the sample into account. We report the results of the logistic regression models calculated as average marginal effects (AME).

5 Results of the analyses

37% of school leavers who exited the general school system in 2011 or 2012 after Year 9 or Year 10 at a mainstream school exhibit a migrant background. One fifth of these young migrants form part of the 1st migration generation, i.e. they were born abroad (cf. Table 1).

Table 1: Young people from a migrant background who left the general school system in 2011 or 2012 after Year 9 or Year 10, differentiated by generation status and by regional origin (distributions in percent)

<table>
<thead>
<tr>
<th>Regional origin</th>
<th>Generation status</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Born abroad (Gen. 1)</td>
<td></td>
</tr>
<tr>
<td>Southern Europe</td>
<td>14.9</td>
<td>14.4</td>
</tr>
<tr>
<td>Eastern Europe, former Soviet Union</td>
<td>57.3</td>
<td>29.0</td>
</tr>
<tr>
<td>Turkey, other Middle East and North Africa</td>
<td>14.3</td>
<td>39.4</td>
</tr>
<tr>
<td>Other regions or not attributable</td>
<td>13.5</td>
<td>17.2</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Regional origin</th>
<th>Generation status</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Southern Europe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eastern Europe, former Soviet Union</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turkey, other Middle East and North Africa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other regions or not attributable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18.1</td>
<td>28.3</td>
</tr>
<tr>
<td></td>
<td>27.4</td>
<td>22.3</td>
</tr>
<tr>
<td></td>
<td>31.2</td>
<td>14.1</td>
</tr>
<tr>
<td></td>
<td>23.2</td>
<td>35.3</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Over half are from the 2nd generation. Just over a quarter can be allocated to the 3rd generation. Two fifths of school leavers from a migrant background originate from families from eastern Europe (referred to below as “eastern European origin”) and around a fifth from families from Turkey, other Middle East and North Africa (referred to below as “Turkish or

---

* For categorical variables, the AME state by how many percentage points the average probability for the event of interest differs in the observed group from the probability of the respective reference group.
Arab background”). The lowest proportion of young migrants is those of southern European origin (16%). A total of 70% of the school leavers from a migrant background learned to speak German in their families whilst they were children. By way of contrast, the remaining group spoke only a foreign language (Table 2).

Table 2: Native language and citizenship of young people from a migrant background who left the general school system in 2011 or 2012 after Year 9 or Year 10, differentiated by generation status and by regional origin (distributions in percent)

<table>
<thead>
<tr>
<th>Native language/nationality</th>
<th>Generation status</th>
<th>Regional origin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From migrant back-</td>
<td>Born in Germany,</td>
</tr>
<tr>
<td></td>
<td>ground in total</td>
<td>both parents</td>
</tr>
<tr>
<td></td>
<td>Born abroad (Gen. 1)</td>
<td>born abroad (Gen. 2a)</td>
</tr>
<tr>
<td>German only</td>
<td>40.7</td>
<td>15.5</td>
</tr>
<tr>
<td>German and foreign</td>
<td>29.2</td>
<td>43.6</td>
</tr>
<tr>
<td>Foreign only</td>
<td>29.2</td>
<td>39.6</td>
</tr>
<tr>
<td>Missing information</td>
<td>0.9</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Source: National Educational Panel Study, Start cohort 4 (10.51.57/NEPS:SC4:9.0.0), calculations by the authors.

As generation status increases, German is more likely to be the native tongue. There are, however, major differences by region of origin. Young people from a Turkish or Arab background are least likely to have learned the German language in their families. Just over three quarters of the young migrants hold German citizenship, although proportions once again vary widely by generation status and region of origin.

5.1 Acquisition of school qualifications

Young migrants are significantly more likely than young people not from a migrant background to leave the school system after lower secondary level with a basic or qualifying lower secondary school certificate. They are also substantially less likely than their non-migrant counterparts to achieve an intermediate secondary school leaving certificate (cf. Table 3). However, school qualifications achieved improve markedly as generation status rises. By the
3rd generation, the average performance of young migrants is just as good as that of non-migrants. School success differs considerably by regions of origin. Whereas young people from an eastern European background are relatively likely to achieve an intermediate school certificate, those of Turkish or Arab origin predominantly leave school with a lower secondary certificate. Comparatively large numbers within the latter group fail to achieve a school leaving certificate at all.

Table 3: School qualification of young people who left the general school system in 2011 or 2012 after Year 9 or Year 10, differentiated by generation status and by regional origin (distributions in percent)

<table>
<thead>
<tr>
<th>School qualification</th>
<th>Generation status</th>
<th>Regional origin</th>
<th>No migrant background</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From migrant background in total</td>
<td>Born abroad (Gen. 1)</td>
<td>Born in Germany, both parents born abroad (Gen. 2a)</td>
</tr>
<tr>
<td>No lower secondary school leaving certificate</td>
<td>3.8</td>
<td>4.2</td>
<td>3.6</td>
</tr>
<tr>
<td>Basic lower secondary school leaving certificate</td>
<td>25.3</td>
<td>33.5</td>
<td>28.6</td>
</tr>
<tr>
<td>Qualifying lower secondary school leaving certificate</td>
<td>15.8</td>
<td>18.4</td>
<td>17.5</td>
</tr>
<tr>
<td>Intermediate school leaving certificate</td>
<td>55.1</td>
<td>43.9</td>
<td>50.4</td>
</tr>
<tr>
<td>Total (per characteristic)</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Weighted results, unweighted sample size 5,952.
Source: National Educational Panel Study, Start cohort 4 (10.5157/NEPS:SC4:9.0.0), calculations by the authors.

Multinomial regression models are now used to investigate whether school qualifications acquired deviate between school leavers from and not from a migrant background and between the various migrant groups even if we control for important further cause variables (cf. Table 4). These models are used to test hypotheses 1a to 1d posed with regard to acquisition of school qualifications.
Table 4: Influences on the acquisition of school leaving qualifications in the case of young people who left the general school system in 2011 or 2012 after Year 9 or Year 10 – results of multinomial regression models (average marginal effects, AME)

<table>
<thead>
<tr>
<th>Socio-economic status of the father (GSEI-06)†</th>
<th>No qualification higher than basic lower secondary school leaving certificate</th>
<th>Qualifying lower secondary school leaving certificate</th>
<th>Intermediate school leaving certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>-0.0792**</td>
<td>-0.0322**</td>
<td>0.0099**</td>
</tr>
<tr>
<td>Place of residence (ref.: Western Germany)</td>
<td>-0.224**</td>
<td>-0.0277**</td>
<td>-0.312**</td>
</tr>
<tr>
<td>Eastern Germany</td>
<td>-1.044**</td>
<td>-0.046**</td>
<td>0.094**</td>
</tr>
</tbody>
</table>

1. Four models were calculated (A1 to A4). These differ only with regard to the socio-economic variables included. The AME shown in this table for the other socio-economic variables refer to Model A1. The AME of Models A1, A2 and A3 only exhibit a slight variance.
2. Results not interpretable because sample size is too low (fewer than 30).
3. Income is the GSEI-06 value by 10 points respectively.
4. Results of multiple imputation estimates (n = 20), weighted dataset (unweighted sample size: 3,838,2).

Significance level * p < 0.1, ** p < 0.05, *** p < 0.01, **** p < 0.001 (two-way test).

Source: National Educational Panel Study, Start cohort 1 (1951-53, NEPS: XI.1-0.6.0), calculations by the authors.

It is revealed that the overall group of young migrants is 5 percentage points more likely than the comparative group not from a migrant background to leave general schooling at lower secondary level with no qualification higher than the basic or qualifying lower secondary
school certificate (see Model A1). By way of contrast, young people from a migrant background are 10 percentage points less likely to achieve an intermediate secondary school leaving certificate. Hypothesis 1a, which assumed lower levels of educational success by young migrants in the general school system, is thus confirmed.

As generation status increases, there is a reduction in the differences that can be identified between young migrants and non-migrants in terms of probability of concluding general schooling after lower secondary level having achieved a certain school qualification (see Model A2). In the 1st generation, young people from a migrant background are 20 percentage points less likely to acquire an intermediate school leaving certificate. This difference reduces significantly in the 2nd generation, although it remains at -13 percentage points (Generation 2a) and -10 percentage points respectively (Generation 2b). In the 3rd generation, no disadvantage vis-à-vis non-migrants is any longer discernible. Hypothesis 1b, in which we presumed that chances of obtaining an intermediate secondary school leaving certificate improve in line with increasing generation status, is therefore shown to be applicable.

If we differentiate for regional origin of the young migrants, all four origin groups display a lower probability of leaving general schooling with an intermediate school qualification as compared to non-migrants (see Model A3). Young people of Turkish or Arab origin are the group least likely to achieve an intermediate secondary school leaving certificate (-20 percentage points). As expected, therefore, the first part of Hypothesis 1c is confirmed. However, the further assumption that results for the other origin groups should not differ significantly is not quite borne out. The difference between migrants of southern European origin and non-migrants in terms of the probability of obtaining an intermediate school qualification is -13 percentage points, whereas those from an eastern European background display a difference of only -4 percentage points.

If migration generation is considered alongside regional origin, a reduction in differences relating to the acquisition of school qualifications as compared to non-migrants can be identified in all origin groups as generation status increases (see Model A4). This is in line with the assumption made in Hypothesis 1d. Nevertheless, development is definitely different within the individual origin groups. Although the probability that young people from a Turkish or Arab background will obtain an intermediate secondary school leaving certificate increases significantly between the 1st and 2nd generations, the difference to non-migrants remains at a high level. In the case of young people of eastern European origin, on the other hand, the difference vis-à-vis non-migrants has already disappeared by the 2nd generation. In the 3rd generation, it is even the case that they are significantly more likely to achieve an intermediate secondary qualification.
5.2 Transition to company-based training

Compared to non-migrants, young people from a migrant background are less likely to aspire to dual vocational education and training if they leave general schooling after lower secondary level (cf. Figure 1). Interest in vocational training is less marked amongst all origin groups compared to non-migrants. The lowest level of interest in vocational education and training is recorded amongst school leavers of Turkish or Arab origin or of other regions. These groups are also comparatively unlikely to aspire to dual VET. By way of contrast, young people from a southern European background are relatively likely to wish to commence vocational or dual training upon completion of schooling.

Only half of young people from a migrant background who leave the general school system after lower secondary level with the aspiration of entering dual vocational education and training succeed in making this transition, i.e. by progressing to company-based training within a relatively short period of time (cf. Figure 2).
By way of contrast, 63% of the corresponding school leavers not from a migrant background were able to find a company-based training place. Although the progression rate for young migrants in the 1st generation is very low, it increases considerably in line with rising generation status and is only slightly lower than the rate for non-migrants in the 3rd generation. If we differentiate by regional origin, it is revealed that young people from a Turkish or Arab background are extremely unlikely to make a successful transition to company-based training. The other origin groups perform considerably better in this regard. The best prospects are enjoyed by school leavers of eastern European origin, closely followed by those from other regions of origin. If we undertake a differentiated consideration of the origin groups by generation status, almost all groups display a lower progression rate than young people not from a migrant background. However, young people of eastern European origin form an exception in this regard. The progression rate of this group in the 3rd generation is even shown to be above that of persons not from a migrant background (not depicted in the figure).

Successful transition to company based training is influenced by a diverse range of factors, particularly school qualifications and occupational interests. The intention now is to use logistic regression models to investigate whether variances with regard to making a successful transition to vocational education and training are influenced by school qualifications and occupational interests.
transition continue to exist between school leavers from and not from a migrant background and between the migrant groups if a large number of significant cause variables are also taken into account (cf. Table 5). Hypotheses 2a to 2d will be tested on this basis.

Table 5: Influences on progression to company-based vocational education and training by young people who left the general school system in 2011 or 2012 after Year 9 or Year 10 and had an explicit interest in dual training – results of binary logistic regression models (average marginal effects, AME)
The overall group of school leavers from a migrant background who are interested in dual training is 10 percentage points less likely to progress to company-based vocational education and training than their counterparts not from a migrant background if occupational interests are not taken into account (see Model B1.1). If we also include important characteristics of the occupations for which young people have applied, the difference falls only slightly to 9 percentage points (see Model B1.2). Divergent occupational interests are thus only responsible for the lower probability of success by migrants to a very limited extent. These results are in line with Hypothesis 2a, in which we assumed that a migrant background would display a negative effect on chances of transition to company-based training even if multifarious influencing factors were taken into account.

If we differentiate by migration generations, it is possible to identify that the disadvantages in opportunity suffered by young migrants with regard to company-based training diminish as generation status rises. If the occupational interests of the school leavers are included in the analyses, school leavers from a 1st generation migrant background are 14 percentage points less likely to progress to company-based training than those not from a migrant background (see Model B2.2). In the 2nd generation, this difference reduces to -11 percentage
points (Generation 2a) and to -7 percentage points respectively (Generation 2b). In the 3rd generation, no significant variance exists any longer. Slightly larger differences are revealed without controlling for occupational interests (see Model B2.1). The supposition formulated in Hypothesis 2b that any reservations regarding company-based training will reduce as the number of migration generations increases, thus leading to a subsequent improvement in chances of achieving transition, is therefore shown to be applicable.

If the young migrants are differentiated by regions of origin, all four origin groups are shown to be less likely to progress to company-based training compared to non-migrants (see Models B3.1/B3.2). In the analyses including and not including occupational interests, school leavers from a Turkish or Arab background exhibit the lowest level of probability of transition. By way of contrast, young people of eastern European origin are least likely to be affected by disadvantages in opportunity. Hypothesis 2c, in which we expected that chances of progression would be worse for all origin groups and poorer for young people from a Turkish or Arab background in particular, is thus confirmed.

If additional differentiation by migration generation is conducted, very different developments can be identified in the four regional origin groups (see Models B4.1/B4.2). The assumption made in Hypothesis 2d that chances of transition would improve for all origin groups in line with rising generation status is only discernible for young people of eastern European origin. The major disadvantages in opportunity that are present in the 1st generation are alleviated significantly in the 2nd generation. By the 3rd generation, no significant difference compared to non-migrants is any longer exhibited. By way of contrast, the probability of obtaining a company-based training place is very low in the 2nd generation of the Turkish or Arab migrant group, whereas this group does not display any significant variance to non-migrants in the 1st generation. If occupational interests are taken into account, the southern European origin group presents the opposite picture. In this case, significant disadvantages in opportunity exist in the 1st and 3rd generations, whilst these are not present in the 2nd generation. In overall terms, the expectation formulated in Hypothesis 2d that chances would increase in all origin groups in line with rising generation status is largely shown not to apply.

6 Summary and conclusions

In average terms, young people in Germany who are from a migrant background acquire lower level school qualifications than their counterparts not from a migrant background and also have worse chances than the latter of successfully progressing to company-based vocational education and training. This applies even if other important influencing factors such as social origin are taken into account.
If we consider acquisition of a general school qualification, the proportion of young people achieving an intermediate secondary school leaving certificate is lower than that of non-migrants for all four regional origin groups differentiated. Although the differences between young people from and not from a migrant background diminish significantly as generation status rises, considerable variances frequently continue to exist in the 2nd generation. This is particularly true of young people from a Turkish or Arab background, although it also applies to those who are of southern European origin. By way of contrast, young people from an eastern European background (including the former Soviet Union) only perform worse in the 1st generation than young people with no migrant background. By the time we reach the 3rd generation, this group is even at an advantage compared to non-migrants. Their school success is in line with the classical assimilation model.

What could be the reasons for these differences in school education success between the various origin groups? If we consider the individual migrant groups from eastern Europe, account needs to be taken of the fact that these are frequently “late resettler” families, i.e. persons of German descent. This may have made it less difficult for the young people in question to acquire a very good knowledge of German. We may also assume that the parents of these young people enjoyed a higher social status in their country of origin than in Germany in some cases and that this has been reflected in higher educational aspirations for their children. Immigrants of southern European and Turkish origin on the other hand, who were originally recruited to fill “guest worker” positions in unskilled industrial workplaces and usually came from poorly developed rural regions in their home countries, were more likely to have had a lower educational status than immigrants from eastern Europe. To this extent, it is also more likely that they children grew up in a less favourable educational environment.

The German system of dual vocational education and training and dual training in particular are largely unknown in most of the countries of origin of the young people from a migrant background. For this reason, the value of a vocational qualification on the German labour market is frequently not correctly assessed. The result of this is that interest of young migrants in dual vocational education and training is often less marked, especially in the case of young people of Turkish or Arab origin.

In Germany, progression to company-based training depends heavily on the general school qualification achieved. It is therefore particularly conspicuous that migrants still have significantly poorer chances than young people not from a migrant background of making a successful transition in this regard, even if we control for school qualification and other factors. Although chances improve as generation status rises, disadvantage of opportunity is still discernible in the 3rd generation in some cases. What could be the reason for the lower chances of progression for young people from a migrant background, even if we control for other cause variables? It may be the case that school qualifications achieved do not reflect the performance differences that exist between the young people in overall terms. Poorer lan-
guage competences on the part of young people from a migrant background could possibly be exerting an effect, including on those who grew up in Germany and attended a German school.

Whereas upwards-directed integration with regard to acquisition of general school qualifications can be observed as early as in the 2nd generation for migrants of eastern European origin at least, this does not apply with regard to transition to company-based training. In the 2nd generation, all origin groups display less favourable results than non-migrants, even if we control for school qualification achieved. The particularly negative results for young people from a Turkish or Arab background should be highlighted in this regard. Discrimination could also be a possible explanation for the considerably worse chances of progression exhibited by young people of Turkish or Arab origin. Much indicates that for this origin group there are particular reservations on the part of companies. This especially applies in the case of young men. Young male migrants from a Turkish background often report about experiences of discrimination (Skrobanek, 2007). One possible factor here could be the fact that the habitual disposition of young males from Turkish-Arab background differs more strongly from that of young people not from migrant background than is the case for young men from other migrant groups (El-Mafaalani & Toprak, 2011).

If we make a comparison with the educational outcomes for migrants in traditional immigration countries such as Canada and the USA, which are better in some cases, it is noticeable that none of the four origin groups of migrants formed for Germany performs better in the educational system than non-migrants. We believe that the reason for this is that immigration to Germany has taken place in a less systematically planned way compared to other immigration countries and has also occurred without any high requirements with regard to the qualification of immigrants. Particular emphasis should be placed on the fact that the disadvantage suffered by migrants in the German school system and when accessing vocational education and training is frequently also continued into the next generation. Any comparison between different migration generations needs to be qualified by pointing out that this is a cross-sectional study rather than a longitudinal consideration. The individual generations of individual origin groups could also be composed differently because of varying historical and one-off immigration constellations. As already mentioned, for example, many of the Turkish “guest workers” who were essentially recruited to work in German industry in the 1960s and 1970s came from rural and structurally weak regions of Turkey and often displayed a low educational status. This may have been entirely different for later generations of immigrants from Turkey and the Arab region.

The results of our analyses signalise a clear need for action on the part of German policy makers and German society to reduce the educational disadvantages suffered by young migrants and to develop better support and integration measures. Young migrants should above all get better information of the German system of vocational education and training and
the importance of recognized qualifications for the labour market in Germany. Integration is rarely achieved in the short term. It is a long-term task which frequently extends over several generations.

References


Beicht, Walden


**Biographical notes**

Ursula Beicht is an academic researcher in the ‘Sociology and Economics of Vocational Education and Training’ Department at the Federal Institute for Vocational Education and Training, Bonn. Her main research topics have been transitions from school to training and work, participation of young migrants in general education and vocational education and training costs and benefits of vocational education and training.

Dr. Günter Walden is a retired director of the Federal Institute for Vocational Education and Training, Bonn, and a former Head of the ‘Sociology and Economics of Vocational Education and Training’ Department. His main research topics have been transitions from school to training and work, participation of young migrants in general education and vocational education and training, training behaviour of companies, costs and benefits of vocational education and training.
What students who perform in “secondary roles” can learn from scenario training in vocational education

David Sjöberg\textsuperscript{1}, Staffan Karp\textsuperscript{2}, Oscar Rantatalo\textsuperscript{2}

\textsuperscript{1}Unit for Police Education, Umeå University, 90187 Umeå, Sweden
\textsuperscript{2}Department of Education, Umeå University, 90187 Umeå, Sweden

Received: 27.05.2018, Accepted: 12.12.2018, Published: 30.04.2019

Abstract

Context: Learning through scenario training and live simulation in vocational education is generally regarded as an effective tool for developing professional knowledge. However, previous research has largely overlooked the learning of students in secondary roles in scenario training. The objective of this study is to explore learning for students who act in secondary roles during scenario training in vocational educational settings.

Method: The studied case entails scenario training for police students in a Swedish police education programme. A case study design, which included both participant observation and a questionnaire, was used. The analytic lens applied was inspired by practice theory and focused on how structural and situational arrangements of the training activity affect learning.

Results: Our findings show that students who act in secondary roles learn from their scenario training experiences, but this learning often is overlooked in the design of training activities. Due to the structural arrangements of training activities, learning emerged as students in secondary roles were tasked to support the primary participants in relation to their learning objectives. In addition, it emerged in how students in secondary roles used previous scenario training experiences in relation to the current scenario and its learning objectives. Examples of learning from situational arrangements emerged as students in secondary roles formulated and provided feedback to primary participants and through informal discussions and reflection processes. Learning also emerged as students in secondary roles embo-
died the “other” during scenario training, something that provided the students with new
definitions on police encounters.

Conclusions: We theorize and extract three dimensions for how learning emerges in this
case for secondary participants. It emerges through embodying the “other”, in students’
sensory experiences, and through reconstruction of knowledge through repetition. How-
ever, our findings also show that learning for students in secondary roles can be improved
through mindful set-up and design. Based on the findings, our article provides a discussion
and suggestions on how scenario training can be planned and set-up to develop professional
knowledge for students in secondary roles.

Keywords: Scenario training, simulation, vocational education and training, learning, poli-
ce education, practice, VET

1 Introduction

Scenario training is integral to educational activities in many professional and vocational
educational settings where the development of reliable operational work performance is of
importance (Rooney, Hopwood, Boud & Kelly, 2015). Examples of such settings include med-
ical education (Rystedt & Sjöblom, 2012), fire services training (Childs, 2005) and police
education (Sjöberg, Karp, & Söderström, 2015). In educational contexts such as these, scena-
rio training is generally viewed as a fruitful approach for giving students opportunities to
experience and make sense of relevant professional situations (Crookall, 2010). Studies have
shown that, through scenario training, students can probe different behavioural and tactical
approaches, take on different roles, and gain understandings of their own, as well as others’,
behaviours in work situations (Nestel & Tierney, 2007). Furthermore, scenario training can
provide a protected environment that allows students to repeatedly train in situations that
can be both common and rare in professional practice, and sometimes even dangerous (Roo-
ney et al. 2015; Kneebone, 2005). Research on scenario training has indicated that this type
of activity has merits in that it helps students to gain experience and to develop professional
knowing for their future occupational practice (Andersson 2016; Sjöberg, 2014; Bland, Top-
ning & Wood, 2011; Issenberg, McGaghie, Petrusa, Lee Gordon & Scalese, 2005; Rystedt &
Sjöblom, 2012).

Naturally, the bulk of research on scenario training has revolved around students acting in
the capacity of their future professional roles, e.g., as surgeons, nurses, firefighters, or police
officers. Whilst this is a given focus, a common practice in scenario training is that students
also partake in what we call “secondary roles”, such as standardized patients, victims, bystan-
ders or perpetrators (Sjöberg et al. 2015). A current shortcoming in the research literature is
that we know little about what students in secondary roles experience during scenario trai-
What students who perform in "secondary roles"

What students who perform in "secondary roles" (Hopwood, Rooney, Boud & Kelly, 2016; Mandrusiak et al. 2014; Nestel, Mobley, Hunt & Eppich, 2014). Emblematic of the dearth of research on secondary roles is the fact there is currently no unified vocabulary for these roles. In health care and medicine they are often labelled as standardized patients, simulated patients (SP), or, if the role is someone other than a patient, “confederates” (e.g., Sanko, Shekhter, Gattamorta & Birnbach, 2016; Utz, Kana, & Van Den Broek, 2015). In the military and emergency services, the term “markers” is sometimes used (MSB, 2012).

The use of actors in secondary roles improves realism, leading to learning experiences for the students acting as professionals, but also helps keep situations on track (Nestel et al. 2014) and supports focus on the learning objectives (cf. Dieckmann, Lippert, Galvin & Rall, 2010). Secondary roles in scenarios are commonly performed by trained (sometimes paid) actors, playing an opponent or relevant “other” (such as a simulated patient; Paquette, Bull, Wilson & Dreyfuss, 2010). Casting of secondary roles is regularly delimited to teachers (McAllister, Searl & Davies, 2013), faculty members (Mavis, Turner, Lovell & Wagner, 2006), alumni (Alfes, 2013), retired professionals (Paquette et al. 2010), or actors from local theatres (Endacott et al. 2012; Brown, Doohan & Shellenberger, 2005). A common practice in vocational training is also that students, whether at the same or another course level, are used as actors in scenarios. Given this fact, it is a shortcoming that only a few studies specifically have addressed the question of learning for actors in secondary roles.

Mandrusiak et al. (2014) is an example of a study that addressed learning for students in secondary roles as they used survey methods to study the use of senior students as standardized patients for junior students. Their main finding was that senior students, through their experience in secondary roles, gained insights into what it is like to be a mentor and the experience of being a patient. Senior students also reported increased ability in giving feedback, and greater confidence in doing so. Mavis et al. (2006) evaluated a scenario training initiative, wherein faculty members and students complemented professional actors in the role of standardized patients. One main finding from this study was that students acting in secondary roles were able to use the encounter as a learning experience: they gained insights into their own abilities in the situation by understanding the strengths and weaknesses of their peers’ actions.

In sum, we conclude that while scenario training itself has been extensively studied, few studies have addressed learning for students who perform in secondary roles in these training activities. Furthermore, the few studies that have employed this perspective indicate that there seems to be a presently unexplored learning potential for students in these roles. With this background, the objective of this study is to further explore learning for students who are acting in secondary roles during scenario training in vocational educational settings. Empirically, we draw on a case study of scenario training in police education, and the research questions we aim to answer are what potential for developing professional knowing there
is for participants who enact secondary roles in scenario training, as well as how scenario training can be arranged to facilitate learning for students who are acting in secondary roles.

2 Learning in scenario training

To explore how acting in secondary roles might facilitate learning, we draw on practice-based learning theory as an analytical lens for our study. From this perspective, learning is understood as an emergent phenomenon that takes place as individuals (in interaction with each other and the structural/material settings they encounter), strive to construe meaning and make sense of experience (Billet, 2014). As stated by Mäkitalo (2012 p.61), learning thus entails gap-bridging and “coordination of actions and perspectives” which allows individuals to carry on with their activities.

Applied to scenario training, this perspective states that learning is seen as an emergent phenomenon, one that arises as participants draw on previous knowledge and interact with each other and the specific structural and social resources embedded in a situation in order to construct meaning from what is going on (Hopwood et al. 2016; Nyström, Dahlberg, Edelbring, Hult & Dahlgren, 2016; Rooney et al. 2015; Dahlgren, Dahlgren & Dahlberg, 2012; Boud and Hager, 2012; Hager, Lee & Reich, 2012). Learning in scenario training is specifically impacted by the fact that this type of training needs to strike a balance between being perceived as vocationally relevant by the involved participants and being prefigured to support learning. Regarding the relevancy of vocational scenarios, these need to be applicable to professional practice, as the goal of scenario training is that participants should gain vocational experience (Sjöberg, 2016; Rystedt & Sjöblom, 2012). To achieve this, role-playing and interaction are key components to enact a scenario in a way that makes the situation feel authentic for the involved participants (Rooney et al. 2015; Rystedt & Sjöblom, 2012; Dieckmann, Molin Friis, Lippert & Østergaard, 2012). However, this does not mean that the scenarios have to be realistic in every aspect (Sjöberg, 2016; Sjöberg, 2014; Rooney et al. 2015). In fact, a common observation in the research on scenarios is that too great a focus on increasing realism in the set-up of scenarios can actually cloud learning, for instance by making a scenario too complex or difficult (Hopwood et al. 2016; Sjöberg, 2014; Alinier, 2011; Beaubien & Baker 2004). In sum, it can be concluded that to facilitate learning optimally, scenarios need to be set-up to provide relevant experiences and the right level of difficulty.

2.1 Theoretical framework

Based on the above described perspective on learning, we conclude that interacting social and structural factors are important to include in an analysis of learning in scenario training. In the following, we will be focusing specifically on how learning is facilitated through struc-
tural and situated domains of scenario training. These dimensions of a scenario are further discussed using the concepts of set-up, prefiguration, doings and sayings, and embodied experience.

The structural aspect of learning in scenario training is analysed by focusing on how situations are designed through the set-up of training activities, and on how student roles are prefigured (c.f. Hopwood et al. 2016). Set-up refers to the material arrangements and pedagogical design of the exercise, and prefiguration (as it is used in this context) refers to guidance, briefings, and instructions as well as previous experiences, and other types of preparation that guide how participants are expected to act. As such, both prefiguration and set-up entail structuring elements that enable and/or constrain what participants are likely to do in a scenario.

The situated aspect of scenario training entails a focus on how learning is reliant on students’ enactment on a moment-to-moment basis. This dimension of learning is of course informed by the enabling/constraining arrangements of the structural domain, but learning can also be analysed as emerging in an ongoing manner. In this regard, learning is impacted by what students experience and what activities they partake in as a scenario unfolds in situ. We will analyse the situated domain of scenario training through the notion of doings and sayings and through the concept of embodied experience. The former targets the performances and enactments that students engage in as they train for scenarios, and the latter describes sensory learning such as sensations that students come in contact with through scenario training and role-playing. Both doings and sayings as well as embodiment seem to be important for how students in secondary roles learn. As stated by Hopwood et al. (2016 p. 173), the experience of taking on a secondary role in scenario training can facilitate quite specific affordances for learning just because it offers a different perspective on doings, sayings and embodiment:

- They [students] […] take on the doings and sayings of other kinds of bodies they will encounter when they are at work. The pedagogical idea here is that the experience of playing a relative or patient (even if only through speaking the patient’s voice) leaves an embodied trace, helping students empathise with others in the “real” world – supporting learning objectives relating to producing professionals.

- Taken together, the notion of a structural arrangements (consisting of scenario set-up and prefiguration of roles) and a situated domain of training (i.e., doings, sayings and embodied experience in situ) will be used to inform our analysis of emergent learning for students in secondary roles (see Table 1).
Table 1: Theoretical concepts for the study

<table>
<thead>
<tr>
<th>Phenomenon under study</th>
<th>Emergent learning in scenario training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical units</td>
<td>Structural arrangements</td>
</tr>
<tr>
<td></td>
<td>- Set-up</td>
</tr>
<tr>
<td></td>
<td>- Prefiguration</td>
</tr>
<tr>
<td></td>
<td>Situational arrangements</td>
</tr>
<tr>
<td></td>
<td>- Doings and sayings</td>
</tr>
<tr>
<td></td>
<td>- Embodied experience</td>
</tr>
</tbody>
</table>

3 Methods

To empirically explore learning in secondary roles, we conducted a case study of scenario training within the context of Swedish police education. To capture the dynamics of scenario training we used a combination of participant observation and a questionnaire.

3.1 Study settings, sampling, and procedure

Throughout the two-year basic police training programme, students continuously act in scenario training. The training settings can be shorter role-plays embedded in specific courses in which students role-play against each other in the same course groups, but can also range over longer periods of time such as whole days. In these larger training activities, a common practice is that students role-play as secondary actors against peers from other terms. At the time of our study, the police education was designed so that students acted in secondary roles twice for students in terms other than their own. In their first term, they acted in secondary roles for primary participants in term two, and likewise in term three they acted for students in term two.

The scenario training setting we observed in this study was when students who are in their third term act in secondary roles for students in term two. This means that they know the scenario from when they themselves acted in it and that they also have experience from acting in secondary roles in one other scenario against other students than those from their own course group. Participant observations were conducted in three naturalistic sites of scenario training where groups of students acted as primary as well as secondary participants.

Empirical data was collected simultaneously by three observers at the three sites. The sites were designed as stations wherein a pre-designed situation was presented for groups of students (mainly working in groups of six) in the capacity of police professionals (i.e., primary participants). The primary participants were given instructions that resembled information from a dispatch centre and were then left to handle the various situations to their best of their
What students who perform in "secondary roles"

ability. Their enactment was supervised by an instructor and afterwards the groups received feedback on their performance. In total, the observations extended to 24 (8*3) hours of scenario training at the following sites:

1. The Party (8 hours of observation): This scenario was designed as a situation in which the police are dispatched to deal with a potential case of loitering and the associated legal matters regarding public intoxication and the right to remain in the area. Later, the situation develops so that the police have to give first aid to one of the participants. In this scenario, six students simultaneously acted as primary participants (their future professional selves) and four students performed as secondary participants in the roles of drunk and disorderly persons.

2. Youth Brawl (8 hours of observation): This scenario was designed as a situation in which two groups of youths attack and assault each other verbally and physically; the role of the police is to separate the groups, identify the instigators and talk with the involved individuals afterwards. In this scenario, six students acted as primary participants (their future professional selves) and twelve students role-played members of the youth groups.

3. The Protesters (8 hours of observation): This scenario was set up as a road-block protest by environmental activists against a logging company. Police are called to the site by the landowner, who wants protesters removed. In the scenario, six students acted as primary participants (their future professional selves) and six students participated as loud and agitated protesters. In this scenario, one student is given instructions to take on a leadership role among the protesters.

Observations were recorded through open-ended field notes and a structured observation protocol that was filled out by each observer after the observation periods. In detail, the protocol registered data pertaining to different dimensions of the observation. It included descriptive data such as location, time and date, and objective of the training activity. Observations also included structural and social dimensions of the situation. These included being outside, inside, what tools were used for the activity, how the training activity was designed to prompt or facilitate learning, or what room there was for the participating subjects’ self-directed interactions at the site, for instance through opinion sharing. Short notes were logged in relation to each dimension.

In addition to observations, a questionnaire with 14 items was distributed to the students acting in secondary roles in the scenarios shortly after their performances. The questionnaire contained questions about what could be learnt from acting in secondary roles (i.e., what acting in the scenarios meant for developing knowledge of how to handle critical incidents in police practice, and what this meant for an understanding of the feelings and reactions of
people whom the police acted against). The questionnaire also contained how each enactment contributed to reflection (i.e., to what extent the acting had contributed to reflections on how police should act in critical incidents) and how the students perceived the set-up and prefiguration of scenarios (questions about how well the educational setting gave information for the students to produce a realistic scenario, and whether there was space for feedback and reflection for them as actors). The students gave their answers on a five-point Likert scale, ranging from “very low extent” to “very large extent”. The questionnaire was distributed as an online questionnaire and was sent through a learning management platform to the students the day after they had acted in the scenarios. The response rate for the questionnaire was 76% (N=68), of which 61% were men and 39% were women. Two students did not answer the question about gender.

3.2 Data analysis

The qualitative data mainly grounded our interpretations of the observed situations and the quantitative measures gave insights into students’ first-hand experiences of these situations. As such, the questionnaire functioned as a follow-up in aspects where observations fell short (targeting how participants value activities) and as a validation for interpretations of observational data.

In the analysis of observational data, the objective was to make data-to-theory connections regarding how learning in secondary roles unfolded. This meant that the analysis of observational data was conducted in two main phases. First, an inductive “narrative strategy” was applied (Langley, 1999) wherein we merged open-ended field notes and structured observation protocols into detailed, chronologically coherent narratives of training activities. These narratives provided the basis for further analysis, as they contained contextual details and depictions of the courses of events at the observed scenario training sites. For instance, the narrative regarding the protester scenario contained descriptions of how this specific scenario developed as different groups of students trained during the day.

In the second step of analysis, we mobilized our theoretical framework, specifically the theoretical constructs of structural and situational arrangements as “lenses” for theorizing the observed events. Based on the observations, we described the set-up and prefiguration that the various scenarios contained and how the enactment of scenarios took place from the point of view of an observer. To more directly describe experiences (such as for example embodied experience) we analysed instances in which students verbalized this, and we also made use of quantitative data where students valued their experiences of training.

In both steps 1 and 2 of our analysis of observational data, the use of quantitative results aided our validation of the observations. We calculated questionnaire results as frequencies and percentages of Likert scales at the item level. The findings are presented as stacked
bar graphs describing how students generally valued their experience as secondary participants in terms of learning (see Figure 1), how students perceived the set-up (see Figure 2), and how students communicated during the training activity (see Figure 3). One example of how quantitative measures validated our interpretative work was that the questionnaire data showed that students appreciated reflection on an individual level, which substantiated our interpretations of how verbal and collective (and hence observable) reflection processes were occurring at the various scenario training sites.

4 Findings

Initially, it can be concluded that students in secondary roles to a high extent perceived their performances in the scenarios in terms of learning experiences. The results show that more than half of the students, 58%, answered that enactment in the scenario contributed to their understanding of how situations in general could be handled by the police to a large or very large extent, and as many as 78% answered that they had gained an understanding of how police should handle the specific situation they had acted in. Furthermore, 82% of the students reported that the enactment had contributed to personal reflection on how actions taken by the police shape how events unfold. The strongest results concern the insights into how each situation is to be treated by the police (86%), and personal reflections on how they themselves would act in similar situations (86%; Figure 1).

<table>
<thead>
<tr>
<th></th>
<th>0%</th>
<th>50%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding of how situations in general can be handled by the police</td>
<td>6</td>
<td>36</td>
<td>52</td>
</tr>
<tr>
<td>Understanding of how the specific situation in the scenario can be handled by the police</td>
<td>4</td>
<td>18</td>
<td>58</td>
</tr>
<tr>
<td>Reflection on how actions taken by the police impact on how situations develop</td>
<td>4</td>
<td>14</td>
<td>58</td>
</tr>
<tr>
<td>Understanding of how it is to be treated by the police</td>
<td>6</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Reflection on how students themselves want to act in similar situations</td>
<td>2</td>
<td>12</td>
<td>48</td>
</tr>
</tbody>
</table>

![Fig. 1: Extent to which acting in secondary roles contributes to learning experiences](image)
In the following section, we expand on these findings and describe the learning potential for students who are acting in secondary roles in more depth, based on a blend of observational data and questionnaire data. Specifically, we describe how the structural and situated arrangements of the social situation impacted emergent learning in practice.

5 Structural arrangements

With regard to structural arrangements, the students who act in secondary roles can be concluded to have an active part as co-creators of the scenarios for the primary participants. As such, they take on a slightly different position to that of a student undergoing training: they become facilitators of learning through their enactment. This instrumental position in the setting alters the power dynamics and relations between the students and instructors, as they become more reliant and co-dependent on each other for the implementation of the planned activity.

In this position, the arrangements that secondary participants experience differ from those experienced by the primary participants. For instance, the set-up directed to the secondary participants contained briefings from the instructors about what the different scenarios were about, both on a surface level and in terms of the learning objectives. However, the briefings were not explicit and systematic for all the groups. Briefing information was not always disclosed to the primary participants, as this could run the risk of spoiling surprise elements in scenarios. Furthermore, briefings also outlined how the training activity was going to play out during the day, and usually outlined the instructors’ expectations for the secondary participants to provide feedback to the students under training. This type of set-up, whilst not having learning as its primary aim, contains some elements of “backstage information” about how the instructor, with the help of the secondary participants, wanted to design the activity. Examples of briefings were when instructors in the protester scenario gave the students directions to be loud in their protests, but also receptive to how the primary participants communicated so that a good dialogue between police and protesters could alter the outcome of the scenario. Another example of how students in secondary roles were co-creators of scenarios was when an instructor in the protester case informed the students about the objective, and they then jointly designed the scene:

The instructor describes how the landowner has called the police, and how the owner wants the protesters to disperse so he can get through. The instructor also says that they (actors) should be loud. Furthermore, the instructor also points out that communication is important [for the police - observer interpretation] and that they (actors) should listen to the police and decide if they communicate well. If so, they can be a little more helpful. The instructor also mentions that they will give feedback to the “police officers” afterwards, and continues to say that somebody needs to take on the role of a leader of the protesters - "to see if the police officers can differentiate them". But, it is not specified much about how they should act. […]
What students who perform in "secondary roles"

The students try to figure out how they should do the scenario, as they continue to have a discussion among themselves. They tentatively discuss matters such as “which protest chant should we have?” and “who will be leader?” [...] they arrange props and build a barrier of obstacles in front of the place they are going to sit and they seem to get themselves ready for what is to come (observational notes from protester scenario).

Another key part of the training was the feedback session that followed the enactment component. In the session, the group of police students who had acted in the scenario started by describing the situation, how they interpreted it, and their actions. After this, the instructors and students in secondary roles provided feedback to the police group. Peer feedback from students regularly revolved around specific tactical and technical details, such as “it did not feel good to be dragged that way” (in the protesters scenario), or criticizing how the police patrol had handled one of the drunk youths that sat by the campfire holding a knife (in the party). The feedback could also point to and explain how they perceived the police officers: “you were a little awkward” (the party) or “you looked angry” (the protesters).

The notion that secondary participants received a set-up that was more directed at the task at hand rather than at their own leaning is also validated by data from the questionnaire. The answers show that students highly valued the instructions for creating the situations aimed for in the scenarios. The general opinion of the students was that the instruction they received contributed to a large or very large extent (84 %) to creating the situations aimed for. However, we can also see that 42 % of secondary participants considered that the set-ups contributed to their personal learning experiences to only a low or moderate extent (Figure 2). Likely, this result is a reflection of the task-oriented briefings.

Fig. 2: Set-ups for secondary participants in the scenarios
With regard to the secondary participants’ prefigurations, two aspects stood out in both the observational and the questionnaire data: first, that prefiguration was largely self-directed and drew on students’ own experiences from previous scenario training, and second, that repetition in the role of secondary participant offered the possibility to improve scenario performance.

As described earlier (set-up), the first aspects of prefiguration were described in different ways and to different extents in different scenarios. Concerning the second of these aspects, the students who were acting in secondary roles had previous experience of similar types of scenario training and, in addition, experience of the specific training activities, but from the perspective of primary participants. In the breaks between acting, students’ talk and interactions displayed attempts to recollect their own experiences as a basis for their enactment. In our interpretation, these types of experiences enabled the students to partake in scenario training with new outlooks compared to their previous experiences when acting as police officers. The quote below exemplifies how previous experiences shaped how students saw their role as secondary participants:

[…]

The third aspect of prefiguration that stood out in the data was the significance of repetition and adaptation of enactment over time. In the observations, it became apparent that the outcomes of the scenarios varied for different groups of students.

When the police patrol has left, the two teachers discuss the first two scenarios with the secondary participants. They jointly talk about how differently the situations developed for the first and second patrols (Observational notes – youth brawl scenario).

Often, the actions of the primary participants prompted responses from secondary participants, so that it was the interaction (doings and sayings) between police and other actors that determined the situation and its possibilities in situ (Reich & Hager, 2014). With repetition, the students became more secure in their actions to create the situation aspired to in the scenario: when repeating a scenario, the space of possible outcomes increased as the secondary participants expanded their experiential knowledge base.
5.1 Situated arrangements

When analysing students’ doings and sayings and embodied experiences in relation to the enacted situations, it becomes clear that the situated arrangements affect two important aspects of the scenario training. The first aspect is how participants in secondary roles interact to facilitate good learning opportunities for the primary participants, and the second aspect is the learning emerging for participants in secondary roles when they enact the “other” and in the informal discussions between scenarios.

The observations show how informal discussions amongst the secondary participants influence how scenarios unfold. Students regularly discussed their performances between scenarios, and the quantitative data show that these discussions were important in making sense of their roles. In fact, 84% of the students reported that these discussions supported their creation of the situations aimed for in the scenarios to a large or very large extent (Figure 3).

![Fig. 3: Communication about scenario training amongst secondary participants](image)

This finding means that both instructions (see Figure 2) and informal discussions contribute to students’ creation of the situations in the scenarios. While talk was important during scenario training, figure 3 also indicates that transferability of these types of discussions outside the immediate training context occurred to a lower degree. Here, 36% of the secondary participants reported that enactment contributed to further discussions to a large or very large extent, of which only 8% answered that this occurred to a very large extent.

In addition to ongoing small talk about how to enact and adjust scenarios during the training activity, we also observed how students in secondary roles regulated the scenario in quite subtle ways, based on their interpretations of how things were unfolding. They could, for example, adjust the scenario’s difficulty, “hinting” at matters that the primary participants...
had overlooked, keeping the situation on track despite differences in performance from the primary participants. One example of this was in the party scenario:

*The actors soon give clues that there is one person missing (by asking each other questions). The police do not really consider these clues. The actors hint a little more clearly about this and then the police officers begin to search. They then find the person quite quickly (observational notes – the party scenario).*

Other examples of adaptation were in altering their behaviours in relation to the actions of the police. For example, in the youth brawl scenario, the secondary participants could escalate their noise level if the police students did not pay attention. Similarly, in the protester scenario, the level by which the secondary participants were willing to cooperate with the police students was directly dependent on how the police behaved towards them. Aspects such as these made the scenarios highly dynamic. In the example above, cue-giving was incorporated into the interaction by the secondary participants based on the difficulties they perceived the primary participants to be experiencing, or on their interpretations of courses of events.

In addition to adaptation based on how secondary participants interpreted the primary participants’ enactment, scenarios could also develop differently based on who the secondary participants were, and what difficulties and challenges they experienced in performing the roles that had been handed to them. Overall, the secondary participants reflected on the challenges of shaping the roles in terms of finding the right level of acting. Questions could include how drunk a student should act, or how much they should resist for the scenario to unfold as planned.

In the observations, there were also explicit instances indicating how learning emerged for secondary participants. For example, after the second police patrol had left the youth brawl, students discussed why the latest patrol managed better in the scenario than the previous one.

*[…] secondary participants attributed the fact that the first patrol stopped and gained an overview before they acted as a significant success factor (for a good solution to the scenario – observer) (Observational notes – youth brawl scenario).*

This example show how secondary participants made some clear insights into police work by discussing the different approaches of two police patrols they encountered. They construed meaning through interaction with each other and the structural/material settings they encountered in the scenarios. Further, when giving feedback, the students were forced to formulate their thoughts and experiences of seeing and interacting based on their alternate outlook as secondary participants. One example of such feedback was found in the party scenario:
What students who perform in "secondary roles"

[...] secondary participants at the campfire expressed that in their view, the police did well with their communication. At first when they (secondary participants) tried to approach their injured friend, they had not been allowed access, something that initially caused frustration. However, the police had done well to explain that they could not go to the injured friend because they were trying to help him with first aid. Furthermore, the officers kept track of their arrival time and radioed that information to the ambulance. This information was perceived as calming to the secondary participants [...]. The police officers had also engaged the persons (secondary participants) at the campfire with questions that could help their friend - if he was injured or had any illnesses earlier, and the police had said "come on now, let's do this together" (help the injured person). Secondary participants concluded that this was a good approach, since it made them feel involved (observational notes – the party scenario).

Meeting with the professional practitioners that they aspire to become in the role of the "other" (embodied experience) seems to have made an impression on the students, as this was frequently discussed between the scenarios. One example to illustrate this from the protester scenario:

I hear someone commenting on how the police officers acted and how it made them feel - I then ask the group what they think about the police's actions? The participants in secondary roles respond jointly what they think about the behaviour, body language and tactics of the police officers. One says, for example, that "I think of how they make me feel …" Another actor says, “I think they should tear down the obstacle (to facilitate moving the protesters) but that they must tell the protesters why they do this” (observation notes – the protester scenario).

The embodiment of the “other” as a resource for learning could also be quite direct and sensory, as was the case in the party scenario, when a student who acted in the role of a person with a skull trauma got to experience how the police students put on a neck brace at a slightly wrong angle, resulting in breathing difficulties. In sum, both enactment against students who were performing as police officers and the verbal feedback that students gave each other are part of the learning process for secondary participants.

Learning through embodied experiences was also confirmed by the questionnaire, wherein 78 % of students answered that their experiences as secondary participants had developed their understanding of how the police ought to deal with the specific situations they had enacted to a large or very large extent (see Figure 1).

We have in this section tried to unpack learning in scenario training for students in secondary roles using some theoretical concepts. To summarize the findings and in order to clarify the connection between the theoretical and analytical concepts and empirical examples, a table is used to visualize this.
Table 2: Summary of how the theoretical concepts unpacked learning in scenario training for secondary participants.

<table>
<thead>
<tr>
<th>Phenomenon under study</th>
<th>Emergent learning in scenario training</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analytical units</strong></td>
<td>Structural arrangements</td>
</tr>
<tr>
<td></td>
<td>Set-up</td>
</tr>
<tr>
<td>Support primary participants in relation to learning objectives</td>
<td>Previous experiences of both scenario training and this exercise</td>
</tr>
<tr>
<td>Briefings on the relation; learning objectives — scenario content</td>
<td>Formulating feedback</td>
</tr>
<tr>
<td>Repetition in the role of secondary participant</td>
<td>Reflective spaces: Informal discussions between scenarios</td>
</tr>
</tbody>
</table>

6 Discussion

The present study was designed to explore the learning potential for participants who enact secondary roles in scenario training. Secondary roles are something previous research on scenario training and live simulations has largely overlooked (Mandrusiak et al. 2014; Nестel et al. 2014). When narrowing the subject to the learning potential for students who are enacting the “other” in training, the dearth of research becomes even more obvious (Mavis et al. 2006).

To remedy this shortcoming, the present study examined structural and situational aspects of training situations and how students in secondary roles valued their experiences of performing in these roles. A specific aspect of learning in scenario training for those in secondary roles seems to be that the learning primarily is unintentional, because the students’ participation in scenario training is motivated mainly by instrumental arguments and not by learning objectives in course plans or syllabi. Our review of previous research showed that the purpose of these roles is to support the primary actors and their learning from the inside (cf. Dieckmann et al. 2010; Smith, Gephardt & Nestel, 2015). As showcased by our study, however, this does not mean that no learning takes place for secondary participants. Rather, this role offers possibilities for learning that other roles in scenario training do not provide. In the following, we theorize and draw out three specific dimensions for how learning emerges in the training situation for secondary participants in terms of embodying the "other", sensory experience, and reconstruction by repetition. A striking finding of our study was the
learning potential of embodying the “other” in scenario training. Embodiment meant that students got to perform and enact situations where they interacted with the police from a different standpoint than that of a (developing) professional practitioner. Previous research has shown that opportunities to shift or move in and out of roles, such as a patient, a customer, or a pupil, can be a strong resource for learning in professional and vocational education. Such alterations, through the provision of a partial outsider perspective, can facilitate reflection on learning and practice (Hopwood et al. 2016). In the case reported on here, such reflections were reported on in the questionnaire, but were also noted by observers: in their verbal reflections on participation, students pointed to how the roles made it easier for them to connect their own previous knowledge and experiences of acting in the capacity of a police officer to the experiences of being handled by police.

Closely connected to the embodiment of the “other” is a sensory dimension of learning that was observed on several occasions within the scenarios. An example illustrating this kind of learning, which is grounded in sensory experiences, was the student who got breathing problems because of the incorrect application of a neck brace. Being addressed and approached in more or less successful ways by peer students enacting police officers provided embodied experiences, through which the students seemed to develop professional knowing. This was also indicated by the questionnaire, as 86% of the students thought that the enactment to a large or very large extent gave them an understanding of how it is to be treated by the police, and also how they themselves want to act in similar situations (see Figure 1). These results show how acting as a secondary participant contributed to a direct first-hand understanding, and, as a consequence, a reflection on how they themselves will act as professionals. This is a form of knowing that cannot be achieved by acting “only” in the role of a professional and while professional experience is useful, it is limited in scope. It is also hard to facilitate from a more distanced or detached position. The role of the other is needed in combination with the professional and in this regard embodying a secondary participant seems to hold a compelling potential for learning.

In addition to the above presented, we also encountered a somewhat unexpected form of learning in the study: namely that, due to their instrumental role, secondary participants in scenario training experienced repetition in their enactments to a higher degree than primary participants. In the observational material, students frequently highlighted their astonishment over how the scenarios unfolded in slightly different ways for the various groups of primary participants who trained during the day. Through repetition and variation in how the scenarios played out, the secondary participants expressed that they gained an understanding of how actions, responses, communication and tactics in a very concrete way shaped what the scenarios became. This was expressed in feedback sessions as something they had not understood when they themselves performed in scenario training as police officers. Thus, by repetitive encounters with various groups, the students reconstructed their professional
knowing of how the scenarios they acted in could be handled by the police (see also Figure 1). The results accordingly indicate that learning of professional knowing relevant for policing has emerged among the students in secondary roles as a result of their enactment in the scenarios (see Hopwood et al. 2016; Nyström et al. 2016; Rooney et al. 2015).

A final point that can be made based on the findings concerns scenario training and self-reported non-learning. In this regard, between 2 % and 8 % of the students who answered the questionnaire experienced that participation in secondary roles contributed to learning only to a low or very low extent (Figure 1). As the study design doesn’t allow us to link observational data to questionnaire results of individual respondents, we are hesitant to draw far-reaching conclusions with regards as to why this variation in student responses is evident. However, a plausible explanation drawn from our observations is that students seem to vary in how comfortable they are in role-playing. Less confident actors may thus manoeuvre themselves to peripheral positions in the situations with fewer interactions. Similarly, the set-ups of various scenarios also naturally differ in how central (or conversely peripheral) a particular secondary role is, so that some roles might contain little interaction between the student actors and the police under training. These circumstances may explain why 8 % of the students reported that their experience of role-playing in secondary roles only to a low or very low extent aided their understanding of how it is to be treated by the police. In all, we conclude that the issue of non-learning in scenario training lends itself well to further examination in future studies.

In summary, the findings suggest that the experience of assuming a secondary role in police scenario training seems to aid police students in their development towards professional practice, as it gives insights that otherwise are hard to make available. In this light, our findings point towards the conclusion that there might be an unrealized potential to adapt scenario training to also take secondary participants’ experiences into account for developing professional knowing. We now move on to discuss how such ambitions might be undertaken in practice.

6.1 Scenario training design and learning in secondary roles

The research review conducted in this study shows that learning for secondary participants is often overlooked in scenario training. This is also the case in our study, as learning objectives as well as scenario design are adjusted to the primary participants. This means that learning for students in secondary roles is unintentional, informal and variable as it is highly dependent on how students individually choose to navigate and act in the situations they take part.

However, the narrow view of learning in scenario training could with relatively few measures be widened. For instance, the set-up for participants in secondary roles can include activities before and after the scenario training. We suggest that activities beforehand should
include preparation of the role-playing aspects and prefiguring the learning potential for those in secondary roles. Not least this would aid students who are initially uncomfortable with role-playing to be better prepared and more active in the situations instead of withdrawing themselves to a peripheral position with less interaction. The activities should be aimed at building “simulation competence”, or knowledge about the general conditions for learning in scenario training, and about not only what is specific about the current scenario (see Sjöberg 2016; Rystedt & Sjöblom 2012 for discussion of simulation competence), but also an understanding of the learning potential for actors in different roles. Simulation competence includes knowledge of the ground rules for the scenario, such as shared responsibility, frames of the scenario, and how to handle breaches and uncertainties.

Simulation competence also includes preparing for role-playing, such as deeper knowledge of the kind of situations aimed for and the roles to enact. Prefiguring should rest on clear learning objectives for those in secondary roles and include clear explanation of the learning potential for those enacting these roles. This includes explaining how students, by immersing themselves in the role of the “other” in scenarios and seeing situations from a perspective other than their professional selves, can develop professional knowing (c.f. Hopwood et al. 2016; Mandrusiak et al. 2014). After the scenario training, a seminar design can be used, wherein the students from various scenarios can share their “other” experiences. Here, there is an opportunity to draw out aspects they feel are important for the development of professional knowing (cf. Crookall, 2010). Both before and after the scenario training, as well as between the different scenarios, the instructor can play a key role as a scaffold and support, focusing specifically on the experiences of students enacting secondary roles (cf. Rooney et al. 2015).

The before and after perspectives target how preparation can be mindfully directed for students in secondary roles as they are withdrawn from the scenarios, but we also identify a learning potential which is of a more direct situational nature. This is the learning that was observed to emerge in a self-directed manner momentarily between scenarios, namely situated reflections over the enacted situations. Thus, we believe there is a potential to work with “reflective spaces” (see Baud, 2006) during small, naturally occurring breaks in the scenarios. In such spaces, students have opportunities to share and discuss the professional situation on their own, but also with support from an instructor. We argue that this enables collective reflection and discussions in ways that can inform students by connecting their shared experiences with their “future professional selves”. These suggestions can become important ingredients in a scenario training (live simulation) pedagogy that also includes secondary roles, which we see as a take-home message for developing these kinds of activities in vocational education.
References


Biographical notes

David Sjöberg, PhD, is a lecturer at the Unit for Police Education at Umeå University, Sweden. His research interests include areas such as learning processes in police education and police practice with a specific focus on learning through simulations and scenario training.

Staffan Karp is PhD and Associate professor in Pedagogy at the Department of Education at Umeå University in Sweden. His main research interest is learning processes in police education and police work. Karp has long experience of teaching at the Police Training Programme in Umeå and he has also been Chair of the board of the Unit for Police Education at Umeå University.

Oscar Rantatalo, PhD, holds a position as associate professor at the Department of Education at Umeå University, Sweden. His research interests include areas such as workplace learning, education-work transitions, organizational sensemaking, and policing.
Exploring visual languages across vocational professions

Alessia Eletta Coppi¹, Alberto Cattaneo¹, Jean-Luc Gurtner²

¹Swiss Federal Institute for Vocational Education and Training, 6900 Lugano, Switzerland
²University of Fribourg, Department of Educational Sciences, 1700 Fribourg, Switzerland

Received: 13.07.2018; Accepted: 07.11.2018; Published: 30.04.2019

Abstract

Context: Discovering visual languages across professions is a complex task since it entails discovering a communication system composed of information in image or textual form called representations and also including various kinds of annotations such as notes. Such a task has been previously scarcely considered within research, and basically only investigating in white collar professions (e.g., doctors). This leaves us wondering about all the possible shapes of these vocational visual languages and the potential of using these images to foster learning. For this reason, the current research aims to investigate commonalities and differences of visual languages across vocational professions with the goal of using the outcomes to design educational activities for vocational education and training (VET).

Approach: 55 semi-structured interviews have been conducted within eleven professions from the areas of Craftsmanship, Industry, Health and Services such as a plumber and fashion designers. The interviews were audio-recorded and analyzed with NVivo through a coding scheme which served as the main reference for the analysis.

Findings Results showed that, in terms of visual representations, professionals use different types of drawings such as technical drawings (e.g., woodworkers), evaluation forms (e.g., dental assistants) and illustrations (e.g., gardeners). For sketches, participants indicate the practice of creating sketches depicting objects to produce (e.g., goldsmiths). For photos, they portrayed things to remember or pay attention to (e.g., chemical technologists). Participants

*Corresponding author: alessia.coppi@iuffp.swiss

ISSN: 2197-8646
http://www.ijrvet.net
across professions use annotations such as notes to specify details of their job. On the other side, they also report profession-specific annotations such as mathematical symbols like the surface roughness (e.g., polymechanics) and diagrammatic elements like different type of lines to indicate the status of the bones and muscles (e.g., massage therapists) or where to cut textiles (e.g., fashion designers). In terms of communalities, participants within technical professions indicated a shared use of both representations and annotations. Conversely, other professions had very specific visual languages hardly shareable across professions.

**Conclusion:** These results helped in discovering the visual languages of different professions and this knowledge will be used to implement educational activities based on specific skills needed in different professions such as observation skills with the use of VET-specific educational technologies.

**Keywords:** Visual languages, visual representations, annotations, vocational professions, vocational education and training, VET

1 **Introduction**

For many decades the exploration of language has been a topic of research in many disciplines, such as philosophy and communication (e.g., Chomsky, 1962), psychology and education (e.g., Vygotsky, Whorf, & Wittgenstein, 1990) professions and organization (e.g., Loewenstein, 2014) or semiotics and anthropology (e.g., Goodwin, 2004). These areas of knowledge focused on the concept of language, the impact of language in cognitive development or the use of textual and spoken language in different workplaces. Differently, this research will focus more on the topic of language from a visual point of view; visual language is a communication system that uses visual elements (Cherry, 1957) such as visual representations (Chang, 1986) or graphical signs like dots, lines, and arrows and their spatial relationships (Calvani, 2011). Aiming to research the visual language of multiple professions can be seen as a cumbersome task and one way to narrow the goal of this study is to focus on visual representations and annotations. These two concepts comprise most of the visual language of different professions and have also been the object of many years of research in the area of learning and psychology (e.g., Gibson, 1950; Anderson, 1978; Smith, 1998; Ainsworth, 1999; Arcavi, 2003). This is due to their potential for fostering students’ and workers’ learning and productivity by decreasing cognitive overload and enhancing general understanding. Although the research on representations and annotations is extensive, the principal investigations’ focus is mainly on: 1) producing taxonomies, identifying the cognitive and psychological benefits and main uses and 2) white-collar professions rather than vocational professions. What about blue-collar vocational professions? What types of visual representations, annotations and colors do they use? Are there features or elements of visual language used across profes-
sions; is there any evidence of a shared visual language within and between these professions? Answering these questions could be beneficial for education and especially for vocational education: especially in dual systems, understanding better the use of visualizations within the professional domains could help on one side to bridge the gap between the work-based and the school-based track, and on the other side to design learning activities based on visual representations and fully exploiting the potential of annotations.

2 Theoretical background

2.1 Visual Representations

Visual representations are an established concept in the literature insofar as they have been studied in many humanistic sciences, although it is sometimes difficult to find a comprehensive definition of this term. Perini (2005) defined them as external objects that function as symbols, such as written text or numerical formulas. Other definitions that originated in the area of technology-mediated learning refer to visual representation as ‘visual display’, and specify that visual representations are representations of information that can have the form of text and static or dynamic images (Schraw, McCrudden, & Robinson, 2013).

In general, there is no widely accepted definition of visual representation; some of the prominent conceptualizations have focused on distinguishing different types of representations, such as internal and external representations (see, Gilbert, 2010), descriptive and depictive representations (Schnotz and Bannert, 2003) dynamic and static representations (Höffler, Schmeck, & Opfermann, 2013) and multiple representations (Ainsworth, 2006).

Alongside these studies, others have focused on representations such as drawings and sketches. In design and engineering the emphasis has been on producing taxonomies to unify the language and increasing understanding within the profession. For instance, Pei, Campbell and Evans (2011) created an extensive taxonomy that included different types of visual representations such as sketches, drawings, models and prototypes, with many different subsets (Fig. 1).

![Fig. 1: Taxonomy of Visual Design Representation (from Pei et al., 2011, p. 7)](image-url)
On the other hand, others distinguished between types of representation in design and engineering using the categories of: 1) concept design, 2) development design sketch, 3) embodied design and 4) detailed design (Kim, Jung, & Self, 2013).

Other studies have identified the types of representations used in different professions such as by architects, geographers, medical professionals, archeologists, manufacturers and dancers. In the case of architects, Styhre and Gluch (2009) indicated that they mainly use sketches, generate CAD images, retrieve photographs from the internet and use full-scale models. Geographers (Yates and Humphries, 1998) generate different types of schema such as a city map or others that are more suitable for showing relationships, such as a tube map. Radiographers (Hartswood, Procter, & Rouncefield, 2002) working with mammograms use capture sheets to report information such as the location of cysts, presence of pain, issues in reading the scans and diagnostic options (Fig. 2).

In the area of design, some authors (Eckert, Blackwell, & Stacey, 2004) interviewed professionals and identified different categories of users of drawings; some use them extensively (e.g. designers or architects), others occasionally for a specific task (e.g. engineers or web designers), while others avoid using them (e.g. food designers). In other research on sketches (Stacey, Eckert, & McFadzea, 1999) the focus was more on the communicative aspects of sketches that can result in ambiguity and miscommunication due to their incomplete nature.
Furthermore, the same groups of researchers (Eckert, Blackwell, & Stacey, 2012) investigated the impact of computer-generated sketches on dancers’ creativity; they asked dancers to interact with Choreographic Language Agent (CLA) software (Fig. 3), which produces random sketches from moving geometric shapes, and then use the outputs to create new combinations of movements.

![Fig. 3: Sketch produced by CLA software (from Eckert et al., 2012, p.7)](image)

Finally, a famous example of research in this area is from Goodwin (see, 2004) that explored the concept of professional vision in different professions by analyzing graphic representations, highlights or coding schemes. Goodwin pointed out that professions such as archaeologists use specific maps and charts (e.g. Munsel Colour chart) to understand the layering of the ground at excavation sites and that images allow them to categorise the world into coherent object that guide their perception in a professional way.

### 2.2 Annotations and colours

As visual representations, annotations are hard to define and to grasp due to the different perspectives from which the topic has been – from psychology, to education, to computer science. For instance, Stefanut and Gorgan (2008) considered annotation as a process that individuals use to analyze and interact with different objects such as documents or images. They included in annotation a series of actions such as making circles around words, underlining portions of text, using colours for text analysis, making corrections on a student paper or using check-marks. On the other hand, Zywica and Gomez (2008) considered annotation as a reading strategy for learning, since it allows better text structuring and marking. Examples are highlighting or drawing signs around important part of the text such as a definition, key content and words.
In spite of the contrasting definitions and the lack of general classifications of annotations, research has addressed annotation both in the area of learning and in the professions. For instance, Heiser and Tversky (2006) identified what they called diagrammatic elements that generally help to enhance understanding of a representation, such as lines, blobs, boxes, crosses, arrows and circles. Elements such as arrows and lines are useful to emphasise the structural organization and functioning of a machine or the working of a body (Azkue, 2013). Another example in engineering showed (see, Eckert et al., 2012) that designers produced drawings using CAD software's and that they create a wide variety of signs and textual annotations that were used to duplicate, juxtapose and overlay images. In the medical field (see, Hartswood et al., 2002) radiographers working with mammograms use different notes to report abnormalities, such as abbreviations like ‘BT’ for breast tissue or ‘?’ to signal uncertainty. Other examples include ‘Dense BT’ for dense patches of material, ‘X NRC’ for no real changes in that area and ‘Benign’ for benign patches. Generally, these notes are annotated on the screening report, as illustrated in the image below (Fig. 4):

![Fig. 4: Section of a mammography screening report (from Hartswood et al., 2012, p.93)](image)

In this study we conceptualise visual representation as a visual object or an image that individuals can create and manipulate such as a mind map, photograph or a sketch. Similarly, we conceive of annotations as the products of a process that includes a series of actions in which a visual representation is manipulated by adding one or more layers of information, which take the form(s) of text, lines, highlights and symbols.
3 Research methodology

To answer our research questions an exploratory study was conducted in the Italian-speaking part of Switzerland (Tessin Canton). Data were collected during 55 semi-structured interviews performed with five professionals from each of eleven professional areas, broadly grouped as: craftsmanship (woodworkers, plumbers, goldsmiths, fashion designers, winemakers, gardeners), industry (chemical technologists, polymechanics technicians, multimedia technicians) and health & services (massage therapists, dental assistants). The interviews lasted for an average of 35 minutes (ranging from 13-90 minutes long) overall. During the sessions, participants were encouraged to show examples of representations and annotations typically used during their everyday work practice; such examples were collected for further reference. All of the interviews were audio-recorded, transcribed and analyzed using NVivo software. A coding scheme was created specifically for this research, based on Pei et al., (see, 2011), Heiser and Tversky (see, 2006), Schraw et al., (see, 2010). The coding scheme was also directly induced from the interviews, to accommodate the fact that many professions included in our study go beyond the area of engineering and design. According to our research aims, the coding scheme distinguishes the following layers of coding: type of visual representation, type of annotation, use of colours and presence of shared language.

Visual Representations includes four codes:

- Drawings are formal arrangements of lines that determine a particular form. Drawings can picture different subjects; they are more structured than sketches;

- Sketches are preliminary design representations of something without details as the basis of a more finished product

- Photographs are images of an object, person or scene recorded by a camera on photosensitive material (Hanks, 1979);

- Other includes any other type of image such as colours scales or chromatographic images.

Annotations are considered to be the result of a series of actions in which a visual representation is manipulated by adding written text, lines, highlights, arrows, drawings, numbers, and so forth (see, Stefanut and Gorgan, 2008; Zywica and Gomez, 2008). The categories of annotations that were observed are the following:
Notes are organised records of textual information present in a participant’s documentation (see, Schraw et al., 2013). This category includes letters and combination of letters (A; AA), numbers (1, 2, 3) and combination of numbers and letters such as measurements (600mm);

Diagrammatic elements are devices such as lines, blobs, boxes, crosses, arrows and circles (see, Heiser and Tversky, 2006). In this research this category also included plus (+) and minus (−) signs and alphanumeric characters such as asterisks (*), hashtags (#) or at signs (@);

Symbols (e.g. diameter, hazard symbol, pain) are conventional signs used in writing relating to a particular field to represent operations, quantities, elements, relations or qualities (Merriam-Webster’s collegiate dictionary, 1979). They fulfill the criteria of standardization due to being professionally defined in standardised manuals and norms (e.g. International Standards Organization, ISO).

Colour is a layer of categorization that is applied to both representations and annotations. This layer was inserted in the coding scheme since colours is a dimension closely linked to images and annotation (e.g. Marshall, 1998).

Presence of Shared Language is another layer of categorization that can be applied to both representations and annotations. It was coded whenever participants mentioned that a specific representation or annotation was shared within their profession or together with professionals from other professions with which they normally cooperate (e.g. medical doctors and nurses, electricians and plumbers, etc.). A subset equal to 20% of the corpus was independently coded by two researchers. The interrater reliability analyses for the four layers of codes showed substantial agreement that ranged from Kappa=0.75 to Kappa=0.94 (Landis and Koch, 1977).

4 Results

In this section, we will focus on presenting the results of the content analyses of the interviews. Alongside the description of the results, we have provided the illustrative quotation and some of the visual examples provided by the participants.
4.1 What are the types of visual representations used across professions?

Table 1 displays how frequently different visual representations were mentioned by the interviewees, grouped by profession. Drawings were the most often mentioned representations across all professions. Sketches were reported less often than drawings but were mentioned by all the professions. Photos were mentioned by all winemakers, gardeners, goldsmiths and dental assistants.

Table 1: Frequency of references to different visual representations, by profession

<table>
<thead>
<tr>
<th>Professions</th>
<th>Wine (n = 5)</th>
<th>Wood (n = 5)</th>
<th>Poly (n = 5)</th>
<th>Multi (n = 5)</th>
<th>Mass (n = 5)</th>
<th>Plumb (n = 5)</th>
<th>Gold (n = 5)</th>
<th>Gard (n = 5)</th>
<th>Dent (n = 5)</th>
<th>Fash (n = 5)</th>
<th>Chem (n = 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drawings</strong></td>
<td>24 (5)</td>
<td>21 (5)</td>
<td>14 (4)</td>
<td>18 (5)</td>
<td>19 (5)</td>
<td>11 (5)</td>
<td>8 (3)</td>
<td>9 (3)</td>
<td>8 (2)</td>
<td>20 (4)</td>
<td>8 (4)</td>
</tr>
<tr>
<td><strong>Sketches</strong></td>
<td>2 (2)</td>
<td>15 (5)</td>
<td>5 (4)</td>
<td>5 (3)</td>
<td>3 (2)</td>
<td>3 (2)</td>
<td>17 (5)</td>
<td>11 (4)</td>
<td>4 (2)</td>
<td>6 (4)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Photos</strong></td>
<td>10 (5)</td>
<td>6 (3)</td>
<td>1</td>
<td>5 (2)</td>
<td>4 (2)</td>
<td>14 (5)</td>
<td>11 (5)</td>
<td>22 (5)</td>
<td>5 (4)</td>
<td>3 (3)</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>6 (4)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

(The numbers refer to the number of times a specific representation was mentioned, the numbers in parentheses standing for the number of persons that mentioned them within each profession)

After looking broadly at the frequencies table, it is important to explore the specific visual representations used by the sample.

In terms of **Drawings**, professionals such as polymechanics technicians and woodworkers reported using mainly technical drawings [1 – see numbered quotes below for examples of the type of use being mentioned] and illustrations [2]. Beside these types, plumbers reported using schematic diagrams [3], which were also the main types of drawing used by multimedia technicians. The difference is that in the first case the representations are picturing hydraulic systems, in the second electronic equipment:

[1] “We produce drawings using CAD and its internal library of tools. Our drawings are called ‘raiders’ and they show all the tools, position, info on the possible connections. With this drawing our workers are able to go to the site of the event with all the info needed.” [MultimediaTechnician_P23]

[2] “We use technical illustrations of the machines so we know how certain machines work and how they can be cleaned.” [PolymechanicsTechnician_P12]
"They're drawings representing the house. We can see the thermal power station, boilers, pipes, the sanitary systems, counter, and the distribution of the water." [Plumber_P40]

Fashion designers reported using two types of technical drawings; patterns [4] are templates for tracing the pieces of garments before cutting the fabric and technical sketches [5] are drawings of the garment with defined measurements and information:

[4] “Beside all the other types of images we use patterns. A fashion designer knows patterns. She knows that what is on the table is a jacket and not a dress.” [FashionDesigner_P08]

[5] “Technical sketches contain all the information about the garment from start to finish. I know that this garment is from a specific product line, that this jacket has a specific lining and pattern, that I'll need to start stitching from the bottom.” [FashionDesigner_P41]

Gardeners’ planimetry is a type of technical drawing that shows the outline of the desired garden. It can have multiple formats and these drawings are generally produced by landscape architects [6]. Planimetries are also used by winemakers, who produce them to abide by the canton’s regulations or when they need to create a new vineyard [7]. Winemakers also use machine technical illustrations and scientific illustrations depicting plants and disease [8].

[6] “Drawings are made by the architects and then we create the actual garden. We don't make the drawings! These drawings are from the top and show all the different flowerbeds, description of the plants, possible building, walls, pathways and everything else that could be in a garden.” [Gardener_P47]

[7] “We make technical drawings depicting the new vineyard since they are required by the canton.” [Winemaker_P34]

[8] “I use illustrations during the harvest to show the workers what kind of grapes they have to pick. I also use the plant disease ones to understand what grapes I have to remove.” [Winemaker_P42]

Dental assistants and massage therapists reported using evaluation forms representing the body, called dentition charts and body charts. Dentition charts [9] are currently digital images presented in software (e.g. ZaWin32 or OneBox) depicting a prototypical set of teeth that can be modified by the assistant to match that of the patient. Similarly, body charts [10] depict the whole body or specific body parts. They both also reported using scientific illustrations of the body or the mouth [11]:

[9] “The software has many settings. You can add all the different types of cavities and fillings, the pathology, the type of prostheses, implants or retainers that the patient has. You can also draw or write a note about a broken tooth or if the crown is made of gold or ceramic.” [DentalAssistant_P26]
We use images representing the mouth with descriptions of different sections of the tooth. They are useful to explain to patients what type of treatment they are going to experience.” [DentalAssistant_P26]

Anatomy books are useful to explain things to patients.” [MassageTherapist_P10]

Finally, the main source of information for chemical technicians was not graphical but rather text-based, and the only types of drawings used were technical drawings representing machines [12]:

“Drawings can help with the machines. It’s rare but if machines do not work we need them to fix the problem!” [ChemicalTechnician_P01]

Sketches are often created to put some ideas on paper and to show or explain something to the client. Therefore, sketches are simple visualizations of the possible product (e.g. jewelry). In the case of industrial and craftsmanship professionals, such as polymechanics technicians, woodworkers, multimedia technicians and plumbers, sketches can take the form of idea, study, informative or prescriptive sketches (see, Pei et al., 2011) and are used as a starting point to build the required piece [13], multimedia installation [14] or sanitary installation:

“We always use them when building parts. If someone asks for a simple part such as a hook we sketch it and we don’t waste time with the technical drawings. We start working directly from the sketch.” [PolymechanicsTechnician_P12]

“Sketches created in the first meeting with the client are the ‘phase zero’ of the project. They might look like unintelligible doodles but they are just the initial phase and they include also the ‘emotional side’ or the ‘fil rouge’ of the event.” [MultimediaTechnician_P23]

Goldsmiths favored sketches over drawings; they produce idea and study sketches in which they try different versions of the jewelry to be shown to the client before starting to work on the precious material [15]. In case of complex jewelry they produce a sketch with counts and measurements [16]:

“I make simple sketches with a pencil in black and white. In other cases, it’s the client that brings me some drawings and I just try to redraw it a little better. Typically clients are happy with the result.” [Goldsmith_P24]

“Well, if I have to make very complex jewelry or if I have to do something difficult.” [Goldsmith_P13]

Gardeners produced simple planimetry sketches (prescriptive sketches), but if the project was extensive, they required technical drawings from architects [17]. If the project was ex-
tensive or well-financed, they might ask architects or artists to produce renderings of the final results. Renderings were also used by woodworkers and multimedia technicians [18]:

[17] “The idea is always to start with a small sketch in pencil that can be understood by everyone. Then it depends, if you’re a private client we just talk and we find a solution together by showing them some simple sketches on the spot. While if it’s a big building with 30 apartments, there is typically a company and architect involved and they’ll give us proper drawings.” [Gardener_P53]

[18] “Renderings are useful to interpret the client’s desire since they show the emotional aspect of what we’re going to build and help in showing the technical drawings in a realistic form.” [MultimediaTechnician_P23]

Dental assistants and massage therapists reported using information sketches to explain something to the patient [19]. Winemakers produced sketches only when designing a new vineyard [20]:

[19] “I rarely use them, but in some cases I’ll use them to show what a hernia or a nerve compression looks like.” [MassageTherapist_P10]

[20] “We use sketches that look like planimetry to understand how big the vineyard will be, how many plants I’ll need, how many poles and all the rest of the materials.” [Woodworker_P57]

Fashion designers reported using another type of sketch called measurement tables [21] that include a sketch of the final dress and its measurements:

[21] “It’s a standard table in which all the main measurement such as chest, waist and hips are reported. We also add simple and quick sketches so the client can have an idea of the dress.” [FashionDesigner_P08]

In terms of Photographs, the only two types identified were photos taken with a camera or a phone and x-rays. In general, massage therapists reported taking snapshots of the patient’s body to show the status of the healing process [22]. Dental Assistants used them to clarify information given by the dentist and also used panoramic and single x-rays [23]:

[22] “Some chronic patients are unable to see their progress. In the case of an edema, I put photos next to their body to show their progress.” [MassageTherapist_P03]

[23] “We do panoramic x-rays but we can also look at the status of the teeth with 12 or 14 single x-rays that are more accurate. X-rays help us see if bones are retracting and there’s risk of periodontal disease.” [DentalAssistant_P16]
Also, professionals such as fashion designers, goldsmiths and gardeners reported that they take or find photos to use them as inspiration or reference sources for a dress, a piece of jewelry [24] or a garden [25]:

[24] “Typically when clients come to my shop I show them photos from website or I can find other examples online.” [Goldsmith_P32]

[25] “I use photos of plants and reference images of previous work done on retaining walls and other plantings.” [Gardener_P05]

Chemical technologists reported that they simplify a procedure by displaying photos of the machines they must use [26]:

[26] “I write instructions for analyses and I use photographs to show the machines to be used in a specific procedure; in this way, they all understand.” [Chemical Technologist_P49]

In the case of plumbers, photos were used to remember to pay attention to certain things when installing or while building something such as a hidden pipe/tube [27]:

[27] “We take pictures of the bathroom and the furniture. If I have to install a tube that is behind the furniture I need to install it correctly or the furniture won’t open properly.” [Plumber_P54]

Winemakers reported using photos to learn new techniques and to identify the presence of diseases in the vines [28]:

[28] “I use images when I need to check the health of the vine.” [Winmeaker_P39]

The last category, Other, is the least represented in the sample; it includes mentions of other types of representations such as graphs for multimedia technicians, pH scales for winemakers, chromatographic images for the chemical technologists [29]:

[29] “I use chromatographic images that show the results to achieve with the solution.” [Chemical Technologist_P05]

### 4.2 What are the types of annotations used across professions?

Table 2 displays how frequently different types of annotations were mentioned by the sample, grouped by profession. Notes were strongly mentioned by members of all of the professions. Similarly, Symbols are present in the remarks of all of the professionals but were rarely mentioned by massage therapists, goldsmiths and fashion designers. The use of Diagrammatic Elements was less frequently mentioned; however, they are nevertheless referred to by all of
the massage therapists and fashion designers interviewed and by all but one of the woodworkers. That revealed an interesting language of profession-specific diagrammatic elements.

Table 2: Frequency of references to different annotations, by profession

<table>
<thead>
<tr>
<th>Professions</th>
<th>Wine</th>
<th>Wood</th>
<th>Poly</th>
<th>Multi</th>
<th>Mass</th>
<th>Plumb</th>
<th>Cold</th>
<th>Gard</th>
<th>Dent</th>
<th>Fash</th>
<th>Chem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note</td>
<td>7(4)</td>
<td>30(5)</td>
<td>14(4)</td>
<td>8(4)</td>
<td>23(5)</td>
<td>16(5)</td>
<td>22(5)</td>
<td>31(5)</td>
<td>22(5)</td>
<td>31(5)</td>
<td>6(3)</td>
</tr>
<tr>
<td>Symbol</td>
<td>7(3)</td>
<td>14(5)</td>
<td>12(4)</td>
<td>18(5)</td>
<td>1</td>
<td>13(5)</td>
<td>2(2)</td>
<td>14(5)</td>
<td>9(3)</td>
<td>9</td>
<td>12(5)</td>
</tr>
<tr>
<td>DElem</td>
<td>0</td>
<td>9(4)</td>
<td>0</td>
<td>1</td>
<td>35(5)</td>
<td>3(2)</td>
<td>2(2)</td>
<td>11(3)</td>
<td>1</td>
<td>16(5)</td>
<td>1</td>
</tr>
</tbody>
</table>

More specifically, in terms of Notes, professionals such as polymechanics technicians, plumbers, woodworkers, multimedia technicians, and fashion designers all produced notes that included information such as general type of processing (e.g. surface roughness) [30], scheduling of the work, presence of errors, information about the materials and measurements [31]. Gardeners and winemakers created notes with information about the status of their plants and possible diseases [32]:

[30] “We write description of the processing such ‘flat, laminated, 600X400mm and 105mm long with a surface roughness of 12.5’. Also the numbers 1 and 2 next to the measurements indicate edits to the original drawing.” [PolymechanicsTechnician_P46]

[31] “We received sketches from the headquarters with fabric samples. They include all sort of notes and measurements and also a description of the prototype indicating type of stitching, type of button, the length of the fabric used and much other info.” [Fashion Designer_P33]

[32] “We walk in the vineyard, observe and write down that some grapes are almost ready or that some vines are most resistant or mature faster than others. We take notes and then we reproduce that vine.” [Winemaker_P57]

Similarly, goldsmiths indicated the type of material to use, colours of the stone, type of effect such as glazing and rhodiation, measurements of both the client’s body and the materials (e.g. stones) [33]. They also included different type of abbreviations [34]:

[33] “I write down the measurements of the fingers or other measurements of the client’s body, the width needed and the type of processing for the metal.” [Goldsmith_P32]

[34] “For the material I can write AU (aurum) for gold and if the jewel is made of white gold I’ll write WG.” [Goldsmith_P30]
Dental assistants produced notes that include standardised descriptions [31] of the status of the mouth or the procedure to perform [35]:

[35] “The doctor can write that the cavity is mesio-occlusal with the abbreviation ‘MO’ or ‘DO’ for distal-occlusal. For the dentition numeration we use 1, 2, 3 and 4 for the quadrants so if we remove the 8th tooth from the first quadrant I’ll write ‘1.8 removed’.” [DentalAssistant_P16]

Chemical technologists produced internal warnings and instructions about the functioning of the machines or the procedure itself, but these are generally discouraged [36]:

[36] “We have personal notes in which we write tips like waiting a certain time for a machine to be ready, but this info is not in the procedure. These notes create doubts so they are only in our notebooks.” [Chemical Technologist_P05]

In the case of Diagrammatic Elements, fashion designers used them to signal where to sew parts together [37]. Depending on the design studio, dotted/straight lines might indicate different type of bindellos (tapes) or show where to shrink/tighten, wrinkle, and cut/sew the fabric [38]. Also, gardeners used cross signs to show where already existing elements such as plants or the irrigation system are placed [39]:

[37] “I use a cross and another signal that means I have to sew the pieces together.” [FashionDesigner_P08]

[38] “Printed dotted lines indicate where to sew, while straight lines indicate where to cut.” [FashionDesigner_P33]

[39] “I use an cross to indicate where the irrigation system is.” [Gardener_P47]

Massage therapists reported extensive use of diagrammatic elements such as circles, zigzags, hashtags, numbers, dots and plus and minus signs to indicate areas of pain, trigger points and other pain-related symptoms. Sometimes they re-draw a part of the body to make it more similar to that of the patient. Other signs included asterisks for scars and arrows for hyperextensions or rotation of the neck or hip [40;41]:

[40] “I use numbers to indicate where the problem is and I use circles to indicate the pain areas. I also use plus and minus signs to indicate the level of pain.” [MassageTherapist_P09]

[41] “I use a cross to indicate crossing knees. I redraw the shape of the spine on the body chart to make it similar to the patient’s actual spine if they have lordosis or it it’s too straight. I also use a hashtag for a scar.” [MassageTherapist_P03]
Dental assistants seem to be different from all the other professionals, because most of the paper dentition charts have been replaced by software with digital dentition charts. This means that they use software to mark (by selecting from a menu) the status of the teeth [42]:

[42] “You can do anything with the programs; add implants, protheses, retainers or other info, like if we need to change the filling.” [DentalAssistant_P26]

Polymechanics technicians use lines to signal errors in the drawings [43]:

[43] “I can only annotate where there is an error. I have to open the file in the program and change it with a red line, sign it and send it to the engineer.” [Polymechanics_P18]

The professionals in our sample used various types of Symbols. Woodworkers, for instance, reported using technical symbols such as the radius or diameter, but also other symbols specific to their profession such as the presence of invisible elements (e.g. glass) or others that differentiate between types of woods or types of openings in a window [44]:

[44] “Triangles are conventional signs that indicate the location of the top, bottom, right and left sections of pieces of furniture to assemble. Lines indicate the opening direction of the window.” [Woodworker_P14]

Chemical technologists reported using biohazard and ‘risk and safety’ symbols. Hazard symbols were also used by winemakers and dental assistants; the latter also used symbols describing the status of the teeth (e.g. square with dots). Plumbers also used standardised symbols (International Organization for Standardization [ISO], 2016) to indicate the water direction and different mechanical components [45]:

[45] “We use specific signs. A triangle with a circle is a pump, a butterfly-looking sign is a valve and the arrow with a circle is a manometer.” [Plumbers_P37]

Goldsmiths performing gem certification reported using standardised symbols (from Gemological Institute of America) to mark issues of the stone. Multimedia technicians pointed out that they use CAD-CAM programs that already contain symbols for all the components of an electrical diagram such as the socket, aerials and use measurement units (e.g. decibel). They use standardised symbols identifying aerials, channels and transformers but also codes like the American Standard Code for Information Interchange (ASCII) the National Television System Committee (NTSC). Polymechanics technicians use standardised symbols in their technical drawings in conformity of ISO and DEN norms that can be found in “Extrait de normes pour écoles techniques” (Verein Schweizerischer Maschinenindustrieller, 1991). Other symbols are those for surface roughness that indicate the type of processing of the
metal. Examples of some of the symbols reported to be used by the participants are shown in Table 3:

Table 3: Examples of the main symbols mentioned by specific professions

<table>
<thead>
<tr>
<th>Professions</th>
<th>Symbols</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodworker</td>
<td>![Symbol]</td>
<td>Use of mathematical symbols and woodworker-specific symbols (e.g. window opening)</td>
</tr>
<tr>
<td>Chemical Technologist</td>
<td>![Symbol]</td>
<td>Bio-hazard symbols</td>
</tr>
<tr>
<td>Winemaker</td>
<td>![Symbol]</td>
<td>Bio-hazard symbols</td>
</tr>
<tr>
<td>Dental Assistant</td>
<td>![Symbol]</td>
<td>Use of squares (position of cavity), circles (amalgam fillings) and bio-hazard symbols</td>
</tr>
<tr>
<td>Multimedia Technician</td>
<td>![Symbol]</td>
<td>Use of mathematical and electrical drawing symbols representing measurements and equipment</td>
</tr>
<tr>
<td>Polymechanic Technician</td>
<td>![Symbol]</td>
<td>Use of mathematical technical drawing symbols (e.g. VSM) representing tolerances and texture of the industrial process (e.g. surface roughness)</td>
</tr>
<tr>
<td>Plumber</td>
<td>![Symbol]</td>
<td>Use of technical symbols representing valves and other sections of the piping system</td>
</tr>
</tbody>
</table>
4.3 What are the colours used across professions?

In Table 4, it can be observed that almost all the professions had multiple verbalizations regarding the use of colours in their representations or their annotations.

Table 4: Frequency of references to different colours, by profession

<table>
<thead>
<tr>
<th>Professions</th>
<th>Wine ((n=3))</th>
<th>Wood ((n=5))</th>
<th>Poly ((n=5))</th>
<th>Multi ((n=5))</th>
<th>Mass ((n=5))</th>
<th>Plumb ((n=5))</th>
<th>Gold ((n=5))</th>
<th>Gard ((n=5))</th>
<th>Dent ((n=5))</th>
<th>Fash ((n=5))</th>
<th>Chem ((n=5))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colours</td>
<td>4(3)</td>
<td>7(5)</td>
<td>8(3)</td>
<td>7(5)</td>
<td>10(4)</td>
<td>15(5)</td>
<td>7(4)</td>
<td>9(5)</td>
<td>8(4)</td>
<td>6(4)</td>
<td>3(3)</td>
</tr>
</tbody>
</table>

Nevertheless, the category Colours was not used extensively, and most participants indicated that their drawings or sketches are often in black and white \([46;47]\) even if there are some exceptions. For instance, plumbers colours pipes in red (hot water/high pressure), blue/green (cold water) or brown according to what they contain (e.g. drained water) while drains for the refrigeration system are sometimes marked in purple \([48]\). Multimedia technicians also have standard colours (International Electrotechnical Commission [IEC], 2017) such as red, yellow, green, brown and black to differentiate cables \([49]\):

- \([46]\) “Sketches are in black and white, but I can use some color for a specific client for the color of the stones.” [Goldsmith_P13]
- \([47]\) “Drawings are mostly monochromatic. Colored lines and colored codes can be useful in complex drawings.” [ChemicalTechnologist_P01]
- \([48]\) “In general, hot water is in red while the return water is in blue. Blue is for high pressure water, green is for cold water and red or pink is for hot water.” [Plumber_P40]
- \([49]\) “Cables’ colours can be black, brown and red. In the case of microelectronics, colours are now printed numbers.” [MultimediaTechnician_P44]

Massage therapists reported using colours to indicate problematic areas in body evaluation forms \([50]\) while dental assistants used them to differentiate pathologies, and to flag important info to communicate, symbols and notes about surgeries \([51]\):

- \([50]\) “I write notes in red to indicate surgeries.” [DentalAssistant_P16]
- \([51]\) “I use red and blue to highlight the problem. I can use red for areas of pain, while areas of tension are in blue. Red is also for trigger points.” [MassageTherapist_P09]
4.4 Illustrative examples

In this section are displayed some of the images collected during the interviews. From these examples it is possible to observe the different layers of observation used in the research and how they are all integrated in the images. For instance, massage therapists mainly use evaluation forms on which they put annotations such as notes, arrows and lines and colours like red (Fig. 5).

![Fig. 5: Evaluation charts](image)

Fashion designers’ use of images is chronological. First they produce a table with measurements and a sketch of the possible garment (Fig. 6). Then, they produce drawings called technical sketches that show the final design. And ultimately they use patterns that are the definitive technical drawings of the pieces composing the garment, with notes and diagrammatic elements indicating the name of the piece and the cutting/sewing lines (Fig. 7).

![Fig. 6: Different forms of measurement table](image)
Goldsmiths use sketches to try out different concepts for the final look of the jewelry; in the case of a complex piece of jewelry they produce sketches with measurements, calculations and symbols (Fig. 8).
Plumbers produce sketches (Fig. 9) of the plumbing system with symbols and notes and then a technical drawing with specific colours for the different types of pipes and standardised symbols (Fig. 10).

Gardeners produce sketches in the form of planimetries with notes, diagrammatic elements and colours (Fig. 11). They also use technical planimetries that are colored and that include symbols indicating different types of plant (Fig. 12). Furthermore, they also employ other professionals to produce paintings called renderings (Fig. 13).
Fig. 11: Planimetry sketch

Fig. 12: Planimetry drawing
Woodworkers use different types of technical drawings with different perspectives that include notes, diagrammatic elements and symbols (Fig. 14).
4.5 Is there any evidence of a shared visual language in the professions?

Table 5 shows important differences in the use of shared visual language across the professions. Technical profession such as woodworkers or plumbers mentioning it more that non-technical ones such as winemakers or goldsmiths.

Table 5: Frequency of references to presence of shared language, by profession

<table>
<thead>
<tr>
<th>Professions</th>
<th>Wine (n = 5)</th>
<th>Wood (n = 5)</th>
<th>Poly (n = 5)</th>
<th>Multi (n = 5)</th>
<th>Mass (n = 5)</th>
<th>Plumb (n = 5)</th>
<th>Gold (n = 5)</th>
<th>Gard (n = 5)</th>
<th>Dent (n = 5)</th>
<th>Fash (n = 5)</th>
<th>Chem (n = 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared Language</td>
<td>1</td>
<td>16(5)</td>
<td>5(3)</td>
<td>8(4)</td>
<td>4(4)</td>
<td>11(4)</td>
<td>2(2)</td>
<td>3(3)</td>
<td>6(4)</td>
<td>4(4)</td>
<td>3(2)</td>
</tr>
</tbody>
</table>

More specifically, it was observed that members of professions characterised by the use of technical material, such as woodworkers, plumbers, polymechanics technicians and multimedia technicians, share similarities in their visual language both within [52;53] and between [54;55] their professions. This is mainly due to the need of using standardised norms and regulations such as ISO norms (Internal Organization for Standardization [ISO], 2003;1989) that consequentially enforce the use of standardization in the images:

[52] “We didn’t invent them! It’s a convention! If you go to another plumber he’ll know that hot water return piping is marked in red and the cold water ones in blue.” [Plumber_P40]

[53] “We share the drawing style. At school we used the same norms and symbols. Companies might be a bit different from each other but the standard is still the same.” [Woodworker_P06]

[54] “The measurement standard that we use is SWISS, EU or USA since we work with national and international companies.” [PolymechanicsTechnician_P12]”

[55] “Technical drawings are technical drawings regardless of being from a woodworker, electrician or a bricklayer.” [Woodworker_P14]

Chemical technologists are in a similar situation since their language is shared internationally due to their products being sold worldwide [56]. Their work is regulated by standardised documentation such as the one used in the production of medication (European Pharmacopoeia Commission and European Directorate for the Quality of Medicines and Healthcare, 2010):

[56] “Procedures are national but the analyses are codified in USA, EU or internationally depending to where we market the product.” [ChemicalTechnologist_P21]
Clinical-related professions such as massage therapy and dental assisting both have similar visual languages since they use evaluation forms for the teeth or the body on which they mark health issues, add symbols and write notes about the treatment and status of the patient [57]:

[57] “Evaluation charts are used even by doctors, physiotherapists and massage therapists and osteopaths. If I have to communicate with them I’ll use body charts.” [MassageTherapist_P04]

Another profession with shared language is that of gardeners, since they borrow symbols from landscape architects [58] and, depending on the type of work, share responsibility in the creation of the representation [59]:

[58] “These symbols are official between the architects. They have symbols for everything!” [Gardener_P53]

[59] “We do some measurements on the spot and we give them to the architect who will make the technical drawing and the we carry it out in the garden.” [Gardener_P55]

Specifically this result indicates that all of the professions produce notes that are similar in content, which focus mainly on the scope, materials, and schedule of the work. The main types of Diagrammatic Elements used are cross signs, lines and arrows. In terms of Symbols, the ones shared between the professions are technical ones such as radius or diameter, while within the professions other symbols are shared, such as the one for surface roughness used by the polymechanics technicians or the ones indicating different types of wood used by the woodworkers. For the feature of Color, there is shared language between the technical professions, since they all produce black and white drawings, but also within professions, such as the use of color coding of the electrical cables for the technicians or color differentiation in the hydraulic systems for plumbers.

5 Conclusion and discussion

The aims of this research were to explore the visual language of vocational professions by identifying the types of visual representations and annotations used and also to find evidence of a shared visual language. Unlike previous research that focused mainly on specific types or branches of professions (e.g. Pei et al., 2011), this study deliberately included a large variety of vocational professions. With respect to our first question, it is possible to conclude that the professionals in the sample make use of different types of visualizations in their professions, such as many different types of Drawings (e.g. technical drawings, evaluation forms or schematic diagrams), Sketches (e.g. technical sketches or prescriptive sketches), Photos and other forms of visual representation (e.g. chromatographic images). In terms of annotations, the most frequently used type is Notes, which are present across all professions, and have a simi-
lar purpose and content. Other types are Diagrammatic Elements such as arrows and lines, which are mainly used by fashion designers, dental assistants and massage therapists. There are also Symbols that are used extensively in the form of standardised technical symbols (e.g. radius) and profession-specific symbols (e.g. surface roughness).

In terms of the second question it is possible to conclude that shared language is present both within and between the professions, but the level of sharing might be different from profession to profession or according to a type of specific representation or annotation. For instance, for standardizations reasons, technical and clinical professions possess a specific language that is shared both within and between their communities. A technical drawing of a building can be read by plumbers, multimedia technologists and woodworkers. In other professions, such as fashion design, they have their own specific language that is mostly not shared outside the profession.

The results of this research could be relevant for VET by helping educators to design courses and activities more in line with real working practices. Specifically, the results pointed out the strong presence of visual representations in a variety of different professions, but also indicated that annotations are fundamental, such as in the case of the massage therapists and fashion designers. VET is an essential part of the education system in Switzerland, but there are still some gaps to fill and some progress to be made in order to create cohesive and better integrated experiences for students who move across different learning environments such as schools, companies and branch-courses. For instance, the pedagogical model 'Erfahrraum' (Schwendimann, Cattaneo, Dehler, & Zufferey, 2015) can be used for designing activities aimed at the integration of knowledge and professional skills. Examples in this direction are the work of Cattaneo, Motta and Gurtner (2015) with chefs or studies such as the one from Caruso (2017) that identified how fundamental observational skills are for fashion designers and the potential of developing a training program to promote this ability. Along this line, further research will continue to explore representations and annotations in vocational education, the possibility of developing e-tools to build students’ visual abilities with the help of representations and annotations and, at the same time, the development of an educational scenario to provide better integration between school and workplace.
References

Caruso, V. (2017). Fashion designers and observation skills: How learning technology supports apprentices in decoding non-textual information. (Ph.D. Cumulative), University of Fribourg, Fribourg, Switzerland.
McCrudden, & D. Robinson (Eds.), Learning through visual displays. (pp. 133-163). Charlotte, NC, US: IAP Information Age Publishing.


**Biographical notes**

Alessia Eletta Coppi is PhD student at Swiss Federal Institute for Vocational Education and Training (SFIVET). Her main research interests focus on vocational education and training, new technologies and games, usability and cognitive enhancement.

Alberto Cattaneo is professor at the Swiss Federal Institute for Vocational Education and Training (SFIVET) where he leads the Research Field “Innovation in VET”. His main research fields concern the integration of ICT – and especially video-based technology – in vocational teaching and learning, reflective learning in VET, instructional design, multimedia learning, teachers’ training.

Jean-Luc Gurtner is Professor of Psychology-Education at the University of Fribourg, Switzerland. He co-directs the Leading House “Technologies for VET” of the State Secretariat for Training, Research and Innovation (SERI). His research explores the potential of information and communication technologies for training and learning and also students’ motivation and reflection.
Book review: Teachers and teaching in vocational and professional education

Joy Papier*

Institute for Post-School Studies, University of the Western Cape, Bellville, Cape Town, 7535, South Africa

Published: 30.04.2019

Book Review


The book is published in the series Routledge Research in Vocational Education. This series present the latest research on Vocational and further Education and provides a forum for established and emerging scholars to discuss the latest practices and challenges in the field. Sai Loo (PhD, MA, BSc, FHEA, ACA, FETC) is an academic at UCL Institute of Education, University College London.

Purpose

The concept of the vocational teacher, as distinct from the general academic teacher, is receiving significant attention in emerging and transforming VET systems across the world. However, it is apparent from Sai Loo’s new monograph ‘Teachers and Teaching in Vocational and Professional Education,’ that even in established VET systems there are still many unanswered questions with regard to teaching that is work-directed. Much of the scholarly debate revolves around the nature, form, volume, depth and breadth of vocational/occupational knowledge required by VET students in particular programmes, and the implications of this for vocational teachers’ knowledge. Notions of knowledge that are usually juxtaposed as if in opposition to each other include inter alia, Bernstein’s theorisation of vertical and

*Corresponding author: jpapier@uwc.ac.za

ISSN: 2197-8646
http://www.ijrvet.net
horizontal knowledge, context-dependent vs context-free knowledge, practical vs disciplinary knowledge – terms which circulate periodically in well-worn arguments related to what VET learners should learn and what VET teachers should teach. Indeed, Professor Simon's question posed in 1981, cited by Loo (2018) in the opening line of his introduction (see p.1), could today be rephrased to read simply ‘why no vocational pedagogy?’ given the concerns of Loo's new book.

Content

Sai Loo in this volume shines a light on the teacher in vocational and professional settings, and brings what are mostly esoteric philosophical debates, into the realities of the classroom where the voices of teachers can be heard. A notable feature of the monograph is the range of occupations from which case studies have been drawn, spanning the better known disciplines of accounting, dental hygiene and tourism, but including equine studies, fashion, and social care, and from the level of technician training to professional clinician training. This is an important spectrum being presented, as vocational training is often seen as the poorer cousin of ‘professional training,’ irrational as that distinction in terminology may seem, and VET has tended to be looked down on from a classist perspective, hence the struggle for parity of esteem with the traditional academic qualifications route. The deliberate terminology of ‘occupational’ to refer to all work related offerings therefore cuts across the three levels of training, as in pre-university (college); higher education (first degree vocational level); and the professional training level. Academic teaching is also not polarised from occupational teaching, with Loo preferring to see both as part of a continuum where they co-exist according to their immediate intent i.e. orientated more to the discipline in the former instance, and more to the workplace in the latter.

Loo's monograph therefore enables a holistic view of occupational/vocational pedagogy which traverses historical hierarchies of knowledge and practice, and treats the teachers in this domain as practitioners with similar concerns and interests who are ultimately ‘facing both ways’ (Barnett, 2006).

Having addressed the potentially distracting issues at the outset, Loo poses the two main questions that he will be grappling with in his research: ‘what is occupational pedagogy?, and how is its related knowledge acquired and applied by those teaching on the programmes?’

Chapters 2 and 3 together constitute a solid theoretical backdrop for the empirical work in the chapters which follow. In chapter two, Loo draws on a broad array of relevant scholarly works to circumscribe the knowledge relevant to pedagogy that is required for a ‘dual professionalism’ (Peel, 2005). Vocational teachers, as dual professionals with one foot in education and one in the world of work, require essential knowledge of both of these domains, i.e. from the knowledge of education foundations that inform teaching practices and curricula, to the
disciplinary knowledge and applications relevant to the workplace. From the works of such salient education theorists as, inter alia Becher, Shulman, Loughran, Mitchell, Polanyi, Collins, Verloop, Nonaka, Takeuchi – the varied modelling of knowledge types and its impact on the knowledge bases required for teaching, are gleaned, albeit that much of this theorisation has been in reference to general academic schooling and to higher education.

As a basis for the occupational teacher research, the literature on occupational practices is also set forth, for instance by scholars such as Clarke and Winch, Hager, Eraut, to name a few. In chapter two also, Bernstein’s (1996) classificatory schema for horizontal and vertical knowledge, pedagogic discourses, and the concept of ‘pedagogic device’ are introduced, as this forms an essential explanatory framework for the investigations captured later within the monograph. Chapter three thus expands on teaching and learning in occupational settings, and the knowledge and pedagogies required for training in the domain of work. Here Loo draws attention to the foresight evident in Bernstein’s theorising about occupational education and acknowledging the learning that takes place at, and for work, and which encompasses skills, practices, and collective learning, ideas taken forward in the post-Bernsteinian era but within a social constructionist paradigm. Regarding knowledge required for occupations, or occupational/work related knowledge, the idea of recontextualisation first posited by Bernstein and expanded upon by van Oers, Barnett, Evans and others, has been a recurring theme in attempting to articulate an occupational pedagogy for vocational/occupational teachers.

The literature reviews in chapters 2 and 3 constitute an essential resource for introducing emerging VET researchers and scholars to the theoretical complexities of this field, but in an accessible and engaging manner. In this regard the monograph makes a welcome contribution to the literature on VET, particularly for researchers new to vocational education debates and discourses. The summaries in each chapter provide a helpful synopsis of the ideas that move the reader incrementally and systematically to the conceptual framework in chapter 4.

The build up to chapter 4 has therefore been competently managed when the reader arrives at the conceptual framework which is premised on the notion of dual professionalism, i.e. the vocational teacher as a professional teacher but also as an occupational specialist, both of which are depicted in the conceptual framework diagram on p.50. The synergistic essence of the relationships captured in the conceptual framework model are encapsulated in the definition of occupational pedagogic knowledge as being “a result of the complex interaction between applied pedagogic knowledge and applied occupational knowledge via the integrated applied recontextualisation process” (p.54). This pithy summary of what has undoubtedly been an outcome of careful thought and distillation from the literature, provides a fitting entry to the three chapters that follow, which deal with each of three levels of occupational training in turn: TVET courses; first degree courses; and professional courses. Here the continuum of knowledge and practice is observed in action, as each programme type is
discussed in relation to how teachers have described and explained their occupational pedagogy and application in terms of the conceptual framework set out earlier.

The case studies in Chapter 8 are based on the narratives of five vocational teachers in the subfields of art and design; travel and tourism; dental hygiene; emergency medicine; and finally in clinical medicine. Each case has been constructed from the analysed data obtained through interviews, questionnaires, and documentary sources, and in each instance there are insights into their sources of ‘teaching know how’, and how this has been applied by these teachers. Their narratives have been carefully constructed, and provide a clear window onto their pedagogies and practices at different levels of the training system in which they operate.

In chapter 9 the empirical evidence obtained from respondents, the various levels and content of their course offerings are placed side by side for comparative purposes, and are viewed through the lens of the conceptual framework. Here analysis reveals the array of knowledges that vocational teachers in the study drew on for their classroom delivery – their applied pedagogic knowledge (disciplinary and life-wide knowledge), their applied occupational practices (work experience and knowledge), finally culminating in their occupational pedagogic knowledge (OPK) or occupational teachers’ capacities (OTC) - the result of the recontextualisation of all their sources (explicit and tacit) of teaching ‘know-how’. While the comparative empirical evidence reveals the particularities of the different milieus or ‘occupational ecologies’, it also reveals their commonalities, which could contribute to the development of a standardised occupational teacher training curriculum.

The contribution of this volume

Loo’s achievement in this monograph is a convincing illustration of the essential elements of a vocational/occupational teacher training curriculum, through careful empirical analysis of what occupational teachers in their practice rely on. In addition, the collective wisdom and scholarship garnered through the ages is acknowledged and built upon throughout the development of his argument. Second, the conceptualisation of occupational teachers’ capacities (OTC) offers a holistic approach to training teachers that recognises and values their life and work experience. Several implications for policymakers, curriculum developers, and teacher educators are apparent from this study, but it will no doubt interest occupational teachers and their managers to reflect meta-cognitively on what it is that these teachers do, often implicitly, which this book illuminates.

The conversations started in this book are not new or unfamiliar, but they serve to confirm many suppositions and anecdotal accounts of what is needed in curricula for the training of vocational/occupational teachers. Loo has made a considerable contribution to thinking around occupational teacher development, and has pointed to the gaps with regard to appropriate teaching strategies and further codification of his findings through additional research.
Biographical Note

Professor Joy Papier, PhD is director of the Institute for Post-School Studies at the University of the Western Cape in Cape Town, South Africa. She has been active in vocational research, capacity building and policy development for more than 20 years, and currently holds the National Research Foundation Chair in TVET studies. Professor Papier is also the Editor-in-Chief of the recently established peer reviewed Journal of Vocational, Adult and Continuing Education and Training (JOVACET).
Training marketing by German companies – which training place characteristics are communicated?

Margit Ebbinghaus*

Federal Institute for Vocational Education and Training, Vocational Education and Training, Supply and Demand/Training Participation Division, Robert-Schuman-Platz 3, 53175 Bonn

Received: 20.07.2018; Accepted: 08.02.2019; Published: 29.08.2019

Abstract

Context: Although the German dual system of vocational education and training makes a major contribution to securing the supply of skilled workers for trade and industry, its function has been under scrutiny for several years. Companies are finding it increasingly difficult to recruit trainees, and increasing numbers of training places are vacant. However, such recruitment problems tend to be concentrated in certain occupations rather than occurring across all sectors equally. This has led to a significant increase in competition among companies seeking to secure the services of trainees in various occupations and calls into question the extent to which such fierce rivalry is reflected in the type of training marketing they conduct.

Approach: This paper investigates the training place characteristics companies communicate in their advertisements. Among these characteristics, differences exist in the general conditions of training, requirements for trainees and incentives the companies provide. Latent class analyses were used to investigate the patterns revealed in the training place characteristics and to examine if the frequency with which patterns occur correlates with whether a company is seeking trainees for an occupation with or without recruitment problems and with company size. The analyses were based on data collected from 1,939 small and medium-sized enterprises via standardised telephone interviews conducted at the beginning of 2016. The companies in question had offered training places in one of nine selected dual occupations. Four of the training occupations considered have recruitment problems. There are no recruitment difficulties in the other five.

*Corresponding author: ebbinghaus@bibb.de

ISSN: 2197-8646
http://www.ijrvet.net
Findings: The single group latent class analysis initially conducted resulted in a model with three latent classes exhibiting clearly differentiated patterns of training place characteristics. As well as focusing on general conditions and the requirements for training, the “aggressive” pattern mainly emphasises the incentives the training place or company offered. The “requirements-oriented” pattern concentrates on the future requirements for trainees. The “basic” pattern communicates only a very few fundamental training place characteristics. A subsequent multi-group latent class analysis revealed evidence that small and medium-sized enterprises offering training are more likely to display an aggressive pattern in occupations with recruitment problems than SMEs providing training in occupations where there are no recruitment difficulties. By the same token, small and medium-sized enterprises with training provisions in occupations with recruitment problems are less likely to exhibit training marketing aligned to the requirements of applicants than firms offering training in occupations without recruitment difficulties, although this is significantly clearer amongst small companies than medium-sized companies. Nevertheless, the class with requirements-oriented marketing constitutes the largest class for all four company groups.

Conclusion: The results indicate that conditions in the training market affect the training marketing companies carry out. However, they also show that companies are more likely to use their training marketing to react to recruitment problems that have already occurred rather than take a preventative approach towards such difficulties. For small companies in particular, the limitations in resources available for more elaborate training marketing likely contribute to this approach. Nevertheless, further research is needed to consolidate the outcomes identified here.

Keywords: German system of dual vocational education and training, recruitment problems, training marketing, latent class analysis, VET

1 Introduction

Dual vocational education and training is an important location factor for German trade and industry. The majority of persons making up the labour demand in Germany is in possession of a dual vocational qualification. Such a qualification is acquired by completing a training programme that is mostly of a duration of between three and three and a half years. During this period, occupational skills, knowledge and competencies obtained via practical work at the company for three to four days per week are supplemented by teaching at a vocational school on one to two days per week. Although vocational schools are involved in the vocational education and training, the training contract governing this type of employment for

training purposes is solely concluded between the company and the young person on the basis of the Vocational Training Act (Berufsbildungsgesetz).

Training contracts are thus entered into as a result of supply and demand in the same way as contracts of employment (cf. inter alia Herkner, 2013, p. 1). Companies offer their training places on the market and use criteria which they are largely free to stipulate for themselves to select their future trainees from the young people who have submitted an application. The number of training places in companies is primarily geared to their own demand for skilled labour. At the same time, securing one’s own demand for skilled workers is the most important reason why German companies participate in dual vocational education and training (Merrilees, W. J. 1983; Niederalt 2005; Jansen, Pfeifer, Schönfeld & Wenzelmann, 2015, Gessler 2017).

However, this route towards securing a supply of skilled workers is increasingly creating difficulties for companies in Germany. School leaver numbers are falling due to demographic reasons, and young people are increasingly attracted by universities and universities of applied sciences. The consequence of this is that fewer and fewer young people are applying for the training places on offer. As a result, recent years have seen a continuous rise in the proportion of companies affected by recruitment problems because they are unable to fill or completely fill their training vacancies. In 2016, 45.4% of the companies reported such problems (Troltsch, 2017a, pp. 232–233).

Considerable differences between the individual occupations encompassed by dual vocational education and training are behind this general development. Whereas particularly marked recruitment problems exist in occupations connected with the hotel and restaurant trade and in traditional craft trade occupations (such as baker), these difficulties are significantly less pronounced in occupations in the media, commercial and technical sectors (for example mechatronics fitter) (Matthes, Ulrich, Flemming & Granath, 2017, pp. 25–27).

Although it has become harder in overall terms for companies to find apprentices, the main effect has been to create considerably tougher competition between firms seeking to acquire interested young people for different training occupations. This poses the question as to the extent to which such fiercer rivalry is reflected in the type of training marketing they conduct. The present paper investigates this issue with regard to the characteristics communicated by companies in respect of the training places they offer. It looks at which training place characteristics are emphasised by companies within the scope of their training marketing and examines the extent of significance of the training occupation for which applicants are being sought. Section 2 provides a theoretical and empirical alignment for the investigation. It begins by outlining possible explanations for recruitment problems which vary according to the specific occupation (2.1) before moving on to outline approaches as to how training marketing could be used to counter these difficulties whilst placing the emphasis on contents communicated (2.2). Section 3 describes the database deployed to address the issues
and delineates the analytical methods and stages. Section 4 reports on the results obtained, and these are subsequently discussed in the final Section (5).

2 Theoretical and empirical points of reference

2.1 Problems with the filling of training places which vary in an occupational-specific way

The difficulties of recruiting apprentices differ between individual dual training occupations and may be viewed as the result of career choice behaviour on the part of young people. Various models (including Esser 1999, Gottfredson 2002) have approached this elective behaviour on the basis of the expectancy theory of motivation (Vroom 1964). The core assumption of the models is that two aspects affect the occupational choice and therefore also affect the application behaviour of young people. The first of these is the value or attractiveness of an occupation. The second aspect relates to the occupational expectations.

The value or attractiveness of an occupation refers to the extent to which the tasks correspond to individual preferences (e.g. Holland’s six personality traits; Holland 1966), but also to the extent to which the occupation serves personal aspirations in terms of goals (Rojewski 2005), such as gaining social prestige through the occupation (Gottfredson 2002). A couple of studies indicate that aspirations, particularly prestige, influence occupational choice more strongly than tasks (Farmer, Rotella, Anderson & Wardrope 1998; Rojewski & Kim 2003; Eberhard, Scholz & Ulrich 2009; Steinritz, Kayser & Ziegler 2012).

Occupational expectations refer to the assumed chances of getting access to an attractive occupation. According to Esser (1999) those expectations are materially dependent on the circumstances on the training market (Esser 1999, pp. 251–259). A high degree of competition between young people seeking a training place lessens occupational expectations whereas a high number of unfilled training places increases occupational expectations. In other words: If market conditions are less favourable young people will shift their aspirations towards more accessible – but most of the time less attractive – occupations such as occupations in the craft trades (Kaiumov, Kanikov & Iskhakova 2014). Otherwise they will draw their attention on occupations which enjoy greater social recognition like occupations in the fields of media, administration and organisation (ibid.; also NORC’s studies of occupational prestige by Smith & Son 2014), because they appear to be well within reach. The statistics of the German training market confirm these mechanisms. Parallel to the decrease in the overall number of applicants during the recent years the number of young people seeking a training place in the occupation of baker has, for example, fallen rapidly. By way of contrast,
applicant numbers for training places in the occupation of mechatronics fitter are even tending to show an increase (BIBB survey as of 30 September).

Compared to the significance of the occupation, there has been very little consideration to the importance of the company within the context of explaining the application behaviour of young people towards training places offered in Germany. Within this context, expectancy theory can also be used to argue that young people prefer to apply to companies which offer them something which they perceive to be of high value. According to generational theory (Mannheim 1952, Howe & Strauss 1991), nowadays most of the training seekers belong to Generation Z. While the period of time used to define this generation differs between studies and papers (e.g. born as from 1995, 2000 or 2005) some work related characteristics of Generation Z members are reported quite consistent. They are described as being highly interested in security of employment as well as in fast career opportunities, they are attentive to work-life balance, like spaces located near their homes and appreciate order, structure and predictability in their lives (inter alia Stillman & Stillman 2017 pp. 139-170 and pp. 248-272; Hurrelmann 2016, pp. 4-9).

Taking this into account, young people should be more likely to apply for a training place if a company possesses attributes that go along with their work related desires. Furthermore, there are some indications that these characteristics even increase the incentive to apply for training in an occupation different to that which the young person in question originally aspired to enter (Gei & Eberhard 2017, pp. 260–261). In other words, young people may sometimes find it more desirable to seek training at an attractive company rather than in a certain occupation. The prerequisite is, however, that the company must be perceived as an attractive employer or provider of training, and this draws attention to the training marketing that it conducts.

2.2 Training marketing for the acquisition of applicants

Training marketing may be viewed as a special form of human resources marketing. Due to an increasingly competitive labour market human resource marketing gained attention among scholars and practitioners (e.g. Boxall 1998; Backhaus and Tikoo 2004; Mosley 2015). The essential aim of human resource marketing is to establish a company as an employer of choice in such a way so as to arouse the wish in targeted job seekers to attend this company and if possible no other (e.g. Backhaus & Tikoo 2004, pp. 502-505; Berthon, Ewing & Hah 2005, pp. 151-152; Edwards 2010, pp. 6-7). Human resources marketing therefore needs to provide targeted potential employees with information they need to consider applying for a job. Communication measures are indispensable in this regard. Within the context of filling positions for skilled workers and management staff, in this case, a significantly higher degree of importance is attached to the choice of company or employer by researchers, including in Germany (cf. inter alia Feldmann & Arnold 1978; Böckenholt & Homburg 1990; Lieber 1993).
positions for skilled workers and management staff. A variety of studies has focused on 'classical' formal and informal communication channels, such as job advertisements in newspapers and word-of-mouth, that are used by companies to communicate their positions (e.g. Mencken & Winfield 1998; Breaugh & Starke 2000; Allen, Van Scotter & Otondo 2004; Van Hoye 2012). Findings indicate that job seekers are more attracted through informal recruiting sources than through formal communication channels (e.g. Collins & Stevens 2002; Van Hoye & Livens 2009). As far as training places are concerned, the few studies available suggest that craft enterprises tend to communicate training offers via informal channels, whereas companies from industry and commerce more frequently choose formal channels (Gerhards & Ebbinghaus 2014, pp.9-14).

Another aspect of human resource marketing concerns the information contained in employment advertisements. Theoretically speaking, advertisements may be viewed as conglomerates of information about the Position as a product (inter alia Freimuth 1989, p. 43; Brast, Holtgrave & Flindt 2017, pp. 38–39). Such information can relate to general conditions, to requirements made of applicants, or to incentives offered by the company.

Various studies indicate that the kind of information provided in employment advertisements has an impact on the decision to apply (inter alia Feldman, Bearden & Hardesty 2006; Born & Taris 2010; Wille & Derouse 2018). Following on from this, there is now also a wide range of guidebook literature which emphasise that it is simply impossible to overemphasise the importance of communicating the conditions and benefits of the training place on offer given the current state of affairs on the German training market in general and recruitment problems in particular (inter alia Beck & Dietl 2014). In addition, there are various websites, blogs and platforms on the subject of training marketing (e.g. ausbildungsmarketing.com). In contrast to this, however, only little is known so far about which information companies in Germany provide in advertisements about the training places they offer. While these studies indicate that companies tend to concentrate more on general conditions than on incentives but also suggest that the latter have gained a greater degree of significance lately (Eisele & Ziegler 2013; Association of German Chambers of Commerce and Industry 2017, pp. 12-14), there is no clarity as to the extent to which this constitutes a general phenomenon or whether it is simply the case that particularly companies seeking trainees in occupations where there are recruitment problems are making greater use of incentives in their training marketing. The combination of characteristics communicated by the companies is a further unresolved issue. The aim of the present paper is to deliver findings in this regard. In specific terms, it investigates a) the extent to which training place characteristics communicated by the companies within the scope of their training marketing exhibit certain patterns and b) whether there is a correlation between these patterns and the training occupation in which places are

---

3 Meanwhile the focus of research has shifted towards recruiting techniques using company web sites and social media (e.g. Van Hoye & Lievens 2007; Klucmper, Mitra & Wang 2016; Wordaz 2018).
being offered or apprentices sought. Latent class analyses (LCA) are conducted in order to expose such patterns and correlations. More details of these and of the database used for the analyses are provided in the following section.

3 Data and methods

3.1 Sample

The data used was collected via telephone at the beginning of 2016 from small and medium-sized enterprises (1 to 249 employees) located in Germany which were offering at least one training place for the training year 2015/2016 in one of nine selected occupations within the dual system of vocational education and training in Germany (cf. Table 1). We chose to focus on SMEs to take account of the circumstance that 99% of all companies providing training in Germany fall within these size categories (cf. inter alia Troltsch 2017b, p. 216) and in light of the fact that firms of this order of magnitude are more likely to face recruitment problems than major companies (cf. Troltsch 2017a, pp. 232–233).

The nine training occupations included are in all cases amongst the most significant in the dual system in terms of the numbers of trainees learning the occupations (cf. BIBB survey as of 30 September – Table 67/2015). All nine are also craft trades or trade and industry occupations and thus fall within the main dual VET sectors. There are, however, significant differences with regard to the ratio between numbers of applicants and numbers of training places offered (supply-demand ratio, SDR) and in respect of the amount of training places that remain unfilled as a proportion of all places offered (vacancy rate, VR) (cf. Table 1).

These indicators, which formed the basis for selection of the occupations alongside size and economic sector, show that two of the occupations selected (baker, restaurant specialist) already had far fewer applicants than training places offered at the beginning of the three-year period of observation. In the case of two further occupations (plant mechanic for sanitary, heating and air conditioning systems [SHK], hairdresser), the same situation entered into force during the period of observation itself. These four occupations are therefore affected by considerable recruitment difficulties, something which is also reflected in the vacancy rate, and have accordingly been conflated into a group of occupations with recruitment problems for the purpose of further analysis. In the case of the five other occupations, the number of applicants continues to exceed the number of training places on offer. In one instance (management assistant for retail services), demand outstrips supply considerably, and in another (information technology specialist), the tendency towards excess demand is growing. At the same time, companies were largely successful in obtaining applicants to fill the places on offer.

4 The training year in Germany usually commences on 1 August or 1 September.
in these occupations. Vacancy rates are significantly lower than in the four comparison occupations and are also mostly lower than the average across all occupations in the dual system. In the following analyses, these five occupations accordingly form the group of occupations without recruitment problems.

**Table 1: Occupational-related training market indicators for the training years 2013 to 2015**

<table>
<thead>
<tr>
<th>Training occupation</th>
<th>Year</th>
<th>SDR</th>
<th>VR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant mechanic for sanitary, heating and air conditioning systems (CT, TI)</td>
<td>2013</td>
<td>100.9</td>
<td>5.9</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>99.6</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>98.3</td>
<td>7.8</td>
</tr>
<tr>
<td>Baker (CT, TI)</td>
<td>2013</td>
<td>84.7</td>
<td>22.3</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>81.0</td>
<td>25.3</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>79.5</td>
<td>26.6</td>
</tr>
<tr>
<td>Electronics technician for industrial engineering (TI, CT)</td>
<td>2013</td>
<td>103.4</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>102.7</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>103.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Information technology specialist (TI, CT)</td>
<td>2013</td>
<td>113.8</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>116.7</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>117.1</td>
<td>4.1</td>
</tr>
<tr>
<td>Hairdresser (CT)</td>
<td>2013</td>
<td>102.0</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>98.8</td>
<td>12.9</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>98.4</td>
<td>12.7</td>
</tr>
<tr>
<td>Insurance and financial services broker (TI)</td>
<td>2013</td>
<td>102.3</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>103.1</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>102.0</td>
<td>5.8</td>
</tr>
<tr>
<td>Management assistant for retail services (TI, CT)</td>
<td>2013</td>
<td>114.5</td>
<td>8.7</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>115.8</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>113.6</td>
<td>8.8</td>
</tr>
<tr>
<td>Mechatronics fitter (TI, CT)</td>
<td>2013</td>
<td>105.9</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>104.1</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>103.1</td>
<td>4.6</td>
</tr>
<tr>
<td>Restaurant specialist (TI, CT)</td>
<td>2013</td>
<td>76.4</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>72.2</td>
<td>33.8</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>69.9</td>
<td>34.9</td>
</tr>
<tr>
<td><strong>All occupations in the dual system</strong></td>
<td>2013</td>
<td>108.8</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>107.9</td>
<td>6.6</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>107.0</td>
<td>7.4</td>
</tr>
</tbody>
</table>

SDR = supply-demand ratio, number of applicants per 100 training places offered, VR = vacancy rate, number of unfilled training places as a proportion of all training places.  
* The areas in which training is provided are stated in brackets. The predominant sector is placed first. CT indicates craft trades, TI denotes trade and industry.  
Source: BIBB “Survey of newly concluded training contracts as of 30 September”, Table 59 - 2016, as at 12.12.2016 (https://www.bibb.de/de/53472.php), own calculations
Between 210 and 220 companies with relevant training place provision were surveyed on each of the nine occupations. The total sample size is 1,939 companies. The necessary sample was taken from the Federal Employment Agency company database and comprised a random selection of firms stratified for occupations and regions. The purpose of stratification by regions was to avoid distortions by geographical area by ensuring that companies from the entire area of the Federal Republic of Germany were included in the sample for each occupation. The statistical population for the sampling procedure was defined as being all small and medium-sized enterprises whose employees included at least one trainee in one of the occupations forming the object of consideration as of the cut-off date of 30 September 2015.

The issue as to whether a company had offered at least one training place in an occupation included in the sample in the training year 2015/2016 was clarified at the outset of the telephone interview by posing a screening question. The survey was only continued if this enquiry received an affirmative response. Alignment to the group of small and medium-sized enterprises was validated during the interview by obtaining information regarding number of employees. Firms with up to 49 employees are categorised as small companies. Those with between 50 and 249 employees are deemed to be medium-sized companies.

3.2 Data

Companies were asked by telephone to state which characteristics they had included in their written advertisements for training places offered in the 2015/2016 training year differentiated according to general conditions, requirements and incentives. The term “advertisement” was used as a collective designation for all forms of written or text-based announcements of training place provision. The purpose of limiting the investigation to text-related forms of notification was to ensure that training place characteristics were communicated by the company itself and had not been imparted as the result of an enquiry.

Inclusion of general conditions governing training and of requirements made of applicants was surveyed dichotomously (yes/no). Five characteristics were taken into consideration for each group (cf. Table 2). The collation of these characteristics was based on research works conducted into criteria frequently used by companies for the (pre) selection of training place applicants (cf. inter alia Kohlrausch & Richter 2013, p. 7) and on findings relating to general conditions which are viewed by trainees as being important (inter alia Schank 2011, pp. 45–46).

In the case of incentives, which were compiled in alignment with existing studies on company training marketing (Eisele & Ziegler 2013, p. 29; Eisele & Ullrich 2014, p. 19) and via

---

5 We would like to take this opportunity to express our gratitude to the Federal Employment Agency for the support provided.
6 The German training market is characterised both by occupational disparities and regional imbalances (cf. inter alia Matthes et al. 2017).
reference to research findings relating to expectations of young people vis-à-vis their company providing training (inter alia Schank 2011), a two-stage survey design was deployed. Firstly, companies were asked in respect of every incentive whether such an incentive was in place (yes/no). If a positive response was elicited, further dichotomous enquiry (yes/no) was made in order to identify whether the companies had also included the incentive in question in training place advertisements. For the purpose of the analyses undertaken in the present paper, the two dichotomous statements separately collected were each transferred to a categorial variable containing the three characteristics “incentive not in place”, “incentive in place but not communicated” and “incentive in place and communicated”.

Table 2: Training place characteristics identified

<table>
<thead>
<tr>
<th>Training place characteristics identified by a singlestage process</th>
<th>Training place characteristics identified by a twostage process</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General conditions</strong></td>
<td><strong>Incentives</strong></td>
</tr>
<tr>
<td>• Information regarding the training occupation, e.g. duration and contents of training</td>
<td>• Possibility of being offered permanent employment after completion of training</td>
</tr>
<tr>
<td>• Amount of training allowance</td>
<td>• Opportunities for advancement at the company*</td>
</tr>
<tr>
<td>• Location of vocational school</td>
<td>• Part-time training</td>
</tr>
<tr>
<td>• Information regarding the company providing training, e.g. size and location</td>
<td>• Shortening of duration of training</td>
</tr>
<tr>
<td>• Working times</td>
<td>• Periods of time spent abroad during training</td>
</tr>
<tr>
<td><strong>Requirements</strong></td>
<td>• Acquisition of additional qualifications</td>
</tr>
<tr>
<td>• Expected school education (qualification, marks)</td>
<td>• Payment of necessary travel costs</td>
</tr>
<tr>
<td>• Expected virtues, e.g. reliability, punctuality</td>
<td>• Payment of necessary accommodation costs</td>
</tr>
<tr>
<td>• Expected communication skills</td>
<td>• One-off financial incentives, e.g. funding of driving licence</td>
</tr>
<tr>
<td>• Expected ability to work as part of a team</td>
<td>• Regular special payments, e.g. Christmas bonus</td>
</tr>
<tr>
<td>• Expected motivation and commitment</td>
<td></td>
</tr>
</tbody>
</table>

*Was only asked if there was a possibility of subsequent permanent employment, otherwise set as “not in place”.

3.3 Data analysis

The first stage of the analysis involves a descriptive evaluation of which training place characteristics are more or less likely to be included in advertisements for training places offered. However, this descriptive consideration does not enable us to identify how companies combine the characteristics and whether these combinations follow certain patterns that are typical of groups of companies. Exploratory latent class analyses (LCA) are conducted in order to discover this.

An LCA is a multivariate analytical procedure. The primary objective of the exploratory type of LCA deployed here is to divide investigation units (in this case companies) into a priori unknown sub-groups (latent classes) (cf. Inter alia Geiser 2011, p. 235; Berlin, Williams &
Groups are formed on the basis of the similarities and differences in the responses provided by the companies to questions relating to the training place characteristics communicated. One benefit of the LCA is that responses to both dichotomous and polytomous items can be included in the analyses at the same time.

The number of classes needed to map the data adequately is not a model parameter and must be determined indirectly via comparisons of models with different class numbers. Theoretical measurements from the group of information criteria (IC) are deployed for this purpose on the basis of Geiser (2011, pp. 260–271) and Geiser, Okun & Grano (2014, pp. 10–11) – Akaike’s information criteria (AIC), the Bayesian information criteria (BIC) and the sample size adjusted BIC (aBIC). The intention was to prefer the model with the lowest IC values, whereby the relevant literature particularly recommends the BIC (Geiser 2011, pp. 269–270).

The statistical test procedures used are the bootstrap likelihood ratio difference test (BLR test) and the Vuong-Lo-Mendell-Rubin Test (VLMR test). These enable a comparison to be undertaken between two models in which the class numbers differ by 1. Significant test results indicate that the model with an additional class is a better fit for the data than the other model (Geiser 2011, pp. 260–271; Geiser, Okun & Grano 2014, pp. 10–11). The BLR test is deemed to be the more robust of the two test procedures (Geiser 2011, pp. 265–269).

Further criteria included to evaluate the quality of the model are the mean class affiliation probabilities in their capacity as indicators of class homogeneity, the entropy as a global measure of reliability of the allocation of companies to classes, and the presence of boundary estimations. Boundary estimations often indicate that a model is invalid or exhibits too many classes (Geiser 2011, p. 270). Finally, the interpretability of the solution also has a part to play.

Alongside the patterns as such, the main point of interest here is whether correlations exist between the patterns and the occupation for which companies are seeking trainees. In order to explore this question, multi-group LCAs are performed for the whole sample once the number of classes has been determined. The grouping variable used is the occupational group (occupations with recruitment problems versus occupations without recruitment problems, cf. Section 3.1). Company size (small company versus medium-sized enterprise, cf. Section 3.1) is included as a further grouping variable. This accords due consideration to the fact that the segment of the economy which provides training in occupations with recruitment problems is more structured along the lines of small companies than the segment in which training takes place in occupations without recruitment problems. Multi-group LCAs permit restrictions (equalisations of parameters between groups) to be used as a vehicle for checking whether the frequency with which patterns of training place characteristics communicated are exhibited vary with the occupational group, with company size or in terms of both variables.
All analyses were conducted on the basis of the recommendations of Geiser (2011, pp. 235–271), Berlin, Williams & Parra (2013) and Muthén & Muthén (2017, pp. 168–178) and using the software package Mplus Version 7.2.

4 Results

We will begin with a brief general look at which training place characteristics were communicated more frequently and more rarely by the companies surveyed in order to acquire potential applicants. A more detailed description of the findings of the LCAs on the patterns contained will then follow.

4.1 Descriptive results for the training place characteristics communicated

Table 3 shows the descriptive findings on the individual training place characteristics. These reveal that, as far as the general conditions are concerned, characteristics relating to the training occupations, such as the contents and duration of training, are most likely to be included in training place advertisements. Just over three quarters of the companies surveyed adopt this approach. This is understandable to the extent that companies increasingly complain that young people submit applications with very few clear occupational ideas (Association of German Chambers of Commerce and Industry 2016, pp. 14–15). Even information on the company itself (size, location) is significantly less likely to be imparted. Only just over half of companies include these details. The remaining general conditions form part of the training marketing of only between just over a fifth and just over a quarter of companies.
By way of contrast, requirements made of applicants are communicated by significantly higher proportions of the companies. They are particularly likely to formulate requirements regarding the ability of young people to work as part of a team, followed by motivational requirements. The requirements that are least likely to be addressed are those that relate to trainees’ communication skills. Even so, just over one in two companies include these aspects in their training marketing.

As far as incentives are concerned, the first thing to be said is that there is a type of division between those which are found at large numbers of companies and those that are only available at comparatively few firms. Just under nine in ten companies, for example, offer the prospect of a permanent contract of employment upon conclusion of vocational education and training. However, only one in eight afford an opportunity to complete training on a

| Table 3: Proportion of companies which communicate the individual training place characteristics, in % |

<table>
<thead>
<tr>
<th>a) General conditions</th>
<th>Not communicated</th>
<th>Communicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information on the training occupation</td>
<td>23.8</td>
<td>76.2</td>
</tr>
<tr>
<td>Information on the company providing training</td>
<td>45.8</td>
<td>54.2</td>
</tr>
<tr>
<td>Working times</td>
<td>78.5</td>
<td>21.5</td>
</tr>
<tr>
<td>Amount of training allowance</td>
<td>76.4</td>
<td>23.6</td>
</tr>
<tr>
<td>Location of vocational school</td>
<td>71.7</td>
<td>28.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b) Requirements</th>
<th>Not communicated</th>
<th>Communicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected school education</td>
<td>35.0</td>
<td>65.0</td>
</tr>
<tr>
<td>Expected ability to work as part of a team</td>
<td>28.0</td>
<td>72.0</td>
</tr>
<tr>
<td>Expected communication skills</td>
<td>44.7</td>
<td>55.3</td>
</tr>
<tr>
<td>Expected motivation</td>
<td>33.0</td>
<td>67.0</td>
</tr>
<tr>
<td>Expected virtues</td>
<td>37.0</td>
<td>63.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c) Incentives</th>
<th>Not in place</th>
<th>In place but not communicated</th>
<th>In place and communicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possibility of subsequent permanent employment</td>
<td>11.2</td>
<td>56.6</td>
<td>32.2</td>
</tr>
<tr>
<td>Opportunities for advancement</td>
<td>25.2</td>
<td>40.9</td>
<td>33.9</td>
</tr>
<tr>
<td>Acquisition of additional qualifications</td>
<td>23.9</td>
<td>47.3</td>
<td>28.8</td>
</tr>
<tr>
<td>Periods of training spent abroad</td>
<td>82.9</td>
<td>12.7</td>
<td>4.4</td>
</tr>
<tr>
<td>Regular special payments</td>
<td>30.9</td>
<td>50.4</td>
<td>18.7</td>
</tr>
<tr>
<td>One-off financial incentives</td>
<td>78.2</td>
<td>16.3</td>
<td>5.4</td>
</tr>
<tr>
<td>Payment of travel costs</td>
<td>57.7</td>
<td>34.2</td>
<td>8.1</td>
</tr>
<tr>
<td>Payment of housing costs</td>
<td>77.6</td>
<td>18.3</td>
<td>4.2</td>
</tr>
<tr>
<td>Shortening of duration of training</td>
<td>23.4</td>
<td>57.0</td>
<td>19.6</td>
</tr>
<tr>
<td>Part-time training</td>
<td>87.6</td>
<td>9.2</td>
<td>3.2</td>
</tr>
</tbody>
</table>
part-time basis if necessary. Irrespective of this, it is also revealed that only a relatively small proportion of companies with a certain incentive in place actually make use of this in their training marketing. Most companies fail to tap into the potential of offering incentives in order to gain kudos amongst potential applicants.

4.2 Latent class analyses

4.2.1 Single group LCA

The descriptive findings do not provide any response to the question as to whether the way in which companies combine (existing) training place characteristics within the scope of their training marketing exhibits certain patterns and, if this is the case, how many such patterns can be differentiated.

In order to investigate this issue, models containing between one and five latent classes were estimated for the entire sample across all 20 characteristics. The quality statistics for the five models are shown in Table 4. Replication of the best loglikelihood values proved possible for all models. This indicates clear solutions (Geiser 2011). The IC values AIC, BIC and aBIC become smaller from model to model without reaching a minimum. Although this finding implies a solution with more than five classes, the further parameters contradict this. The entropy, for example, achieves a lower value in the five-class solution than in the three and four-class solution and reaches its best value for the model with four classes. The result of the VLMR test also argues against the five-class solution and supports the four-class solution. By way of contrast, however, the BLR test indicates that the solution containing five classes is a model which is a better fit for the data. Notwithstanding this, boundary estimates have occurred both in the case of the four-class and the five-class model. Such estimates can be interpreted as indications of unreliable solutions and/or models with too many classes (Geiser 2011, p. 270). Finally, a consideration of the mean class affiliation probabilities shows that these each achieve satisfactory values of above 0.80 in all models but do not reach good values of over 0.90. The latter figure only occurs in the case of the models with two and three classes.

---

7 Although part-time training is possible in all occupations, certain prerequisites need to be fulfilled (including parenting responsibilities or acting as a carer for a relative).
Table 4 Model quality statistics for different latent class solutions

<table>
<thead>
<tr>
<th>Fit statistics</th>
<th>1-class model</th>
<th>2-class model</th>
<th>3-class model</th>
<th>4-class model</th>
<th>5-class model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loglikelihood (number of replications)</td>
<td>-27639.846 (49/50)</td>
<td>-26000.102 (50/50)</td>
<td>-25225.291 (49/50)</td>
<td>-24919.468 (50/50)</td>
<td>-24755.040 (50/50)</td>
</tr>
<tr>
<td>AIC</td>
<td>55339.691</td>
<td>52122.204</td>
<td>50634.582</td>
<td>50084.936</td>
<td>49818.080</td>
</tr>
<tr>
<td>BIC</td>
<td>55505.789</td>
<td>52461.969</td>
<td>51147.015</td>
<td>50770.037</td>
<td>50675.849</td>
</tr>
<tr>
<td>nBIC</td>
<td>55411.478</td>
<td>52268.171</td>
<td>50854.727</td>
<td>50379.263</td>
<td>50186.587</td>
</tr>
<tr>
<td>Entropy</td>
<td>--</td>
<td>0.796</td>
<td>0.837</td>
<td>0.852</td>
<td>0.808</td>
</tr>
<tr>
<td>BLR test</td>
<td>--</td>
<td>3279.487</td>
<td>1549.622</td>
<td>611.646</td>
<td>328.856</td>
</tr>
<tr>
<td>p &lt; .0000</td>
<td>p &lt; .0000</td>
<td>p &lt; .0000</td>
<td>p &lt; .0000</td>
<td>P &lt; .0000</td>
<td>P &lt; .2969</td>
</tr>
<tr>
<td>VLMR test</td>
<td>--</td>
<td>3265.572</td>
<td>1543.046</td>
<td>609.051</td>
<td>327.461</td>
</tr>
<tr>
<td>p &lt; .0000</td>
<td>p &lt; .0000</td>
<td>p &lt; .0000</td>
<td>p &lt; .0000</td>
<td>P &lt; .0000</td>
<td>P &lt; .2969</td>
</tr>
<tr>
<td>Boundary estimates</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Mean class affiliation probabilities

<table>
<thead>
<tr>
<th>2-class model</th>
<th>c 1</th>
<th>c 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>c 1 (39.1%)</td>
<td>0.934</td>
<td>0.066</td>
</tr>
<tr>
<td>c 2 (60.1%)</td>
<td>0.054</td>
<td>0.946</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3-class model</th>
<th>c 1</th>
<th>c 2</th>
<th>c 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>c 1 (29.4%)</td>
<td>0.925</td>
<td>0.068</td>
<td>0.007</td>
</tr>
<tr>
<td>c 2 (46.5%)</td>
<td>0.047</td>
<td>0.922</td>
<td>0.031</td>
</tr>
<tr>
<td>c 3 (24.1%)</td>
<td>0.009</td>
<td>0.049</td>
<td>0.942</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4-class model</th>
<th>c 1</th>
<th>c 2</th>
<th>c 3</th>
<th>c 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 (22.1%)</td>
<td>0.936</td>
<td>0.008</td>
<td>0.020</td>
<td>0.037</td>
</tr>
<tr>
<td>C2 (26.5%)</td>
<td>0.004</td>
<td>0.929</td>
<td>0.007</td>
<td>0.060</td>
</tr>
<tr>
<td>C3 (13.6%)</td>
<td>0.020</td>
<td>0.027</td>
<td>0.877</td>
<td>0.077</td>
</tr>
<tr>
<td>C4 (37.8%)</td>
<td>0.026</td>
<td>0.047</td>
<td>0.018</td>
<td>0.909</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5-class model</th>
<th>c 1</th>
<th>c 2</th>
<th>c 3</th>
<th>c 4</th>
<th>c 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>c 1 (22.4%)</td>
<td>0.837</td>
<td>0.074</td>
<td>0.070</td>
<td>0.001</td>
<td>0.017</td>
</tr>
<tr>
<td>c 2 (25.5%)</td>
<td>0.094</td>
<td>0.845</td>
<td>0.003</td>
<td>0.036</td>
<td>0.022</td>
</tr>
<tr>
<td>c 3 (18.6%)</td>
<td>0.091</td>
<td>0.003</td>
<td>0.894</td>
<td>0.011</td>
<td>0.001</td>
</tr>
<tr>
<td>c 4 (12.6%)</td>
<td>0.004</td>
<td>0.069</td>
<td>0.027</td>
<td>0.872</td>
<td>0.027</td>
</tr>
<tr>
<td>c 5 (20.8%)</td>
<td>0.017</td>
<td>0.023</td>
<td>0.002</td>
<td>0.017</td>
<td>0.941</td>
</tr>
</tbody>
</table>

N = 1,939

An analysis of the patterns resulting for the three and four-class solution ultimately showed that the patterns of two latent classes in the four-class solution were very similar in terms of their fundamental structure (cf. Annex 1), whereas the patterns of all latent classes vary more significantly in the case of the three-class solution (cf. Fig. 1 to 3).

In conjunction with the criterion of parsimony, the results thus suggest that the three-class model should be accepted as a clear and interpretable solution which is suitable for the data. In accordance with their patterns, the classes of this solution can be interpreted as “aggressive training marketing” (class 1), “requirements-oriented training marketing” (class 2) and “basic training marketing” (class 3).
In specific terms, training marketing in aggressive class 1 is characterised by a wide-ranging communication pattern (cf. Fig. 1). Companies that belong to this class are more likely to use all training place characteristics as an object of training marketing than companies in the two other classes. One prominent aspect is that the marketing potential offered by existing incentives is frequently exploited.

By way of contrast, existing incentives are highly likely not to be communicated in the case of requirements-oriented training marketing in class 2 and basic training marketing in class 3 (cf. Fig. 2 and 3) even if the probability that such incentives are in place is similar to in class 1. Instead of this, companies in class 2 (which accounts for 46.5% of firms and constitutes the largest class) are highly likely to address the requirements that they make of training place applicants. Such an approach tends to be unlikely in the case of companies which pursue basic training place marketing. In overall terms, it is not very probable that companies falling within class 3 will communicate training place characteristics. The likelihood that they will do so is only somewhat higher with regard to information on the company providing training and prior school learning of applicants.
Training marketing by Germany companies

Fig. 2: Latent class 2 – requirements-oriented training marketing

Fig. 3: Latent class 3 – basic training marketing
4.2.2 Multi-group LCAs

Multi-group LCAs were subsequently performed in order to undertake a detailed analysis of the three-class solution identified. In specific terms, the object of investigation was to discover whether the three patterns of company training marketing occur in a structurally identical way but with varying frequency at companies offering training places in occupations with or without recruitment problems and/or at companies of different sizes. In order to test this, various models were estimated which allow the class size to be varied between the four occupational groups (2 types of occupation [with/without recruitment problems] x 2 company sizes [small company/medium-sized enterprise]) but which also enable equality restrictions to be used to keep the marketing patterns constant for different company groups. Model 1, which permits structurally varying patterns of training place characteristics communicated between all four company groups, constitutes an exception in this regard. Model 2 specifies structurally equal patterns for companies in both size classes but not for companies of both occupational types. This model accordingly investigates whether frequency of communication patterns varies with company size. By the same token, model 3 keeps constant patterns for companies of both occupational types but not for companies in both size classes. This investigates whether type of occupation is associated with varying frequencies of the patterns. Finally, model 4 defines structurally identical patterns for all four company groups. This model accordingly checks whether frequency of the individual patterns varies by company size and type of occupation, i.e. whether the occurrence of the individual patterns is more likely for certain of the four company groups than for others.

The statistics on model quality in Table 5 show that a different model appears to be the best fit for the data depending on the parameter observed. The only exception in this regard is model 3, which does not reach the best value for any of the parameters. Model 1 exhibits both the smallest AIC and the best global measure for reliable classification (entropy). In the case of model 2, the BIC adjusted for the sample size adopts the smallest value. However, boundary estimations occur in respect of both models. No boundary estimations are contained in model 4, which also has the lowest BIC value. Because BIC is considered to be a particularly valid measure of model quality (inter alia Geiser 2011, pp. 269–270) and boundary estimations frequently indicate invalid solutions, we would appear to be justified in viewing model 4 as the best fit for the data structure, especially as observation of the respective patterns has produced very similar structures for all four models. The results of the analyses also suggest that the three training marketing patterns occur at companies with differing levels of frequency depending on whether the firm in question is a small or medium-sized company or is seeking trainees for an occupation which has or does not have recruitment problems.
Table 5 Fit statistics for different multi-group models with three latent classes

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Varying class profiles across all four company groups</td>
<td>Same class profiles for company size</td>
<td>Same class profiles for training occupations</td>
<td>Same class profiles across all four company groups</td>
</tr>
<tr>
<td>Loglikelihood (number of replications)</td>
<td>-27136.256 (35/50)</td>
<td>-27350.963 (50/50)</td>
<td>-27387.878 (50/50)</td>
<td>-27623.524 (50/50)</td>
</tr>
<tr>
<td></td>
<td>AIC: 55010.511</td>
<td>55083.925</td>
<td>55157.756</td>
<td>55449.047</td>
</tr>
<tr>
<td></td>
<td>BIC: 57076.955</td>
<td>56147.789</td>
<td>56221.612</td>
<td>56011.610</td>
</tr>
<tr>
<td></td>
<td>aBIC: 55898.279</td>
<td>55540.970</td>
<td>55614.801</td>
<td>55690.731</td>
</tr>
<tr>
<td>Entropy</td>
<td>0.943</td>
<td>0.934</td>
<td>0.934</td>
<td>0.928</td>
</tr>
<tr>
<td>Boundary estimations</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 6 shows these frequencies. They indicate that aggressive training marketing is more likely to occur at both small and medium-sized enterprises if they are seeking trainees for occupations with recruitment problems than if they are attempting to find trainees for occupations without such difficulties. By the same token, small and medium-sized companies with training provision in occupations with recruitment problems are less likely to exhibit training marketing aligned to the requirements of applicants than firms offering training in occupations without recruitment difficulties, although this is significantly more clearly manifested amongst small companies than medium-sized firms. Nevertheless, the class with requirements-oriented marketing constitutes the largest class for all four company groups.

Another interesting aspect to be revealed, however, is that small companies offering training places in occupations with recruitment problems are more likely than small companies with training provision in occupations without recruitment problems to display basic marketing. The opposite applies in the case of medium-sized enterprises. Companies offering training places in occupations without recruitment problems are more likely to exhibit this pattern than companies with training places in occupations with recruitment problems.
Table 6 Latent class proportions for model 4 of the multi-group latent class analysis

<table>
<thead>
<tr>
<th>Latent class</th>
<th>Small companies</th>
<th>Medium-sized enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>with recruitment problems</td>
<td>without recruitment problems</td>
</tr>
<tr>
<td>Class 1 Aggressive training marketing</td>
<td>33.3%</td>
<td>22.6%</td>
</tr>
<tr>
<td>Class 2 Requirements-oriented training marketing</td>
<td>39.0%</td>
<td>55.5%</td>
</tr>
<tr>
<td>Class 3 Basic training marketing</td>
<td>27.7%</td>
<td>22.8%</td>
</tr>
</tbody>
</table>

5 Conclusion

One of the main pathways via which German companies secure their skilled worker requirements is by offering their own training, but increasing recruitment problems are now calling this approach into question. This has raised the question of how companies respond to these problems. Particular attention was directed towards the extent to which companies amend or lower the criteria which they use to select training place applicants (inter alia Ebbinghaus & Gerhards 2013; Dummert, Frei & Leber 2014, pp. 5-6). However, companies do not have the ability to make such a selection until they have succeeded in using their training marketing to motivate young people to make an application. Because a growing number of companies is no longer achieving this objective (Association of German Chambers of Commerce and Industry 2017, p. 11), issues relating to company training marketing are gradually meeting with a higher degree of research interest. Within this context, the present paper has investigated which characteristics of training places are communicated in advertisements by small and medium-sized enterprises.

The analyses conducted show that companies adopt highly differing approaches in this regard. This is made clear by dint of the fact that it proved possible to identify three patterns of training place characteristics communicated, each of which displays specific main focuses. As well as concentrating on general conditions and the requirements for training, the “aggressive” pattern mainly emphasises the incentives offered by the “training place product”. Requirements-oriented training marketing largely avoids any attempt to exploit the potential of existing incentives by primarily addressing the requirements made of future trainees. In overall terms, basic training marketing targets only a very few fundamental training place characteristics. More detailed analyses also enabled us to find indications that both the type of training occupation in which companies are seeking trainees and company size play a part
in the marketing strategy exhibited by the firms. Aggressive training marketing is conspicuously likely to be conducted by companies offering training in occupations with recruitment problems. It is, however, also noticeable that a high proportion of small companies with training provision in occupations with recruitment problems takes the opposite approach by adopting basic training marketing, although this pattern is comparatively rare amongst medium-sized enterprises providing training in the same occupational segment. Firstly, these findings lead to the conclusion that companies tend to use the portfolio of training place characteristics communicated in a similar way to the routes which they adopt to communicate training place provision (Gerhards & Ebbinghaus 2014; Association of German Chambers of Commerce and Industry 2017, pp. 13-14), i.e. to react to recruitment problems that already exist rather than as a means of taking preventative action to counter such difficulties. Secondly, the findings suggest that small companies in particular seem to experience limitations with regard to adapting training marketing to altered circumstances on the training market. This is probably due to the fact that, in contrast to medium-sized enterprises and larger companies, small firms do not in many cases have the necessary experience and / or resources available to develop training marketing which is aligned to the market and to the exploitation of areas of potential offered by existing incentives. In this case, approaches should be considered to help small businesses overcome these limitations. One way could be support offers from chambers and associations that go beyond existing image campaigns, which are usually related to certain occupations or sectors (e.g. the campaign of the bakery trade: https://www.back-dir-deine-zukunft.de/), by addressing the needs and even more so the potentials of individual companies. Such support services could also help small enterprises, but also training companies as a whole, to become more proactive than in the past in order to cope with changes in the training market.

The circumstance that small companies are conspicuously likely only to provide basic information about training characteristics may, however, also indicate that these firms (still) only make limited overall use of the written and text-based advertisements forming the present object of investigation for the purpose of acquisition of training place applicants and instead tend to attempt to fill training places via personal contacts and relationships. Although initial findings which point in this direction have been arrived at (Gerhards & Ebbinghaus 2014, pp. 12–14; Ebbinghaus, Bahl, Gei & Flemming 2017, pp. 14–17), further research work will be needed to back these results up.

More research should also be conducted to address the question of the effectiveness of different strategies for the communication of general conditions, requirements and in particular incentives for the “training place product” for the purpose of acquiring applicants and trainees. Such research activities could go beyond the mere obtaining of more academic research findings and make a contribution towards the scrutiny and consolidation of the re-
commendations on the structuring of company training marketing that are contained within the diverse guidance literature.

Last but not least, further research work on the patterns of company training marketing identified in the present paper would be desirable. Although the three-class solution may be assumed to be a justified approach, there are a number of aspects which certainly indicate the suitability of a solution which contains more classes. Evidence was also found for the assumption that frequency of the marketing patterns varies in line with company size and occupational group. Notwithstanding this, consolidation of this assumption vis-à-vis other assumptions, particularly with regard to variation of frequency purely in line with company size, proved to be somewhat weak. For this reason, further studies into the marketing behaviour of companies should be carried out which involve either a larger sample size or else address a differently constituted number of dual training occupations. Especially in the case of multi-group analyses, sample sizes in the individual sub-groups rapidly become low. To a certain extent, this may exert a negative impact on the reliability of the results or the homogeneity of the sub-groups. At the same time, higher sample sizes and numbers of occupations could shed greater light on the occupational-specific nature of company training marketing and also allow the investigation of further factors influencing such marketing which have not been taken into account here.

A deeper understanding of the conditions, logics and successes of training marketing is important not only with regard to the German training and skilled labour market. In many European and non-European countries, high youth unemployment and a shortage of skilled workers with the qualifications required by the economy have led to a stronger emphasis on the implementation or expansion of in-company training concepts (e. g. Euler 2013, p. 11; Cedefop 2018). Such efforts can be found, for example, in France, the United Kingdom, Norway and the Netherlands (Cedefop 2018). In many countries, the lower attractiveness of vocational education and training compared to higher education poses a major challenge (ibidem). To cope with this, image campaigns were launched, among other things, to demonstrate the advantages of vocational training in order to attract both companies and young people to participate. For example, last year the UK Department of Apprenticeship and Skills commissioned an advertising campaign for over £2 million (without author 2018, S. 7). The fact that such measures have so far only led to limited success may also have something to do with the fact that the training places offered by companies and other practical players are still perceived as not being very attractive. This suggests that marketing for the VET system must be accompanied by marketing for individual training places. It is true that the study presented here does not allow any conclusions to be drawn as to whether companies will be more successful in filling training places as a result of strong marketing. However, there are indications from practical experience that good marketing can make it possible to make in-company training places sought after by young people, even if the VET system is less
well regarded in society as a whole. Even if these indicators concern training places offered by companies with a high reputation, they suggest that smaller companies - and thus the vocational training sector as a whole - will also benefit from good marketing strategies.

References


Training marketing by Germany companies


Holland, J. L. (1966). The psychology of vocational choice. Waltham, Massachusetts: Blaisdell


Training marketing by Germany companies


Data systems

Database BIBB survey as of 30 September (BIBB “Survey of newly concluded training contracts as of 30 September”. https://www.bibb.de/de/39323.php
Appendix

Patterns of the four-class solution

Fig. 1-A: Latent class 1

Fig. 2-A: Latent class 2
Fig. 3-A: Latent class 3

Fig. 4-A: Latent class 4
Biographical notes

Dr Margit Ebbinghaus is an academic researcher at the Federal Institute for Vocational Education and Training in Bonn, Germany. Her focal areas of research are company participation in dual vocational education and training and the strategies adopted by companies for the recruitment of trainees.
Large-scale studies of holistic professional competence in vocational education and training (VET): The case of Norway

Leif Chr. Lahn*, Hæge Nore

OsloMet–Oslo Metropolitan University, Department of Vocational Teacher Education, Kunnskapsveien 55, 2007 Kjeller.

Received: 28.04.2018; Accepted: 08.02.2019; Published: 29.08.2019

Abstract

Context: In this paper, we review and discuss the piloting in Norway of a German methodology for competence diagnostics in vocational education and training: the Competence Development and Assessment in TVET (COMET) project. Our overarching theme is determining to what extent such large-scale assessment systems are valid for international comparisons in this sector.

Method: We present the theoretical underpinnings of the COMET model and position our discussion within the broader context of the concept of “professional competence” (berufliche Kompetenz) and methodological guidelines for its measurement. Terminology from psychometrics on “measurement equivalence” is described and serves as a template for identifying challenges in using the Norwegian data for comparative purposes. Our pilot included students and apprentices in health care, industrial mechanics and electricians and was designed as a three-year follow-up study from the second year of upper secondary school through two years of apprenticeship. Each year, a test on professional competence and a context survey were administered. Similar studies have been conducted in Germany, China and South Africa.

Results: In line with the results from these countries, the Norwegian participants had low scores, particularly the electricians. However, the diagnostic instrument was sensitive to the development of professional competence, and progress on the assessment was influenced

*Corresponding author: l.c.lahn@iped.uio.no

ISSN: 2197-8646
http://www.ijrvet.net
by the quality of the learning support in the companies, as reported by apprentices in the context survey.

Conclusions: The COMET platform may be a viable prototype for the development of diagnostic tools, which may support the monitoring of quality factors at different levels and inspire local improvement projects in schools, companies and training offices. Such an objective would be in line with the latest summaries of the COMET project, in which its contribution to a model for international large-scale assessment is toned down and replaced by a stronger emphasis on its potential for measuring competence development, evaluating contextual factors and generating data for didactic innovations.

Keywords: Vocational education and training, large-scale assessment, professional competence, international measurement comparability, VET

1 Introduction

The pioneering work on international large-scale studies in education was initiated 60 years ago in both a European and US context. Since then, these assessments have expanded in scope, focusing on a broader range of populations and skill domains (Kirsch, Lennon, van Davier, Gonzalez, & Yamamoto, 2013). New countries have been recruited, representing a large mix of economies, cultures and geography (Rutkowski & Rutkowski, 2018). Three overall motives for such efforts could be distinguished (Smith & Comyn, 2003; Kuger & Klieme 2016): (1) a concern for national competitiveness in a global knowledge-based economy, (2) actions to innovate the educational sector, and (3) curriculum development and teaching strategies to improve schools. Baumert (2009) adds that the universalization and standardization of schooling are global trends which stir an interest in international comparisons of educational systems. Thus, it is not surprising that initiatives were taken a decade ago to develop large-scale assessment instruments that should enable across-country comparisons of learning outcomes of different systems for vocational education and training (VET).

There are several reasons why the measurement of competences in the field of VET is more challenging than in compulsory education (Baethge & Arends, 2009). Whereas international large-scale assessments have a limited focus on pupils’ performance in mathematics and science (PISA, TIMMS) or generic competencies (IALS, PIAAC), similar efforts for vocational skills need to take into account a large variety of vocational domains and important differences in the educational configurations between countries. In addition, the development of measurement tools for VET competences cannot draw on long research traditions and accumulated knowledge about vocational expertise. Hence, the design of such projects should be subjected to feasibility testing and explorative inquiries. The elusive character of concepts such as “vocational competence,” “generic competence” and “literacy” does intro-
Large-scale studies of holistic professional competence

duce added challenges of measurement and formal assessment (Mulder, 2017). In this article a major theme is the international and transcultural comparability of such instruments when they are designed to measure holistic competences in VET.

We will present and discuss the study, “Measuring competence development in vocational education and training” (MECVET), which was a pilot in Norway of a German effort to develop and test a methodology for professional competence diagnostics (“Kompetenzdiagnostik”) in VET, COMET (“Competence Development and Assessment in TVET”, Rauner, Heinemann, Maurer, Haasler, Erdwien, & Martens, 2013b). Although the primary objective of the COMET model was to establish a theoretical and methodological platform for an assessment system that should support the pedagogical work of VET teachers (Rauner et al., 2013b), a secondary intention aimed at constructing a tool for international comparisons that would provide data for policymaking in the VET sector. This article leans on the latter by revolving around the comparability of test scores and the adaptability of assessment systems to different institutional and cultural contexts. How did the model and its instrumentation meet such requirements, and to what extent were they implemented in practice? We first position our text in the literature on a competence-based assessment, in which models for a holistic diagnostics of professional competence stands out as an interesting subarea, though problematic if the intention is to generate comparable data across countries. Next, we review the basic principles of the COMET instruments and their implementation in the MECVET study, bringing to the fore issues of measurement equivalence. Our methodological reflections run as a thread through the presentation of test scores and other data on professional competence from our panels of students and apprentices in the vocations of industrial mechanics, electricians and health-care workers – and through our concluding discussion. Norway should be an interesting case for various reasons. It is a small country with a VET system that encompasses approximately 180 vocations and a sequential dual model with two years in school followed by two years in apprenticeships, which differs from the German parallel school/work track. The number of apprentices in each trade is relatively small compared with other European countries. Formal assessment is toned down in Norwegian VET, with the exception of the final trade examination (after apprenticeship, Lahn & Nore, 2018). These factors generate methodological, logistic and cultural challenges when piloting large-scale assessment studies in a Norwegian context.

Holistic approaches to the assessment and comparability of professional competence Competence-based education has become a favorite model for innovations in VET, provoking intense debates about reductionist versus expansive interpretations of such reforms (Mulder, 2007). Surprisingly, the debate about the assessment of professional competence tends to repeat the critical comments made by Hager, Gonczi and Athanasou (1994) more than 20 years ago. They highlighted the weaknesses of two dominant approaches – the behaviorist and the cognitivist, where the main characteristic of the former was a priority attri-
buted to task analysis (functions) and observation of performance, which could easily turn out to be a fragmented and inflexible system of assessment lacking dimensions that take into account the transferability of proficiencies. At the other end, cognitive psychology has a long tradition of advocating the importance of general mental abilities in professional expertise, such as universal mechanisms of problem-solving (Ericsson, 2009) or intuitive thinking (Dreyfus, 2004). A recent version of this perspective that intends to meet the challenges of a turbulent working life is the focus on individual’s self-organizing potential or generalized meta-competences (Haasler & Erpenbeck, 2008), adaptive expertise (Carbonell, Könings, Siegers, & van Merriënboer, 2016), 21st century skills (Pellegrino, Hilton, & National Research Council, 2012) and core work skills (Brewer, 2013).

Hager et al. (1994) introduced an integrative or holistic model that seeks to avoid the challenges of the proliferation of tasks (and abilities) by centering the assessment on key activities or elements of the profession – a position shared with others flagging concepts such as “key competences” (Rychen & Salganik, 2003). Like other versions of holistic approaches (Le Deist & Winterton, 2005; Mulder, 2007; Beckett, 2008), they extend the classification of competences to include action competences, social competences – and contingencies connected with varying contexts of vocational performance and individual strategies. This literature seems to converge on the following features when addressing the assessment of professional competences:

- The holistic logic is often contrasted with a reductive that focuses on one dimension or key task at a time and not a totality of key tasks (Lum, 2013). Hager (2017) argues that the capacity for “putting it all together” is crucial.

- Professional competence is inferred from work performance, and dependent on what Beckett (2008) refers to as a “judgment-in-context.” Thus, properly qualified assessors should be experts in the relevant professional domain (Tigelaar & van der Vleuten, 2014).

- Vocational proficiency is a complex activity interacting with contextual affordances and restraints, asking for a multi-method and processual approach to assessment (van der Vleuten, Sluijsmans, & Joosten-ten Brikke, 2017).

- Generative aspects of professional competence are often highlighted in the holistic approaches, thereby reflecting the urgency of including capabilities that align with transformations in working life (Deitmer, Hauschildt, Rauner, & Zelloth, 2013). In the German literature, these characteristics are central to the definition of “profes-
Large-scale studies of holistic professional competence

These scholars have been concerned with the use of holistic assessment, primarily for formative purposes and local curriculum development, which tend to be reserved toward the appropriateness of such a framework for large-scale international comparisons (Lum, 2013). One notable exception is the VET-LSA feasibility study initiated by the University of Göttingen (Baethge & Arends, 2009) — also referred to as “the PISA-VET” (Baethge, Achtenhagen, Arends, Babic, Baethge-Kinsky, & Weber, 2006). It is presented as based on a holistic understanding of competence, although such claims have been challenged by Dietzen (2017). The latter recognizes the multidimensional logic of the VET-LSA, but criticizes its underlying model of professional action competence (Weinert, 2001) for separately examining cognitive, motivational and social components, and not in an integrative manner. The VET-LSA was piloted in four vocational areas (car mechatronics, electricians in craft/industry, business/administration and social/health care) in eight European countries including Norway, where one of the authors of this article participated. In line with the principles of holistic assessment described above, the researchers constructed near-authentic task descriptions (occupational profiles) and qualification requirements based on the US standard classification of professions O*Net (https://www.onetonline.org/). These were validated by a team of experts from the four vocations. A summary of the Norwegian findings indicates that the participants, particularly representatives of the electricians, did not relate to the proposed profiles (Olssen, 2009). For various reasons, this international comparative exploration was discontinued in 2009, but in Germany ideas from VET-LSA were implemented in the ASCOT initiative (www.ascot-vet.net). The latter narrowed the scope by focusing on specific vocations such as business/administration and health care, and was reported to generate promising results in terms of psychometric models and computer-based assessment solutions (Klotz & Winther, 2017).

Partly as a result of the mixed experiences with VET-LSA, the researchers behind the MECVET study were attracted by another model for the diagnostics of professional development underlying the COMET project, an initiative coordinated by the Institute für Berufsbildung at the University of Bremen (Rauner et al., 2013b). In the international literature, this approach worked out by Professor Felix Rauner is described as strongly influenced by the German concept of “Beruf” when underlining the importance of holistic shaping competences (“ganzheitliche Gestaltungskompetenz”) as qualities of personal development and professional identities (Cairns & Malloch, 2017; Winterton, 2012). The COMET model, to which we return in the next section, is firmly based on these principles.

As noted above, the instrumentation of COMET and its implementation in the MECVET study will be discussed using the following categories from a common typology of measu-
rement equivalence or comparability (van de Vijver & He, 2015). Theoretical comparability is threatened when the understanding of key constructs such as “competence” varies in a systematically biased way between participating countries. Sampling comparability is closely linked to the previous category since the conceptual framework has a decisive impact on the selection of content (tasks and items), subjects, etc. Instrument comparability should be attended to since teachers and students may differ in, for example, their familiarity with specific test formats. Linguistic comparability includes an adequate translation of items, scoring rubrics, etc. Administrative comparability is pursued by standardizing the test situation, etc. Rater comparability is not often addressed in the psychometric literature, mainly because the rating is automatic or semi-automatic, but must be seriously considered when scoring procedures involve the use of professional judgment in assessing student achievements on realistic complex tasks (Baartman, Bastiens, Kirchner, & van der Vleuten, 2007). Outcome comparability is included in order to address differences in consequential effects for the testees, such as a low or high stakes assessment. This typology will serve as a template for mapping the instances (in Table 1) when our case of large-scale assessment of vocational competences “breaks down” (Winograd & Flores, 1986), that is when the data do not fit the comparability standards and become the object of inquiry.

2 The COMET conceptual framework

The COMET project is exemplarily well documented in reports, articles, monographs and anthologies. Although the large majority of texts are in German (Rauner, Heinemann, Maurer, & Zhao, 2014; Fischer, Rauner, & Zhao, 2015), there are several reviews and discussions in English (Rauner, Heinemann, & Hauschildt, 2013a; Rauner et al., 2013b). For readers wanting to learn more about the details of the model and the instruments, we refer to this literature. The COMET project was not presented by its designers as belonging to the family of international large-scale assessment studies. Still, since the first pretests in 2006 these instruments have been piloted in a number of countries (Germany, China, South Africa, Norway, Switzerland, Vietnam, Spain and Poland), and broadened in scope by adding vocations such as industrial mechanics, car mechatronics and elderly care nursing to the original focus on craft and industrial electronic technicians. Thus, the model is claimed to have the potential for “international comparative competence diagnostics” (Fischer et al., 2015; Zhao, Zhang, & Rauner, 2016). Given such an ambition, we will review how the COMET instruments meet standard requirements for the comparability of results and indicate what the methodological challenges were when piloting them in a Norwegian context. However, in the following, we first go more thoroughly into the key elements of this “theory-based competence model” (Rauner et al., 2013a, p. 8).
Rauner et al. (2013b) distinguish between performance assessment and professional competence diagnostics. In the first case, VET teachers and trainers would be able to evaluate the professional action competences of apprentices on specific tasks. The examinations or tests should have curricular validity without any pretense of being generalizable to other contexts. In contrast, competence diagnostics generates comparative scores in order to provide solid input to reviews of learning opportunities across vocations and countries. The measurement focus is then displaced from action competence to cognitive (domain-specific) performance dispositions (ibid., pp. 5). In line with other versions of holistic assessment, Rauner (ibid.) maintains that a model of competence is needed in order to make inferences from observed performance. The COMET framework is founded on three dimensions.

The content dimension draws on expertise research, notably the concept “developmental tasks” (Havinghurst, 1974) and the stage model of Dreyfus (2004) and Benner (1982). Thus, this understanding of the content dimension enables an assessment of specific competence levels and developmental progression in specific vocations to be compared with a trans-occupational test concept (Rauner et al., 2013b, pp. 46). In face of the criticism that has been aimed against the Dreyfus model for advocating a restricted linear learning trajectory, an underestimation of training impacts and the diversity of knowledge domains (Lahn, 2010), it may not be as universal as claimed by Rauner et al. (2013b). At the same time, these theoretical ideas may provide the heuristics for comparative inquiries that will enable an empirical validation of the Dreyfus developmental model.

As one of its main building blocks, the action dimension has the concept “complete professional action” (“vollständigen beruflichen Handlung”), with its roots in German work psychology (Hacker, 1973; Oesterreich & Volpert, 1986; Monnier, 2015) and cultural historical activity theory (Leont’ev, 1981). It frames human activity as a generative process when work performance includes goal anticipation and planning processes on the one hand, and the evaluation of action and its outcomes on the other. The idea is that effective learning will take place when workers know the professional task as a whole and can take action to reshape work if necessary – the essence of such concepts as “action competence” (“Handlungskompetenz”) and “holistic shaping competence” (“ganzheitliche Gestaltungskompetenz”). In the vocabulary of the COMET researchers, these concepts are linked to “work process knowledge” (“Arbeitprozesswissen”), which emphasizes the way that a practical understanding or judgment of work processes at different levels and time scales strengthen the generative capabilities of skilled workers. Again, one may question the generality of these theoretical assumptions, and critics contend that they fit with industrial- and a limited number of service jobs, but do not catch the dependencies in advanced professional work (Mieg, 2001).

The third dimension, the requirement dimension, specifies the levels of “professional problem-solving” (“Berufliche Problemlösung”, Rauner et al., 2013b) and is based on the four-stage literacy concept formulated by Bybee (1997) and incorporated in different versi-
ons of PISA. (1) The level of “nominal competence” (“Nominelle Kompetenz”), indicating that the apprentices have superficial conceptual knowledge and are not able to solve the task adequately in practice. (2) At the “functional competence” (Funktionale Kompetenz”) level, the testees will have instrumental abilities in a domain, but be weak at connecting different elements in practice. (3) The level of “processual competence” (Prozessuale Kompetenz”) is the one in which the solutions to the task include an appreciation of work processes and situational constraints, and (4) “holistic shaping competence” (“Ganzheitliche Gestaltungskompetenz”), which entails complex vocational problem-solving that encompasses a generative aspect. The COMET model does not include the nominal level (1) since it does not represent vocational competence. The last three levels are subdivided into eight content criteria (functionality, presentation, efficiency, sustainability, work-process orientation, environmental responsibility, social responsibility, creativity); the model therefore provides the basis for differentiated competence profiles.

3 COMET instrumentation and its implementation in the MECVET design

If we go from the basic theoretical concepts to the COMET test development process, the first stage is the construction of test tasks by experts in the vocation taking the model above as conceptual platform. An instrument in this case is the expert workers’ workshops, which integrate both research-based and experiential input into a shared understanding of core tasks and learning trajectories in the vocation (for a full description of these workshops, see Rauner et al., 2013b; Bremer, Rauner, & Röben, 2001). The COMET design will prescribe the development of open test and learning tasks that enable all the eight content criteria to come into play and prompt a variety of solutions. The learners are sensitized to the open test format by participating in the solution of open learning tasks several months before testing. The testees work on two tasks for 120 minutes each. An underlying assumption is that these tasks represent the core vocational competences of a skilled worker (after trade examination).

The rating of test solutions was subject to stringent procedures. (1) The eight criteria were subdivided into 40 items. (2) For each task, a “solution space” was constructed defining the range of possible solutions. (3) Extended rater training in seminars intended to generate a consensual standard for scoring, strengthen inter-rater reliability and construct validity, and (4) two raters are independently rating each test participant’s solution, hence making it possible to calculate the degree of correspondence using the Finn-correlation (Rauner et al., 2013b). In line with their understanding of vocational learning as an appropriation of a specific identity, the COMET researchers have devised a questionnaire on students’/apprentices’ test motivation, vocational identity, occupational and organizational commitment and learning environments in school and companies.
In short, the piloting of the COMET model outside Germany (China, South Africa and Norway) was mainly done by translating test tasks, criteria, solutions spaces and the procedures for test development into the language of the respective countries. Moreover, the selection of vocations and the temporal patterning of measurements (cross-sectional/longitudinal/combined) were partly replicated. In general, these facets were adapted and validated by specific methods and procedures – especially the use of workshops with experts from the different vocations. The PROJECT study integrated the following elements:

Test development procedure - The different steps progressed in a manner common in test development projects: Review/translation of COMET test tasks, etc., validation of test tasks in workshops, the pretesting of test tasks and revisions, the test administration of test tasks and surveys, rater training and rating, the analysis of results and test context.

Sampling and temporal organization of the study (see Fig. 1) - Three vocations, electricians, industrial mechanics and health-care workers were chosen to approximately match those of the COMET project in Germany, and to fulfill our ambition of having a contrasting case in another sector.

Our longitudinal design was intended as a follow-up of a cohort of students into their two years of apprenticeship. We realized early in the process that it would be impossible to get in touch with the same individuals across the three years, since the Norwegian dual sequential VET system involves a break between two years in school and then two years in companies. It also demarcates a point with students have to choose a specific vocation, and also a stage where a substantial number of dropouts of the VET track. For each year, we recruited new testees, although a subsample was measured in all three years. Due to these difficulties, our planned sample of 100 participants in each vocation for each year was reduced to approximately half, as indicated in the figure. We also attempted to obtain a regional balance, but...
had to accept an overrepresentation of testees from schools and companies on the west coast of Norway, where there is a more favorable climate for VET than in the eastern part of the country.

Test tasks and web-based survey - For both the vocations of industrial mechanics and health-care workers, three out of four test tasks were translated and one considerably revised to meet typical work tasks and requirements in a Norwegian context. In the case of the electricians, three test tasks were made anew, while one was partly modified due to the professional profiles and (restricted) responsibilities for electricians in Norway. Another divergence from the COMET set-up with testees working on two tasks for four hours was our decision to contend with one task within a two hour limit. Schools and companies were not willing to allocate “nearly a day” for the MECVET project. We administered a web-based survey on the testees’ engagement in the assessment, their work conditions and learning environments, as well as their vocational identities based on a German version. Some items were not relevant because of the different VET systems in Germany and Norway, which also required two surveys – one for the year in school and one for the two years of apprenticeship.

Field studies of workshops, test administration and rater training. Both workshops and rater training sessions were videotaped, selectively transcribed and analyzed using software for qualitative analysis (AtlasTi). Whereas teachers organized the testing in Germany, this was done by the MECVET researchers in Norway, which provided us with field data recorded in memos.

Mixed method data analysis - Since the process of constructing the assessment system was compromised along several dimensions, we had to rely less on harmonized templates and procedures, and instead rely on methods that enabled the analysis of the contextual contingencies of the testing (variation logic for inferential work (Maxwell & Chmiel, 2014). This would be an example of an explanatory sequential design (Creswell, Plano Clark, Gutmann, & Hanson, 2003), in which qualitative data should deepen the interpretations of the numerical material processed for descriptive and inferential statistics using IBM SPSS+. The international comparisons were done a posteriori and indirectly based on documentary (reported) data, since our access to data files from the other countries was very limited. For the Norwegian material, log-linear statistics were combined with principles of configurational comparative methods (Ragin, 1987) in order to explore structural and local causal relationships in these data (statistical analyses in the MECVET final report, Lahn, Nore, Johannessen, & Bakken, in print).
4 Measurement equivalence in principle and practice

This article is basically a methodological reflection on the contingencies and constraints imposed on the transfer of the COMET project from German to Norwegian VET. As noted above, international large-scale assessments rely on standards of measurement equivalence, which may be a challenge in VET given the diversity of vocations and the heterogeneity of educational systems, both within and across countries. Table 1 refers to the typology introduced earlier, and links it to stages in test development:

Table 1: Comparability typology related to COMET design and practices in the MECVET study

<table>
<thead>
<tr>
<th>Comparability types</th>
<th>Stages in test development</th>
<th>Guidelines for COMET projects</th>
<th>PROJECT implementation (ethnostatistical account)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical comparability</td>
<td>Research framework</td>
<td>Holistic shaping competence</td>
<td>Norwegian competence-based VET</td>
</tr>
<tr>
<td>Sampling comparability</td>
<td>Sampling</td>
<td>Expert groups</td>
<td>Experts groups from industry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same test tasks</td>
<td>Many test tasks were reconstructed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Educational level</td>
<td>Educational level differences for specific vocations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level of aptitude</td>
<td>Variation in competence levels</td>
</tr>
<tr>
<td>Instrument comparability</td>
<td>Test construction</td>
<td>Paper-pencil test without use of external resources</td>
<td>Trade examinations are performance based</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Assessment with the use of resources is common</td>
</tr>
<tr>
<td>Linguistic comparability</td>
<td>Pilot implementation</td>
<td>Translation and back-translation</td>
<td>Rating criteria were difficult to translate in a meaningful way</td>
</tr>
<tr>
<td>Administrative comparability</td>
<td></td>
<td>Standardization of instruction, procedures...</td>
<td>Voluntary participation of schools, companies, training offices, apprentices-generated variation</td>
</tr>
<tr>
<td>Rater comparability</td>
<td>Rating of scores</td>
<td>Intensive rater training Solution spaces/nurcics</td>
<td>Rater training was resource-demanding</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Few raters used solution spaces</td>
</tr>
<tr>
<td>Outcome comparability</td>
<td></td>
<td>Feedback to schools, teachers and testees</td>
<td>Assessment scores without consequences for schools, teachers and testees</td>
</tr>
</tbody>
</table>

The third column indicates how the COMET design and its implementation in the MECVET study were tuned to such principles. The empirical evidence for the ethnostatistical account (Maddox, Zumbo, Tay-Lim, & Demin, 2015) in the fourth column is based on documentary data and field observations.

Theoretical comparability - The terminology of “work process knowledge” and “holistic shaping competence” is part of the German discourse on “Berufspädagogik,” and provides an ideological basis and a recognition that is not present among Norwegian actors in the VET sector. More importantly, the construction of the COMET model and measurement instruments was partly motivated by the German German VET reforms, which facilitated the acceptance of the project in German VET. These interests were not present in the Norwegian case. Here, we would add that in the psychometric discussion of international large-scale assessments, the country-specific rationales for participating in those programs have not been
a highlighted topic, although it may have a strong impact, not only on the use of test results, but also on how the assessment is implemented (Baethge & Arends, 2009). Both the Chinese and South African involvement in COMET can be traced back to their ambition of improving the connection between schools and companies in VET (Rauner, Heinemann, & Maurer, 2011; Rauner, Heinemann, Hauschildt, & Piening, 2012), whereas MECVET was framed as a research project that had an interest in developing new tools for formative assessment. Thus, a comparability in purpose could have been added to the typology of measurement comparability.

Sampling comparability includes decisions about recruitment to expert groups (for test task development), and about test tasks and the characteristics of the testees. Compared with the German composition of expert groups (and the rater groups), the Norwegian had a stronger representation of participants from industry. Additionally, the test tasks in the MECVET project were more totally reconstructed compared with the other countries – notably for the electricians.

A major issue in both the COMET project and the VET-LSA project has been the equivalence of the educational levels of testees across the participating countries. The different national COMET datasets include measurements of similar vocational groups training at various levels (upper secondary/tertiary in the technical sector), while the VET-LSA managed to establish an adequate comparability between the occupational profiles at the end of VET (Baethge & Arends, 2009). Differences in scholastic aptitude between vocations in the participating countries may account for the observed variation. The measurement of this variable is not easily equated and seems to influence the test results, but the COMET studies suggest that this interaction was lower than expected (Rauner et al., 2014). In the Norwegian material, however, the testees’ grades at the second year of upper secondary vocational schools correlated significantly with their professional competence on the COMET test.

Instrument comparability - Biases in measurement may be introduced when the test format favors or penalizes the groups to be compared. The COMET test tasks were essay-based paper and pencil tasks to be worked on without any support materials, which go against the norm of assessment in Norwegian VET schools. The MECVET researchers had to accept that the testees could have access to, e.g., resources on the web, which of course made the comparison with the other countries less reliable.

Linguistic comparability may be an issue in the COMET studies, given that the test tasks are case-based, with a fairly elaborate presentation of a complex problem or order from clients. However, purely linguistic translation of these texts was less of a challenge than the exact wording of the criteria and items on the rating schemes, which had a strong influence on how raters weighted different aspects of the testees’ solutions. For instance, we used the following translation from German:
Large-scale studies of holistic professional competence

<table>
<thead>
<tr>
<th>Utility</th>
<th>Use value/sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy</td>
<td>Effectiveness/profitability</td>
</tr>
<tr>
<td>Business and work process orientation</td>
<td>The organization of work</td>
</tr>
<tr>
<td>Social compatibility</td>
<td>Work environment/HSE</td>
</tr>
</tbody>
</table>

Administrative comparability - The Norwegian sequential VET system generated logistic challenges, since first and second year apprentices are spread around in a number of workplaces. In collaboration with schools and training offices, we had to gather groups ranging from two to 20 apprentices, and negotiate with the companies about how much production loss could be traded for the general benefits of the MECVET project. We had to abandon the COMET guidelines of letting the testees work on two test tasks for four hours. As a rule, we settled for one task and a two-hour time frame, but if the apprentices had to take the last ferry to get back to their workplace, a shipyard on an island, we had to accept a shorter time frame. Another, but somewhat surprising experience, was that teachers and instructors were used to having exams with “comforting rounds” (trøsterunde), in which they clarified questions, suggested ways of framing the problem and so on, and they felt uncomfortable when asked to take a pure surveying role. Consequently, nearly all of the test administration had to be done by the research team – which was a costly affair, but gave us the opportunity to do field notes.

Rater comparability is hard to achieve on international large-scale assessments in the VET sector, where there is no “lingua franca” about what constitutes vocational expertise. As pointed out above, the Norwegian raters had a stronger basis in working life than the COMET raters in the other participating countries, which may be associated with less endurance when it comes to rater training and fine-grained assessments using rubrics and solutions spaces. In order to observe these effects, we triangulated the inter-rater reliability measures with video recordings of rater training sessions and collaboration between raters aiming to agree upon scores. We performed a test-retest rating to uncover systematic biases, e.g., in terms of group norms.

Outcome comparability - Compared with the other countries where the COMET instrument was piloted, the institutional involvement (from schools, policymakers, etc.) was low in Norway, and for the apprentices/students their achievements on the test had no impact on their scholastic standing or workplace ratings. Due to the forthcoming trade examination at the end of the second year of apprenticeship, the testees were more committed to the test, which in addition to work performance, includes planning, argumentation and documentation. Given the methodological angle of this article, the review above about the “intangibles of measurement” (Viswanathan, 2005) or “break-downs” of measurement standards represent findings from the MECVET study, while at the same time framing the interpretation of test-score distributions and the survey data to be presented in the next section.
5 Presentation and discussion of results on professional competence across countries, vocations and educational levels

Our ambition to do an international comparative study was toned down, not only due to the challenges of piloting the COMETmodel, but also because we did not obtain access to raw data from Germany, South Africa and China. Thus, the tabulations of variation in competence levels between these countries in Table 2 below are primarily based on publicized data, and of course, this rescue strategy has a number of shortcomings. The most obvious is the lack of data on critical dimensions such as the variations in scores, the indexing of items, etc. Relevant meta-data information about sampling, the indexing of items, etc. is often not provided, with the implication that the transnational analyses are only suggestive. Our empirical foundation for making comparisons across the three vocations and educational levels in Norwegian VET is much stronger.

General vocational competence - Table 2 shows the differences in competence levels for
electricians or electro-technicians (industrial and craft) among the four countries (Rauner et al., 2013b). The patterns are similar but elevated for the German and Chinese results on Functional competence, while the scores on Processual and Holistic competence are generally very low. The Norwegian results are almost identical with those of South African testees, but when compared with a subsample of electricians in Germany (Hessen) with no experience on the specific type of open test tasks typical of COMET, these were slightly lower than the South African and Norwegian results. Measures of variance indicate large differences between schools and training providers with the participating countries, but no transnational comparison on this dimension is provided in reports, etc.

Differential vocational competence - Although the three dimensions of vocational competence represent requirement levels, the concept of “professional problem-solving” is associated with the idea that flexible performance depends on high ratings on all of the eight criteria mentioned earlier. One main purpose with the competence profile is to provide diagnostics of strengths and weaknesses for differential didactic measures in schools and companies. The variation coefficients are higher for the Norwegian testees, compared with the re-
results reported from the other countries for the industrial vocations. This could reflect a more heterogeneous sample of participating students and apprentices or rather broadly composed Norwegian rater teams – with a stronger representation of raters from industry compared with the other countries.

The evolution of vocational competence - The Norwegian data on competence development during the three years of the COMET piloting indicate a slight progression, but with interesting differences between the vocations. The electricians stagnated in the apprenticeship period, whereas the health-care workers had a marked improvement in scores from their first year in companies to their second. For the industrial mechanics, there was a drop from the second year in school to the first year in apprenticeship, but then a major recapitulation took place for this group during the second year in apprenticeship. Compared with the international COMET projects, the latter reported stagnation when measures were repeated after one year in combined school/company training (Germany and South Africa) or in transitions from school to work (China). Several explanations have been given for these patterns, most notably the effects of transitions to new curricular context (Fachschule), to restrictive learning environments in apprenticeship in China (Rauner, Piening, & Yingvi, 2015a).

Test motivation, learning environment and vocational identity - A hierarchical log-linear analysis of the Norwegian material indicates that both the learning support of the companies and the training offices contributed significantly to the performance levels on the COMET test – with the strongest effect to be traced back to the activities provided by the training offices (Lahn et al., in print). Test motivation also had an influence on the performance of the apprentices, though the perceived relevance of the test tasks for their jobs was less important than their reported effort used in solving the assignments. Yet, in all cases the differential interactions between these factors and the three vocations were highly significant.

If we compare these results with the German and Chinese COMET scores, the items that measure the quality of learning environments are somewhat elevated for the Norwegian apprentices compared with their German and Chinese counterparts (electro-technicians), and showed the same trend on, for example, the statement: “The work tasks I carry out fit my skills and capacities.” Apprentices in their second year of apprenticeship were significantly more positive in this respect when compared with those in their first year. The Norwegian figures also indicated that apprentices who scored high on professional identity also reported strong support from the workplaces as learning environments. Similar results in German and Chinese studies were interpreted by Rauner et al. (2013b) as indications that high quality learning opportunities strengthened occupational commitment and professional identity. However, in our Norwegian sample, a strong support from the companies to competence development was not associated with an increase in occupational commitment and professional identify when comparing the first-year and second-year apprentices. It needs to be
added that in line with the international COMET results, we found low, non-significant positive correlations between the professional identity index and competence levels on the tests.

In summary, it is tempting to interpret the similarity of the Norwegian scores with the other countries on general and differential measures of professional competence as evidence for satisfactory equivalence. However, given the lack of data on variability etc., we cannot rule out that these results are due to chance factors when doing the transnational comparisons. The comparability between the three vocations is not subject to the same pattern of validity threats as the ones suggested by the typology for international studies. Firstly, we may expect a higher degree of homogeneity for nearly all categories, although the measurement instrument may favor differences in familiarity with the assessment format. This privileged the health care apprentices who were training for their case-based trade examination. Secondly, by collecting fidelity data on how the COMET model was implemented in MECVET, we could turn “noise” or contextual observations into rich data, thereby making it possible to identify systematic biases, e.g., the emergence of strong group norms among the raters of the electrician apprentices’ solutions, resulting in high inter-rater reliability scores but unreasonably skewed distributions. As we experienced the challenges of implementing a psychometric logic, the MECVET study gradually turned into a case of ethnostatistics as defined by Gephart (1988) as studies that “… investigate the adequacy of basic technical and practical assumptions made in statistical analyses” (p. 30).

6 Concluding comments

In this article, we have explored perspectives on holistic professional competences, both in terms of conceptual and methodological issues – leaning strongly on the models and instruments of the COMET researchers. As pointed out above, their emphasis on holistic professional competences as multidimensional in an integrative and generative way is shared by many scholars. Yet, divergent views on the assessment of such skills have surfaced. We questioned the COMET rationale for a written case format, and noticed in our analysis of the Norwegian results that there was a one-to-one correlation between the scores on the criteria “(written) presentation” and the sum scores on “professional competence.” These results were corroborated when we subjected a large sample of test solutions to a quantitative analysis of writing literacies, which raises a number of questions that need to be further explored. Are the COMET instruments biased towards the measurement of generic skills in order to strengthen comparability across countries? On the other hand, an ubiquitous “textualization” of work processes (Karlsson & Nikolaidou, 2016; Rein, 2017; Lahn & Nore, 2018) could tip the balance in favor of the generic dimensions of holistic professional competences. From a methodological point of view, one could argue that international large-scale assessment studies in this respect follow the path of VET-LSA and ASCOT, referred to earlier – to develop
advanced statistical models and automatic scoring in specific vocations (Klotz & Winther, 2017). This strategy may work for certain professional domains, but as advocated here, up-scaled testing for the international or educational development of holistic professional competence at the aggregate level should include mixed methods strategies (Bazeley, 2017) for the generalization of results that attend to contextual features and diversity (Mislevy et al., 2013). In MECVET, such a strategy was embarked on by accident, but more effort should be invested in establishing flexible ex ante research designs for this type of studies that combine relevant statistical models and contextual analyses.

MECVET could be positioned on the international arena for VET research in the stream of activities initiated 10 years ago by the German projects of establishing a VET-PISA (Baethge et al., 2006), as well as models and tools for international large-scale assessment in this sector. At present, these ambitions seem to dampen, and are replaced by projects that have a narrower focus. In this context, the MECVET results add to a growing realism on the feasibility of such enterprises given the complexity of VET – even in small countries. As mentioned above, Norway has approximately 180 vocations and Germany only slightly more. Furthermore, recent research on VET systems indicates stronger type differences between countries and cluster of countries (Pilz, 2016) than previous models.

References


Bremer, R., Rauner, F., & Röben, P. (2001). Experten-Facharbeiter - Workshops als Instrument der berufswissenschaftlichen Qualifikationsforschung. In F. Eicker & A.W. Petersen (Eds.), Mensch-


Large-scale studies of holistic professional competence


Biographical notes

Dr Leif Chr. Lahn is a professor at the Department of Education, University of Oslo, and adjoin professor at the Department of Vocational Teacher Education, OsloMet – Oslo Metropolitan University. His research areas are workplace learning and ICT, vocational education and mixed methods research.

Hæge Nore is a professor at the Department of Vocational Teacher Education, OsloMet – Oslo Metropolitan University. Her research interests are vocational education, assessment in VET and recognition of informal and unformal competences.
Francesca Salvà*, Carme Pinya, Nuria Álvarez, Aina Calvo

University of the Balearic Islands Department of Applied Pedagogy and Educational Psychology Edifici Guillem Cifre de Colonya. Campus de la UIB. Cra de Valldemossa s/n 07122 Palma

Received: 21.05.2018; Accepted: 17.04.2019; Published: 29.08.2019

Abstract

Context: In 2016, the early leaving from education and training (ELET) rate in the Balearic Islands, Spain, was 26.8%. According to the most recent data, the participation rate in intermediate vocational education and training (VET) was 31.5%, and the graduation rate was 53.2%. In this paper, we present the main elements of the social agreement among political and social actors, derived from social discussion, which may form the main building blocks for addressing the problems of ELET and, more specifically, dropout in VET.

Approach: The social discussion was developed under the need for a broader and more inclusive vision between the formal education system and the community as well as among their agents and initiatives, the mutual understanding between the educational strategies and the models of formal and non-formal education systems and the need for a dynamic and holistic approach to experiential learning processes. As researchers, we analysed the video-recorded content of participants’ contributions using three categories: problems, strategies for improvements and contributions of the work group to the social agreement.

Findings: The experience evidenced the severity of the ELET problem in the Balearic Islands and proved that preventing ELET and returning people between the ages of 16 and 24 to education and training programmes must become political priorities. The social agreement reflects the consensus reached regarding the need to work in networks, encourage collaboration between formal and non-formal education and emphasise the central role of the

*Corresponding author: f.salva@uib.es

ISSN: 2197-8646
http://www.ijrvet.net
community and the active participation of students. The proposed actions regarding VET focus on the need to establish a system that integrates VET from education and from employment systems and the need to increase the offer to connect with the needs of businesses, the territory and a new model of production. The necessity of improving the quality of the system, moving towards more inclusive education and training teachers to recognize and reduce dropout risk factors was also brought up.

**Conclusion:** The social agreement is possible even in contexts with little tradition. The innovation of this experience lies in its equating all participants at the same level of discussion. We highlight the intersection of the variety of positions that emerged in the debates as well as the consensus reached regarding the suggested proposals to address the problem of ELET and dropout in VET in the Balearic Islands.

**Keywords:** Early leaving from education and training (ELET), Dropout, Vocational Education and Training, Community and Experiential Learning, VET

### 1 Introduction

This paper presents a social discussion on early leaving from education and training (ELET) and specifically dropout in secondary vocational education and training (VET). It is the result of a collective action between the European Anti-Poverty Network of the Balearic Islands; the Cooperativa Jovent, a non-governmental organization (NGO) focused on labour-market and social integration of young people; and the ‘Education and Citizenship’ research group at the University of the Balearic Islands (UIB), which studies pathways leading to success and dropout among young people in VET programmes in Spain. This experience is part of a wider and longer collaboration developed as an action research process, guided by the in common interest in the emancipation of individuals and groups against injustice, irrationality, suffering, etc. (Carr & Kemmis, 1986).

The need for a broader and more inclusive vision between the formal education system and the community as well as among their agents and initiatives; the deepening of mutual understanding between the educational strategies and the models of formal and non-formal education systems; and the need for a dynamic and holistic approach to experiential learning processes, led us to arrange the shared reflection activity we present herein.

This paper is broken down into eight sections, including the introduction. In section two, ELET, and specifically dropout from secondary VET in the Balearic Islands, is explained. Then, the Social Inclusion Pact, led by the European Anti-Poverty Network of the Balearic Islands, is presented. In the subsequent section, the role of third-sector organizations is analysed followed, in the fifth section, by a description of the characteristics of experiential learning as a learning theory of reference in the context of new learning networks for dropout
prevention. The sixth section describes the research question and the methodology that we carried out, and the seventh section addresses the results that respond to the research question. The last section includes a discussion and conclusions regarding the social reflection experience.

2 The Context: ELET and Dropout in Secondary VET in the Balearic Islands

In 2016, 26.8% of young people between the ages of 18 and 24 left the Balearic education system before obtaining a high school diploma (Advanced Secondary Education Qualification or intermediate VET) and without transferring to another school. According to this data, the Balearic ELET rate is well above Spanish (19%) and European (10.7%) averages (Ministry of Education, Culture and Sport, 2017).

In other studies, we have analysed the evolution of ELET rates in the Balearic Islands, highlighting current, deep-seated problems and the pessimistic outlook for social and educational policies if no major changes are made (Salvà Mut, 2017). We have also delved into the reasons behind dropout before earning the Compulsory Secondary Education Qualification (GESO). Literature on the subject suggests that the causes behind dropout are multidimensional, but in the case of the Balearic Islands, they are determined by the interrelationship between the characteristics of the labour market, poor academic results, and dominant social values (Salvà-Mut, Oliver-Trobat & Comas-Forgas, 2014).

Low levels of participation and numerous dropouts from secondary VET (at the basic and intermediate levels) in Spain and the Balearic Islands lead to the high ELET rate. According to the European Centre for the Development of Vocational Training (Cedefop, 2016), higher levels of participation and higher graduation rates would have a positive effect on reducing this ELET rate.

Our longitudinal study tracked the pathways of a representative sample of students who began basic VET and intermediate VET in the Balearic Islands during the 2015/16 academic year, and the data obtained reflect high dropout rates. Given that both basic and intermediate VET programmes have a duration of two academic years, the data we gathered is partial and only reveals the number of dropouts that took place during or at the end of the first year of studies. Current data do not contain information concerning students who leave after the second year of studies nor the number of students who repeat a year. Despite this, the information provided by participating centres shows that 31.9% of the students who started a basic VET programme and 30.4% who began an intermediate VET programme, dropped out during or at the end of the first year (Salvà-Mut, 2018). An analysis, based on official statistics published by the Spanish government, of the participation and graduation rates in intermediate VET programmes show a nationwide participation rate of 38.7% (31.5% in the
Dropout prevention in secondary VET from different learning spaces

Balearic Islands) and a graduation rate of 50.5% (53.2% in the Balearic Islands) (Salvà-Mut, Oliver-Trobat, Ruiz-Pérez, Psifidou, under review).

3 The Social Inclusion Pact driven by EAPN

On 14 October 2014, all political parties with parliamentary representation in the Balearic Islands signed the Social Inclusion Pact, which aims to improve the conditions of people at risk of falling into poverty or/and social exclusion and to facilitate and strengthen the activities of social entities that work with these groups.

The Pact was spearheaded by the European Anti-Poverty Network of the Balearic Islands (EAPN-IB). As explained on its website (https://www.eapn.eu), the EAPN is a network of 31 groups of national volunteer organizations and grassroots groups along with 13 European organizations involved in a variety of activities aimed at combating poverty and social exclusion, including, education and training activities, service provision and activities aimed at fomenting the participation and empowerment of people living in poverty and experiencing social exclusion. The EAPN aims to move the fight against poverty up on the EU’s agenda and ensure cooperation at the EU level when it comes to eradicating poverty and social exclusion. The network has consultative status with the Council of Europe and is a founding member of the Social Platform (Platform of European Social NGOs).

As a result of the Social Inclusion Pact, all of the parliamentary groups, together with the EAPN-IB, have committed to introducing different measures across the public administrations of the Balearic Islands. These measures basically include the following: social inclusion measures designed for people living at risk of poverty and/or social exclusion and measures aimed at facilitating the relationships between social organizations that work with these groups and public administrations.

In order to ensure the implementation of these measures, a follow-up committee formed by representatives from Parliament and the EAPN-IB was created. It holds meetings periodically.

The committee decided to organize a two-day seminar to reflect upon and debate the issue of ELET in the Balearic Islands and also to involve our research group in the whole process, as we are the only one in Spain that coordinates an R&D project focused on the pathways that lead to success in or dropout from VET (www.itinerariosfp.org). Specifically, we aim to provide scientific evidence, strategies and intervention instruments to further the knowledge about VET in secondary education (basic VET and intermediate VET) and, in particular, to help to reduce and correct the serious ELET problem.

The team involved in the project is led by the 'Education and Citizenship' research group (http://eic.uib.eu) at the UIB, and it includes researchers from various departments at the UIB, the Autonomous University of Barcelona and the University of Valencia. At the inter-
national level, it is important to highlight the participation of the Swiss Federal Institute for Vocational Education and Training.

The establishment of strategic alliances is essential to the fight against educational exclusion and dropout, and these alliances must not only exist among the school, family and community but also among academic researchers, like the ones described in this article. The key point is to move from students having to make an effort to adapt to having the educational system adapt to the individual and collective needs of its youth (UNICEF, 2017). This idea will come up again in the following sections.

4 New Learning Networks for Dropout Prevention: The Role of Third-Sector Organizations

The educational landscape of the contemporary world is shifting from traditional educational institutions to open, diverse, complex learning spaces. We now find educational settings where professionals with different profiles (social educators, sociologists, anthropologists, social workers, etc.) carry out their work in collaborative partnerships with the educational community (teachers, students and families). This collaborative work, inside and outside of schools, is based on the concept that learning is a continuum in which formal educational institutions interact with non-formal educational experiences. ‘The changes in the spaces, times and relations in which learning takes place favour a network of learning spaces where non-formal and informal spaces of learning will interact with and complement formal educational institutions.’ UNESCO (2015, p. 48). In Spain, more and more secondary schools are carrying out service-learning programmes: educational projects that combine learning processes with activities that are of service to the community. With these programmes, participants learn to work around the real needs of their surroundings in order to improve them (Puig, Batlle, Bosch & Palos, 2007, p. 20).

Furthermore, in Spain, third-sector organizations are responsible for the management of many of the education programmes in second chance schools. These programmes are mostly attended by young people who have not obtained their Compulsory Secondary Education Qualification and have been transferred to social services and/or school guidance services. Some of these young people have also been excluded from other school programmes, such as basic VET or Adult Secondary Education.

In 2015, a study conducted by the NGO Platform for Social Action (Plataforma de ONGs de Acción Social, 2015) to identify the impact of the crisis in the third sector of social action, emphasized the positive contribution of NGOs to Spanish society. Their reasoning included the following: its mobilizing role, the values they defend and promote and the fact that they respond to social needs. Furthermore, we should not forget the role that they play in economic development and the creation of employment as a part of the productive system. In fact,
as noted in the study, even though the economic crisis decreased revenues, expenditures and employment in the social sector, its relevance in the Spanish economy has increased. Therefore, not only is the social work that these entities carry out important, but so is their role in the productive economy.

There is a broad consensus on the need to improve the quality of the existing educational supply, adjusting it to the characteristics and needs of its recipients and territories. With respect to this improvement, experts highlight the existing commitment of the professionals and institutions concerned (Salva-Mut, Oliver-Trobat & Calvo-Sastre, 2006). NGOs involved with social action ‘carry out integrated actions, to develop personal pathways of insertion, linking training and employment, and to permanently renew the programme for a better adaptation to the youth and labour market reality’ (Lopez-Aranguren, 2004, p. 51). The professionals claim that ‘there is no student who does not want to learn, what can happen, is that a student does not want to study the way the system has established’ (EAPN, 2015, p. 34), and at the same time they defend that the right to education is not only acquiring a place in a school, but importantly, is the right to enrol in an educational programme focused on success. In working with young people, these entities promote a sense of belonging, which is ‘fundamental to be socially inserted and to exercise citizenship, based on positive experiences of acceptance and participation, and the generation of future expectations’ (Lopez-Aranguren, 2007, p. 26).

Focusing on dropout prevention, there is strong evidence stressing that joint action from formal and non-formal education, especially from the community, is required. One of the leaders of the Tomillo Foundation (https://tomillo.org/en/), a Spanish organization dedicated to improving society by helping people in difficult situations better their lives and their community, points out:

Schools must abandon their traditional breeding, and open up to the rest of society assuming the role of extending educational opportunities and of facilitating local education networks. Similarly, any person or institution that can bring something for the benefit and growth of others should have the opportunity and the tools to do so through these local education networks. And anyone who wishes to learn, renew themselves professionally etc., throughout their lives, must have the opportunity to do so. This network organization must promote a rich and effective offer that includes the three useful learning categories: formal learning, non-formal and informal. (Lopez-Aranguren, 2007, p. 36)

5 Experiential Learning and the Value of the Community

Experiential learning (Kolb, 1984; Kolb & Kolb, 2005 and 2017) is a significant conceptual framework for both formal and non-formal education programmes aimed at preventing dropout, especially those based on a deeper connection with the students’ context of learning
and with the future they begin to glimpse. As Taylor (2010) recommends, working on the partnerships between training centres and companies to make effective policies can increase the employability of young people instead of ignoring their needs in labour apprentices. In this sense, the contributions of the work of Moshuus (2018) remind us of the importance of prioritizing young people’s perspective and raise the need for a more active involvement of the companies in such debates.

Experiential learning is developed in a continuum that unfolds in four steps: firstly, students begin the learning process from a specific action, experience or situation. From here, they observe the effects of their own actions and try to understand them. The third step in the process involves generalization and understanding the principles underlying the situation experienced, without that necessarily meaning the transformation of this knowledge into theoretical constructions. And, finally, the fourth step is the application of the acquired knowledge to new circumstances through action and following the generalization principle mentioned above.

Community resources (NGOs, community networks, etc.) are essential when connecting the learning experience of young people with the reality of their surroundings and their possible future learning paths (Institute of Education Sciences, 2017). The need for a greater permeability of educational institutions in promoting experiential learning is directly linked to the principles for designing learning environments formulated by the Organisation for Economic Co-operation and Development (OECD, 2017, p. 26), especially with respect to the seventh principle: ‘the learning environment strongly promotes ‘horizontal connectedness’ across areas of knowledge and subjects as well as to the community and the wider world’. This powerful statement supports the idea that making connections, and especially empowering learners to be able to make these connections by themselves, promotes learning on a deeper level. In this sense, learners can integrate isolated objects of learning into larger frameworks of knowledge and curricular issues. In the words of Avis (2018, p. 22) ‘expansive version of VET that embraces notions of citizenship, democracy and individual development are conditional upon the balance of power between labour and capital present within the social formation, and indeed beyond’.

Following the cycle of experiential learning, connections need to link the learning that takes place within and outside schools, and they need to be made in inter-disciplinary ways, as real-life problems are not governed by subjects. Thus, the group of educational agents expands and includes not only teachers but also other professionals (from the labour, social and community fields, etc.), families, the community and the wider world, and it becomes a powerful mechanism that offers learning possibilities to young people. Partnerships and networks become strategic tools for the design of teaching models and educational practices inside and outside classrooms. The successful experiences of second chance education, collected for more than one decade, by the Commission of the European Communities (2004,
p. 11) confirm that ‘innovative pedagogical approaches will be needed, as well as specialised guidance facilities, links with local enterprises and other measures designed to create a motivating learning environment within which second chance education can develop its full potential.’ The idea is to provide a social response to a social problem, as complex social problems require specific responses (Lopez-Aranguren, 2007, p. 44). The relationship between education and society becomes strategic in this policy change towards social justice (Walker & Unterhalter, 2007).

6 Social Discussion on ELET and Dropout in VET: Research Question and Methodology

The research question pertaining to the experience described in this article is as follows: Deriving from social discussion, what are the points of social agreement between political and social actors, that might serve as the main building blocks from which to address the problem of ELET and, more specifically, of dropout in Secondary VET of young people?

It should be noted that the social agreement that was reached was the consequence of a two-day seminar that took place on the 8 and 9 of February 2018 at the house of the Parliament of the Balearic Islands, with a total of 95 participants on the first day and 35 on the second. The participant profile was diverse and included professionals from the VET field, professional community and social education workers, public administration technicians, and lastly, deputies from the Parliament of the Balearic Islands. Without any doubt, the most innovative and differentiating aspect of this social discussion was the participation of deputies from every one of the Parliament’s political groups. This circumstance is even more extraordinary if we take into account that Spain does not have any tradition of having political educational pacts. In fact, quite the opposite is true. Since 1970, Spain has had seven education laws and none has enjoyed the political stability needed to meet the educational challenges that have come up.

Research on deliberative democracy shows that the support of (local) politicians for a deliberative procedure (‘event-limited support’) seems to enhance the probability of its success (Geisel & Hess, 2017, p. 5). Additionally, empowered deliberation can increase ‘the sense of political efficacy of both participants and observers and encourage them to value reasoned exchange of views and participation in the future’ (Johnson & Gastil, 2015, p. 6). Ours is an experience of egalitarian democracy as ‘a new way of dealing with inequalities from a global and transformative point of view’ (Subirats, 2012, 162).

We created the necessary conditions for an environment that was able to promote a relaxed dialogue. The most praiseworthy aspect of the social discussion was that the participants worked in the Parliament with a willingness to listen, discuss, compare and share. This intention went beyond the rapprochement of positions: during the social discussion, great
effort was made to focus on converging rather than just adding. Following Nielsen, Bryndum and Bedsted (2017, p. 8) in creating the framing conditions for stakeholder workshops, we considered both ‘the aims of stakeholder dialogue and the importance of participation contributing to existing representative processes’. From our research perspective, one of the strategic actions to deal with the problem of ELET in the Balearic Islands, particularly of VET dropout, is to deepen the diversity of positions from the Sociology of Knowledge perspective (Keller, 2005, Zenner, 2017).

Each day of the seminar had a different level of social discussion. The first day, open to people interested in the subject upon registration, was structured around various presentations and round tables that dealt with diverse issues from international, national, regional and local perspectives. The second day consisted of a group work session led by a professional and addressed to specific invitees with a focus on both problems and solutions. The social discussion through group work was carried out via two types of dynamics (Cembranos & Medina, 2003): (1) the ‘wheel technique’, which has the advantage of allowing everyone’s opinion to be heard and of making all group members active participants, and (2) the ‘past tomorrow method’, which through creative thinking enables different work groups to design and describe an aspect of reality as they would like it to be in the medium- or long-term future, without taking immediate difficulties into consideration.

To respond to the posed research question, we analysed the video-recorded contents of the contributions made by the participants of the two-day seminar. These analyses were broken down into three categories: problems, strategies for improvements and measures for the future. The first two correspond to the main issues being considered by the presentations and the debate that took place during the first session. The third category was mostly based on the contributions made by the work groups that were formed during the second session and which focused on social agreement among the various actors involved.

7 Results

The results of the present work are presented in three different analytical categories: (1) problems; (2) strategies for combating ELET and specifically dropout from VET; and (3) contributions of the work group to the social agreement. The results are based on the contributions of the three types of participants in the social discussion: researchers; professionals, such as educational organizations and teachers; and political and technical managers, such as authorities in the public administration.
7.1 Problems

The analyses are based on the results obtained by the ‘Education and Citizenship’ research group at the UIB in relation to the issue of ELET in VET and, more specifically, the evidence extracted from the project entitled ‘Pathways leading to success in, or dropout from, vocational training in the education system at levels 1 and 2’ (Ref EDU2013-42854-R). The main contributions of this presentation are described below.

An analysis of the ELET problem in the Balearic Islands highlights the severity and continuous nature of the issue, as well as the consistency between statistics related to academic results and the educational level in the Balearic Islands, namely:

- The ELET rate in 2016 was 26.8%, while the Spanish rate was 19% and the European rate was 10.7% (Ministry of Education, Culture and Sport, 2017). In absolute terms this means that 20,990 young people aged 18 to 24 in the Balearic Islands were in this situation.

- The school failure rate (number of young people who did not obtain the Compulsory Secondary Education Qualification) was 31%, while the Spanish average was 22.4%, according to data from the 2014-15 academic year (Salvà-Mut, 2017).

- 40.6% of the population between 25 and 34, and 40.7% between 35 and 44 have a low level of education. This percentage was never less than 40% for any of the age groups, but the EU and OECD averages (2015 data) were 21% and 24%, respectively (Salvà-Mut, 2017).

It is also important to highlight the uneven impact of sex, place of birth and social origin. A comparative population study of individuals between 26 and 28 years of age with low levels of education and others at the same age with higher levels of education in the municipality of Palma (Salvà-Mut, Thomas-Vanrell & Quintana-Murci, 2016), exhibited trends similar to those described in international and Spanish literature on the topic, but to a greater degree: men (60% vs. 45.6%), people born abroad (20.5% vs. 14.3%) and those whose mother had only primary level studies (46.5% vs. 34.9%).

As in a previous study (Salva-Mut, Oliver-Trobat & Comas-Forgas, 2014), an analysis of the causes brought to light their multidimensional nature and how they progress, versus the one-dimensional vision that centres, almost exclusively, on the Balearic labour market effect (pull factors). In this context, the reflection focused on the factors that provoke school leaving (push factors), referring to the fact that, for many young people, it does not make sense to continue school, mainly because they do not feel comfortable, they do not feel capable of obtaining good academic results or they think that what they are studying has no future uti-
lity. In addition, all of these elements occur during a specific moment of personal evolution characterized by the need for self-assertion in the context of a society where having money and consuming are dominant values.

The studies that we conducted in the Balearic Islands, based on the life stories of young people who have left school without obtaining the Compulsory Secondary Education Qualification, clearly show that finding work is related to bad academic results, but that students leaving school, do not always leave in order to work. They often seek other training styles in which they can succeed, and they also often find barriers when it comes to accessing them or persevering, due to the characteristics of the training being offered (Salvà-Mut, Quintana-Murci & Desmarais, 2015).

The current ‘post crisis’ context has increased inequalities as well as the number of people who do not have the basic rights of citizenship. This was brought about by the effects of the economic crisis that started in 2008. The evidence is conclusive:

- Between 2009 and 2015, the number of people at risk of poverty in the Balearic Islands increased by 42,000 (Llano, 2017).

- The Balearic Islands is the Spanish autonomous community with the third highest rate of extreme poverty, affecting 10.4% of the population (Llano, 2017).

- Children under 18 years of age at risk of poverty or exclusion represent 34.1% of the total population of this age group in the Balearic Islands (2015), similar to the Spanish average. In absolute terms, it affects 69,178 minors (Unicef- Balearic Islands Committee, 2017).

Another central element worthy of consideration involves the main economic activity of the islands: tourism. The new movement towards mass tourism, with a model that increases the number of visitors in a disproportionate manner without considering the environmental and social limits of the territory, is occurring at the same time as labour conditions are worsening by successive labour reforms, which are implemented under the pretext of the crisis. Real-estate speculation and low wages have led to an increase in the number of people who do not have access to housing, which has become a major social problem.

In this context, we consider the right to an intermediate level of education to be a right of citizens and a requirement for the population to actively exercise their citizenship in a 21st-century society. We furthermore defend that, in the current situation, the development of appropriate upper-secondary education and training is essential for this right to be exercised, especially among the least favoured members or society.
7.2 Strategies for combating ELET and specifically dropout from VET

Throughout the discussion, it was clear that preventing ELET and returning young people between the ages of 16 and 24 to education and training programmes had to become a priority in the political agenda of the Balearic Islands. When it was time to come up with strategies to address this problem, participants in the social discussion focused mainly on evidence from research, public policies and pedagogical practices.

Researchers participating in the discussion stressed the importance of promoting participation in and preventing dropout from VET programmes, as well as the need to come up with a strategic plan (in the short, medium and long terms) that includes a budget, evidence-based policies and strategies that can be evaluated and pilot plans at a territorial level with the participation of various actors and institutions.

Three kinds of measures were also suggested, in accordance with the contributions of the Cedefop (2016): (a) preventive measures to avoid the conditions that trigger dropout processes (VET reforms, bridge programmes and VET preparatory courses; financial incentives to reduce VET dropout; specific prevention resources; and teacher and job tutor training); (b) intervention measures to address issues at an early stage (early warning systems for situations that may lead to dropout; professional support, including guidance and accompaniment; and time-out or short-term breaks); and (c) compensation or remedial measures aimed at offering training opportunities to those who have dropped out (open VET to new groups of students; VET second-chance programmes; second opportunity education programmes with the global perspective used by VET procedures).

During the discussion, it was generally agreed upon that the most common strategies involve reward or remediation within the basic VET programmes—as a part of the education system; projects, designed and managed by third sector players, that are specifically directed at young people—this under the framework of employment, due to increased flexibility when compared to the education system; and other projects and programmes under the framework of the Youth Guarantee Programme. It is for this reason that highlighting prevention and intervention strategies was a priority of the social discussion.

An example of good practices for basic VET programmes was given by a public secondary school (Sa Colomina, Ibiza). Teachers from this school explained the principles and relevant strategies that led to student perseverance and the completion of studies in basic VET. They presented two initiatives: the simulation of a company project made by students via video, and the tutoring action plan made by the educational team with another video. Both began three years ago with students in their first year of basic VET (electrical and electronic systems and computer components) and in two general modules (communication and society and applied sciences), with very positive results in terms of perseverance and completion of studies.
Teachers underlined the contribution of learning from projects to the development of the following core competencies: linguistics, mathematics, knowledge and interaction with the physical world, information handling, digital and social citizenship, culture and fine arts, learning to learn, autonomy and personal initiative.

The representative third-sector project designed for young people was the ‘Labour insertion, training, and guidance pathways’ project from the Cooperativa Jovent. It is considered to be a flagship project in this field in the Balearic Islands and focuses on young people aged 16 to 29 who have left the formal education system. Since 1989 this second chance school has promoted various initiatives focusing on personal and vocational guidance and training as well as support in finding a job. Its pathways offer a wide and varied range of personal and professional orientation and training, as well as accompanying students through inclusion processes.

In both cases (Sa Colomina and Cooperativa Jovent) they welcomed students who had not yet obtained their Compulsory Secondary Education Qualification (ISCED 0-1) and both showed high levels of educational success. They utilized educational practices that were focused on preventing dropout, incorporating strategies that had shown themselves to be effective with the population groups that they were targeting (main tutor; actively searching for companies and modules focusing on professional practice and digital transformation; learning from projects), which allowed for early, individualized interventions (accompanying students and providing follow-up throughout the process; offering flexible and individual work plans; providing specific services for youth and families and participating in research with the UIB).

The Youth Guarantee Programme, aimed at young people under 30 who do not work or study, offers youth enrolled in this programme training, guidance and an internship or an employment contract in four months. In this context, the SOIB created and financed several training structures like the Young SOIB mixed programme offering training and employment with a duration of between 6 and 10 months carried out in collaboration with local authorities and other public entities. The training programme is part of the Professionalism Certificates (certifications that rely on the Public Employment Administration), which enable participants to accumulate professional modules that facilitate a progressive learning pathway to university. Specific orientation services have been also established within the framework of the Youth Guarantee Programme that perform the task coaching, which includes individualized follow-up through graduation and finding employment. The programme also provides people who return to Compulsory Secondary Education or VET studies with grants.

Under the framework of public policies that address preventing VET dropout, it is worth highlighting the promotion of dual VET programmes and the reinforcement of career counselling. Dual VET programmes are carried out in the same education system as other VET programmes, and they involve a one-year contract. The SOIB also conducts a dual VET pro-
gramme with public, private and third-sector entities, and it finances a specific procedure for vulnerable youth, which includes a comprehensive tutoring process.

Regarding counselling, representatives from the public administration underlined the Academic and Professional Orientation Centres (POAP)—a collaboration between the autonomous government and the Employment Office of the Balearic Islands (SOIB). Considering the traditional academic counselling that is offered in secondary education centres and given the complexity of the VET system, the POAP carries out academic and career counselling focused on VET studies, taking into account the wide range of pathways offered and the permeability that exists between general and labour-related education and between the VET offered by the education system and the employment system (as well as recognition of previous work experience).

7.3 Contributions of the work group: The social agreement

In relation to the contributions of the work group, of note is the unanimous consensus that the problem being addressed is severe. The fact is that 30% of students leave their studies before their second year in secondary VET. This is an alarming figure in any case, and even more considering that it is post-compulsory education. The reasons for leaving include a lack of orientation and motivation, job offers before the end of studies, inadequate methodological strategies, obsolete curricula, etc. There was a consensus regarding the difficulties for young people living in families with low levels of income—and which could thus benefit from another salary—to participate in non-mandatory secondary education. Although educational centres are aware of these reasons, the government generally does not ask about them.

Among the issues regarding educational policies and practices, three stood out: (a) the many difficulties related to evolving the educational offering in accordance with new needs and given the characteristics of the teaching staff; (b) with regard to guidance, insufficient knowledge about VET by part of the teachers and counselling services in the compulsory education system, thus preventing proper student guidance; and (c) the lack of adequate transportation between where students live and the centre that offers the training in which they wish to enrol.

Among the strengths of VET, it was noted that there is an exponential increase in the hiring of students who graduated, one year after they finish their studies. Requests by companies for degree-holding students exceed the number of students who actually hold degrees in a great number of vocations. In order to take advantage of this situation, with respect to the training programmes and job placement for young people, there is a need to increase the social and economic prestige of VET.

The social agreement reached by the participants incorporates a variety of measures that were agreed upon during the social discussion. There was a high level of social awareness
regarding the seriousness of the problem as well as its systemic and structural nature. This is reflected in the clear focus on measures to prevent dropout, including making fundamental changes to the dynamics of the education system and VET. The proposed changes involve core elements of educational practices, such as curriculum and teacher training, while also encouraging families and the community to participate in finding solutions and points where improvements can be made.

With respect to the curriculum, work focused on motivation and the diversification of contents; examples include the following: coming up with motivating teaching strategies at all stages; working on students’ abilities, talents and values throughout the education process; working on different types of competences via experimentation; and building a more flexible and individualized curriculum.

All of those involved in the discussion underscored the need to improve tutoring plans and follow-up throughout the education process, especially when students move from primary to secondary education, in order to detect problems and take specific actions early enough to avoid detachment from the school, which leads to a large number of students dropping out. The consensus regarding the need for measures other than punitive ones (especially expulsion) was unanimous. Among the proposals included in the social agreement, we consider the following to be especially notable: offering students stable tutor figures and stressing emotional bonding using inclusive and cooperative education, focusing on the consideration of ‘I’ and on the centre’s education plan as well as spaces and specific hours for providing support to students.

To do this, centres must be properly organized so as to articulate the various measures, defining common objectives and incorporating meetings and shared work into the work schedule. Teachers must also be properly trained. To this point, training regarding the risk factors for dropout and related prevention strategies is a must, as is improving access to basic-level training for teachers using a selection and training process and focusing on teaching attitudes, emotional connections and the development of inclusive education.

Specific measures are paramount to preventing dropout in VET. Among the measures for which a general consensus was reached, we feel that the following five are noteworthy: (1) increasing VET offers, facilitating access to VET programmes and connecting them with the working world; (2) doing away with the division between the VET system, the employment system, etc. by increasing flexibility between existing systems until they can be blended into one; (3) improving and expanding the offers linked to the new constructive model we would like to promote; (4) making VET programmes more flexible and adapting them to the characteristics of the students; and (5) including a rating system for degrees in the job market.

On a more strategic level, the social agreement recognizes increased family and student participation during the various stages of education to be crucial in the fight against dropout (i.e., involving them in the design of the programmes, improving communication channels
with the education community, etc.). The social agreement proposes making education centres, as well as the various agents in the socio-educational community, more open and permeable so as to promote working in networks and create learning communities.

In line with other participants, it is our belief that for these changes to be carried out, two important issues must be addressed. On the one hand, there should be an autonomous community-level law that covers essential points, such as improving funding, reducing student/teacher ratios and restricting repetition of school years. On the other hand, there must be an autonomous community-level plan to combat early school leaving from VET programmes—and the education system in general—that involves all stakeholders and utilizes the good practices being employed in the formal education system as well as innovative practices coming from third-sector projects.

8 Discussion and conclusions

The experience presented herein is part of a greater process of work towards social inclusion and guaranteeing young people a right to education. It was led by the EAPN-IB, whose interests coincide with the main areas of study of the UIB’s ‘Education and Citizenship’ research group: training, work and equity. The social and academic collaboration between these institutions represents a commitment to the exercise of citizenship and the emancipation of individuals and groups as discussed by Lopez-Aranguren (2004) and Carr and Kemmis (1986). We understand that the synergies arising from this type of collaboration give greater legitimacy to the social discussion and greater feasibility to the proposed actions as they stem from an experiment in egalitarian democracy (Subirats, 2012) and contribute to dealing with inequalities from a comprehensive and transformative point of view.

Roundtables, presentations and posters have framed the intense and productive discussion of the group work. The main results of the analysis of the social discussion are the proposals that saw a majority consensus among the participants. As previously noted, the innovation of this exercise in empowered deliberation (Johnson & Gastil, 2015) lies in equating, at the same level of discussion, researchers, professionals, students and families, administration authorities, third-sector representatives and the politicians in charge of legislation. Of special interest are the intersection of the variety of positions that emerged in the debates as well as the consensus that was reached with regard to the suggested proposals.

Therefore, while the public administration focused on highlighting actions that have been implemented, families, NGOs and professionals underlined the insufficiency of such measures. From a research perspective, we consider that one strategic action would be to deepen the diversity of positions (Keller, 2005, Zenner, 2017), establishing channels for participation and stable debate from which to pilot necessary changes that can combat the problem of ELET, and specifically VET dropout. Stakeholder workshops contribute to existing repre-
sentative processes (Nielsen, Bryndum & Bedsted, 2017) and increase community participation in moving policies towards social justice (Walker & Unterhalter, 2007). This is why we interpret the commitment to maintain this space of shared reflection as a success. Within it, it is remarkable to note the active participation of representatives from each and every parliamentary group in the Balearic Islands.

The contents of the social agreement reflect the consensus reached regarding the need to develop preventative and intervention strategies (Cedefop, 2016), such as working in networks, encouraging collaboration between formal and informal education, the central role of territory and the community and the active participation of students. This consensus is in line with what has been discussed in literature on this topic, notably from the Commission of the European Communities (2004); Moshuus (2018); Puig, Batlle, Bosch and Palos (2007); UNESCO (2015); and Taylor (2010), among others. These proposed actions regarding VET focus on the need to establish a system that integrates vocational education and training from the education system and from the employment system, as well as the need to increase the offer to connect with the needs of businesses, the territory and a new model of production. According to Taylor (2010) and the Cedefop (2016) the need for greater flexibility and attention to student diversity, as well as joint work among education centres and businesses, is key to preventing VET dropout.

The need to improve the quality of the system and move towards more inclusive education was also brought up, as was the need to increase related lines of the budget and offer grants and better transportation in order to enable students to access and remain in VET. Other suggestions included improving public policies related to training teachers to recognize dropout risk factors and prevent them. With regard to teaching practices, of note are the suggestions to give a greater role to students via improving monitoring, follow-up and tutoring; to focus on motivating and diversified contents; and above all, to focus on experiential learning (Kolb, 1984; Kolb & Kolb, 2005 and 2017).

Each one of the educational agents (formal, informal and non-formal) has its own insecurities stemming from the times of constant change in which we live and which have given way to the so-called ‘Penelope syndrome’: whatever one educational agent instils into a young person during the day, another agent undoes at night time. Sometimes, one need not even wait until night, as the variability in—often contradictory—educational stimuli can reach extreme levels, as claimed by Del Pozo (2009). In this context, collaborative alliances, such as those described previously, contribute to dealing with this complexity and serve as an opportunity to fight against dropout and favour the right to education.
References


Bibliographical notes

Dr Francesca Salvà is an associate professor at the Department of Applied Pedagogy and Educational Psychology and member of the research group 'Education at Citizenship' (http://eic.uib.eu) at the University of the Balearic Islands, Spain. Her research interests focus on vocational education and training, school dropout, training and career paths, young people with low education profiles, gender, work and education.

Dr Carme Pinya is an assistant professor at the Department of Applied Pedagogy and Educational Psychology and member of the research group 'Childhood, Technology, Education and Diversity (GITED).' She is currently working on teacher education, inclusive education, teaching methods and educational innovation.

Dr Nuria Álvarez is member of the research group 'Education at Citizenship' (http://eic.uib.eu) at the University of the Balearic Islands, Spain. Her research interests focus on the construction of otherness, racism, ethnocentrism, prejudice and stereotype.

Dr Aina Calvo is an associate professor at the Department of Applied Pedagogy and Educational Psychology and member of the research group 'Education at Citizenship' (http://eic.uib.eu) at the University of the Balearic Islands, Spain. Her research interests focus on community development, social participation and youth work.
Analysing training needs of TVET teachers in South Africa: An empirical study

Bernd Zinn*, Kevin Raisch, Jennifer Reimann

University of Stuttgart Institute of Educational Science Department of Vocational Education focused on Teaching Technology (BPT) Azenbergstr.12, 70174, Stuttgart, Germany

Received: 02.01.2019; Accepted: 17.04.2019; Published: 29.08.2019

Abstract

Context: This paper reports on a study of the progress of vocational education and training (VET) and the need for further profession-oriented training of lecturers in public, technical vocational colleges in South Africa, under the consideration of societal and political conditions.

Approach: The study is based on a mixed methods approach in which an analysis of educational policy documents and a qualitative and a quantitative study with VET teachers and representatives of education authorities in South Africa are conducted.

Findings: The classification of the results is conducted in line with the conditions defined by Phillips and Ochs regarding policy transfers. The following can thus be observed through the bilateral relationship between Germany and South Africa: (1) The Guiding Philosophy of the educational system is characterised by societal and political power structures. This is evident in an analysis of approved reforms within the last two decades. (2) The desired effects of “Ambitions Goals” have thus far not taken hold. Nonetheless, there is a willingness to enact reforms to continue developing vocational education, including the training and further education of lecturers that must be noted. Minimum requirements regarding lecturers’ basic qualifications have been formulated, which one in five vocational lecturers in South Africa currently cannot fulfil. (3) The Strategies formulated to implement training methods face the main problem of difficulty in implementation in colleges. (4) The Enab-

*Corresponding author: zinn@ifc.uni-stuttgart.de

ISSN: 2197-8646
http://www.ijrvet.net
ling Structures, i.e. the education-management-system as well as the financial and personnel support of the educational system, are widely perceived by lecturers as unsupportive, ineffective and discriminatory. This is observed, for example, when looking at the equipment used, teachers' salaries, classroom sizes as well as the mentorship programme and further training opportunities. (5) Processes: a discrepancy exists on the level of the lecturers and the central need for further training regarding modern technologies, especially those used by foreign firms in their production in South Africa. (6) The results of the conducted study document a high variation of qualifications among TVET lecturers when it examines their teaching Techniques.

Conclusions: Overall, the empirical results of the study reveal a complex structure with respect to the requirements for further training of TVET lecturers, describe central needs for further training of lecturers and deliver connectable knowledge for both the practical educational advancement of lecturer training and further education training, as well as for research in the context of the internationalisation of vocational training in South Africa.

Keywords: Internationalisation, Vocational Education and Training, Vocational Teachers, Further Education, Public TVET College, South Africa, VET

1 Introduction

The cooperation in vocational training between the Federal Republic of Germany and other countries, especially with developing countries, as well as the related international research on vocational training have a storied tradition (Gross, 1981; Deißinger, 2001; Wolf, 2011; Barabasch & Wolf, 2011). In the late 19th century, both the German elementary education model and the vocational training model were discussed in the Anglo-American sphere. Organised international cooperation in the form of transfers of educational structures or vocational curricula between Germany and other countries has been in effect since approximately the middle of the previous century (Ochs & Phillips, 2002; Gonon, 2009; Barabasch & Wolf, 2011). Currently, there are intentions to grow international educational cooperation in the discourse of united European educational reforms with several European countries (including Greece, Spain and Portugal) (Euler, 2013) as well as with non-European countries (including China, South Africa and the Russian Federation) (BMBF, 2017a). The goals of bilateral cooperation in the areas of vocational training in Germany are varied and focus on, amongst other aspects, a reorganisation of country-specific educational and training systems, interconnected with the hope that they will produce increases in the standard of education and a lowering in youth unemployment, increased competitiveness of companies or an improvement in the employability of young people. There is also strong interest in orienting this reorganisation on the dual training model (BMBF, 2017a). The importance of interna-
tional cooperation for the expansion of vocational training cooperation has also increased significantly, due to increasing economic globalisation and further current global societal challenges, such as intercontinental refugee flows from Africa to Europe along with the apparent high regard for the German educational system (Baumgarten et al., 2017). As such, research on international vocational training is increasingly coming into focus in vocational education research (Baumgarten et al., 2017).

Since the passing of the ‘strategy paper of the German government: Vocational training cooperation from a single source’ (BMBF, 2017b) in 2013 and the establishment of the Federal Centre for International Vocational Training Cooperation (GOVET) within the Federal Institute for Vocational Training (BIBB), the political, societal and economical relevance of the expansion of research on an internationalisation of vocational training has become apparent.

The strategy of the German government is to strengthen foreign national systems and their dual educational training programs. This is characterised by the following five core elements: the promotion of cooperation between social partners, the inclusion of economic and state actors, learning within work processes, the acceptance of national standards, support for the training and advanced/expanded instruction of qualified vocational training teachers and the expansion of institutionalised vocational training research and vocational training counselling (BMBF, 2017b). The core elements are not limited to certain fields of educational training.

This bilateral vocational training cooperation is further outlined in five specified fields of action. There is support for vocational training reform in the form of a system consultation (1) in regard to the legal framework and the framework curricula, and (2) in regard to the establishment of vocational training colleges. (3) There is also support and encouragement for social-partnership dialogues, (4) pilot projects to train the trainers and (5) pilot projects in dual education programmes which are intended to take place in cooperation between the German Chambers of Commerce Abroad [Außenhandelskammer (AHK)], small and medium-sized businesses [Klein- und Mittelständische Unternehmen (KMU)] and vocational training institutions.

The present funding guidelines have the intention to further strengthening and developing the institutionalised vocational training research field, which is the fifth core element of the bilateral vocational training cooperation. German academic expertise in the research field of vocational training and the academic training of VET lecturers should be made available to all foreign partners in order to assist reforms of their national systems. Overall, the establishment of an interdisciplinary- and transdisciplinary research network for international vocational training collaborations should be promoted (BMBF, 2017b). Country- and state-specific challenges and characteristics associated with vocational training cooperation
as a result of the aforementioned core elements thus become all the more obvious. In this context, Euler (2013, p. 4) writes:

*If a foreign educational system is to be transferred into one's own country, existing circumstances must be considered, and the execution of dual vocational training programmes must be adjusted to local educational policies as well as social and economic goals. Thus, it is a question of a clever transfer of adapted elements and not a carbon-copy of a foreign approach.*

According to the research findings and context factors of a policy transfer as defined by Phillips and Ochs, a transfer of educational systems and curricula is highly conditional on (1) the Guiding Philosophy or Ideology (i.e. the guiding philosophy of the educational system), (2) the 'Ambitions' Goals (i.e. the educational goals and requirements), (3) the Strategies (i.e. the formal and material rules and strategies for the execution of educational measures), (4) the Enabling Structures (i.e. the structures of educational authorities and the financial and personnel supply of the educational system), (5) the Processes (meaning the teaching process) and (6) the Techniques (meaning the competences of the individual teachers) (Phillips & Ochs, 2003, pp. 329-330; see also Barabash & Wolf, 2011, pp. 285-289). The transfer of one state's/country's educational systems and curricula, partial or full training and advanced instruction systems into another state/country appears highly complex and is significantly affected by the technological and economic as well as historic, cultural, political and social structures of both countries/states (Phillips & Ochs, 2003).

The research and development project, TRAINME¹, in the frame of which this article is authored, focusses on the professionalisation of South African vocational lecturers (TVET² lecturers). The project aims to conceptualise and implement target group-specific further training modules for lecturers in the metal and electrical engineering fields as well as to promote the reputation of public vocational training colleges (public TVET colleges³) (European Commission, 2014, p. 45), consequently strengthening the local economy (Lumby, 2000, p. 101). The qualification of lecturers in the vocational education and training (VET) sector is a central, constituting feature of vocational training (Euler, 2013).

A fundamental step in the expansion of German-South African cooperation is the joint declaration of intent by the Department of Higher Education and Training (DHET) and the Federal Ministry of Education and Research (BMBF) and the related bilateral operational programme. This bilateral operational programme provides for the support of the continued development of the South African Vocational Training Institute (SAIVCET⁴), the trial of dual

---

¹ The project 'Modular training and further education of South African TVET lecturers in mechanical and electrical engineering' (TRAINME) is financed by the Federal Ministry for Education and Research in line with the internationalisation of vocational training under the Financial ID 01BE17014B (Operational Timeframe: 01.01.2018 – 31.12.2020).

² TVET means Technical and Vocational Education and Training.

³ In South Africa, there is a noticeable difference between public vocational schools (public TVET college) and private vocational schools (private TVET college). The prospects of employment after graduation differ to a vastly disproportionate degree.

⁴ SAIVCET (South African Institute for Vocational and Continuing Education and Training).
training courses in South Africa, the development of vocational training standards and the assembly of curricula which align themselves more closely to the needs of the South African economy. The programme also supports the reform requirements of the training and continued education of vocational teachers (Baumgarten et al., 2017, pp. 26-27).

In addition to South Africa, other African nations such as Egypt, Ghana, Tanzania and Ethiopia have recognised the importance of highly qualified teachers and trainees at vocational colleges and, in this spirit, have declared their intention to institute appropriate reforms. These African nations are either working towards a modernisation of their educational plans and frameworks or have realised this modernisation already (Allais, 2011a; DHET, 2013a; Field, Musset & Álvarez-Galván, 2014; Hailemichael, 2016). The government of South Africa is striving to include international standards in their curriculum planning to raise the standard of professionalisation to an internationally comparable level (Allais, 2011a; Akoojee, 2016).

In the frame of the cooperation between Germany and South Africa and under the declared goals of the TRAINME project, this article aims to systematically examine the current state of things and the reform aspirations towards the educational training of lecturers as well as the related needs for further training in South Africa. In section 2, the state of current research on the training of lecturers in South Africa is described. This section also gives specific notes for the hedging of a sustainable transfer of relevant projects in the context of an intended policy transfer, so that in section 3, the conducted research presented in the appendix can be explained. In section 4, the results of the investigation are presented, and then in section 5, the findings are discussed in the context of links between international VET research and South Africa.

2 State of Research

The international state of the research leaves no doubt about the significance of lecturers’ profession-related competencies in the development of their students (Shulman, 1987; Zlatkin-Troitschanskaia et al., 2009; Terhart, Bennewitz, & Rothland, 2014). Established models regarding professional occupational competencies usually account for four aspects of competence: vocational knowledge, beliefs/values, motivational orientations and self-regulating capabilities (Krauss et al., 2004). Vocational knowledge is further divided into four central subcategories, specifically content knowledge, pedagogical content knowledge and pedagogical-psychological knowledge as well as counselling knowledge (Baumert & Kunter, 2011, pp. 32–33). The continued interdisciplinary training of teachers is also seen as promoting the practical teaching methods employed by lecturers for the academic success of the student (Lipowsky, 2011; Lipowsky, Rzejak & Dorst, 2011).
Specifically regarding competencies of and advanced training courses for South African TVET lecturers with respect to profession-related content- and subject content knowledge focussing on electrical and mechanical engineering, no empirical findings from the data under consideration in this paper demonstrate these research areas. The state of research on the teaching of lecturers in South Africa is generally scant (Field, Musset & Álvarez-Galván, 2014, p. 10). A case study by Watson and Wedekind (2016) uses a best-practice example of an electrical engineering lecturer in order to find a pedagogically and didactically valuable education at a TVET college. Zungu examines potential relationships between the development of trainees’ competencies in electrotechnical jobs and the curricular content as well as institutional conditions (2016, p. 61). The vast majority of published empirical studies related to African VET focus on the general circumstances of TVET colleges, either compared to other (African) countries or explicitly for South Africa as an object under investigation (McGrath, 1998; Lumby, 2000; Letseka, 2004; Young, 2006; Wedekind, 2008; Marope, Chakroun & Holmes, 2015; Arfo, 2015; Akoojee, 2016; Allais, 2011a, 2011b & 2017).

Several publications from international research networks list a broad spectrum of qualifications for teachers at vocational schools in South Africa (Papier, 2008, p. 7; European Commission, 2014, p. 52; Arfo, 2015, pp. 20–22; Green, 2018). Accordingly, TVET college lecturers possess several different qualifications or are missing qualifications (Ibid.). Only a small minority of vocational school teachers possess both work experience as well as technical knowledge and pedagogic-psychological qualifications (Papier, 2008; Green, 2018). If the qualification guidelines published by the South African government in 2013 (National Qualification Framework, NQF) were to be used as a set of requirements, then one in every five lecturers in South Africa would fail to satisfy those requirements (European Commission, 2014, p. 53). This difficulty is further confirmed by current data and statistics published by the South African Education Administration on the qualification levels of TVET college lecturers (n=8,375). In this regard, according to Green (2018), 4.8% of lecturers are academically and vocationally qualified as school teachers (n=400), 33.1% are academically qualified as college lecturers (n=2,774), 36.3% possess only an academic qualification (n=3,037), 20.6% possess no qualification (n=1,726) and the remaining 5.2% cannot be accounted for statistically.

If the state of research on policy transfer shows room to improve (Barabasch & Wolf, 2011), then existing individual general and particular clues can serve as points of connection in order to secure a sustainable transfer of international educational projects. We can thus assume that the probability of transferring model projects, such as the further training of South African lecturers, increases as long as the potential recipients of the model project share the intended goals of the project, are convinced of its effectiveness and assume its practicability under the present working conditions. The necessary support must also be available and the transfer concept allow enough room to adapt to the context in line with lecturers’ personal experiences (Prenzel, 2010; Barabasch & Wolf, 2011).
In summary, we can determine that one in every five lecturers at a South African vocational college possesses no academic and vocational qualification to teach (i.e. at least three years full-time university tuition with an NQF grade of at least 6 or higher). The multitude of lecturers’ differing qualifications, in addition to missing ones, allows the assumption of a generally wide range of available content and pedagogical-psychological and pedagogical content competencies; in developing further training modules, this highlights the importance of further analysing profession-related starting points for vocational school lecturers. Also, based on the knowledge gained from the policy transfer and to ensure and support a sustainable safeguarding of the transfers in the TRAINME programme, we can establish the necessity for a further systematic judgement of (1) the educational policy and general curricular framework, (2) the general situation regarding vocational schools in South Africa and (3) the actual, profession-related need for further lecturer training in the specific fields of electrical and metal engineering.

3 Approach to the Study

3.1 Research Goals and Methods

Faced with the significantly limited empirical findings available on the training of vocational lecturers in South Africa, it would seem necessary to establish a continued training concept in the electrical and mechanical engineering fields to gain a better, more systematic overview of the subject-specific qualifications, needs and other determining factors of South African vocational teaching education. Over the course of the three case studies in this paper, the following research questions will be investigated:

1. What are the institutional, individual and organisational framework conditions at public TVET Colleges in South Africa?

2. What profession-oriented qualifications do TVET lecturers in South Africa possess?

3. Based on their perspectives, what needs for further education training do South African TVET lecturers have?

This project poses a challenge in more than one way. Firstly, as mentioned, the qualification level(s) of vocational lecturers vary to a great degree. Secondly, it is to be expected that even in the event of a survey of potential lecturers, with minimal effort for the participants, only a partial image of the situation will be revealed. Against this backdrop, a methodical approach involving three case studies was chosen, specifically focussing on the following.
- **Case Study 1** aims to **judge the educational policies and curricular framework** of lecturer education in South Africa and was conducted as a qualitative content analysis (Lamnek, 2005) of educational policy and curricular documents.

- **Case Study 2** aims to **judge the further training possibilities in the context of the wholistic, scholastic situation** from the perspective of vocational college practices and educational administration experts. The methods used included structured group discussion as a type of focus group (Morgan, 1996; Dürenberger & Behringer, 1999; Schulz Mack & Renn, 2012; Mäder, 2013) and interviews.

- **Case Study 3** focusses on a systematic **knowledge of the description of further training needs** from the perspective of South African lecturers at vocational colleges (TVET colleges). A quantitative survey study was conducted, where n=309 teachers from South Africa took part.

### 3.2 Conducting the Case Studies

For **Case Study 1**, different educational policy documents were made available through the DHET. The extraction of the data for **Case Study 2** occurred in Johannesburg during a two-day conference in March 2018, entitled **Towards a Continuing Professional Development (CPD) Framework for TVET Colleges**, planned and conducted by the South African Department for Higher Education and Training. Both South African directors and lecturers at vocational colleges took part in this conference. All participants of the conference (n>200) were divided amongst six large groups in order to form focus groups. These groups were then divided into five further subgroups of 5–8 participants each. The respective results were then compiled in reverse order to the original division. First, the subgroups exchanged ideas and thoughts after the first work phase. Then a representative of the groups presented the combined results in a plenary session. Both the audiovisual recordings of the presentations of the respective focus groups, totalling approximately one and a half hours (Case Study 2), and the educational policy documents (Case Study 1) were evaluated using a content-analytical method based on Mayring (2007). The quantitative data analysis in **Case Study 3** was conducted using pertinent statistical methods (Bortz & Döring, 2006).
4 Findings

As part of the analysis, extensive information about the VET sector in South Africa and its operational framework was gathered within the three conducted studies. Against the backdrop of a wealth of information, selected results are presented which, in a systematically justified way, show the current state of affairs in scholastic practice and in the professionalisation of vocational teachers in South Africa. The display of the findings is based on the three studies and is closely based on the context factors of a policy transfer explained in the first section (Phillips & Ochs, 2003).

4.1 Case Study 1: Document Analysis

In Case Study 1, three central educational policy documents — the White Paper (2013), the Green Paper (2012) and the Government Gazette (2013) — were evaluated in a content-analytical way in light of the reform efforts and the current targets of vocational college lecturer training in South Africa. The White Paper (DHET, 2013b) and the Government Gazette (DHET, 2013a) are considered especially significant in this context. Considering the first four factors defined by Phillips and Ochs (2003, pp. 329–330) — (1) guiding philosophy of the educational structure, (2) goals and standards of education, (3) rules and strategies of education and (4) enabling structures — the documents are examined chronologically.

Since the Federal Education and Training Act5 (FET) of 1998, several reforms have been passed which provide a look into the philosophy, goals and standards of the educational system in South Africa and the desired changes in the work and educational training in TVET colleges (Papier, 2008, p. 6; European Commission, 2014, p. 43). One central reform was the fusion of 152 colleges into 50 central campuses with different fields of specialisation (DHET, 2012, p. 20; European Commission, 2014, p. 43). The reform aimed to neutralise local differences between colleges and states and to establish equity as well as the same available opportunities within population groups (Ibid.). Further reform efforts included the establishment in 2007 of the National Certificate of Vocational Training, under which dual training programmes were replaced with theoretically guided full-time education programmes at colleges. Due to pressure from the private sector and the ‘college community’, the intention to introduce purely academic/scholastic full-time education programmes was reconsidered, and dual training programmes were readmitted. The reform was provided with significant financial resources in the hopes that the reputation of FET colleges would increase (Wedekind, 2016, p. 136). Colleges were also unable to identify with an academic orientation and

---

5 Federal Education and Training Act: This law signals a radical, continuous and currently still ongoing change in the vocational sectors in South Africa. In this article, this change is addressed in the context of the technical field(s).
instead focused on a practical and more vocationally oriented gaining of competencies (Ibid., pp. 43–45). In 2012, FET colleges were renamed TVET colleges.

A preliminary conclusion reached in 2012 by the DHET found that the desired effect (improvement of the reputation of vocational colleges and their diplomas) was far from being reached (The Presidency, 2012; DHET, 2012). TVET college graduates are often seen by the labour market as subpar, which, amongst other factors, comes down to the lack of practical phases during their college education and the lack of cooperation between firms and the vocational colleges (Akoojee, 2016, p. 4). Wedekind’s analysis for the South African Qualifications Authority (SAQA) shares this conclusion on the apparent failure of reforms and adds: ‘… The reforms have not only changed the “what” and “how” of the lectureship, but also the entire existence of institutions, students and the entire vocational education establishment that effects these reforms’ (2016, pp. 135–136).

The Government Gazette focuses on the professionalisation of lecturers and describes various areas of competence and their requirements for TVET lecturers. Professional linguistic competence, theoretical and practical expertise and a knowledge of central vocational requirements in the workplace are thus regarded as essential. This knowledge and these skills are to be gathered and collected into several different training programmes. But there is no further elaboration on concrete learning content, how this professionalisation will take place or who will conduct it (DHET, 2013a, pp. 9–32). The HEQC\(^6\) is responsible for the certification of university courses of study, which orient themselves on the ‘Policy on Professional Qualifications for Lecturers in Technical and Vocational Education and Training’ (DHET, 2013a, pp. 2–4).

The subtitle of the White Paper, ‘Building an expanded, effective and integrated post school system’ (DHET, 2013b, p. 1), reflects the central content and goals contained therein. On a societal level, an improvement in social, cultural and economic relations is sought. Social inequalities must be balanced out and apartheid overcome. Further, the improvement of the reputation of public TVET colleges is of paramount importance. Since Lumby (2000, p. 101) realised early on the importance and effects that vocational training at TVET colleges has with respect to both the society and economy of South Africa, it has been determined that societal and historical events during the apartheid era as well as an inequality of resources in South Africa have had a profound effect on the education and development of the country (Allais, 2011a; Field, Musset & Álvarez-Galván, 2014). Despite the end of apartheid and the attempted reforms intended to bring equal opportunities, the after-effects of apartheid policies are still visible today in society and the educational system (Allais, 2011a; DHET, 2012; Field, Musset & Álvarez-Galván, 2014). The ‘special’ societal conditions in South Africa are a recurring theme even in reformation attempts in the fields of vocational training (Allais, 2011a; Wedekind 2016, p. 192). The formation of vocational training is thus affected by histo-

\(^6\) Higher Education Quality Committee of the Council on Higher Education.
An OECD review from 2014 suggests to cope with the current challenges by providing topic-specific recommendations. Some of the central points are:

1. Vocational programmes must be made more attractive. Therefore simplifying vocational pathways by merging VET programmes on the upper secondary level into two main tracks as well as offering second chance VET programmes would be necessary. Further it is recommended to actively support the acquisition of diplomas and certificates.

2. Artisan skill sets should meet the demands of the labour market. While current VET programmes not offering the required skills demanded by industry, the gap can be closed by setting workplace exposure from voluntary to mandatory for vocational programmes as well as establishing a committee which is responsible for the cooperation between TVET colleges and industry and the co-ordination.

3. Reduce administrative costs of the current levy grant system and initiate a reform to facilitate the process.

The European Commission’s report from 2014 concludes that while various reforms in South Africa have commenced, implementation thus far has not taken place, and lecturers are still being employed who do not possess the necessary qualifications or competencies (European Commission, 2014, p. 55). A potential cause of this is thought to be an acute lack of lecturers, a situation which exists in many colleges. In 2012, a lecturer had an average of 55 students (European Commission, 2014, p. 53). The state of research is poor regarding the actual level of implementation as well as the often criticised ’mentorship programme’, which aims to assist in the professionalisation of lecturers. Papier recommends an evaluation of the existing mentorship programme as well as an increased orientation towards the German system for such matters of professionalisation (Papier, 2008, p. 20).

The following quote defines the central challenges for teachers at TVET colleges:

*Vocational teachers are … required to span these two spheres (work and education) and embrace a dual identity that combines liberal education and economic enterprise, placing them in a state of tension between ‘industry expert’ and ‘expert educator’ identities, even though they are dislocated from both traditional sites — the industrial workplace and the traditional school. (Papier, 2011, p. 106)*

When considering the societal perspectives, this guiding thought forms a bridge between theory and practice for the future professionalisation of TVET lecturers. To gain a further
understanding of the current situation with respect to the education of teachers, especially in regards to the actual college-practical needs, the findings of the focus group study will be explained in the next section.

4.2 Case Study 2: Focus Group Study

An analysis of the focus group data yields the following four central categories: Completed Further Training (61 codes), Motivation and Mindset (83 codes), Need for Further Training (44 codes) and External Circumstances (69 codes), totalling 257 codes across all four categories. Case Study 2 thus focusses especially on the aspect of 'enabling structures' from the perspective of teachers, as introduced by Phillips and Ochs (2003, p. 329).

Category 1 (Completed Further Training): The qualitative results indicate that the participants at the conference, who also took part in the case study, have rarely taken part in further training over the past five years. The case study participants’ name various single further training programmes in pedagogical, technical and curricular fields as well as programmes for further personality development. Thematically, the sphere of pedagogy includes further training dealing with cultural diversity in the classroom, equal treatment, inclusion and classroom management or PGCE. The technical sphere includes the themes of CAD and CNC mentioned by one group. Aside from one existing curricular further training programme, all focus groups especially highlight further training programmes whose core goal is the development of leadership ability. The material content and competencies which these programmes teach cannot be identified using the available data. Against the backdrop of the low number of participants in further training programmes, the question of why this is the case is posed.

Category 2 (Motivation and Mindset): The results of this category are definitive and overwhelmingly point towards an extrinsic motivation for participation in a further training programme. Such participation is justified with additional financial incentives or improved career advancement opportunities. Only a few associate participation at a further training programme with, for example, the personal goal of delivering better and more wholistic instruction. Statements like the following are rare: “We want to leave the sector because it is not motivating [Salaries], but we are driven by passion to take the skill to the rural areas where we come from” (EP5, 599–601); a majority of interviewees indicate financial advancement as the biggest motivation to take further training. On the other hand, transformative factors were also extracted from the transcripts. Some groups determined that they would be intrin-

---

7 PGCE = Postgraduate Certificate of Education. PGCE includes a 1- or 2-year, on-the-job pedagogical further training initiative:

8 EP5, 599-601: ‘EP5’ stands for ‘Ergebnispräsentation der fünften Gruppe’ (Results presentation of the fifth group). The Numbers ’599–601’ indicate which part of the transcript the citation is extracted from:
sically motivated if, for example, they were to take part in forming the curriculum or received more recognition for completing qualifying programmes.

**Category 3 (Need for Further Training):** On the whole, it becomes clear that in the content knowledge, pedagogical content knowledge (didactics) and pedagogical-psychological competencies, there is a central need for further training. In the content knowledge sphere, there are needs in cooperation with the digitalisation of the professional world (in addition to classical CAD and CNC training programmes and themes). This becomes more obvious considering the following:

> From our group as well there was a whole issue about preparation for the fourth industrial revolution. We also spoke about the importance of basic research skills. You know that's required for a lecturer to meet the changing environment; reskilling to meet technological changes have been discussed, but also utilising technology in the classroom is an area that we found needed to look at. (EP4, 375–380)

Observed across all groups is a need for further training in the methodological usage of digital media during classes and the construction of appropriate and suitable e-learning materials in the field of pedagogical content knowledge. In the pedagogic-psychological field, themes of inclusion, dealing with cultural diversity and individual training/advancement and the rating of students with learning difficulties or special needs is mentioned. Further training in class leadership, conflict resolution, project management, digital media and social networks is also classified as urgent.

**Category 4 (External Circumstances):** A central critique from all groups is the lack of appreciation received for taking further training. It is lamented that despite the successful completion of further training programmes and the attainment of higher qualifications (e.g. a master’s degree), there are no chances of career advancement, and there is no increase in payment. This aspect — next to the problem of securing substitute lecturers and the financing of further training programmes — seems central to the general lack of motivation to participate in and complete further training programmes. A majority of the groups also sharply criticise the current mentorship programme for young lecturers. This is justified through the few pedagogic-psychological, pedagogical content knowledge and content knowledge competencies of the mentors as well as through missing constructive and qualified feedback about the teaching of young lecturers. The interviewees also wish for significantly closer cooperation with the relevant industry, so that students as well as lecturers can gather practical experience in subject-specific companies.

Overall, it would be desirable to be able to make more statements on concrete matters regarding the need for further training. It would also be interesting to understand what qualifications lecturers bring with them from prior education. As the answers obtained from the
focus groups were generally broad, this epistemological interest could not be satisfied here. Therefore, a questionnaire was authored for this purpose. The results of the survey, given in section 4.3, close the epistemological gap. However, it remains an open question how many persons in one focus group had taken part in the further training programme mentioned. One of the advantages of the survey is in the scope of field research on the philosophy of the educational systems and structures (Phillips & Ochs, 2003, p. 329). A great degree of transparency in the field of vocational education in South Africa was established through the large number of participants.

4.3 Case Study 3: Questionnaire Survey

Participants in the questionnaire case study numbered 309 persons (n=309), of whom 24.9% answered the questionnaire in a paper-pencil version as part of the two-day DHET event in Johannesburg while 75.1% used the online link to the questionnaire. The representative sample consists of 20.7% female participants (n=64) and 78% male participants (n=241), and 1.3% (n=4) give no indication of gender. Lecturers teach an average of 29.9 hours per week. The average age of the participants is 44 years (min=21, max=64). The participants are divided as follows with respect to areas of work: constructional engineering (1.2%), electrical engineering (37.1%), mechanical engineering (31.7%), automotive engineering (9.1%) and other fields of work (20.9%).

The questionnaire participants also possess various profession-oriented qualifications; 17.9% indicated a Bachelor of Education (BEd), and 7.3% indicated a Master of Education (MEd) as pedagogic qualifications. A Postgraduate Certificate of Education (PGCE) was completed by 18.5% of participants. A Diploma in Education (DE) was indicated by 8%, a Higher Diploma in Education (HDE) by 6.6%, a National Higher Diploma (NHD) by 4%, a National Professional Diploma in Education (NPDE) by 13.9%, a Teacher Diploma (TD) by 11.9% and a Technical Education (TE) by 1.3% as pedagogic qualifications. Meanwhile, 10.6% indicated miscellaneous qualifications.

**Developmental needs from a teacher perspective:** The case study participants realise the greatest need of development in the content knowledge area of competencies (e.g. the content/themes: new technologies, control engineering, CNC, electronics and information technology). About one in ten participants identifies a further development need, in the pedagogical content knowledge (didactic) area (e.g. the topics/themes of lesson planning, execution and methods), in pedagogic-psychological knowledge (e.g. the topics/themes of assessment and classroom management) and in organisational knowledge (e.g. the topics/themes of curriculum, infrastructure and resources).
Analysing training needs of TVET teachers in South Africa

It is observed by lecturers that there is a central developmental need for modern technology, and they are interested in practically oriented further training programmes and better cooperation with the industry. The following are two sample answers from the written feedback:

*New technology in the field of mechanical, electrical, and electronics, and mechatronics; the implementation of new technologies linked to each subject content, new labs and workshop (M, 43Y, ME & EE, 253)*. In the training process more hands on tutoring should be adhered to. Most Nated and NCV Programmes focuses on mostly theoretical concepts whereby more practical training should be implemented. Within the curriculum more focus to be placed on the practical content as industry requires that when students are placed that they are able to perform certain practical tasks. (M, 48Y, EE, 190)

An immediate need for further training is seen by lecturers as follows. In pedagogical-psychological themes, 27% indicate assessment, moderator, methods, psychology, interests/motivation and individual teaching. In pedagogical content knowledge themes, 7% indicate lesson planning, class attendance and curriculum. In content knowledge themes (working field: electrical engineering), 22% indicate information technology, SPS, electronics, electrical machines and control technology. In content knowledge themes (working field: mechanical engineering), 9% indicate CNC, CAD/sketching and manufacturing engineering/machines for the manufacturing of manual tools. Practical training in the form of sitting in on companies and the application of new technologies is desired by 24%, while 11% declined to answer.

---

9 (Gender, Age, Class Subject(s) (ME: Machine-Engineering, EE: Electrical Engineering), Questionnaire Number).
In order to learn more about the various assistance needs during practical teaching challenges, the participants were asked an open question on the perceived challenges and learning requirements of trainees. The results are clustered in the categories of the cognitive, constituting, conative and motivational determinants of the trainees (Fig. 1). The participants particularly identify problems with cognitive determinants of trainees (69.1%). Many of the participants also identify learning problems associated with (missing) language competencies, which become clear in the wake of the following answers: “Language barrier and lack of technical exposure/thought what their career choice require prior to learning” (M, 40Y, EE, 8) and “Language is a big challenge with a number of students, they simply don't know enough English” (M, 41Y, EE, 150).

Problems in the field of constituting determinants (14.3%) are viewed by lecturers as financial and societal problems and learning difficulties, for example “concentrating for long when teaching theory” (M, 28Y, ME, 167) or “learning disabilities – e.g. autism” (F, 49Y, Other, 29). The following is stated in regards to conative (volitional) determinants, such as learning strategies, learning aims and lack of time: “Most of them struggle to study on their own” (M, 38Y, ME, 77), “lack of effective study methods, time management” (F, 54Y, Other, 302) and “They do not know how to study” (M, 48Y, EE, 295). In regards to motivational and affective determinants, teachers write the following: “They are very lazy, disobedient and passive” (M, 56Y, ME, 228) and “In some case, lack of motivation and self believe” (M, 37Y, EE, 173).

![Challenging situations/insufficient learning conditions of students](image)

Fig. 2: Challenging situations/insufficient learning conditions of students

---

10 Amongst others, intelligence, background knowledge and basic competencies are also considered part of cognitive determinants (Helmke & Schrader, 2001, p. 90). Also amongst others, learning strategies and learning styles are considered part of conative determinants (Helmke & Schrader, 2001, p. 90; Wang, Haertel, & Walberg, 1993). Interest and motivation are considered part of motivational and affective determinants, amongst others (Helmke & Schrader, 2001, p. 91) and amongst others, biological features such as age and gender or learning difficulties are considered part of constituting determinants (Helmke & Schrader, 2001, p. 91).
When asked about cooperation with companies, 47.3% stated that a basic cooperation exists. When asked what makes up this basic cooperation, 80% state that the partnership involves potential job placement, 14% state that the partnership involves visiting businesses and 6% state that they are proposing partnerships.

About a third of the lecturers (33.7%) recognise that they invest more than half their teaching time in practical learning phases. Only 55.7% of the students take part in this practical teaching, however, as additional fees arise for trainees in acquiring further qualifications (DHET, 2012, pp. 23–28).

An urgent need for technological equipment is also seen by participants. Lecturers highlight for example the need for computers (31.6%), the Internet (7.4%), projectors/overhead projectors (30.1%) and other learning models (9.6%). For practical teaching/lessons, a special need is determined for CNC machines/machines to manufacture manual tools (22.7%), electrical machines/equipment (28%) and control technology (16.6%).

5 Discussion

Based on the situation as described in the first section, this research aimed to systematically analyse (1) the educational policy and curricular circumstances of vocational teacher education in South Africa, (2) further training conditions in the context of the scholastic/academic background from the perspective of practical vocational school and educational administrative experts as well as (3) the provision of descriptive knowledge of further training needs of South African vocational college lecturers at TVET colleges. The results from the three case
studies will be discussed in the light of the six previously mentioned context factors of policy transfer, as defined by Philipp and Ochs (2003).

The results of the document analysis (Case Study 1) find that the educational policy desire to improve vocational education and to professionalise teachers through various reforms has manifested and begun, though it has only partially been implemented. The reasons for this are various and can be partially attributed to the “Enabling Structures” which are still significantly affected by the special societal power relations and history of the country, especially apartheid and the unequal distribution of opportunities, for example in education. The “Guiding philosophy” of the educational system as well as the educational establishment is fundamentally affected by this, and this makes the training of professionals more difficult (DHET, 2012, p. 13). The discrepancy between the standard of education received and companies’ expectations of college graduates’ skills is striking. In order to reach the self-imposed “Ambitions Goals” to improve TVET lecturers’ qualifications, new “Strategies” were formulated with the Government Gazette, focussing on a higher standard of professionalisation of lecturers. In reality, however, the results of the document analysis concur that this defined standard has thus far not been reached by at least one in every five lecturers. The results also point towards insufficient cooperation between the industry and the vocational colleges in terms of practical training, and there seems to be a need for an optimisation of the circumstances in the training of lecturers, which can be assigned to the context factor “Strategies”. In comparison to Germany, although a company-based dual training system has existed since the 1960s, there is still a tremendous lack of collaboration between vocational schools and companies (Gessler, 2017, p. 164). But notwithstanding this situation, with reference to the passed reform initiatives, it is clear that a need for reform has been recognised along with the will to reform the existing system. With regard to the first four context factors, the results show that the first three factors seem to be currently subject to a change process, while the fourth factor, the “Enabling Structures”, has further optimisation potential that has yet to be identified and exploited.

The results of the focus group study (Case Study 2) in regards to further training programmes for lecturers give several clues about the supporting and restricting factors which constitute lecturer training in South Africa. The predominantly low income positions and career advancement opportunities in the professional field of vocational training, a lack of societal appreciation, an insufficient amount of guidance through mentors, the perceived lack of quality of further training courses as well as the limited financial situation at TVET colleges pose significant restricting factors for further training of South African lecturers, and they form fundamental obstacles. These barriers have also been observed and analysed in German research and literature in further teacher training studies (Richter, Richter, & Marx, 2018). The factors mentioned for Case Study 2 thus deliver central points that the willingness for further training of South African lecturers can connect to and positively sti-
The results mentioned in this section identify concrete points as to how to further develop the existing “Enabling Structures”.

The results of the questionnaire survey (Case Study 3) establish a broad spectrum of qualifications possessed by the surveyed lecturers as well as their further training interests and the classroom methods they employ. It thus provides an insight into the “Techniques” (e.g. the level of teacher training and teaching methods). The results also point towards a concrete need for further training, stemming from the lecturers’ specific fields of operation (e.g. dealing with insufficient linguistic skills and the prior knowledge of students). The profession-oriented qualifications possessed by lecturers vary in type all the way from vocational training to a completed university degree. The largest need for further training is identified by lecturers in the field of content knowledge (37%), followed by pedagogic-psychological knowledge (27%) and pedagogical content knowledge (20%). In these results, not only is the context factor “Processes” found, but also subject-specific training needs to improve the teaching “Techniques” are identified.

In summary and conclusion, the results of this paper deliver an empirically justified extension of knowledge on the further individual training requirements and professional qualifications of vocational college lecturers and the perceived further training needs of teachers. The results also offer several varied points of connection for the development of lecturer education in South Africa. According to Andersson, Hellgren and Kõpsén, it is imperative to consider ‘two intertwined parts — teaching skills and knowledge in the subject that they teach’ (2018, p.141) when conceptualising further education training. The professionalisation of South African lecturers should also consider the current challenges posed to the working world by digitalisation as well as considering the changing competence expectations of employers and the pedagogical content knowledge implications for modern learning and teaching arrangements (Zinn, 2017). Otherwise, the gap between the current skill levels of graduates from a public TVET college and the requirements from the industry will become even bigger. This requires strong, stable cooperation with local companies and a programme to finance internships for socially disadvantaged students. By applying the context factors defined by Philipps and Ochs (2003) to the research findings, multiple points of contact for further research will be exposed, including further research on competencies of TVET lecturers in order to develop and provide lecturers with adequate further educational training possibilities.
References


Biographical notes

Dr Bernd Zinn is a professor at the Institute of Educational Science (IfE), specifically in the Department of Vocational Education focused on Teaching Technology at the University of Stuttgart, Germany. His research areas of focus are teacher education, research in transfer of concepts related to training on the job, internationalisation of vocational training, further academic training of the vocationally qualified, inclusion and diversity as well as educational training and virtual reality.

Kevin Raisch is an associate at the Institute of Educational Science (IfE), specifically in the Department of Vocational Education focused on Teaching Technology at the University of Stuttgart, Germany, within the TRAINME Project. His research interests are focused on internationalisation of vocational training, further academic training of the vocationally qualified and the use of digital media for teaching.

Jennifer Reimann is an associate at the Institute of Educational Science (IfE), specifically in the Department of Vocational Education focused on Teaching Technology at the University of Stuttgart, Germany, within the TRAINME Project. Her focus areas are internationalisation of vocational training and further academic training of vocationally qualified and the use of digital media for teaching.
Book Review: India. International Handbook of Vocational Education and Training

Uma Gengaiah*

Institution/University Affiliation: Indira Gandhi National Open University, New Delhi

Published: 29.08.2019

Book Review


Purpose

The book is based on the authors’ work for over a decade in India in the field of vocational education and training (VET). India is a country with diverse social, economic, linguistic, and religious characteristics. The Constitution of India has kept education in the concurrent list by giving responsibilities to both central and federal (state) governments.

Globalisation and market economy encouraged a huge number of private players to enter the educational sector, when they realised that the new demand for high-skilled labour meant more people would need training for these jobs. In this context, VET plays a significant role among India’s learners.
Content

Wessels and Pilz begin by introducing India’s geographical, societal, political, and economic conditions. It becomes important to understand these parameters so one can recognize VET in relation to general education. India is a multi-ethnic, multireligious, and multilingual country with uneven economic progress. The authors clearly explain the structure of the Indian educational system. Politically, India is divided into 29 states and nine union territories. The authors explain the role of the Hindu caste system and its significance in choosing a profession. The economic condition of the family also plays a significant role in choosing vocational education as a stream in school. In the early 1990s, India liberalized, modernized, and diversified its economy. The growth and development of the economy after liberalization in the secondary and tertiary sectors increased the demand for skilled labour. The authors explain India’s growth after liberalization and the restructuring of its economy through statistics, which help readers understand the need to strengthen vocational education and training. The authors state that the tertiary sector (service sector) has contributed much to achieve a higher GDP. The primary sector, such as agriculture and related activities, has only contributed marginally even though more than 60 per cent of the rural population depends on agriculture. The authors also explain the existing status of diversified economic activities by stating that infrastructure development; the automobile, chemical, and pharmaceutical industries; textile engineering; and the service sector play major roles in contributing to a higher GDP and that 60 per cent of the GDP has come from the service sector. Information Technology (IT), Informational Technology Enabled Services (ITeS), and tourism also play a significant role in this regard. The liberalization of the economy in the education sector encouraged private players to start engineering colleges and offer IT-related courses. This background information helps the reader better understand VET in India.

The authors make another noteworthy observation with regard to learning in India. Two methods of learning are practiced in India, that is, learning in the informal sector and the formal academic way of learning. The authors differentiate formal and informal educational systems by presenting two case studies. The first case study is about a fisherman in a village in Orissa, and the second is about an IT professional. One can easily understand the significance of formal education by reviewing these two studies.

In the second chapter, the authors go on to explain the formal learning process in India. Different bodies oversee India’s education system from primary through university level. The Ministry of Human Resource Development (MHRD) in the central government and the Department of Education in the states are responsible for establishing and controlling regulatory bodies and facilitating boards to develop the syllabus at various levels. This is explained briefly by providing facts in tables and diagrams. They give a short introduction about the education system in India in 1000 BC. The authors also elaborate on who controls education and the structure and characteristics of various educational sectors. They explain a signifi-
cant concept, “Massification”, which refers to the growth of society in certain regions. Based on their explanation, we can conclude that Indians have come to respect higher education. The proof is seen in the increasing number of educational institutions, growing enrolment rates in schools and colleges, rising rate of privatization of higher education, and the professionalism of universities.

After analysing Indian educational system in detail, the authors provide an exclusive chapter on Initial Continuing Vocational Education and Training (Chapter 4). They begin the chapter by elucidating on how higher education has gained importance in India, and how there is a chance for the learners to choose vocational education at the school level itself. However, selecting the wrong course at the higher secondary school level may lead to the student quitting school, due to difficulty with the coursework. The authors offer a broad explanation of the structure of vocational education and training and the provisions to use it in India. Vocational education is taught in both government-owned and privately-established Industrial Training Institutes (ITIs). Children get a provision to choose regular stream or vocational stream in the school itself. The authors include a mention if the pre-vocational education system taught at higher secondary school. As many as 150 vocational courses are now offered in higher secondary education, with pre-vocational education at 9th and 10th standard. The central government and the Federal State council are responsible for providing vocational education and training. The authors provide an extensive list of forms, provisions, and training programmes in vocational education and training in India. They start by explaining that the oldest training system, which started in 1950, was called the ‘craftsmen training scheme’. After that, they describe the apprenticeship training established in 1961. Unlike these two oldest programmes, the Bachelor of Vocation (B.Voc) was launched in India in 2014. It is a three-year undergraduate degree with 40 per cent general educational content and 60 per cent vocational education and training. Apart from educational opportunities, in the era of globalization and rapid expansion of service sectors, especially IT and ITeS, big companies like Tata Consultancy Services (TCS) and Infosys Technology Limited have started providing in-house company training. Most of the IT companies are not satisfied with the skills of the engineering graduates. They provide in-house training to the graduates after hiring directly from colleges and universities. The graduates get regular work only after completing in-house training and passing the exam given by the company. Apart from government and companies, vocational education is provided in a small way by non-governmental organizations. If someone studies Indian VET system, they need to give a clear picture about informal vocational education and training. In India, transferring skill and knowledge to the next generation especially in the areas of arts, agriculture, sculpture, pottery, and Indian music (both Carnatic and Hindustani) is referred to as the Gurukul system of education. Certification is rarely involved in this process. This may be considered informal learning. As we have seen earlier, the informal sector plays a significant role in boosting the economy of
the country. Unlike European countries and the United States, women face huge challenges in pursuing education in India. Society and family are not in favour of women choosing technical education. The government of India has conceived and implemented a special programme for women. The authors offer the same explanation in the fifth chapter, which is about the factors and conditions determining vocational education and training in India. In this chapter, the authors trace the history of general and vocational education. The Apprenticeship Act (1961) laid the foundation for vocational education. The government also established the Kothari committee, and it has analysed all aspects of the Indian educational system from 1964 to 1966. The introduction of the Sarva Shiksha Abhiyan Scheme in 2002 laid the foundation for universalisation of primary education. The authors discuss additional governance structures, financing of vocational education and training, and school- and company-based training in this chapter. Apart from regular government-based programmes, the company’s act of 2013 mandated registered companies to contribute two per cent of their net profit to the society. The authors enumerate different training institutions run by the government and their contributions in training ITIs instructors. They also discuss the quality of vocational education and training within the national qualification framework. Finally, they talk about bilateral and multilateral agencies and their contributions to vocational education and training and the major government reforms to improve the status of VET.

Conclusion

This book is about Vocational Education and Training (VET) in India. The government of India has formulated various policies to address the needs of diverse stakeholders by analysing different factors in the country. Initially, the MHRD and the Ministry of Labour dealt with vocational education at different levels. Recently, the centre government introduced a new ministry, namely, the Ministry of Skill Development and Entrepreneurship (MSDE), which started offering vocational education at post higher secondary level. MHRD is still responsible for providing vocational education at the school level. Because of the country’s vast size, it is rather difficult for researchers and policymakers to understand the overall system of education offered at different levels. The authors have thoroughly studied the VET system and compiled comprehensive details. This book is a one-stop solution for researchers and policymakers regarding any and all information about the Indian VET system. With regard to this system and skill development, researchers usually focus on learning in informal sectors. Very few academic research studies or academic papers have been done on the Indian VET system (for ex. Pilz 2016), which is one reason why the authors travelled across the country and researched the various aspects of the VET system in India. After reviewing the bibliography, the reviewer understands the authors’ important contributions on this subject. Overall, this is an important book about the scope of VET programmes in India.
Reference


Biographical Note

Uma Gengaiah PhD is assistant professor in the School of Gender and Development Studies, IGNOU, India. Her primary focus areas are governance, gender and development by specializing agriculture, public policy and social capital. She is active in teaching and research for more than 10 years. She has published research papers in the areas of gender governance, VET, informal learning and informal sectors in India and Asian context.
Skills and employment under automation: 
Active adaptation at the local level

Odd Bjørn Ure*1 and Tom Skauge2

1 Consultur. Studies & Analyses, Westye Egebergs gate 2 B, Oslo, Norway
2 Western Norway University of Applied Sciences, Department of Business Administration, Campus Kronstad, Bergen, Norway

Received: 16.02.2019, Accepted: 08.07.2019, Published: 19.12.2019

Abstract

Context: The article contributes to a discussion of how patterns of employment and qualifications are modified by the ongoing industrial transformation, called Industry 4.0. Although this transformation is said to be a global phenomenon, scholars increasingly discuss the national differences in the wake of Industry 4.0. Our article aims to intervene in this debate by analysing the industrial transformation of a small island situated at the West coast of Norway. We notably investigate the technological renewal by means of Computerised Numeric Control (CNC) and robotics in a network of mechanical firms.

Approach: Nine small mechanical engineering firms are analysed by drawing on theories on business networks and clustering of firms. This allows for a discussion of how automation, employment, staff training and profitability are interconnected. The main research question is how the firms are locally embedded in a way that sheds light on the social dimension of vocational training, which is considered a form of Corporate Social Responsibility.

Findings: It is informative to use the heuristic concept ‘pre-cluster agglomeration’ to characterise how the nine firms under scrutiny are interacting, while being assisted by a forward-looking industrial association and supported by an active local community. The municipality and the county to which this agglomeration belongs, provide training services and other infrastructures that support the firms when they recruit new employees and upskill their staff, notably by setting up a CNC training centre attached to an upper secondary school.

* Corresponding author: oddbure@gmail.com

ISSN: 2197-8646
http://www.ijrvet.net
Conclusion: Our case does not support off-the-shelf narratives of robotisation implies job cuts. In the same way as previous technological transformations were not solely driven by their inherent technical opportunities, the ongoing robotisation is nuanced by the social shaping of technology. There is room for strategic choices when new technology is integrated in work organisations. The extent to which the workforce should be (re-)trained is subject to decisions and negotiations.

Keywords: Case study, technological change, workplace change, employment pattern, labour utilisation, job skills, training activities, vocational education and training, VET

1 Introduction

1.1 Robotisation, skills and employment

Robotisation may be interpreted as a paradigmatic shift from broad data-technological platforms to smart, adaptable production (Schwab, 2016). It is customary to calculate the potential of Computerised Numeric Control (CNC) and robotics (in short: automation) under the headings of mass production, punctuality and quality (Alvares, 2007; Åström, 2004).

It is often claimed that robotisation, as part of the ongoing transformations called Industry 4.0, inevitably leads to less demand for human labour. Some scholars maintain that robotics could engender productivity gains in situations where factories are losing most of their workers (Brynjolfsson et al., 2014; Acemoglu & Restrepo, 2017). This could be a daunting prospect for communities dependent on low-diversified industries exposed to the immediate effects of robotisation, notably the automation of repetitive, mechanical operations.

One of the most influential scenarios of drastic job cuts is found in Frey & Osborne (2013) who distinguish between high-, medium- and low-risk occupations according to their exposure to computerisation. They estimate that 47 percent of total employment in the United States is in the high-risk category, meaning that the occupations concerned are potentially automatable, “perhaps (over) a decade or two” (ibid, p. 41). In a discussion of Frey & Osborne’s arguments as applied to Germany, Bonin et al. (2015) maintain that new machinery has the potential to change the workplace without replacing the actual place of work. Hence, employees who are automated away from repetitive tasks could instead carry out operations less exposed to automation. In the same vein, D. Rus (2015) pinpoints that product innovations can partly counteract staff redundancy during automation and robotisation.

Moreover, Helmrich et al. (2016) point out that the studies on which Frey & Osborne (2013) build their arguments are based on the North-American or United Kingdom labour markets which have fewer workers in the medium-risk occupations claimed to be most exposed to automation. Helmrich et al. note that labour markets in several European countries are
more heterogeneous in the sense that there is a high proportion of medium-skilled workers who are supported by institutionalised arrangements for vocational and educational training. This is supported by S. Pfeiffer (2015) who argues that training in broad vocational skills providing access to a wide array of occupations, including medium-skilled jobs, renders the workers more robust when confronted with the technological renewal of their workplaces.

Another criticism of Frey & Osborne (2013) is that their investigation of the technical potential tends to ignore societal, legal and ethical obstacles to the introduction of new technologies (Bonin et al., 2015). This important approach acknowledges the potential for active adaptation at the local level through public discourse. One example is found in Germany where - from 2011 and onwards - a constellation of business and science interests was enlarged to include trade unions at the same time as the government altered the paradigmatic label 'Industry 4.0' to 'Work 4.0' (Ahrens & Gessler, 2018).

Our article addresses some links between automation, occupational transformation and employment patterns (job losses and job creation) by analysing a specific, local community. Our main hypothesis is that the incremental introduction of robots, combined with upskilling in a context of mutual trust, has facilitated these manufacturing transformations. The article focuses on the local conditions affecting this transformation. We thereby thematise the social dimension of vocational and educational training (Kaiser & Krugmann, 2018) which covers individual and collective or institutional activities, including cooperation between groups of persons or institutions (ibid.). Kaiser & Krugmann argue that the predominance of a relationship of trust and reliance within society is fundamental for developing "a social and participatory attitude towards the new and the foreign". This is a perspective for the whole society, conveyed across various levels, of which the text below concentrates on a local level.

1.2 Theoretical and methodological foundations

The article starts with the literature on business networks and clusters, focusing on how the networks and clusters are embedded in local communities. These theoretical strands are supplemented by literature with a vocational perspective on technological renewal, particularly robotisation. A third theoretical source is contributions that shed light on the social dimension of vocational education and training (VET) and which have some affinity with the literature on Corporate Social Responsibility (CSR).

Methodologically, the article builds on case studies of nine firms, of which the three most robotised ones are scrutinised in depth. In addition to interviews and the examination of written material on the firms, the case studies are supported by a value index to measure enterprises’ economic sustainability. The article addresses the limitations of our findings from one single local community by drawing on literature with a national and transnational bearing.
2 Collaborative training in Business network and clusters: Theoretical perspectives and previous studies

An investigation of automation and robotisation of industrial communities needs to capture relationships between the local firms as well as how these firms individually and collectively interact with the environment. One strand of the study of business networks looks at the activities, resources and actors that are in play in these networks. Broadly speaking, the network actors interact either individually towards their ‘small world’ or collectively towards the ‘large world’ (Håkansson et al. 2009). Theories on industrial communities of a different nature can shed light on which local or regional actors are involved in the various networks supporting a firm. One theoretical discussion is whether a distinction should be made between industrial districts, networks and clusters. Another is how clusters can be distinguished from (local or regional) networks (Bathelt et al., 2004; Fløysand et al., 2012). In practice, however, these notions may refer to very similar organisational constellations (Ure & Skauge, 2014).

The empirical material for the present article concentrates on nine enterprises and a local industrial association, the Osterøy Manufacturing Industry Association, which among other things represents them in contact with municipal and regional authorities. The association covers 40 firms situated around Osterfjorden. The activities of this local business network are therefore characterised by a manufacturing association able to unify the interests of individual firms but these individual firms rarely cooperate directly to increase their added value. Instead of regarding this association as a network external to the firms, it can be determined as an extension of them (ibid.). Furthermore, an understanding of how the firms interact as a business network increasingly exposed to competition and robotisation could cast light on whether they constitute one fragment of a larger industrial district or of a cluster. The terms cluster and industrial district are older terms in economic theory, dating back to Alfred Marshall’s ‘The Principles of Economics’ (1890).

In the industrial association we are studying, the external relations of the firms seem more determined by local society and the municipality than by business relations in the strict sense as outlined in analyses inspired by Michael Porter. The latter primarily aim to determine the competitiveness of industrial agglomerations (Porter, 1980 and 2014; Reve & Sasson, 2012), while the business network of the enterprises now under scrutiny have very close relations to their local environments (Njøs & Jakobsen, 2016). This environment embraces civil society, associations of employers, labour unions, education institutions and other providers of training alongside technology suppliers and cooperative bodies at the local level such as industrial associations or similar bodies of importance in the district. Previous studies of the industrial agglomeration under scrutiny have confirmed the determining feature of the local community surrounding the member firms of the Osterøy Manufacturing Industry Association (Lindeløv 2014; Skjærvik, 2014).
The organisational aspects of a firm, both internally between staff categories or professions and externally towards the firm’s environment, raise the question as to how vocational qualifications can be studied. In an article on formal and integrated strategies for competence development in small firms, Kock & Ellström (2011) suggest that organisational and technological innovations are intertwined. Alice Lam (2006) explicitly shares this view by claiming that collective knowledge is the accumulated knowledge of the organisation stored in its rules, procedures, routines and shared norms. This knowledge guides the problem-solving activities and frames the patterns of interaction among members of the organisation. Furthermore, differences in organisational interpretations of and responses to external stimuli can affect the outcomes of organisational change (ibid.).

Our chosen perspective builds on the theorising of the institutional aspects of innovation (Peng et al., 2009) and the social dimension of vocational training. We investigate how the local community surrounding the group of enterprises is involved when CNC and robotics transform manufacturing processes and the enterprises’ organisational framework. One example is the mobilisation to set up a training centre at the local upper secondary school in order to support the automation and robotisation of the neighbouring mechanical industries. This form of mobilisation is often pivotal for supporting the capacity of the firms to embark on local adaptations and technological renewal (Fløysand et al., 2012). We assume that investments in automation technology and the competencies needed when choosing the most suitable technical installations, as well as how to implement the technology in an inter-firm environment, lay the foundation for innovations at the level of the firm. Our material suggests that this happens in a form of ‘stakeholder dialogue’, which can be broken into the voluntary Corporate Social Responsibility (Carson et al., 2015) exercised by enterprises when confronted with the weighting of job creation vs. job cuts during introduction of CNC and robotics. This weighting underpins the value index displayed in table 2 below (Laurant sen & Bergfjord, 2014).

Studies of similar clusters or pre-cluster agglomerations have also emphasised the importance of having a local labour market characterised by trust between firms, including a reduced fear that an employee trained by one enterprise would leave to work at another (‘poaching’). This coincides with the general findings of Norwegian training patterns and is further explained by low staff turnover and by observations that most of the employees are highly integrated in local communities. This integration contributes to the formation of a quite stable workforce (Ure, 2010). Such characteristics also apply to the pre-cluster agglomeration around Osterfjorden.
The considerations above pave the way for our three research questions:

1. What are the main drivers behind the local shaping of employment patterns in a network of mechanical engineering firms?

2. In local enterprise networks, how are decisions on profitability, investment in technology and automation, and staff recruitment versus layoffs conciliated or weighted against each other? Are there signs that the social dimension of vocational training is manifested through social responsibility and the emergence of specific training cultures?

3. Faced with the widespread apprehension that robotisation implies job cuts, do employers take this into account by implementing a form of Corporate Social Responsibility (CSR) that tackles concerns about keeping staff on during robotisation and provides opportunities for further and continuing training?

We will revert to these questions in the concluding section. Before that, the local community and its mechanical firms are analysed. Then the findings will be discussed and related to the strands of literature presented above.

2.1 The local community: mechanical engineering firms investing in new technology

Small and medium-sized mechanical enterprises (SMEs) in the county of Hordaland on the west coast of Norway survived high production and wage costs during an upswing in the petroleum and oil services industries which ended when oil prices plummeted in 2014. During the preceding years, small firms’ survival often rested on a strategy of gradually introducing Computerised Numeric Control (CNC) machines and later robots. The firms belonging to the network that we investigated introduced robots in a smooth prolongation of their CNC investments. This illustrates a gradual transition between Industry 3.0. and Industry 4.0., whereby typical 4.0-technologies like recognition of images and voices, alongside the storage of data for reuse in the next manufacturing series, are being gradually introduced on the shop floor.

Computerised Numeric Control is a technology with considerable managerial and organisational impact at the level of the firm (Marri et al., 1998). It is usually based on ISO standards and was rapidly disseminated in most branches of industrial production (Martin & Beach, 1992). CNC preceded in many ways robotics because industrial robots are controlled with similar technology. Industrial robots are becoming more and more affordable. They are highly attractive for small and medium-sized enterprises with modest production volumes and differentiated production lines.
For a group of small firms in a district around the Osterfjord, investment in CNC and robotics entails innovation that makes room for new products and more knowledge-based jobs (Skjærvik, 2014). These firms are working in the field of mechanical engineering. Their manufacturing process has evolved from simple products destined for local customers to a portfolio of technologically-advanced products delivered to national and international customers. Some forward-looking firms around the Osterfjord started more than 20 years ago to invest in CAD/CAM programmes, CNC machines and later also robots (ibid.).

In 2010, the county administration in Hordaland joined forces with local industries to set up a 'Competence centre for CNC and robotics' at Osterøy upper secondary school. Before the training centre appeared, the industrial association cooperated with the upper secondary school in order to support its vocational programmes, particularly those of relevance for local industries. The centre now consists of 10 CNC training stations and two robots. A majority of those trained at the centre are enrolled in apprenticeship training, while there are plans to expand the educational offer to allow more employees from local enterprises to attend further and continuing training. The training centre is active in crafting a 'local, high-tech, industrial culture' including a vocational programme for apprentices called 'Technique and Industrial Production (TIP)' at upper secondary level (Gjelstad, 2015). The Osterøy Manufacturing Industry Association has approximately 40 members whose general manager is partly financed by the municipality. The association has a central role in discussing joint projects among its members and, for example, proposing to public authorities the setting up of training at the local CNC centre, as well as being a go-between in discussions with funding bodies, for example Innovation Norway (Lindeløv, 2004).

2.2 Automation and robotisation shape a municipality

Among the 40 member firms of the Osterøy Manufacturing Industry Association, 15 are classified as manufacturing entities. Within this selection, we had enough information about nine firms to allow us to investigate their economic sustainability and employment patterns (see tables 1 and 2 below). The nine selected firms also constitute a sample with fairly similar production processes and production lines.

All these firms are to be found on the island of Osterøy, which constitutes a municipality in the vicinity of Bergen, Norway's second largest city. This rural municipality has some 8,000 residents. Its enterprises feel constrained by a deficient road system which over the years has hampered easy access to Osterøy itself as well as hindering transport across the island. Osterøy today is about to become a robotised municipality due to the local industry’s investment in new technology. The introduction of CNC and robotics adapted to small and medium-sized enterprises was a key innovation strategy for the mechanical engineering industry around the Osterfjord, which expanse of water separates the island from adjacent municipali-
Skills and employment under automation. Moreover, three small neighbouring municipalities have joined together in the Osterfjord Industry Collaboration with a view to coordinating the administrative and counselling services for enterprises in the municipalities. For this purpose, a partnership agreement with the relevant county authorities has been signed, thus demonstrating the intertwining of business and public interests that frames the working conditions of this group of small firms.

2.3 Profitability, staff numbers and robotisation in the nine firms

The overview in table 1 below shows that several firms display consistently solid results over the decade in question (2006-2015). These firms are Lonevåg Fittings Factory, Gunnebo Anja Industries and Jon Solberg Fittings Factory. Two other firms, K. Lerøy Metal Working and Jakta Metal Working, experienced quite low profits, as did Tysse Mechanical Engineering in the aftermath of the 2008 global financial crisis. Yet the latter firm had very good results before this crisis but after 2009, the value creation of Tysse Mechanical Engineering plummeted.

Table 1: Value index of the nine enterprises’ economic sustainability, 2006-2015

<table>
<thead>
<tr>
<th>Firms/Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYSSE MECHANICAL ENGINEERING</td>
<td>413%</td>
<td>329%</td>
<td>224%</td>
<td>211%</td>
<td>128%</td>
<td>99%</td>
<td>38%</td>
<td>7%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>LONEVÅG FITTINGS FACTORY</td>
<td>114%</td>
<td>101%</td>
<td>101%</td>
<td>103%</td>
<td>110%</td>
<td>118%</td>
<td>123%</td>
<td>133%</td>
<td>126%</td>
<td>114%</td>
</tr>
<tr>
<td>GUNNEBO ANJA INDUSTRIES</td>
<td>231%</td>
<td>309%</td>
<td>1029%</td>
<td>1375%</td>
<td>250%</td>
<td>144%</td>
<td>92%</td>
<td>134%</td>
<td>226%</td>
<td>342%</td>
</tr>
<tr>
<td>MJØS METAL WORKING</td>
<td>211%</td>
<td>183%</td>
<td>180%</td>
<td>205%</td>
<td>175%</td>
<td>154%</td>
<td>119%</td>
<td>102%</td>
<td>78%</td>
<td>75%</td>
</tr>
<tr>
<td>K. LERØY METAL WORKING</td>
<td>180%</td>
<td>216%</td>
<td>443%</td>
<td>370%</td>
<td>323%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>JAKTA METAL WORKING</td>
<td>97%</td>
<td>106%</td>
<td>84%</td>
<td>232%</td>
<td>186%</td>
<td>89%</td>
<td>64%</td>
<td>42%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>JON SOLBERG FITTINGS FACTORY</td>
<td>136%</td>
<td>397%</td>
<td>371%</td>
<td>391%</td>
<td>376%</td>
<td>352%</td>
<td>285%</td>
<td>267%</td>
<td>281%</td>
<td>375%</td>
</tr>
<tr>
<td>FJELLSKÅLNES MECHANIC ENGINEERING</td>
<td>190%</td>
<td>188%</td>
<td>221%</td>
<td>303%</td>
<td>231%</td>
<td>181%</td>
<td>178%</td>
<td>123%</td>
<td>115%</td>
<td>115%</td>
</tr>
<tr>
<td>VEVLE MECHANICAL ENGINEERING</td>
<td>0%</td>
<td>105%</td>
<td>139%</td>
<td>246%</td>
<td>212%</td>
<td>140%</td>
<td>165%</td>
<td>169%</td>
<td>159%</td>
<td>157%</td>
</tr>
</tbody>
</table>

Table 2 below shows that the number of employees in the selected nine enterprises has been quite stable over the years 2006-2015. One exception is Jakta Metal Working, which went bankrupt in 2016, i.e. one year after our reference period (cf. Proff Forvalt).
Table 2: Number of employees in the nine enterprises, 2006-2015

<table>
<thead>
<tr>
<th>Firms/Years</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYSSE MECHANICAL ENGINEERING</td>
<td>55</td>
<td>70</td>
<td>81</td>
<td>80</td>
<td>85</td>
<td>81</td>
<td>81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LONEVÅG FITTINGS FACTORY</td>
<td>54</td>
<td>56</td>
<td>53</td>
<td>53</td>
<td>55</td>
<td>55</td>
<td>58</td>
<td>58</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>GUNNEBO ANJA INDUSTRIES</td>
<td>127</td>
<td>127</td>
<td>96</td>
<td>51</td>
<td>54</td>
<td>55</td>
<td>56</td>
<td>59</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>MJØS METAL WORKING</td>
<td>42</td>
<td>45</td>
<td>45</td>
<td>48</td>
<td>49</td>
<td>52</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>K LERØY METAL WORKING</td>
<td>36</td>
<td>45</td>
<td>35</td>
<td>37</td>
<td>37</td>
<td>39</td>
<td>39</td>
<td>36</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>JAKTA METAL WORKING</td>
<td>22</td>
<td>21</td>
<td>16</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JON SOLBERG FITTINGS FACTORY</td>
<td>16</td>
<td>17</td>
<td>15</td>
<td>13</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>FJELLSKÅLNEs MECHAN. ENGINEERING</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>VEVLE MECHANICAL ENGINEERING</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

The next table, Table 3, shows how many robots the enterprises have installed compared to the number of employees. Most of the nine firms have introduced robots but the use of them varies between the firms. Note that other automation technology, like CNC, is not included in the table.

Table 3: Robot density in the nine enterprises, 2015-2016

<table>
<thead>
<tr>
<th>Firms</th>
<th>Robots 2016</th>
<th>Employees 2016</th>
<th>Robots/employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYSSE MECHANICAL ENGINEERING</td>
<td>5</td>
<td>81</td>
<td>12.4 %</td>
</tr>
<tr>
<td>LONEVÅG FITTINGS FACTORY</td>
<td>50</td>
<td>62</td>
<td>80.7 %</td>
</tr>
<tr>
<td>GUNNEBO ANJA INDUSTRIES</td>
<td>4</td>
<td>54</td>
<td>7.4 %</td>
</tr>
<tr>
<td>MJØS METAL WORKING</td>
<td>4</td>
<td>55</td>
<td>7.3 %</td>
</tr>
<tr>
<td>K LERØY METAL WORKING</td>
<td>3</td>
<td>36</td>
<td>8.3 %</td>
</tr>
<tr>
<td>JAKTA METAL WORKING</td>
<td>3</td>
<td>23</td>
<td>13.0 %</td>
</tr>
<tr>
<td>JON SOLBERG FITTINGS FACTORY</td>
<td>0</td>
<td>10</td>
<td>0.0 %</td>
</tr>
<tr>
<td>FJELLSKÅLNEs MECHAN. ENGINEERING</td>
<td>1</td>
<td>8</td>
<td>12.5 %</td>
</tr>
<tr>
<td>VEVLE MECHANICAL ENGINEERING</td>
<td>0</td>
<td>6</td>
<td>0.0 %</td>
</tr>
</tbody>
</table>

(Source: Osterøy Manufacturing Industry Association, data obtained in October, 2016).

As shown in Table 3, Lonevåg Fittings Factory has invested heavily in robots, to the extent that this form of automation is fundamental to the firm's manufacturing process. The large wafer-production bending centre at Tysse Mechanical Engineering roughly corresponds to five robots in a 5 + 5 constellation. A third firm we investigated, Mjøs Metal Working, has bought four robots for the manufacturing of their wide range of mechanical products. We will concentrate our further analysis on these three firms, partly because they are the most automated or robotised among the larger population of nine. In addition, the quality of the
collected material from these three firms, which have been frequently visited as part of a co-operation agreement between the industrial association and a university college, allows us to draw on supplementary information related to our research questions.

3 Timelines for technology investments in the three mechanical enterprises

The following text is based on a timeline of the three mechanical enterprises’ investments in technology as first elaborated in Skjærvik (2014).

3.1 Tysse Mechanical Engineering Ltd.

Tysse Mechanical Engineering produces automotive trailers and started its technological renewal in 1994. The firm then boosted the development of machinery and output in sheet metal forming. A large contract from the Norwegian Army increased the overall production volume. Whereas it was deemed more expensive to buy sub-products from outside suppliers, the firm decided to manufacture the needed sub-products on its own. The first purchase was a stamping machine. The ensuing investments in automation focused on process as well as product development. Our interviews revealed that it was not originally planned to introduce fully-automated production. There were two reasons for this: a fear of drastic job cuts and the unwanted side-effects of having too many types of trailers if a fully-automated plant were to be set up. In addition, the firm feared that its production volumes were too small to allow for full automation.

With these considerations in mind, Tysse Mechanical Engineering extended in 1996 its production facilities and developed a new, upgraded range of models. With plans to introduce a more modern production line, the firm purchased an automated stamping machine. In 2005, the annual production of automotive trailers reached 10,000, thus allowing the firm to obtain several ISO certifications. In 2012, Tysse acquired a new production line where the automated punching machine, a bending machine and the robotics centre were integrated.

The timeline in Fig. 1 below shows that the firm has gradually implemented new technology over the last 20 years.
3.2 Lonevåg Fittings Factory Ltd.

Lonevåg Fittings Factory (Lobas) delivers rooftop safety equipment as well as equipment for gutters and garage doors. Production also includes roof guarding. Automation in Lobas started in 1999 when the firm invested in its first welding robot. The next step was an eccentric press of 200 tonnes and, in 2004, new roll forms and one eccentric press of 400 tonnes. In order to automate more parts of the production line, Lobas implemented a 2D vision system in 2006. This system helps robots identify various parts and carry out the appropriate operations. The production line was further developed in 2010 when the eccentric presses were integrated with robots. In 2012, Lobas introduced a process to use magnets for picking parts from pallets. The following year, an industrial conveyor belt removed the manual suspension of roof structures bound for powder coating. The firm’s technological investments are illustrated in fig. 2 below.
3.3 Mjøs Metal Working Ltd.

The technological upgrading of this firm has been rooted in its strategy to supply customers with a wide range of mechanical products and services, from the development phase through prototyping and testing to production optimisation and delivery of pre-assembled and documented products. The firm accelerated its technological renewal in 1981 when a first lathe was installed. In 1986, its first CNC machining centre was put in place and, gradually, CAD/CAM for producing programmes for CNC machines became customary. The firm bought its first lathe centre in 1995, followed by a Flexible Manufacturing Cell in 2001. The following year a Coordinate Measuring Machine was installed to verify that the manufactured parts comply with the required specifications. The first lathe and milling centre with robots was purchased in 2004 and, two years later, the firm acquired a five-axis machining centre. In 2013, a vertical lathe centre was integrated in the manufacturing process. Mjøs Metal Working is now certified according to ISO 9001:2008.

The timeline in Fig. 3 below shows that Mjøs Metal Working has experienced a gradual technological renewal from 1981 and onwards.
4 Summary and discussion of findings

With one exception, the firms under scrutiny all survived and continued with a fairly stable workforce through periods of automation with CNC and robotics. The firm that most extensively utilises robots, Lonevåg Fittings Factory, has kept its workforce stable over the last ten years. During this period, the number of robots deployed in its manufacturing process increased from five to fifty. Similarly, between 2006 and 2016, the other firms that introduced automation technology did not reduce their number of employees. In some of the enterprises, the handling of new technology led to upskilling of the workers. A local Competence centre for CNC and Robotics has been used for training these workers. This training has allowed them to become more flexible when operating small-batch production for specific customers. Moreover, preliminary studies suggest that the workers concerned started to engage more actively in innovative adaptations of the production process (Gjelstad & Skauge, 2009).

When analysing the three enterprises in more depth, we saw that some machine operators are autonomous in the first enterprise, operators mainly perform routine tasks in the second enterprise, while the third one has set up detailed descriptions of four different work roles for operators, of which one category is in charge of quite advanced 3D programming. The two first enterprises introduced new technology at a slow pace, while the third one has succeeded in a more wide-ranging utilisation of CNC and robotics. This success can partly be ascribed to a longer period of technology implementation. Two of the enterprises deliberately decentralised skills for handling new technology to the machine operators and, consequently,
trained the operators to undertake new tasks. The third enterprise, however, decided to have a few specialists handling the robots while the majority of the operators performed routine tasks (Skjærvik, 2014).

These differences, observed among quite similar enterprises within the same municipality, suggest that there is room for strategic choices when new technology is integrated in work organisation. Skjærvik (2014) ascribes these variations mostly to deliberate decisions as to how to manage existing technological equipment and how to make new technology investments. In particular, a flat organisational structure with a bottom-up approach to managerial decisions seems pivotal for the successful and sustainable introduction of new technology in work organisations on the island under scrutiny (ibid.; Ure & Skauge, 2014).

Other studies confirm that upskilling of operators strengthens the ability of inter-firm innovation which in turn increases the innovative performance towards customers. This is a central axiom in theories on ‘Integrated Development Practices’ such as that proposed by Price et al. (2012) who claim that contemporary workers expect to take responsibility and ownership for work activities not defined by their organisations or not bound to the jobs they were hired to do. The authors claim that if this attitude is acknowledged by employers and other decision makers, new possibilities for workers to be self-directed can arise, thus instigating innovation.

At a political level, the challenge of turning automation into innovative activities when the potential for workers’ learning is being enhanced through a reshaping of work organisation is underlined by Germany’s extension of the discourse on Industry 4.0 to the 4th generation of work organisation (Work 4.0, see above). Although the supposed link between new forms of automation (notably robots) and a novel work organisation is still rather tenuous (Ahrens & Gessler, 2018), the overall discussion could have theoretical and practical consequences.

The shaping of enterprises with a view to spurring innovation brings us back to the widespread theoretical assumption that organisational and technological innovations are intertwined (Eriksson-Zetterquist, Kalling et al., 2011). Likewise, Helmrich et al. (2016) state that the introduction of new technology is followed by the issue of workplace rationalisation which calls into question existing structures of power and control. The organisational set-up of manufacturing processes is often implemented in Norway in a non-hierarchical manner (Hertzberg & Moen, 2010). Scholars subsequently use these characteristics to theorise on the ability of and possibility for employees to influence or even have a lead role in innovation related to a firm’s organisation, processes or products. After analysing the responsibilities employees had in five enterprises belonging to a Norwegian network of mechanical enterprises, Hertzberg & Moen (2010) formulated the following hypothesis:

*The more employees that take part in co-decision making and the more the enterprise is stimulating and rewarding radical or incremental innovations, the more active the employees will be in all kinds of innovative activities of the enterprise*” (ibid:30).
Once more, this evokes the social dimension of workplace design and the training offered at the workplace. S. Pfeiffer (2015) refers to comparisons of the work organisation of manufacturing industries in Germany, Switzerland and Great Britain. One conclusion is that the presence of skilled workers endowed with vocational training at the production level means that the management levels can be leaner than they otherwise would be. The author maintains that Germany exhibits an array of learning requirements, complexity of tasks and problem-solving activities clearly connected to the country’s institutionalised vocational training system (ibid.).

In terms of work operations, skills profiles and employment patterns in the wake of automation, Helmrich et al. (2016) conclude that possible job losses can be explained by the occupational blend (Tätigkeitsmix) at the workplace and in specific trades. Particularly important is the relationship between workers and machinery, and the expectations at the workplace relating to the carrying out of tasks at certain cognitive levels (ibid.). In the same paragraph, the authors refute the hypothesis of Frey & Osborne (2013) that the potential for replacing labour with advanced machinery, as measured by the share of workers carrying out more or less routine work, says much about employment patterns.

4.1 The impact of robotisation on education and pedagogical perspectives

The impact of robotisation at Osterøy can be observed at three levels. First, the pre-cluster agglomeration is showing an active interest in the ongoing revision of upper secondary VET at the national level. Second, there has been a strengthening of collaboration with the nearest tertiary educational institutions to improve the vocational training offered to employees, apprentices and other learners. Third, cooperation has been initiated with an industrial association in another county of Southern Norway with a view to implementing joint training and skills development in the associations’ member firms.

First, the national revision of upper secondary VET will among other things revise the curriculum for the vocational programme Technique and Industrial Production (TIP). This programme is the most relevant one for the island’s enterprises. The revised curriculum will be introduced in 2020-2022 following an analysis of how the existing TIP programme aligns with developments in the labour market of manufacturing industries. Much of the process started in 2016 when a tripartite committee presented its conclusions to all stakeholders in the sector. Afterwards, the industrial association at Osterøy has attentively followed the discussions sparked by the committee’s report. One major recommendation of the report was to revise the composition of vocational subjects within the TIP programme. Another was to place more emphasis on production techniques compared with industrial machinery mechanics, thereby reflecting sectoral trends towards more focus on production planning for
efficiency and quality, alongside the reduction of costs due to errors and derogations and the optimisation of all stages of manufacturing. The committee reviewing the TIP programme notably claimed that the curriculum of the second year of ‘industrial technology’ did not sufficiently mirror the needs expressed by firms working in the sector. Looking into the future, the committee foresaw less need for qualifications in welding and joining techniques. One recommendation of high relevance for the Osterøy Manufacturing Industry Association was to integrate toolmaking in the trade for CNC operators (Utdanningsdirektoratet, 2016).

Second, against the backdrop of the ongoing revision of the TIP programme which is the most popular vocational programme among students at Osterøy upper secondary school, the island’s industrial association increasingly focuses on providing vocational training at all educational levels to its member firms. A cooperation agreement with the nearest university college (situated in Bergen) has been used to strengthen and enlarge the number of courses offered to engineers who want to specialise in robotics as part of their training in production technology. While the Osterøy Manufacturing Industry Association has partly succeeded in this, it is worth noting that the university college during these discussions emphasised a wish to broaden the concept of robotisation beyond the industrial sphere by offering training in robotics applied to multiple sectors, including the health and care sector. This emphasis can be interpreted as a strategy to avoid entrenching the university college's robotics training as being only of benefit to manufacturing industries. In a wider perspective, a university college’s weighting of robotics across various applications mirrors the position of manufacturing industries within the county’s entire industrial and economic framework. As further developed in the following paragraph, this concern has been a point of departure for the industrial association’s networking with similar associations. Finally it should be noted that, as well as approaching the university college, the Osterøy Manufacturing Industry Association also contacted the county’s vocational technical colleges to ask them develop training courses and programmes in robotics for non-university VET studies.

Third, and to enlarge on cross-county networking, the Osterøy Manufacturing Industry Association concluded in 2017 an agreement with another association (SINTEF Raufoss Manufacturing AS), which is establishing a Manufacturing Technology Norwegian Catapult Centre. The two enterprise agglomerations are situated in two different counties in southern Norway. They share a deliberate strategy of providing systematic training to apprentices, students and employees with a view to supporting a technological renewal of their industries. The agreement envisages workshops and counselling for joint upskilling of firms from both associations alongside joint cooperation projects and staff exchanges. One example of joint firm upskilling mentioned in the cooperation agreement is the common design of the training programmes taught in the catapult centre. It is specified that these programmes should cover vocational education from upper secondary to university level. In sum, the impact of robotisation on education and pedagogical perspectives is most visible when an industrial
association communicates the training needs of firms to educational institutions and authorities. Our account also suggests that associations sometimes wait for the clarification of external conditions without taking the initiative themselves. When primarily looking at conditions outside the network, industrial associations may take an observational stance that limits their possibilities to identify future training needs for member firms. This limitation partly stems from the variety of manufacturing sectors covered by industrial associations. The presence of loose internal ties in an industrial association points back to our initial discussion of the nature of business networks and how they could be classified. While Osterøy Manufacturing Industry Association (OMIA) seems able to forge a consistent training strategy, it has not shown itself to be very proactive in its relations with national authorities. The Osterøy association can be determined as an extension of its member firms with some limitations in mobilising them to influence the direction of VET. Our interviews suggest that these limitations are primarily rooted in OMIA’s small staff and the staff turnover in the local training centre set up by OMIA.

5 Conclusions

The literature in the field contains so many contradictory scenarios for job prospects under the present industrial transformation (called Industry 4.0) that the debate now tends to reformulate the key question. Hence, the most fruitful formulation seems to be: which institutional and country-specific characteristics could explain the diverging opinions on the ongoing transformations?

Instead of striking a balance between Industry 4.0 and employment patterns in the USA, Germany and other European countries including Norway, the present article has investigated how some of these processes can be observed at the local level. The relative stable employment pattern that we found in the industrial community under investigation brings us to our first research question:

What are the main drivers behind the local shaping of employment patterns in the network of mechanical engineering firms under scrutiny?

It would be fallacious to draw a clear line between external and internal drivers or mechanisms because, in practice, these mechanisms are intertwined. One general observation is that the Osterøy local network exhibits less cyclical employment variations as a result of simultaneously delivering to two different sectors, the petroleum cluster and non-petroleum-based industries. This seems to ensure more stable employment rates in the agglomeration of enterprises at Osterøy. During preliminary work leading to the present article, one of the key questions formulated was how closely attached specific types of knowledge are to a certain geographical space or, differently phrased, to a cluster-like agglomeration of small mechani-
ocal firms. One preliminary observation is that the recruitment to the island’s industries has been facilitated by a “tinker culture of mechanical work” found among young vocational students and workers (Gjelstad, 2015). Future studies of the types of knowledge found on the island should scrutinise the shaping of a local VET culture and the extent to which this culture reflects social characteristics of the local industrial community.

Our second research question was:

_How are decisions on profitability, investment in technology and automation, and staff recruitment versus layoffs conciliated or weighted against each other? Are there signs that the social dimension of vocational training is manifested through social responsibility and the emergence of specific training cultures?_

In the last instance, such decisions are taken at the level of the firm but the weighting of profitability vs. employment is framed by the local industrial association, partly assisted by the triple-municipality coordination body (Osterfjord Industry Collaboration). The social characteristics of the local training culture is also a determining feature (cf. ‘the tinker culture of mechanical work’).

The (mutual) trust observed in our case studies could, in principle, be a result of the conciliation processes between organised vocational and occupational interests, in a similar way as the social dialogue in VET is framed across administrative levels in Norway. This dialogue is not, however, very well structured in the investigated enterprises which have a fairly low trade union coverage. The social dimension of VET should therefore also be sought in less institutionalised environments. Following this line of thought, S. Pfeiffer (2015) argues that even where there is no strong workplace representation, it is important to expand co-determination as well as self-determination. This should be done to strengthen the social partnership and “support this with legislation so that it is effective” (ibid.).

The third research question is aimed at elaborating the second one by explicitly linking the balancing of managerial decisions to social aspects of vocational training, including Corporate Social Responsibility (CSR):

_Do employers take these concerns into account by implementing a form of CSR that includes responsibility for keeping staff on during robotisation and provides opportunities for further and continuing training?_

As suggested by Kaiser & Krugmann (2018), if different VET actors can create an encouraging climate of mutual trust, it will be easier to develop a social and participatory attitude towards “the new and the foreign” which the rapid automation of mechanical industries does exemplify. This perspective coincides with theories on CSR. On Osterøy, Corporate Social Responsibility is exhibited when the mechanical firms concentrate on product innovation.
and the training of existing staff thus avoiding laying off workers and replacing them with robots during the automation of the island’s industry. More specifically, CSR takes the form of a collaboration between enterprises and the local manufacturing association (i.e. a collective expression of individual firms) on the one hand and the municipal and county authorities on the other – in other words a ‘stakeholder dialogue’ is applied in a specific local context (Carson et al., 2015). The dialogue can be considered a form of voluntary CSR which frames the manner in which technological renewal takes place as well as its rapidity.

Corporate Social Responsibility does, however, have certain limitations in profit-oriented firms. Studies of similar industrial associations in Norway suggest that, above all, attitudes to CSR are conditioned by the length of recessions that the member firms have to tackle. This implies that corporate self-interest is weighted with the common interests within the local community and inside the industrial association, to the extent that the firm’s profitability is not at stake (cf. also table 1 on economic sustainability). Applied to enterprise training, similar Norwegian enterprise networks are inclined to keep a kernel of staff during recessions and train these workers until the next economic upswing appears. In general, this allows the firms to compensate for previously postponed staff training to keep abreast with new technical equipment. Such postponements tend to occur during periods of full order books (Teige, 2013; Ure, 2010). Training to avoid lay-offs is normally subsidised by the Public Employment Services. That this is a feature of the CSR in Norway suggests that a closer look at industrial and tripartite relations in pre-cluster agglomerations could be a follow-up of this article.

References


Skills and employment under automation


Biographical Notes

Odd Bjørn Ure, cand. polit. from the University of Bergen (Norway), is independent researcher and consultant in his own firm, Consultur. Studies&Analyses (www.consultur.no). His main research interests are links between enterprises and the labour market, in terms of vocational training and other forms of education.

Dr polit. Tom Skauge, from the University of Bergen (Norway), is Head of Department at the Western Norway University of Applied Sciences, Department of Business Administration. His main research interests are ethical aspects of professional practice, corporate social responsibility and regional development.

Acknowledgements

Several persons from or trained at the Western Norway University of Applied Sciences (HVL) have contributed to the article or to the empirical material on which it builds, particularly: Ole Jacob Bergfjord, Åge Garnes, Roald Laurantsen, Hanne S. Sjøvold and Kjerstin R. Skjærvik. Towards the end of the writing, the comments from Professor Åge Garnes were very helpful.
Job satisfaction, work engagement, and turnover intention of CTE health science teachers

Kathleen A. Park¹ and Karen R. Johnson*²

¹Austin Community College, Medical Laboratory Technology/Phlebotomy Program, Health Science Division, 4400 College Park Drive, Round Rock, Texas 78865, USA
²University of North Texas, Department of Learning Technologies, 3940 North Elm Street, G180, Denton, Texas 76207-7102, USA

Received: 21.03.2019, Accepted: 26.09.2019, Published: 19.12.2019

Abstract

Context: The healthcare profession is one of the largest growing occupations in the United States (US). Yet, there is a shortage of healthcare professionals and the situation is further compounded by insufficient instructors to prepare individuals to provide safe and quality care. A number of teachers leave the profession within 3 years of work in the classroom. The deficiency of health science teachers will negatively influence the workforce needs of the health sector. Addressing the issue of turnover of career and technical education (CTE) health science teachers is particularly important not only to respond to the chronic teacher shortage but also the deficit of healthcare professionals. It is important to ensure that teachers are satisfied and engaged at work because of the positive impact these job attitudes contribute to performance. Considering the importance of CTE health science teachers to the health sector, there is need to examine teacher job satisfaction and work engagement and the impact this may have on turnover intention. The purpose of this study is to examine the relationships between job satisfaction, work engagement, and turnover intention of health science teachers in the US.

Approach: In this study, hierarchical multiple regression was used to analyze a total of 249 responses from CTE health science teachers in the State of Texas in the US.

*Corresponding author: Karen.Johnson@unt.edu
Findings: The results showed positive correlations between job satisfaction and work engagement. Additionally, job satisfaction and work engagement were negatively correlated with turnover intention. The findings also indicated that work engagement did not moderate the relationship between job satisfaction and turnover intention.

Conclusions: This study builds on the work of previous researchers by further supporting the links between job satisfaction, work engagement, and turnover intention specifically in the context of teachers in CTE health science. Leaders in academic settings play a role in ensuring that strategies are in place to satisfy and engage teachers as practical ways to reduce turnover intention. In particular, administrative leaders should recognize teachers’ contributions, provide development opportunities, and promote challenging responsibilities and autonomy within the classroom. It is critical to have adequate and qualified teachers to prepare individuals to deliver safe and quality healthcare.

Keywords: Job satisfaction, work engagement, turnover intention, CTE, health science teachers, vocational education and training, VET

1 Job Satisfaction, Work Engagement, and Turnover Intention of Health Science Teachers

The healthcare profession is one of the largest growing occupations in the United States (US) (US Bureau of Labor Statistics, [BLS], 2015). Of the top 20 fastest growing job categories, 11 fit into the healthcare field. Nationwide, the job growth outlook for healthcare professionals is projected to be on average 34% between 2014 and 2024 (BLS, 2015). Despite the growing healthcare job category projections, there is a shortage of healthcare professionals in the US (Rowe, Fulmer, & Fried, 2016). The national average of physicians to Americans is 2.3 to 1,000 putting a strain on the healthcare professional population (Texas Medical Association, 2016). However, a deficiency of instructors has been noted as one of the primary reasons thousands of applicants are denied admission to pursue health related careers (American Association of Colleges of Nursing, 2015) despite the projected high job growth over the 2012-2022 decade (BLS, 2013). With an aging population, the need for excellent care management increases and healthcare professionals play a major role in delivering safe and quality care (Snavely, 2016). The imbalance of supply and demand will negatively affect the healthcare system and more broadly the health of the nation’s economy. Therefore, it is critical to have adequate and highly trained healthcare professionals (Snavely, 2016). However, in several US States, there is a chronic health science teacher shortage affecting both secondary and postsecondary education. More specifically, there is a demand for Career and Technical Education (CTE) health science teachers. In the US, the Carl D. Perkins Act of 1984 was the first
of four legislative Acts passed to support vocational education, now called CTE (Dougherty & Lombardi, 2016).

CTE is the practice of teaching specific career skills to students in middle schools, high schools, and post-secondary institutions. CTE prepares both youth and adults for a wide range of early careers and more advanced educational opportunities (Advance CTE, 2017) and also aids in preparing individuals to teach in numerous occupations including health-related careers. Some of the certifications students may earn in the CTE healthcare professions include certified nurse aide, clinical medical assistant and patient care technician, pharmacy technician, emergency medical technician, dental assistant, and phlebotomy (Texas Education Agency [TEA], 2017). These professions are foundational to more advanced healthcare professions. Although part of the vision of CTE leaders includes the recruitment of health science teachers to help alleviate the shortage of healthcare professionals by increasing interest at the secondary education level in the US (Advance CTE, 2017), if not addressed soon, this deficiency of health science teachers will negatively influence the workforce needs of the health sector.

In general, approximately 25% of new teachers in the US leave the teaching profession before the third year on the job (Skaalvik & Skaalvik, 2011). Many teachers in CTE related areas leave the teaching profession for a variety of reasons (Ruhland & Bremer, 2003; Walter & Gray, 2002; Song, Martens, McCharen, & Ausburn, 2011), such as, job dissatisfaction, career dissatisfaction, available opportunities, or job performance (Rhodes & Doering, 1983). Job satisfaction is one of the most studied topics in organizational psychology (Judge, Weiss, Kammeyer-Mueller, & Hulin, 2017) because of its positive impact on job performance in general and turnover intentions (Skaalvik & Skaalvik, 2011). Job satisfaction pertains to how an individual evaluates his/her present job conditions (Judge & Kammeyer-Mueller, 2012). Research shows that satisfied individuals are likely to be more engaged at work resulting in increased organizational outcomes (Harter, Schmidt, & Hayes, 2002). In the human resource management and development literature, engaged employees are described as energetic, proactive, produce quality work, effectively handle difficult job situations (Schaufeli, Bakker, & Salanova, 2006) and are less likely to leave the job (Hakanen, Bakker, & Schaufeli, 2006). We feel that teachers who are engaged can be described as having the same attributes.

In today’s competitive work environment, it is important to ensure that teachers are satisfied and engaged at work because of the level of dedication and value provided to the success of students and schools. Few studies have been done on the turnover intention and retention of secondary CTE health science teachers. Ideas have been investigated on ways to retain teachers through such programs as teacher mentoring; however, the factors influencing teachers’ intention to leave the profession needs further investigation (Ruhland, 2001). Considering the importance of CTE health science teachers to the health sector workforce, there is a need to examine job satisfaction and work engagement and the impact this may
have on turnover intention. While job satisfaction, work engagement, and turnover intention have been studied extensively, these variables have not been examined together in the context of CTE health science teachers despite high teacher attrition rates and the significance of satisfied and engaged employees. This study will address a gap in the literature and provide insight to academic leaders/administrators and decision makers in managing the educational setting. The purpose of the study is to investigate the relationships between job satisfaction, work engagement, and turnover intention of CTE health science teachers. The study addressed the following research questions:

1. What are the relationships between job satisfaction, work engagement, and turnover intention of health science teachers?

2. Does work engagement moderate the relationship between job satisfaction and turnover intention?

The results of the study may influence retention of health science teachers in CTE. This teacher shortage will have an impact on the future labor market projections for healthcare professionals and the health of the society. In the following sections, details are provided on the theoretical framework and a review of literature on job satisfaction, work engagement, and turnover intention.

2 Theoretical Framework

**Herzberg Motivation/Hygiene Theory.** Herzberg (1971) proposed a two-factor theory, called the Motivation-Hygiene Theory (Herzberg, Mausner, & Synderman, 1993). The theory posited that humans have two different types of needs and different aspects of the work environment either satisfies or dissatisfies those needs. The theory includes factors for motivation and hygiene (Herzberg et al., 1993).

**Motivation factors (intrinsic).** Certain characteristics, called motivators, are important for employees’ level of job satisfaction (Waltman, Bergon, Hollenshead, Miller, & August, 2012). The motivation factors are fundamental to the job and are intrinsically rewarding for individuals (Herzberg, 1971; Herzberg et al., 1993). For example, tasks well done, advancement, recognition of achievement, job responsibility, or the work itself are considered to be intrinsically rewarding (Herzberg, 1971; Sharp, 2008). Therefore, motivation is based on a sense of achievement and personal growth (Herzberg, 1971). When these factors are satisfying to the individual, the factors then work as motivators for the individual (Herzberg, et al., 1993). However, the factors do not cause dissatisfaction if they are missing in the workplace; instead, there is a lack of satisfaction for the individual (Herzberg, 1971; Herzberg et al., 1993).
Hygiene factors (extrinsic). Other characteristics, known as hygiene factors, lead towards an employee’s job satisfaction (Waltman, et al., 2012). The hygiene factors, also known as extrinsic factors, are important for individuals basic survival needs (Herzberg 1971; Herzberg, et al., 1993). These factors include salary, rewards, benefits, proficient supervision, competent administration, a good work environment, and work relationships (Herzberg, 1971; Herzberg et al., 1993; Bassett-Jones & Lloyd, 2005; Sharp, 2008). If these factors are not satisfied then the individual becomes dissatisfied (Herzberg et al., 1993). Even if these factors are not met for the worker, they do not motivate an individual but help to prevent dissatisfaction (Herzberg et al., 1993). Herzberg’s theory implies that satisfaction and dissatisfaction are opposite of the other and that job satisfaction is an absence of job dissatisfaction (Herzberg, et al., 1993). An individual’s attitude or behavior is based on the needs, motives, and values to be satisfied (Muller, Alliata, & Benninghoff, 2009). This theory has been applied to teachers in educational settings (Nias, 1981).

The Herzberg motivation-hygiene theory offers an explanation for the relationships between job satisfaction, work engagement, and turnover intention. Teachers may have the intent to leave the job due to a lack of motivation and not being satisfied in the workplace. For example, if the hygiene factors are not present, it will be challenging for teachers to perform the daily tasks of instruction, and the teacher may become dissatisfied with the job. Without these factors, teachers’ levels of work engagement may decrease due to lack of satisfaction that could possibly contribute to the intent to leave the teaching profession. It is important to note that, according to some researchers (Lindsay, Marks, & Gorlow, 1967), the concept of satisfaction cannot be evaluated only on the basis of two components. However, in spite of ambiguity, Herzberg motivation-hygiene theory has informed numerous studies over the years and is still viewed as “the basis for sound managerial principles” (Sachau, 2007, p. 390).

3 Literature Review

3.1 Job Satisfaction

Job satisfaction is defined as a “...a pleasurable or positive emotional state resulting from the appraisal of one’s job or job experiences” (Locke, 1976, p. 1304). Individuals experience increase in job satisfaction when their needs are met in the workplace (Locke, 1976). Job satisfaction can be influenced by job characteristics (Oldham, Hackman, & Pearce, 1976). Five job characteristics proposed as influencers on job satisfaction are: identity of the task, significance of the task, the variety of skills needed for the task, autonomy, and feedback about the task completed (Oldham et al., 1976). Some researchers have emphasized that job satisfaction is derived not so much from the climate of the work environment but more so
Various aspects of a job that affect job satisfaction can be grouped into two categories: intrinsic and extrinsic. Intrinsic job satisfaction pertains to the work tasks or job content such as variety, skill utilization, and autonomy, while extrinsic satisfaction is derived from working conditions, pay, and supervisor and peer support (Spector, 1997). When individuals are dissatisfied, tendencies toward absenteeism, lack of energy, and lack of regard for one's own work increase within the organization (Bakker, Demerouti, & Euwema, 2005). Research indicates that job satisfaction is an antecedent of employee engagement (Abraham, 2012).

A lack of job satisfaction and emotional exhaustion leads to increased intention to leave the organization (Skaalvik & Skaalvik, 2011).

3.2 Work Engagement

Work engagement is defined as “a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption” (Schaufeli & Bakker, 2004, p. 295). Vigor describes the individual’s willingness to invest in work and persist in that work, even when it is very difficult. Dedication is how involved, enthusiastic, and inspired the individual is by the job performed. Absorption means the employee is so immersed in the job that time becomes distorted (Schaufeli & Bakker, 2004) and the individual has a hard time leaving work because of the absolute enjoyment gained (Schaufeli, Salanova, González-Romá, & Bakker, 2002).

Khan (1990), the first to develop thoughts on the concept, found that when individuals are engaged at work their cognitive, emotional, and physical selves are reflected in their job performance and are less likely to leave the organization. Work engagement has become significant for practitioners and researchers because of its significant influence on organizational outcomes (Kim, 2017), including increased individual productivity and commitment, a decrease in recruitment and retention costs; and organizational stability (Harter et al., 2002; Saks, 2006; Saks & Gruman, 2014; Schaufeli et al., 2002; Schaufeli & Bakker, 2004). Workplace factors, such as learning activities and strong support, have been found to predict work engagement in higher vocational education (Nagele, Neuenschwander, & Rodcharoen, 2018). Work engagement is beneficial to the organization and the employee, both at work and outside of work (Seppälä, Mauno, Feldt, Hakanen, Kinnunen, Tolvanen, & Schaufeli, 2009). Work engagement has been found to be a predictor of turnover intention and an antecedent (Abraham, 2012) and outcome of job satisfaction (Yalabik, Rayton, & Rapti, 2017); therefore emphasizing the need for supervisor support, fair and sound company policies and procedures, and a job that is challenging is important (Abraham, 2012). Engaged individuals are immersed in their work roles and are less likely to leave the job (Khan, 1990). Because of the
potential outcomes associated with engaged workers, teachers should strive for this desired state especially in view of the intricate and complex nature of jobs in the health sector.

3.3 Turnover Intention

Over the years, turnover intention has been studied by researchers because of its important effect on productivity. Ingersoll (2001) defined turnover intention, as the likelihood an employee would voluntarily leave the organization. Job satisfaction (Mobley, 1982), organizational commitment (Reio & Segredo, 2013) and administrative leadership (Thibodeaux, Labat, Lee, & Labat, 2015) have been found to be significant predictors of turnover intention. A dissatisfied employee has the tendency to evaluate the cost of quitting and searching for alternative jobs (Mobley, 1982). To find a new job means starting over and could involve significant risks that a worker might be hesitant to take (Halbesleben & Wheeler, 2008). Reio and Segredo (2013) found that workers who adapted well to the work environment, connecting with mentors, were more committed to the organization; this resulted in decreased intent to leave the profession.

Teacher turnover affects students and the school districts; training and replacing teachers can be very costly. Even seasoned tenured teachers have the desire to leave the profession if the teacher experiences job dissatisfaction (Ingersoll, 2001). Ingersoll (2001) further pointed out that “popular education initiatives, such as teacher recruitment programs, will not solve staffing problems of schools if they do not address the organizational sources of low retention” (p. 499). One of the major reasons for teacher turnover is organizational conditions (Ingersoll, 2001). Because research reveals that teachers have the tendency to leave the job after three years of teaching (Skaalvik & Skaalvik, 2011), job satisfaction is investigated in this study since it is a highly salient antecedent of turnover and turnover intention (Lambert, Lynne Hogan, & Barton, 2001). Having an engaged workforce should be top priority in all organizations because an engaged employee may find it difficult to leave work since they would have invested high energy in the job and a feeling of work pride and aspiration resulting in strong work performance (Schaufeli & Salanova, 2007). The shortage of CTE health science teachers coupled with the projected growth of health-related job positions warrants a need to investigate job satisfaction, teacher engagement, and turnover intention. Based on review of the literature, the following hypotheses were formed:

H1. Job satisfaction will be positively related to work engagement.
H2. Job satisfaction will be negatively related to turnover intention.
H3. Work engagement will be negatively related to turnover intention.
H4. Work engagement will moderate the link between job satisfaction and turnover intention.
3.4 Research Method

The target population for the study consisted of full time health science teachers in CTE in the US. The sample of the population included health science teachers in the state of Texas. As the second largest state with an estimated population at 28 million (US Census Bureau, 2017), a projected population of 45 million by 2040 from the Texas State Data Center, and more than 5.7 million baby boomers who are eligible for Medicare, there is increasing strain on the healthcare professional population (Texas Medical Association, 2014). The study sample consisted of current full-time health science teachers in public secondary independent school districts across the state of Texas with at least one year health science teaching experience and at least two years of work experience in a healthcare profession previously to teaching in this area, with an associate or bachelor’s degree within the field. This information was provided by a public information request from the Texas Education Agency. The list of health science teachers was from the 2017-2018 school year.

The data were collected through a computer-based questionnaire using the web-based software, Qualtrics. The teachers currently listed as full-time with the Texas Education Agency received a letter explaining the importance of the survey and invitation to participate. This was followed by invitation emails. Of the 900 emails sent to independent school districts in Texas, 250 respondents completed the survey, resulting in a response rate of 27.8%. After deleting one unusable survey, 249 were analyzed for this study. The majority of respondents were females (89.6%). Most respondents were 45-54 years of age (37.6%) or 35-44 years (29.6%). The majority of respondents held a bachelor’s (40%) or master’s (34%) degree. Almost 30% of respondents had one to three years teaching experience with 22% having four to six years of experience.

The variables for this study were job satisfaction, work engagement, and turnover intention. All items on the questionnaire were adapted from previously existing scales. Weiss, Dawis, and England (1967) developed the Minnesota Satisfaction Questionnaire (MSQ) to survey individuals on their overall feeling of the job. Used for this study was the short form of the MSQ containing 20 questions with three subscales: 1) intrinsic satisfaction, 2) extrinsic satisfaction, and general satisfaction (Weiss et al., 1967). The 20 questions combined measure general job satisfaction. However, the intrinsic and extrinsic subscales were used for this study with 12 items measuring intrinsic satisfaction and 6 items measuring extrinsic satisfaction. The survey is designed with a five-point Likert Scale, ranging from 1 (not satisfied) to 5 (extremely satisfied). Sample items of intrinsic and extrinsic satisfaction are, respectively, “the feeling of accomplishment I get from the job” and “my pay and the amount of work I do”. The shortened MSQ has been used in previous studies with Cronbach’s alpha of 0.90 (Hancer & George, 2003).

Utrecht Work Engagement Scale (UWES) was used to measure work engagement (Schaufeli et al., 2006). The shortened nine-item survey UWES-9 with three subscales (vigor, de-
Job satisfaction, work engagement, and turnover intention

dication, and absorption) was used for this study. Work engagement has been examined as both one-dimensional or three-dimensional construct (Seppälä, et al., 2009). The three subscales were measured using three items each. The UWES-9 is measured on a seven-point scale, with “never” as (0) and “always” as (6). A sample item is “when I get up in the morning, I feel like going to work”. The reliability of the nine-item scale was 0.92 in the original study (Schaufeli et al., 2006).

The Michigan Organizational Assessment Questionnaire (MAOQ) that includes a turnover intention subscale was used in this study to measure turnover intention (Camman, Fichman, Jenkins, & Klesh, 1979). The three-item subscale was designed to investigate the psychological state of the participants related to the issues regarding life at work (Reio & Segredo, 2013) and is measured on a Likert seven-point scale with responses ranging from 1 (strongly disagree) to 7 (strongly agree) (Camman et al., 1979). The sub-scale has been used in several studies over the last several decades and has a Cronbach’s alpha value of up to 0.88 (Abraham, 1999).

3.5 Results

Various techniques were used to analyze the data to answer the research questions. Reported in this section are the descriptive statistics, (including mean and standard deviation), correlations, reliability and construct validity and results from hierarchical multiple regression analyses.

In Table 1, the mean, standard deviation, and bivariate correlations among all variables in the study are presented. As shown in Table 1, intrinsic and extrinsic job satisfaction and all three subscales of work engagement were positively correlated. The relationship among these variables ranged from $r=0.284$ to 0.818. For example, work engagement (vigor) was significantly and positively associated with intrinsic job satisfaction ($r=0.690$). Although both intrinsic and extrinsic job satisfaction are positively related to work engagement, overall, the relationship between intrinsic job satisfaction and work engagement was stronger than the relationship between extrinsic job satisfaction and work engagement. This means, teachers are more motivated and therefore intrinsically satisfied with recognition of achievement, job responsibility/autonomy, and the work itself.
Table 1: Simple Correlation Matrix for all Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Job Satisfaction-Intrinsic</td>
<td>4.04</td>
<td>0.65</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Job Satisfaction-Extrinsic</td>
<td>3.12</td>
<td>0.93</td>
<td>.690**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Work Engagement-Vigor</td>
<td>5.18</td>
<td>1.25</td>
<td>.603**</td>
<td>.500**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Work Engagement-Dedication</td>
<td>5.74</td>
<td>1.07</td>
<td>.535**</td>
<td>.426**</td>
<td>.818**</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Work Engagement-Absorption</td>
<td>5.69</td>
<td>1.02</td>
<td>.442**</td>
<td>.284**</td>
<td>.678**</td>
<td>.744**</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>6. Turnover Intention</td>
<td>1.93</td>
<td>1.93</td>
<td>-.529**</td>
<td>-.452**</td>
<td>-.452**</td>
<td>-.452**</td>
<td>-.295**</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. **Correlation is significant at the 0.01 level (2-tailed).

Job satisfaction and work engagement negatively correlated with turnover intention. The relationship among these variables varied from $r=-0.295$ to $-0.617$. For example, turnover intention negatively correlated with extrinsic job satisfaction ($r=-0.617$). The teacher who is absorbed ($r=-0.295$) in his/her work will be least likely to leave the job. The absorbed teacher is so involved at work and will lose track of time. Overall, the Pearson correlation coefficient values indicated that as job satisfaction and work engagement increases, turnover intention decreases. These results supported hypotheses 1, 2, and 3.

Cronbach’s alpha was calculated to determine reliability for all scales. The reliability scores for all the scales were within the acceptable range in comparison to previous studies and as recommended by Nunnally and Bernstein (1994). Cronbach’s alpha values for this study ranged from 0.775 to 0.933.

Confirmatory factor analysis (CFA) was used to confirm the factor structure of the scales. Each of the constructs used in the study was validated in previous research. The output from CFA suggested that the model for this study was a reasonable fit with the a priori factor structure $\chi^2$/df acceptable at 3.62 (Hooper, Coughlan, & Mullen, 2008), Tucker Lewis Index (TLI) also acceptable at 0.796 (Cangur & Ercan, 2015) and root mean square error of approximation (RMSEA) at 0.10. RMSEA between 0.80 and 0.10 is considered neither a good or bad fit (Cangur & Ercan, 2015).

When conducting multiple regression analysis, certain assumptions should be met to promote the validity of the results. Multicollinearity is a problem when predictor variables correlate at a level greater than 0.80 (Keith, 2015). The correlation matrix in Table 1 shows a slightly high correlation between the work engagement subscales, vigor and dedication (0.818). Collinearity diagnostics were also done. A variance inflation factor (VIF) of more than 10 indicates that multicollinearity may exist (Keith, 2015). However, the VIF results for the collinearity statistics in this study were less than 10. Delete ‘therefore, multicollinearity did not occur. Outliers were evaluated using Cook’s distance method in SPSS. The results obtained found one outlier that did not affect the results of the regression analysis since the
difference in R-squared change was 0.001. The assumption of normality was met because the residuals approximated a normal curve.

Hierarchical multiple regression analysis was used to determine the effect of job satisfaction and work engagement on turnover intention. Job satisfaction was first entered in the model, followed by work engagement. When conducting hierarchical regression, all variables are entered into the model in the order supported by previous research. Work engagement is affected by employees who are satisfied with their job (Abraham, 2012; Skaalvik & Skaakvik, 2014).

The model summary for the hierarchical regression analysis is presented in Table 2. Model 1 was a job satisfaction only model, which included both intrinsic and extrinsic job satisfaction. Model 1 was statistically significant \( F (2, 246) = 82.436, p < .001 \). The first step of the hierarchical regression model showed that intrinsic and extrinsic job satisfaction explained 39.6% of the variance in turnover intention.

Table 2: Model Summary: Hierarchical Multiple Regression Analyses on Predicting Turnover Intention

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>.633a</td>
<td>.401</td>
<td>.396</td>
<td>.401</td>
<td>82.436</td>
<td>2</td>
<td>246</td>
<td>.000</td>
</tr>
<tr>
<td>Model 2</td>
<td>.646b</td>
<td>.417</td>
<td>.405</td>
<td>.016</td>
<td>2.217</td>
<td>3</td>
<td>243</td>
<td>.087</td>
</tr>
<tr>
<td>Model 3</td>
<td>.647c</td>
<td>.419</td>
<td>.400</td>
<td>.002</td>
<td>.268</td>
<td>3</td>
<td>240</td>
<td>.848</td>
</tr>
</tbody>
</table>

Note: a.) Predictors: (Constant), Job Satisfaction-intrinsic, Job Satisfaction-extrinsic; b.) Predictors: (Constant), Job Satisfaction-intrinsic, Job Satisfaction-extrinsic, Work engagement-vigor, dedication, and absorption; c.) Predictors: (Constant), Job Satisfaction-intrinsic, Job Satisfaction-extrinsic, Work engagement-vigor, dedication, absorption, gender, age, and years of experience; Dependent Variable: Turnover Intention

Model 2 included the predictor variables: job satisfaction (intrinsic and extrinsic) and work engagement (vigor, dedication, and absorption). When work engagement was added to the model, it was statistically non-significant \( F (3, 243) = 2.217, p = .087 \). The change in variance was 1.6%.

Model 3 included job satisfaction and work engagement variables as well as demographic variables (gender, age, and years of experience). The R squared change indicated that work engagement and the demographic variables did not provide a substantial increase in the shared variance percent with job satisfaction. The change in the model was statistically non-significant \( F (3, 240) = 0.268, p = 0.848 \) with a small change in variance of only 0.2%. Adding the demographic variables into the model had an almost negligible increase in the shared variance.

The predictor variables (job satisfaction and work engagement) examined in the study had a negative relationship with turnover intention. Job satisfaction accounted for a mode-
rate percentage (almost 40%) of unique variation in turnover intention. In addition, findings also showed that work engagement does not moderate the relationship between job satisfaction and turnover intention. This result did not support hypothesis four.

3.6 Discussion

The purpose of the study was to gain a more in-depth understanding of the impact of CTE health science teachers’ job satisfaction and work engagement on their intent to leave the job. Overall, there were positive and significant relationships between job satisfaction (intrinsic and extrinsic) and work engagement (vigor, dedication, and absorption). Both job satisfaction and work engagement negatively correlated with turnover intention. The more satisfied and engaged teachers are, the less likely they will leave the job.

This study confirms the findings of previous research that there is a positive relationship between job satisfaction and work engagement. Yalabik et al. (2017), in a study with banking specialists concluded that both intrinsic and extrinsic job satisfaction are linked to work engagement; emphasizing that when workers are satisfied with the job, they are fully engaged at work. Overall, intrinsic job satisfaction had a stronger positive correlation with work engagement when compared to extrinsic job satisfaction. These findings align with Hancer and George’s (2003) study that the major source of satisfaction for restaurant workers was intrinsic job satisfaction. Workers need to have a certain level of achievement, competence, and autonomy to be intrinsically motivated (Gagne & Deci, 2005). Job satisfaction impacts engagement levels therefore emphasizing the need for supervisor support, good working conditions, and a job itself that is challenging (Abraham, 2012).

Job satisfaction and work engagement negatively correlated with turnover intention, suggesting that as work engagement and job satisfaction increases, turnover intention decreases. Mobley (1982) theorized that an employee has intent to leave a job when the worker has experienced job dissatisfaction. Research has shown that when job satisfaction increases, worker turnover and turnover intention decreases (Derby-Davis, 2014; Herzberg, 1971; Kabungaidze, Mahlatshana, & Ngirande, 2013).

Skaalvik and Skaalvik (2011) in their study noted that when teachers have a lack of motivation, work engagement is affected. Clarke (2012) studied the retention of health science teachers in North Carolina and found that continuing education is an important tool for increasing work engagement and decreasing turnover intention. A study of career and technical education teachers found that high levels of work engagement led teachers to a greater commitment to the school district (Song, Bae, Park, & Kim, 2013). When teachers are engaged at work there is positive employee relations, organizational stability, and retention decreases (Saks & Gruman, 2014). However, the relationships between job satisfaction, engage-
ment, and turnover intention of CTE health science teachers have received far less attention in spite of the shortage of health professionals.

3.7 Implications for Research

This study builds on the work of previous researchers by further supporting the links between job satisfaction, work engagement, and turnover intention. Turnover affects teachers, students, families, school districts, and the community. Creating strategies to retain teachers is critical to student success. Further research on teacher satisfaction, engagement, and turnover intention will not only benefit CTE health sciences but also other disciplines. Possible future studies may include qualitative research, such as, face-to-face interviews with health science teachers to gain richer perspectives. From this research, it was found that the majority (30%) of the teachers who participated in the study had only 1 to 3 years of experience. Interviewing the teachers with more years of experience would add information critical to teacher success and retention in the health science classroom. Research including healthcare professional educators at the postsecondary levels would also build on the theories of job satisfaction, engagement, and turnover intention.

The findings of this study aligns with past research by indicating that when workers are satisfied and engaged, turnover intention decreases (Kulikowski, 2017; Skaalvik & Skaalvik, 2011). Future research could broaden the findings of this study by adding constructs, such as leadership in school administration, various job resources, well-being, and other factors that may contribute to the satisfaction and engagement levels of teachers to aid with retention. This study found that work engagement did not moderate the relationship between job satisfaction and turnover intention. Work engagement has not been extensively studied as moderating the relationship between job satisfaction and turnover intention. Future studies should also conduct further investigation of work engagement as a moderator variable. Because healthcare is a global concern, it would also be value-adding to replicate the study in other countries to be able to compare similarities and differences in findings.

3.8 Implications for Practice

This study resulted in an increased understanding of the importance of having satisfied and engaged teachers. Most teachers surveyed were satisfied with their teaching position. However, the majority of teachers participating in the study had taught for an average of one to three years. Retaining teachers after three years is a challenge since prior research shows that 25% of new teachers in the US leave the teaching profession by the third year on the job (Skaalvik & Skaalvik, 2011). Faculty development through continuing education also leads to positive work engagement (van den Berg, Mastenbroek, Scheepers, & Jaarsma, 2017).
Gauging the engagement and satisfaction levels of teachers periodically can help to reduce the rate of turnover.

Derby-Davis (2014) found that factors affecting job satisfaction are noteworthy to reduce turnover intention. It is imperative for school administrators and decision makers to be knowledgeable of the influence of teacher job satisfaction and engagement on turnover intentions to be able to stabilize and increase teacher retention especially those with health science related skills that are scarce and in demand. Strategies, such as, creating positive working conditions, professional development initiatives, pay, benefits, rewards, recognition, peer and supervisor support, increased and challenging responsibilities, and a certain level of autonomy, should be encouraged to reduce attrition rates among teachers. Some amount of autonomy is necessary for teachers to be able to handle classroom situations timely (Derby-Davis, 2014).

3.9 Limitations and Conclusion

The study has limitations that should be considered when making recommendations. The study relied on the self-report measures which means data were collected just once, in a single US state, implying that the results may not be generalizable beyond this study. However, the constructs used for this study were appropriate for use of self-report data (Conway & Lance, 2010). Common method bias may be a concern because the method used to measure the variables in this study were explored by the same research method (Siemsen, Roth, & Oliveira, 2010). The survey had time constraints that may have impacted participants responses (Simon & Goes, 2013). Additionally, participants may provide biased responses to the survey, that could have skewed the results of the study. An external variable called the participant variable depends on the respondents' individual characteristic that may affect how a participant responds to the questionnaires (Clarke, 2012), therefore influencing the results.

Healthcare is essential for the US and globally. Adequate and qualified health science teachers at the secondary level can have an impact on the healthcare professional shortage. CTE health science teachers can mentor students to not only choose the healthcare profession as an early career but to progress to more advanced levels; thereby helping to balance the supply and demand factors associated with the shortage of teachers and healthcare professionals. Educational leadership should recognize the value of healthcare professionals in the classroom by promoting factors that lead to job satisfaction and teacher engagement for the success of students and the health of communities and nation.
References


Clarke, W. L. (2012). *An inquiry into the factors that contribute to the health science teacher attrition and retention.* ProQuest Dissertations and Theses (3538705).


Biographical Notes

Kathleen A. Park, PhD, is a professor and assistant department chair in Medical Laboratory Technology at Austin Community College, Texas, USA. She recently earned her PhD in Applied Technology and Performance Improvement from the University of North Texas.

Karen R. Johnson, PhD, is an assistant professor of Learning Technologies in the College of Information at the University of North Texas, USA. She conducts and publishes research on organization development, workplace learning, and performance improvement. She earned both an MA and a PhD in Work and Human Resource Education from the University of Minnesota.
Identifying teachers’ competencies in Finnish vocational education

Annukka Tapani*1 and Arto O. Salonen2

1Tampere University of Applied Sciences, School of Professional Teacher Education, Kuntokatu 3, 33520 Tampere, Finland
2University of Eastern Finland, Faculty of Social Sciences and Business Studies, PO Box 1627, 70211 Kuopio, Finland

Received: 17.02.2019, Accepted: 23.08.2019, Published: 19.12.2019

Abstract

Context: In Finland, vocational education has been competence-based and learner-orientated since the beginning of 2018. Teachers’ work has changed because there is a need to pay more attention to students and their specific personal needs. Learning processes are planned individually and more learning options are offered in the workplace.

Approach: In this article we ask the following: What kind of teachers’ competencies can be identified in Finland? The metadata comprises twelve recent pieces of research on teachers’ competencies in the field of Vocational Education and Training (VET) in Finland. We apply data-driven content analysis.

Findings: According to our results, the work of vocational teachers included 53 separate skills comprising seven categories of competencies and three main categories of scholarships as follows: Scholarship in teaching and learning relating to pedagogy, guidance and counselling, and interaction, Scholarship in authentic learning and development referring to pedagogical leadership, partnership and innovator competency, and Scholarship in evaluation and monitoring associated with assessment.

Conclusion: The work of vocational teachers in Finland has become fragmented. The fragmented work of a vocational teacher may influence the teacher’s identity. The fragmented nature of the work of vocational teachers also raises the need to share expertise in education.

*Corresponding author: annukka.tapani@tuni.fi

ISSN: 2197-8646
http://www.ijrvet.net
tional institutions. The main challenge for teachers in vocational education in Finland is to adopt ways of authentic learning and development.

**Keywords:** Vocational education, teaching, learning, development, skills, competencies, scholarship, vocational education and training, VET

### 1 Vocational education in the Finnish context

“How much attention should I pay to students’ feelings and when can I start to teach?” asked a vocational teacher education student. This question is a typical example of the changes that are occurring in the ways of teaching and learning. There is a need to pay attention to students and their personal needs. The starting point of this research is what it currently means to be a teacher in vocational education in Finland. A role of the vocational teacher is transforming because Finnish vocational education faced its largest reform in 20 years at the beginning of 2018 (Ministry of Education and Culture, 2017).

According to the Law of Vocational Education (2017), in the Finnish education system, following compulsory education of nine years, young people have the possibility of applying for either general or vocational upper secondary education. Both forms of education mean that successful candidates are eligible for higher education (Finlex Data Bank, 2017). More than 40% of the relevant age group starts vocational upper secondary studies immediately after basic education (Finnish National Agency for Education, 2018a). The law defines the aim of Vocational Education and Training (VET) as training vocational competencies, as well as supporting students in becoming active, stable and civilised citizens and members of society (Finlex Data Bank, 2017).

Competency is related to underlying characteristics that enable an individual to achieve exceptional performance (Dubois & Rothwell, 2004). In its broadest sense competencies represent knowledge, skills, abilities, attitudes and values that are important for citizens living good life in society. When it comes to professional action in education sector competence describes knowledge, beliefs, motivation, and self-regulation of the teacher (Baumert & Kunter, 2013). According to Lee c (1986) teaching competencies are about promoting learning so that teacher’s professional knowledge about an issue, concept, or phenomena is combined with pedagogical knowledge. Thus, teaching competence is associated with the ability to explain the specific issue, concept, or phenomena in a way that is understandable to students (Shulman, 1986 & 1987).

The Finnish National Agency for Education (2018b) sets the prerequisites for teachers. Teachers in Finland receive a high level of training. In general education, all teachers are required to hold a master’s degree. In vocational education, teachers should hold a master’s degree or a bachelor’s degree and have at least three years’ work experience before they can
apply to vocational teacher education units (Finnish National Agency for Education, 2018b). Finnish teachers are also highly respected: in the ranking list of trusted organisations, the educational system is ranked fourth after the police, the president and the armed forces (Eva, 2019).

The high level of education required by teachers relates to the respect they receive. If you want a permanent job as a teacher in a vocational school in Finland, you must be qualified (Finlex Data Bank, 1998). It is different in Norway, for example, where there are no national qualification requirements for vocational college teachers and each institution sets its own competence requirements (Cedefop, 2019). Also, the attitude towards qualifications is quite different in the Nordic countries. However: There is a great variety of unqualified teachers working in vocational education in the Nordic countries: in Denmark, 8% are unqualified, followed by Finland 20%, Norway 28% and Sweden 29%. There are also significant differences in the Nordic countries in how teachers are recruited: in Denmark, if no fully qualified applicants are available for teacher positions, the solution is that qualified teachers will teach more subjects and teachers with no qualifications will not be hired. In the other Nordic countries, teachers who are not qualified are hired more easily. Thus, Denmark attaches more importance to qualifications than the other Nordic countries. This also has a connection to the approach to further education for teachers: more than nine out of ten schools in Denmark and Sweden, eight out of ten schools in Finland and seven out of ten vocational schools in Norway have a special budget for further education for teachers (Ståhle, 2005).

The Finnish vocational teacher education programme (60 credits) includes vocational pedagogical studies, teaching practice, basic studies in education and elective pedagogical studies. Most vocational student teachers hold a master's degree and at least three years' work experience in the field in which they aim to teach. In Finland, the qualification for a vocational teacher can be obtained from universities or universities of applied sciences (Finlex Data Bank, 1998 & 2014). In Norway, for example, there are various potential ways of becoming a competent vocational teacher: (a) Vocational teacher education, (b) University education or higher education connected with practical training (180 study points), (c) Subject teacher training programme (three year undergraduate programme in teaching of specific school subjects) (“Faglærerutdanning”), and (d) Trade certificate connected with practical training (Utdanning.no, 2019).

The task of Universities of Applied Sciences (UAS) has also changed recently in Finland. Teachers now have three main roles as educationist, researcher and local development expert (Kotila & Mäki, 2006). Their work has been transformed from teaching alone to teaching interactively in teams and pairs. Teachers no longer just share knowledge; they also take care of the students' individual needs (Tapani & Salonen, 2019). There is also a collective desire among the five UAS that are licensed to arrange vocational teacher education for teacher training to be on the European Qualifications Framework (EQF) level 7 (Saranpää & Kotila,
Vocational teacher education is no longer in the framework of degrees because in the Finnish educational system, vocational teacher education has no degree status; it is referred to as a qualification (Ministry of Education and Culture, n.d.). According to the vocational teacher education curriculum, becoming a qualified vocational teacher requires 1–2 years of flexible and multiform learning. Most vocational student teachers work as teachers while studying. If student teachers work at a vocational institute, they can use the work as a source of learning (Vocational teacher education, 2019).

Changes in education are associated with changes in society. This is a transformation from regarding teaching as a kind of mass production in the 1970s. Interest in competence-based education and training arose in the 1960s and 1970s in the United States (Biemans et al., 2005). Educational policy in Finland emphasises individual learning pathways but there is also a need for communal skills and co-operation competencies because a lot of learning takes place in the workplace (Ministry of Education and Culture, 2018a). Thus, a lot of networking is also required outside vocational institutions. This challenges teachers to be more multi-skilled and not just experts in their respective fields (Vertanen, 2002; Salonen & Savander-Ranne, 2015). The shift towards students’ individual learning pathways enables individual skills to meet the needs of the workplace in a flexible manner. Opportunities to study have become more diverse. Distance learning has become popular and students have become more self-reliant. A new learning agreement model will facilitate studies in the workplace. Teachers and experts from the field assess the students’ performance. It is possible to apply for and start training flexibly according to individual needs. The new model has also impacted funding: it is intended to improve the effectiveness and quality of education and training, and it encourages education providers to more efficiently adopt measures that reduce the discontinuation of studies and recognise skills that have been previously acquired. Education providers are afforded more freedom in terms of how they organise education and training (Ministry of Education and Culture, 2018b).

These days, a new generation of students, learning styles, potential learning environments and the needs of employees are different because of changes in society and throughout the world (Julkunen, 2010). In working life, technological progress is affecting virtually all areas of activity. In the near future there will be new professions, such as AI psychologists and tele-trainers. These could replace previous occupations (Linturi & Kuusi, 2018). Jobs are not disappearing – they are simply changing their form. In the future, the general skills that will be required will be creative thinking and interaction, the ability to ask the right questions, adaptability and learning how to learn (Asplund & Kauhanen, 2018). There is also a need for competencies such as self-reflection, problem solving and cooperation (Isacsson, Salonen, & Guilland, 2016). The teacher’s position is definitely significant as far as a sustainable future is concerned. According to John Dewey (1915), “the conception of education as a social process and function has no definite meaning until we define the kind of society we have in mind”.
Identifying the direction of societal development and halting the developmental shifts that narrow the chances of having a good life are more important (Salonen & Konkka, 2015; Lehtonen, Salonen, Cantell, & Riuttanen, 2018).

In this research, we attempt to identify teachers’ competencies in Finnish vocational education. We focus on VET, and teachers and teacher-educators involved in VET for secondary education, because it is an educational level that has not been extensively studied in Finland. Our specific research question is: What kind of teachers’ competencies can be identified in vocational education in Finland?

2 Materials and methods

The metadata comprises twelve recent pieces of research on teachers’ competencies in the field of VET in Finland. These twelve studies for meta-analysis were chosen from the most recent research, nationally. The studies for meta-analysis were chosen because of the competence and background of the authors in the field of vocational education and vocational teacher education. In other words, we chose these studies because of their quality and their relatively wide understanding of the phenomena of “new ways to be a teacher” (Miles, Huberman, & Saldaña, 2014). All the studies were conducted from the teachers’ perspective. Four studies (Ahonen 2015; Mäki 2012; Kotila & Mäki 2006; Tapani & Sinkkonen 2017) relate to the UAS. Eight studies (Heinilä et al., 2018; Heinilä et al., 2017; Kukkonen, 2018; Lintunen, 2017; Malinen & Salo, 2018; Tapani, 2013; Tapani & Kukkonen, 2018; Vänskä, 2018) relate to VET. Fourteen of the study authors (Halonen, Heinilä, Kilja, Kotila, Kukkonen, Malinen, Mäki, Niskanen, Potinkara, Raudasoja, Salo, Tapani, Uronen, & Vänskä) work as teacher-educators and also have a background in vocational teaching.

We applied data-driven content analysis (inductive content analysis) to the research (Elo & Kyngäs, 2008). First the data were reviewed multiple times. The separate competencies and skills presented in the papers were identified in order to identify the differences and connections between the studies (Silverman, 1993). Similar kinds of words or sentences were collected under different themes. The coding process according to Strauss and Corbin (1990) was applied: in open coding we named and categorised the phenomenon through close examination of the material (Strauss & Corbin, 1990). The units linked with the teaching competencies in vocational education were the words or sentences from the results and conclusions of the twelve selected research articles. After this, we reduced the themes (Schreier, 2012; Mayring, 2002). We attempted to identify specific features: the context in which the phenomenon is embedded, conditions that give rise to it. Finally, selective coding integrated categories to form a grounded theory – in this case, the structure of scholarships of the vocational teacher in Finland (Strauss & Corbin, 1990). Even if a data-driven approach was applied, we were aware that existing theories and pre-knowledge exist in the research process.
3 Results

Our results are based on the analysis of twelve pieces of research on teachers’ competencies in the field of vocational education in Finland. The first research we analysed was by Henna Heinilä, Ilkka Uronen and Heli Potinkara (2017), who studied teachers working in five vocational schools. They stated that, more than ever before, teachers must work as networkers and individual study counsellors. A teacher’s work is more related to nurturing and there is a need for multisectoral and multi-professional networking. These changes make it difficult for teachers to develop their work logically. Teachers act more like a counsellor or coach, which means that students must increasingly be responsible for their studies (Heinilä, Uronen & Potinkara, 2017).

According to Lea Lintunen’s (2017) study, there is a need to focus on a teacher’s mental development, skills for developing learning environments, teamwork, cooperation – especially with working life – digital teaching skills, knowing qualifications and curricula, recognising individual students’ learning opportunities, understanding economics, and also having the ability to support student development (Lintunen, 2017).

Harri Kukkonen (2018) interviewed five vocational teachers. He found three dimensions of vocational teacher identity positions as follows: substance expertise, didactic expertise, and pedagogical expertise. The identity position of vocational teachers included various competencies. A teacher is an educator, expert of the field, integrator, producer of employees, critical evaluator, regenerator of the organisation, developer of working life, creator of a positive atmosphere, and person who understands students’ life worlds (Kukkonen, 2018).

Anita Malinen and Petri Salo (2018) showed that teachers’ work is more complex than before. Guidance and assessment competencies are required in a work context, meaning that networking, interaction and cooperation are becoming core competencies. It demands deeper participation in social practices: the teacher guides the students and there is a need to recognise and identify their competencies. This also applies to the teachers themselves: they need to recognise their own tacit knowledge and share and discuss it with colleagues. There is also a need for teachers to self-reflect (Malinen & Salo, 2018).

According to Pia Ahonen (2015), a master’s degree teacher builds bridges between working life, students and education. Teachers are increasingly becoming reformers of working cultures in their own institutions, in working life and among other stakeholders (Ahonen, 2015). Pedagogical leadership is an important skill for future teachers: teachers must address their own well-being and be capable of multitasking and handling fragmented roles, for example (Heinilä et al., 2018).

Kimmo Mäki and Hannu Kotila (2006) also see teachers in UAS as bridge builders: they connect working life and education. Their study revealed a need for teachers to rethink where, how and when students can learn. Thinking that students can also learn outside the classroom and can learn without being taught in a traditional way represents a remarkable
change (Mäki & Kotila, 2006). Research on vocational teacher education (Tapani, 2013) and on master's degrees in universities of applied sciences (Tapani & Sinkkonen, 2017) shows that the new way of teaching has many similarities to entrepreneurial teaching: both should aim to see possibilities, not obstacles. It is also good to have the courage to do things differently and use creative methods and support an experimental culture. Teaching is moving towards collectivism: the traditional “one-teacher-in-the-classroom” no longer exists. Team teaching, pair teaching, networking and cooperation are the key issues (Tapani, 2013; Tapani & Sinkkonen, 2017).

In Annukka Tapani’s research (2013), the student teachers (n=15) and teacher-educators (n=11) evaluated what the competencies of vocational teachers would be in 2020. The roles suggested were teacher-counsellor, innovative entrepreneur, networker and consultant. The teacher-counsellor is a skilled educationist who uses technology and new teaching methods and enables individual pathways. The innovative entrepreneurial teacher is capable of finding, applying, trying and developing him/herself but is also able to co-operate with entrepreneurs, public sector and third sector. Networkers have the skills to cooperate, create and maintain contacts and develop education together with stakeholders. Consultants have a communicative and deliberative way of working; they can share their knowledge and utilise other people’s skills and knowledge (Tapani, 2013).

Henna Heinilä et al. (2018) reported a study in which a total of 1,476 teachers and teaching staff members of vocational schools participated. This was a national research project that took place in Finland in 2017. The research highlighted six themes as being competencies of future vocational teachers: the competence to guide students in their Personal Competence Development plans (PCDPs), partnership and networking competencies, guidance, new ways of teaching and learning, self-management and quality awareness (Heinilä et al., 2018).

Kirsti Vänskä (2018) emphasised guidance competencies that permit students to become more “visible”: a teacher should have empathy skills, a positive attitude, dialogue skills, the will to ask questions and listen to responses, as well as skills relating to reflection and resilience. Acting in this way permits learners to experience motivation and meaningfulness. According to Vänskä it is important to build a shared counselling space and support the learners’ initiatives, self-efficacy, participation and sense of belonging (Vänskä, 2018).

Annukka Tapani and Harri Kukkonen (2018) compared how well the competencies and contents of the curriculum of Tampere University of Applied Sciences (TAMK) Vocational teacher education met the future needs of vocational teachers (Tapani & Kukkonen, 2018). The competencies in the curriculum comprise assessment competency, cultural competency, facilitation competency, partnership competency and well-being competency (TAMK, 2018). This study revealed that the competencies of the TAMK curriculum cover the primary needs of future teachers.
However, more attention should be paid to mental development, group dynamics and creating a positive atmosphere, documentation skills, i.e. how to document the students’ progress in diverse learning environments, interaction skills, marketing skills, and an experimental culture, including an entrepreneurial way of working and managing one’s work (Tapani & Kukkonen, 2018). In Table 1 we summarise the findings as a synthesis of the teaching competencies in vocational education in Finland. According to our results, 53 different skills were recognised on multiple levels: some of the skills were quite specific, such as “documentation skills”; some were broader, such as “understanding life worlds”. We identified seven main categories of competency.

These competencies formed three main categories of scholarships.

Table 1: Summary of the findings of the teaching competencies in vocational education in Finland

<table>
<thead>
<tr>
<th>Sub-category (skills)</th>
<th>Generic category (competencies)</th>
<th>Main category (scholarship)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- teaching skills</td>
<td>Pedagogical competency</td>
<td>Scholarship in teaching and learning</td>
</tr>
<tr>
<td>- regeneration of pedagogical skills, using innovative teaching methods and trying new ways of teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- being familiar with the curricula and qualifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- transforming skills: teacher-counsellor, teacher-guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- understanding the diverse life worlds of students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- educational skills</td>
<td>Guidance and counselling competency</td>
<td></td>
</tr>
<tr>
<td>- recognising individual learning opportunities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- facilitating skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- expert in a trade or vocation (subject matter knowledge)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- innovative, entrepreneurial, creative teacher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- nurturing skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- supporting individual learning pathways (study personalisation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- supporting learners’ initiatives and self-efficacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- identification and recognition of competencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- study counsellor, teacher guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- knowledge about the educational system as a whole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- positive attitude towards learning opportunities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- empathy skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- dialogue skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- coaching skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- creating and ensuring a positive learning atmosphere</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- skills to support the students’ self-esteem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- digital teaching skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- creating a sense of belonging</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- management
- taking care of student well-being
- skills to adopt new roles
- self-reflection
- ability to multitask
- ability to cope with fragmented work

<table>
<thead>
<tr>
<th>Competency in pedagogical leadership</th>
<th>Scholarship in authentic learning and development</th>
</tr>
</thead>
<tbody>
<tr>
<td>- cooperation skills (will and attitude to ensure cooperation)</td>
<td>Partnership competency</td>
</tr>
<tr>
<td>- multi-professional networking</td>
<td></td>
</tr>
<tr>
<td>- multi-sectoral networking</td>
<td></td>
</tr>
<tr>
<td>- enabling authentic learning</td>
<td></td>
</tr>
<tr>
<td>- helping stakeholders with guidance and documentation</td>
<td></td>
</tr>
<tr>
<td>- organisational regeneration</td>
<td></td>
</tr>
<tr>
<td>- greater participation in social practices</td>
<td></td>
</tr>
<tr>
<td>- taking care of partnerships</td>
<td></td>
</tr>
<tr>
<td>- shared expertise (e.g. team teaching, pair teaching)</td>
<td></td>
</tr>
<tr>
<td>- bridge building skills</td>
<td></td>
</tr>
<tr>
<td>- consulting skills</td>
<td></td>
</tr>
</tbody>
</table>

- marketing skills
- economical understanding
- knowledge about competent employees
- understanding of quality
- reflection and resilience skills
- attitudinal skills for mental development
- developing learning environments
- developing working life
- transforming society

| Innovator competency | |
|----------------------| |
| - documenting the students' learning process | |
| - sharing assessment knowledge in authentic learning environments | |
| - willingness to help working life partners with assessment | |

<table>
<thead>
<tr>
<th>Assessment competency</th>
<th>Scholarship in evaluation and monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Scholarship in teaching and learning is based on three generic categories. The first generic category of competencies addresses pedagogy: they show a tension of being a traditional teacher in the new vocational education. The skills range from substance orientation to entrepreneurial and experimental ways of being a teacher. Guidance and counselling refer to skills ranging from empathy, support and dialogue to the identification of prior skills and understanding the educational system as a whole. The third generic category is about interaction: its content concerns how to create a positive atmosphere for learning, how to support the students' self-esteem and how to use digital tools for teaching.</td>
<td></td>
</tr>
</tbody>
</table>
Scholarship in authentic learning and development is about pedagogical leadership, partnership competency and innovator competency. Pedagogical leadership is associated with management, self-reflection and skills to adopt new roles. Partnership competency comprises skills that enable authentic learning, multi-professional and multi-sectoral networking, participation, teamwork and being a peer consultant. Innovator competency is about marketing, and economic understanding, as well as reflection and the skills to develop and see “outside the box”.

Scholarship in evaluation and monitoring relates to assessment competency. Assessment competency is about being an expert in assessment as well as showing a willingness to help stakeholders with assessment.

4 Discussion and concluding remarks

In this research, we were interested in learning about the kind of teaching skills, competencies and scholarships that could be identified in vocational education in Finland. This research has some limitations. Firstly, our data were derived from only 12 previous research articles. Secondly, we analysed the metadata using data-driven content analysis. Thus, some information may have been lost that would have been essential in identifying the skills, competencies and scholarships of vocational teachers. To increase the reliability of the study, we have attempted to formulate this report with an accuracy that enables replication of this study. We also formulated our research question as clearly as possible and we believe that our findings show meaningful parallelism across data sources. In addition, we specified analytic constructs in sub-categories, generic categories and main categories (Miles, Huberman & Saldaña, 2014).

According to data regarding twelve studies on vocational education, we identified three main categories of scholarship with seven generic categories of competencies and 53 separate skills within them. The main categories relating to vocational teachers’ scholarships comprised Scholarship in teaching and learning, Scholarship in authentic learning and development, and Scholarship in evaluation and monitoring. These scholarships included seven competencies:

- Pedagogical competency
- Guidance and counselling competency
- Interaction competency
- Competency of pedagogical leadership
- Partnership competency
- Innovator competency
- Assessment competency
Scholarship in authentic learning and development comprises skills that enable authentic learning in various learning environments. This is related to the reform of vocational education (Ministry of Education and Culture, 2018a) that emphasises productivity and a quick entry into working life. Authentic work-based learning is an effective way for students to have specific occupational skills and employability. Managing the authentic and effective learning environments is not easy task to do for the traditional teachers who are used to operate in a classroom. It is not possible without multi-professional and multi-sectoral networking. On the other hand, effective learning outcomes can be achieved in many different ways: learning independently, being taught or learning by doing.

Scholarship in teaching and learning is related to the more traditional way to be a teacher. An effective way of teaching may combine a personalised, tailored way of learning with a strict, structured and general way of learning. It may be student-centred, teacher-centred or curriculum-centred (Biesta, 2015; Dewey, 1915). Scholarship in evaluation and monitoring overlaps other identified scholarships. It is about being an expert in assessment as well as showing a willingness to help stakeholders with assessment.

In order to have positive and effective learning outcomes it is necessary for teachers to see the learning options from the students’ perspectives. Students in vocational education expect authentic learning opportunities, cooperation and guidance for their needs and aims (Tapani & Salonen, 2019). This is demanding because students have various backgrounds. For example, the vocational education and training of young people and adults is consolidated in Finland. Students under 20 years of age comprise 31% of all students, students from 20–39 years of age comprise the main population (47%) and there are also students who are over 40 years of age (22%) (Vipunen, n.d.).

A tension between individual and societal needs can be seen in the new vocational education and training plan (Ministry of Education and Culture, 2018a): as a starting point for creating a Personal Competence Development Plan (PCDP), there are ideas relating to both the needs of human growth and competence needs of entrepreneurs, public sector and third sector. According to Cedefop (2019), on a European scale, vocationally-orientated education and training at higher levels (levels 5 to 8 of the European qualifications framework) take many forms. In most cases, they have not been clearly defined. Some aspects are of great importance to further development, for example, considering the needs of labour market demands and wider societal values and the balance between academic and vocational principles. There is also a need to consider the balance between academic and vocational qualifications (Cedefop, 2019).

Our conclusion is that in Finland, the competencies of vocational teachers are fragmented. The fragmented competencies of vocational teachers have also been identified in other European countries (Grollmann, 2008). The fragmented competencies of vocational teachers raise concerns about the fragmented day-to-day work of vocational teachers. The fragmented
nature of the work of a vocational teacher may influence the teacher’s identity: what does it mean to be a teacher today and in the future? There is a trend to avoid using teacher but instead use coach, mentor or facilitator (Maunu, 2018). The word teacher is strongly redolent of traditional methods when teaching was performed by one specialist inside the classroom. Teaching was akin to factory work and teachers treated people like the masses: the teacher took charge and used the questions and answers method. Learning was a sedentary task for the students (Ojanen, 2012).

The fragmented work of vocational teachers raises a need to share expertise in their day-to-day work. This is essential because it is impossible for one person to possess all the identified skills, competencies and scholarships. However, by working in pairs or in teams it is possible to fulfil all the needs of the vocational teacher. Shared expertise enables everyone to concentrate on their own strengths. It is a way of working that will promote well-being, communality and social capital at work. It also could be a way of achieving peer learning and peer support and teacher’s professional development (e.g. Salonen & Savander-Ranne, 2015). Moreover, shared expertise enables the experience of being a meaningful part of society (Salonen & Tapani, 2019).

Even though we found various skills, competency categories and scholarships for vocational teachers, most students are still searching for simple basic things: they expect their teachers to be role models of the profession, guides and experts in learning (Tapani & Salonen, 2019). Students just want to find their place in society, study, graduate, find a job and start a family (Maunu, 2018). This relates to the core of VET: the aim is to train vocational skills and competencies as well as support students in becoming active, stable and civilised citizens and members of society. Cedefop (2019) suggests that in adding vocational drift there should be greater emphasis on employing teachers who have comprehensive work experience, possibly in addition to their academic degree (Cedefop, 2019). New content of vocational teacher’s work could also be used to tempt new teachers. In Finland, the number of applicants has varied quite a lot (Luukkainen, 2019).

Fragmented vocational education also challenges the way in which to conduct vocational teacher education. The identified skills, competencies and scholarships (Table 1) could serve as a checklist for the teacher-educators and trainers. The ideal situation would be that teacher-educators could also work on their strengths and co-operate with others in order to achieve the best learning results for students. That is why connections with stakeholders, peer learning and peer teaching could be used more. According to this, teacher education should be more network-based: teacher-educators together with student teachers can find potential learning environments for different needs (Tapani & Kukkonen, 2018). One potential way forward is also mentoring. In order to overcome the challenge of the new identity of the vocational teacher, in Finnish vocational teacher education, student teachers are asked to discuss their theory of practice with their mentors (Teacher Education, 2018). This means that
student teachers learn to identify themselves as a teacher (Ahlman, 1967). They describe how they feel about learning, knowledge and being human. This may also help them understand what kind of values they promote. One possible way is for teacher education to also move towards becoming competence-based: the student teachers study the themes that are important to their development and with which they are not already familiar (Tapani & Kukkonen, 2018). However, there is a concern that education about competences is too narrow. In order to achieve a meaningful life, not only are the skills required but also an understanding of the world.

In the midst of societal changes, it is important to clarify what the purpose of schooling is and make teachers aware of the impact they make, particularly when fragmentation of the profession is evident. Vocational education contributes to the progress of society (Grollmann, 2008). It supports a social transformation that could improve the conditions for a good life both broadly and profoundly. True opponents this – which must be overcome – are the increasing inequalities between people, public health risks, dirty energy solutions, wasteful industrial processes, atmospheres that negatively impact life, disadvantaged citizens, an uncompetitive economy, as well as all kinds of crooked and unobtrusive factors that stifle the potential of human creation (Salonen, 2014).

As Charles Handy (1989) states, learning is about solving problems by asking, thinking and experiencing until solutions become part of our lives (Handy, 1989). All this has led us to reconsider the concept of the word teacher in vocational education: is it still a relevant word?

**Author contributions:** This research was carried out interactively: both authors participated in writing the theoretical framework. Annukka Tapani was involved in gathering the data for meta-analysis. The analysis, results and conclusions were written jointly.

**Conflicts of interest:** The authors declare no conflict of interest.

**References**


Identifying teachers’ competencies

in the mathematics classroom and professional competence of teachers. Results from the COAC-TIV Project (pp. 28–48). New York: Springer.


Mayring, P. (2002). Qualitative content analysis – Research instrument or mode of interpretation? In M. Kiegelmann (Ed.), *The role of the researcher in qualitative psychology* (pp. 139–148). Tübingen, Germany: Ingeborg Huber.


Biographical Notes

Dr Annukka Tapani works as a principal lecturer in Tampere University of Applied Sciences, School of Professional Teacher Education. The title of her doctoral dissertation was "Does the community really count?" – Identity process and social capital as elements in surviving in insecurity and uncertainty. Her current research interests are in new ways to be a vocational teacher, changes in education and student positions.

Dr Arto O. Salonen works as an associate professor (social pedagogy) in the University of Eastern Finland, Department of Social Sciences. The title of his doctoral dissertation was Sustainable development and its promotion in a welfare society in a global age. His current research is in behavioural change, societal change, sustainable development and transformative social pedagogy.
Cross-country comparison of engagement in apprenticeships: A conceptual analysis of incentives for individuals and firms

Maia Chankseliani* and Aizuddin Mohamed Anuar

University of Oxford, Department of Education 15 Norham Gardens, Oxford, OX2 6PY, UK

Received: 24.09.2018, Accepted: 17.07.2019, Published: 19.12.2019

Abstract

Purpose: A fundamental assumption of the apprenticeship model is that there are benefits to both employers and individual learners. This study offers a broad conceptual interrogation of this inherent assumption underpinning the apprenticeship model.

Approach: This study combines analysis of literature and available data and draws upon apprenticeship systems and practices in ten nations: Australia, Brazil, Denmark, Egypt, England, Finland, Germany, India, Malaysia and South Africa.

Results: For individuals, incentives to undertake apprenticeship may be linked to the process and outcomes of learning, such as the appeal of learning through doing; the opportunities for occupational socialization; the possibility of progression to employment or to additional education; and learning while earning. The analysis of incentives for employers shows a range of reasons related to their short-term interests and the needs of the production processes, technologies, and associated skills; longer-term benefits for the company’s staffing strategy; and the opportunity to make a contribution to the wider education and economic systems. Despite all the potential incentives, many firms consider apprenticeships too costly, risky, and complex to justify the investment. However, firms that are making decisions as part of an umbrella associations are more likely to coordinate their skills investment strategies around collectively beneficial outcomes.

*Corresponding author: maia.chankseliani@education.ox.ac.uk

ISSN: 2197-8646
http://www.ijrvet.net
Conclusions: The links to the labour market and specifically to employers are a key challenge for sustaining apprenticeship systems, as well as for the task of researching them. As such, policy maker (and researcher) consideration of apprenticeship should take account of the capacity and commitment of employers. Another key challenge for apprenticeship is related to the relative attractiveness of this pathway for individuals. What is clear from this study is that the development of a strong apprenticeship system requires the buy-in of both employers and individual learners, and as such the necessity to identify and implement incentives effectively cannot be underestimated. Governments can play a key role in realizing the potential incentives for both employers and learners, thereby yielding benefits for all parties engaged in apprenticeships.

Keywords: Apprenticeship, incentives, vocational education, employers, skills, vocational education and training, VET

1 Introduction

Apprenticeship is a work-based model of learning that combines on-the-job training in the industry with off-the-job training normally based in vocational institutions. Effective links between productive work and hands-on learning under the supervision of trainers, together with the knowledge acquired in more formal settings, is central to the success of this model of learning. Apprenticeships are valuable in supporting young people's transition from school to work, evident by lower youth numbers not in education, employment or training (NEET) in countries with extensive and well-functioning apprenticeship systems (Biavaschi et al., 2012; European Commission, 2013; Gessler, 2019; Jørgensen, 2017; Valiente & Scandurra, 2017).

Empirical and theoretical literature on apprenticeships exists at the macro level (e.g. governance and financing, policy-making), meso level (institutional arrangements), and micro level (learning approaches, individual decision-making), either exploring the context of individual countries or examining crosscutting issues from a comparative perspective. Review of the existing literature points to great contextual diversity in the way apprenticeships are financed and organised, the associated institutional arrangements, as well as the approaches to learning. Across different countries, there are variations in the quality of apprenticeship provision as well as the proportion of learners pursuing apprenticeships based on the occupational sector, type of employer and level of apprenticeship. Through a combination of literature and data analysis, supplemented by country-level examples, this article builds on and expands an earlier study (Chankseliani, Keep, & Wilde, 2017) to offer a broad conceptual interrogation of an inherent assumption in the apprenticeship model, in that it provides incentives for participation to both individual learners and employers. The apprenticeship
models in ten nations are drawn upon for this study: Australia, Brazil, Denmark, Egypt, England, Finland, Germany, India, Malaysia and South Africa.

Given the aforementioned diversity in apprenticeship arrangements and characteristics, defining apprenticeship in relation to vocational education and training (VET) routes can be complicated. This study subscribes to the following definition that is based on the definition from Chankseliani et al. (2017):

Apprenticeship is a model of learning for an agreed duration that formally combines work-based training (periods of practical work experience at a workplace) with institution-based education (periods of theoretical/practical education followed in a school, college, or training centre), online or face-to-face, and that is regulated by a contract/agreement between apprentice and their employer, provides remuneration for the apprentice, and leads to a nationally recognized qualification/certificate upon successful completion.

Meanwhile, the concept of incentives adopted in this study refers to the factors that motivate individuals to participate in apprenticeships as well as for firms to provide the required volume and quality of training. The concept of incentives as overviewed and discussed in this study is closely linked with the concept of attractiveness. Hence, the study examines what makes apprenticeships attractive to learners and to employers. This is a pertinent question considering that apprenticeship as a mode of learning has been 'increasingly in dispute', arguably 'becoming an ...anachronistic institution' (Young, 1995, p. 137) to the extent that a recent comparative report recognises it as a 'relatively fragile mode of VET' (Chankseliani et al., 2017, p. 85). The article starts by explaining the methodological choices underpinning this study. What follows is an overview of apprenticeship participation in ten national contexts; the statistics reflect between-country differences in supply and demand for this mode of learning. Subsequently, we focus on the conceptualization and analysis of incentives for engaging with apprenticeship for individuals and employers. Finally, the article discusses possible measures that governments can use to enhance some of these incentives.

2 About the study: methods and sources

This cross-country comparative study of engagement in apprenticeships utilised documentary analysis as its central methodological approach. Maximum variation sampling was employed to capture commonalities and diversities of apprenticeship provision in ten countries, thereby enabling rich comparison and contrast: Australia, Brazil, Denmark, Egypt, England, Finland, Germany, India, Malaysia and South Africa. These countries were selected to represent a broad range of geographic locations, population sizes, economic characteristics, types
of apprenticeship provision, apprenticeship participation rates, and degrees of apprenticeship attractiveness.

This study used examples of apprenticeship systems and practices from ten countries. Unlike a traditional empirical case study design, with each country case analysed separately, culminating in a cross-case analysis, this study goes in-depth into the analysis of one important aspect of the ten apprenticeship systems and practices – the logic behind incentives to engage in apprenticeships. This is a conceptual analysis, building on the knowledge from various international contexts.

Government websites in the ten countries were carefully examined, focusing on the ministries of education, higher education, labour and economic development, as these were deemed most likely to contain the relevant data, policy documents and descriptions of apprenticeship provision. Individual and multi-country reports were also identified and sourced from the websites of international organizations such as the Organisation for Economic Co-operation and Development (OECD), UNESCO, World Bank, CEDEFOP, IDB, and the ILO.

This study also included academic literature searches using the ERIC and SCOPUS databases; the former captures publications in the field of education internationally while the latter also covers more diverse publications across the fields of science, technology, medicine, social sciences, and arts and humanities. Two search items were entered - the country name and the word 'apprenticeship'. The results were filtered according to criteria agreed in early research team discussions: only peer-reviewed papers, publications with specific reference to apprenticeship, normally dating back no further than twenty years to represent current provision, and predominantly publications in English.

The analysis included the development of brief notes to provide overviews of apprenticeship within each of the ten country contexts. Themes emerged gradually throughout the process of reading, summarising, and collating the secondary material and writing up multiple drafts of this study. The revision of the drafts accounted for new material or issues based on evidence from a particular country. Subsequently, cross-country comparison was undertaken using this emergent thematic structure.

3 Context: Apprenticeship participation in ten countries

Incentives for employers and learners to participate in apprenticeships determine the supply of and the demand for apprenticeship within a national context. Although creating a macro indicator for a bundle of incentives operating in each country seems to be impossible, there is one measure that gives an idea about the supply-demand balance and the effectiveness of incentives underlying this balance. This measure is apprenticeship participation that can be expressed as a proportion of the labour force - the sum of employed and unemployed individuals aged 15 to 64 (ILO, 2016) – who participate in apprenticeships in a given country. The
combination and subsequent calculation of data from national and international databases and from smaller, country-specific reports indicate that the ten countries analysed differ considerably in terms of apprenticeship participation (Fig. 1). The participation in apprenticeship per 1000 in the labour force ranges from 48 in Denmark, to one in Egypt and India. Meanwhile, Germany and England have 33 and 32 apprentices per 1000 in labour force respectively, while Australia has 23 and Finland has 19. There are eight apprentices per 1000 in the labour force in Malaysia, five in South Africa, and two in Brazil.

**Fig. 1. Number of apprentices per 1000 in labour force**

Sources: Own calculations based on the data from Department of Higher Education & Training (2016); Department of Information Malaysia (2015); Destatis (2015); European Commission (2013); Fazio et al. (2016); Finnish National Board of Education (2016); House of Commons (2016); Ministry of Education of Egypt (2014); NATS (2017); NCVER (2016a); ILO (2017); ONS (2015); Hudson Institute (2017).

Note: The South African numbers are for learnerships (including apprenticeships), but not for internships or other skills programmes. The Australian numbers include apprenticeships and traineeships. The Malaysian numbers only cover the National Dual Training System (NDTS).

However, the analysis of participation rates in Fig. 1 is partially compromised by a number of factors. Inherent challenges complicate the handling of apprenticeship data internationally, partly due to the diverse interpretation of the terminologies used in different countries, and the ensuing allocation of categories. For example, in Germany, apprenticeships are generally for young people entering the labour market, whereas in England and Australia, apprenticeship is increasingly becoming an ‘all age’ provision. In addition, these statistics do not capture
the substantial role played by informal and non-formal apprenticeship (which is the predominant mode of apprenticeship in India, for example) as well as fragmented apprenticeship schemes that are not aggregated nationally, due to the lack of published and reliable data. A further complication arising in the comparison of apprenticeship participation globally is the data collection method used in international databases (such as UNESCO Institute of Statistics, World Bank, OECD), which do not distinguish between vocational education and training in general, and apprenticeships specifically. Thus, the embeddedness of apprenticeship within each national context necessitates detailed contextualisation of the analysis of incentives and interpretation of the statistics in order to render them meaningful for comparison.

4 Incentives for individuals to engage with apprenticeships

For individuals, incentives to undertake apprenticeship may be linked to the process of learning as well as the outcomes of that learning. Two aspects of the process and outcomes of learning, respectively, are explored below.

4.1 The appeal of learning through doing

The opportunity of learning through doing as a way of exploring the world of work and achieving occupational aspirations can serve as a major incentive for prospective apprentices. The value of the apprenticeship model lies in the technical, cognitive and motivational aspects associated with its integration of theory and practice. In some apprenticeships that practice can result in the development of a craft. In *The Craftsman* Richard Sennett (2008) explains how skills, judgement, practice and thinking are required to connect hands and head, hence developing craftsmanship. Development of skills starts as a bodily practice, through touch and movement, but it is through the powers of imagination that craftspeople gain technical understanding and forge the connections between hands and head.

Apprenticeship allows the blending of cognitive understanding and practical experience which cannot be achieved through verbal communication alone (Ünlühisarcıklı, 2001). It is an action-oriented learning process in workplace settings where apprentices take part in problem solving (Pilz, 2007). Apprentices use real tools in an authentic work environment and their learning is focused on real-life application (Gessler, 2019). Evidently, where learning requires doing, vocational training is more effective in an occupational environment, instead of a school environment: ‘Being told in a school how concrete is mixed and poured on a construction site is something quite different from living through the drama and the crises of fifteen or twenty-four hours of continuous, minutely timed and tightly coordinated hard physical work’ (Streeck, 1989). Apprenticeship may also be appealing because of the flexible, learner-centred approach to training. As part of the apprenticeship contract in Finland, for
instance, each apprentice has a personal study plan which is put together by the training organiser and includes the credits for prior training; it also outlines how the apprentice will learn to achieve the desired qualification.

Learning through doing and work-based learning could, however, also become a disincentive if the quality of the learning is not sufficiently high, or if it is very ‘restrictive’, as defined by Fuller and Unwin (2003 & 2011). Restrictive learning is characterised by narrow learning objectives and work that is structured around tightly defined tasks, which limits an apprentice’s participation in the wider community of practice and constrains the opportunities for developing their identity (Fuller & Unwin, 2003). The traditional apprenticeships in Egypt demonstrate such a disincentive, where apprentices are perceived as cheap labour and the system is characterised by ‘the partial transfer of knowledge from the master to the apprentice; large variations in the quality of the training provided; the perpetuation of existing low-productivity technologies; and a tendency for slow innovation’ (Ministry of Education of Egypt, 2014). Learning in this apprenticeship system is commonly passive and non-experimental. Thus, the realities on the ground may not be supportive of the craftsmanship aspirations of apprentices and may discourage others from engaging in this model of learning.

4.2 Occupational and/or workplace socialization

Apprentices may also be incentivized by the opportunity for occupational socialization, characterized by the development of ‘occupational values and skills which might generalize across organizational settings in which the occupation may be practiced’ (Fisher 1986). Occupations ascribed to apprentices reflect the chosen trade, such as baker, hairdresser, plumber, or engineer, and the corresponding socialization may involve the advancement of occupational values such as ‘reliability, the ability to hold up under pressure, and solidarity with others working at the same tasks’ (Streeck, 1989). Experiencing the reality of a working context is a central feature and appeal of apprenticeships, as indicated in the work of Michaela Brockmann (2013), who conducted studies with retail apprentices in Germany. Apprenticeships in Germany are closely linked to the concept of occupations (Berufskonzept), and are seen as a beneficial mode of learning—acknowledged by individuals and their families—that develops Handlungskompetenz, or competence to act responsibly at the workplace and in society (Brockmann, 2013).

Depending on the sector, the employer and the country context, apprentices may undergo workplace socialization rather than full occupational socialization. In Australia, the concept of socialization seems to be workplace related as the training arrangements refer to the bundles of competencies and skills required for a particular type of work, rather than to individual occupations per se (Pfeifer, 2016). Similarly, in Malaysia’s National Dual Training System (NDTS), which was developed through a strategic partnership with Germany star-
Cross-country comparison of engagement in apprenticeship

Cross-country comparison of engagement in apprenticeship
ting in 1996, workplace socialization features through the integration of a broad category of employability skills and social values into the curriculum, thus distinguishing this model from other vocational training schemes in the country (Yahaya, Rasul, & Yasin, 2016).

Nevertheless, occupational socialization may vary by occupation and by context, resulting in some apprenticeships being more attractive than others. If apprentices are not in an occupation of their choice, perhaps due to high levels of competition or relatively low levels of prior attainment, the value of occupational socialization will be compromised. Furthermore, in countries such as Egypt, India and South Africa, where apprenticeships are often informal and of relatively low status, occupational socialization may not be a viable incentive. In addition, where there is a strong non-formal occupational context, such as in India, these incentives may still accrue without the need to undertake a formal apprenticeship.

4.3 The possibility of progression to employment or additional education

Progressions to additional education and training and to decent employment are also potential incentives for individuals to opt for apprenticeship. Nevertheless, such incentives take different forms in the individual country contexts, based on how apprenticeship is conceived, its worth within the education and training provision and also the labour market structure of each country.

For countries with a high proportion of youth who are NEETs, apprenticeship provision is often touted as a means of increasing youth employability. Brazil’s institutionalisation of the Apprenticeship Law in 2000 is one such example, aimed to address the dearth of skills among young people, high employment turnover, and prevalence of informality in the job market (Fazio et al., 2016). An econometric evaluation of the programme under this law revealed it has been successful in increasing real wages and, though employability was slightly lower in the short term, the probability of gaining employment in non-temporary jobs within the formal sector was higher in the medium term (Corseuil, Foguel, Gonzaga, & Ribeiro, 2014). In the contexts where the likelihood of successful employment is not high, the appeal of apprenticeship, as a consequence, may be relatively limited. Progression from apprenticeship in Egypt is affected by the negative perception towards VET in general and the high societal demand for university education. Further exacerbating this issue is the criticism levied towards the Kohl-Mubarak-Initiative, which has approximately 10,000 entrants annually, as a high proportion of its students then proceed to higher education, hence undermining the programme as a genuine apprenticeship route (Adams, 2010). In South Africa, apprentice-

---

1 Decent work ‘respects the fundamental rights of the human person as well as the rights of workers in terms of conditions of work safety and remuneration. It also provides an income allowing workers to support themselves and their families. […] respect[s] the physical and mental integrity of the worker in the exercise of his/her employment’ (UN Economic and Social Council, 2005).
ships are viewed as a ‘bridge’ into a world of formal employment, although the opportunities of obtaining such employment are not abundant (Allais, 2012).

In some countries such as Denmark and Germany, apprenticeship ordinarily results in entry into decent and stable employment, though it is unlikely to lead to higher education. Though Denmark has high employment rates for apprenticeship completers, these individuals are not eligible to move into higher education. Such strict separation of academic and vocational routes acts as a disincentive for some individuals (Jørgensen, 2017). Meanwhile, in Germany, the traditional model of vocational/academic separation has been dissolving in recent years. Access to higher education has been extended to ‘non traditional’ students with vocational qualifications instead of the Abitur school-leaving certificate, although the reach is limited: data from 2013 indicates that three percent of first-year students were non-traditional, but their proportion has more than quintupled since 1993 (Wolter & Kerst, 2015).

Australia, England and Finland demonstrate relatively flexible education and training systems and robust labour markets that ensure transition to employment as well as the possibility to move from vocational to academic routes. In Australia, 92% of apprenticeship completers in trade occupations and 80% of those in non-trade occupations gain employment (NCVER, 2016b). The Australian Qualifications Framework (AQF) indicates that the aim of all qualifications (except for the doctorate) includes ‘a pathway for further learning’ (AQF Council, 2011) and the latest data indicates that 23% of completers progressed to further education (NCVER, 2010). Meanwhile, a longitudinal study in England established that 19% of advanced apprenticeship (those equivalent to upper secondary level academic learning, i.e. Level 3) completers progressed to higher education over seven years (Smith, Joslin, & Jameson, 2015). Finnish apprenticeship completers can also continue to universities and polytechnics after completing an upper secondary vocational school qualification (Aho, Pitkanen, & Sahlberg, 2006; Stenström & Virolainen, 2014b).

On the other hand, the continuing absence of a well-developed national qualifications framework in India results in the minimal utility of apprenticeship certificates for progression into higher-level qualifications. Apprentices who pass their trade tests obtain a National Apprenticeship Certificate but, without integration into a national qualification framework, such certificates remain outside the formal educational system and are therefore relatively unattractive to potential entrants who are looking for pathways to additional higher qualifications (ILO & World Bank, 2013). Thus, progression routes to additional education from apprenticeship are a potentially powerful incentive for participants. However, complex patterns of progression outlined here reflect the difficulties of providing an effective progression pathway while balancing the utility of apprenticeship as a direct route to employment.
4.4 Learning while earning

The fact that apprenticeship allows individuals to earn wages while learning can serve as a very strong incentive for participation. However, in some contexts, individuals may earn more by joining the labour market directly rather than by pursuing an apprenticeship. Therefore, higher pay for unskilled labour may discourage an individual from choosing an apprenticeship and having to shoulder a portion of the training costs (through lower pay), compared to joining the labour market directly.

Apprentices in all ten countries receive wages (referred to as wages, pay, stipend in the case of South Africa and India, or allowance in Malaysia). However, there are considerable variations in the wage amount and arrangements within and between countries. In some countries, apprenticeship offers relatively high levels of remuneration, whereas in other countries, for example in Egypt and India, the pay is extremely low, with no guarantee of post-apprenticeship employment (Álvarez-Galván, 2015; ILO & World Bank, 2013).

Different wage arrangements can provide different incentives for individuals to participate in apprenticeships. In some countries, such as Denmark and Germany, apprentices receive wages for the entire period of their apprenticeship engagement, without any differentiation between their on-the-job training and school-based training (Kuczera, 2017a). In Malaysia, the monthly allowance for apprentices progressively increases over the four semesters in the two-year period (Othman, 2005). In other contexts, financial allowances in addition to wages are offered to apprentices. For example, in Australia apprentices who have moved away from their parents’ home receive The Living Away From Home Allowance. Australian apprentices may also receive the allowance if they are undertaking an apprenticeship and are or become homeless (Australian Apprenticeships, 2013). In Finland, apprentices are offered one free meal per day, can receive school transport and accommodation allowances, and are able to access financial support if they have limited means, are mature students or have families to care for while learning (Finnish National Board of Education, 2016).

Three out of the ten countries - Denmark, Finland and Germany - use collective wage agreement systems to decide apprenticeship pay rates, generally resulting in relatively attractive salaries for apprentices. In Finland, for example, the trainees receive wages of about 80% of the wages of a skilled worker in a particular field (Stenström & Virolainen, 2014a). Contrast this with England, where relatively few private sector employees are covered by any kind of collectively bargained wage agreement; employers have the liberty to set apprenticeship wage rates at their own discretion. A national minimum rate for apprentices below the age of 19 is in place, coupled with a requirement that the apprenticeship wages meet the minimum standard set by the National Minimum Wage. However, this requirement is not always adhered to (BEIS, 2017). Meanwhile in Brazil, apprentices must be paid at least the rate of the national minimum wage, regardless of age, though there are restrictions on the number of working
hours depending on whether or not the individual has completed compulsory education (OECD, 2014).

The examination of apprentice pay reveals its complexity, enmeshed as it is within the wider economic systems and institutional arrangements. Potential determinants of apprentice pay may include the organized interests of employers and employees, the mode and content of state intervention, the supply and demand for trainees, as well as the presence of a gendered dimension in specific sectors (Ryan, Backes-Gellner, Teuber, & Wagner, 2013; Williams, Foley, & Newton, 2013). While apprentice wages may not always be high and therefore appealing across and within selected national contexts, the idea of receiving pay while being trained is in itself very attractive (Heine, Spangenberg, & Willich, 2007; Lehmann, Taylor, & Wright, 2014; Williams et al., 2013), especially in contexts where apprenticeship completers are highly likely to be employable. This is a cornerstone of apprenticeship provision and one of the key incentives for individuals.

5 Incentives for employers to engage with apprenticeship

Employer engagement is an essential component of apprenticeships; firms’ willingness to train apprentices is the conditio sine qua non for an apprenticeship system (Wolter & Ryan, 2011). Employers, as atomistic entities, may view skills as a private, firm-specific good, or may conceive themselves as part of collective entities and see skills as both a private and collective good. These two assumptions underpin the analysis that follows. The aforementioned occupational socialization benefits employers through the opportunity to develop employees within the specific work settings where such skills will be deployed, as well as to expose new employees to the firm’s work routine. Furthermore, employers potentially benefit from apprentices’ contribution towards productivity following their initial training period. In Germany, 41% of employers participating in a nationally-representative survey selected ‘to employ apprentices as workers even during apprenticeship training’ as a reason for providing in-company vocational training (BIBB, 2015). Additionally, in Denmark, there is positive employer feedback on the contribution made specifically by adult apprentices who are perceived to be highly motivated trainees (European Commission, 2014).

The opportunity to undertake preliminary observation of apprentices on the job and to expose them to training as a pre-condition for permanent employment can also be considered an incentive for employers (Jansen, Leiser, Wenzelmann, & Wolter, 2015). In Germany, 83% of employers participating in a nationally-representative survey rated ‘to train young workers with a view to employing them long-term in the company as skilled workers’ as a reason for providing in-company vocational training (BIBB, 2015). Employers also benefit from the fact that following their initial period of training, apprentices contribute to productivity. In Germany, an increase of the share of apprentices in a firms’ workforce in trade,
commercial, craft or construction occupations is linked with higher labor productivity and profitability (Mohrenweiser & Zwick, 2009). The training costs borne by the companies are generally low when considering the productivity of the apprentice across the training period. In England, research suggests that most employers were able to recoup the costs of their investment in apprenticeship training within one to two years (Hasluck & Hogarth, 2010).

The benefits of apprenticeship arrangements are linked to apprenticeship costs and funding arrangements. The main costs of providing apprenticeship are apprentice wages, training in schools and off-the-job settings, and assessment costs. Depending on the country context, various cost sharing permutations exist between firms (through direct payment and levies), governments and apprentices. In Finland’s publicly funded apprenticeship system, the employer receives training compensation to cover the costs of workplace training, whereby employers taking on an apprentice directly from basic education receive an increased subsidy (OPH, 2016). Incentive payments are also available in Australia for employers who take apprentices in occupations that are on the National Skills Needs List (ILO, 2018). The South African case, however, demonstrates how some cost sharing arrangements can create disincentives for employers. The assessment of the South African levy shows that ‘[a] problem has been the continuation of a “voluntarist” and “short-term” mind-set towards enterprise training among employers. Many employers […] view [levy] as little more than an additional tax burden impacting negatively on cost structure and profit margins’ (Kraak, 2008).

Irrespective of the funding arrangement model, firms’ investment in apprentice training can support the apprentice-employer relationship, potentially leading to greater motivation and company loyalty (Poulsen & Eberhardt, 2016), as apprentices appreciate their employer’s willingness to play an active role in their development by investing in training. Firms offering apprenticeships can also gain a reputational benefit by honouring the tradition of investing in people. In Germany, when probed on the reason for providing in-company vocational training, 41% of participating employers in a nationally-representative survey responded: ‘because apprenticeship is part of tradition’ (BIBB, 2015). In other words, firms are encouraged to participate in apprenticeships in order to adhere to a set of societal expectations and values tied to the development of human resources in that society.

Despite all the factors that may incentivize employers to offer apprenticeships, many firms view apprenticeship arrangements as too costly, risky and complex to justify the investment. One of the main disincentives is that trained apprentices may leave their employer following the completion of training when attracted by a competing firm, a phenomenon referred to as poaching or free-riding. In this case, the likelihood that firms are unable to justify investments in apprenticeship training is high. Consequently, save for a few exceptions in stronger systems like Germany and Denmark, employers expect the broader education and training system - funded by individuals or the taxpayers - to produce appropriately trained talent which they can source using competitive pay strategies.
In addition, the relatively low status of apprenticeship in some countries also affects the willingness of employers to partake in this model. In India, where on-the-job training in family businesses or informal employment is particularly important in economic areas such as street food vending, the need for recognized and certified skills may be less urgent. This is due to the high employment levels for those with informally acquired skills, the high cost associated with formal training and the prominent role of families in transferring knowledge and skills in traditional sectors (Noronha & Endow, 2011; Pilz, Uma, & Venkatram, 2015). As a result, the disincentives for apprenticeships in India are reflected by this rather blunt assessment: ‘Young people do not tend to see apprenticeship as a valued career path, and employers have been reluctant to employ apprentices’ (OECD & ILO, 2017).

Thus, a strong and stable apprenticeship system with a ‘...high degree of standardization and consistency’ as exemplified in Germany and Denmark can motivate firms to be involved in apprenticeship on a relatively constant basis (Pfeifer, 2016). This contrasts with the ‘fractured’ system in England (Keep, 2015), the ‘relatively dynamic policy-driven development’ in Australia (Pfeifer, 2016), Malaysia’s system that is largely propped up by the government with the industry only playing a supporting role (Pang, Rajamorganan, & Sim, 2010), and the struggle to establish a functioning system in countries such as Egypt, India and South Africa.

5.1 The value of collective efforts

In contrast to the many microeconomic disincentives briefly described above, below we present institutional explanations of firms’ incentives. Institutional explanations encompass country-specific collective institutions, such as: employer collective organizations (associations, chambers of commerce/trade), employee organizations (unions, councils), associations of educational vocational centres/schools/colleges, as well as trainee/learner associations. Specifically, we focus on employer collective organizations as key social partners. One assumption in previously reviewed incentives and disincentives for apprenticeships was that skills are a private, firm-specific good. Here, the assumption shifts to consider skills as a broader, collective good instead.

When firms make decisions collectively, under the umbrella of chambers or associations, they are more likely to coordinate their skills investment strategies around mutually-beneficial links to skills development as a common good, locally or nationally. From the employer’s perspective, Streeck (1989) highlights that ‘if an employer provides training, he is no more than adding to a common pool of skilled labour which is in principle accessible to all other employers in the industry or the locality, many of which are his competitors’ (p. 94). Therefore, as a collective, the investment and effort of training apprentices are then viewed as a contribution to the ‘pool’ of talent for the broader sector rather than limited to individual firms. Employers engaging in apprenticeship provision as part of collectives may be more
inclined to provide apprenticeships than individual firms. Such collectively-owned organisations may be more legitimate bodies to design, assess and administer apprenticeships than public officials. As a collective, firms may be more receptive to share the information about their skill needs and training options amongst themselves rather than with the government (Culpepper, 2003; Wolter & Ryan, 2011). This sense of collective ownership may also prompt employer associations/chambers to use different mechanisms, such as ‘dialogic capacity’ or peer pressure (Wolter & Ryan, 2011) to persuade resistant firms to invest in the development of mutually beneficial human resource.

Collective employer structures usually exist in countries that have had a long history of apprenticeship training, such as Germany and Denmark. The non-optional employer body - the Association of German Chambers of Commerce and Industry (DIHK) - offers support and advice for individuals with questions regarding apprenticeship training. They provide mediation for problems, determine the suitability of businesses and trainers, register the training contracts, administer examinations and issue certificates (DIHK, 2017). The Employers’ Reimbursement Fund (AUB) in Denmark is an example of a collective structure that establishes a common fund that spreads out the cost and benefits of apprenticeship training amongst its members. All employers in Denmark make contributions to this fund for each full-time employee; subsequently employers with apprentices can then claim reimbursement when their trainees attend a vocational school.

Halfway through the spectrum, South Africa and Australia present examples of employer collective bodies that are not as extensive as those in Germany or Denmark. For example, in South Africa, the Tripartite Sector Education and Training Authorities (SETAs) implement sector skills plans by starting learnerships, disbursing the training levies contributed by all employers, approving workplace skills plans from employers, and overseeing education and training in their sectors. SETAs include representatives from trade unions, employers’ associations, the government, and professional bodies (Department of Labour, 2014). In Australia, the Industry Skills Councils are government-recognized and funded bodies representing employers in different sectors that participate in developing the skills and productivity of the sector’s workforce.

By contrast, in Egypt, employers’ involvement through collective organizations is limited, except for the MKI dual-system programme where investors’ associations of mostly medium and large companies provide the practical training component of the programme. When apprentices finish the training, they receive a certificate from the association and a diploma from the Ministry of Education (Ministry of Education of Egypt, 2014). Meanwhile, Pang, Rajamorganan, and Sim (2010) observed that in the case of Malaysia, employers are not able to take on the role of administering apprenticeship contracts and assessments, or even promoting apprenticeships; these functions are mainly driven by the government’s Department of Skills Development. Overall, the analysis aligns with Wolter & Ryan’s (2011) argument
that countries without organically developed institutions for employer coordination and/or social partnership may face an uphill task in expanding apprenticeship provision. Collective mechanisms as exemplified above may potentially incentivize employers to view apprentice training as a sector-wide investment, though such institutional structures are historically determined within each country context, and are extremely difficult to construct from scratch.

6 How can governments enhance some of these incentives?

There is an indication in literature that governments have tried, with various success, introducing incentives for engagement in apprenticeships (Hargreaves, Stanwick, & Skujins, 2017). Despite the complexity of the nature of such incentives, governments are in a position to encourage employers as well as learners to engage with apprenticeship. A number of these possible measures are discussed below.

The attractiveness of apprenticeship among young people can be increased by improving schools-based education and training provision, focusing on enhancing VET teacher training, informing parents, career professionals and teachers as key influencers for young people (Loveder, 2017), providing the flexibility for individuals to move from one qualification to another within the vocational route as well as into the academic pathway. Governments can also tap into the potential of events such as WorldSkills competitions to encourage people to pursue this route (Chankseliani, James Relly, & Laczik, 2016; Chankseliani, James Relly, & Mayhew, 2015). WorldSkills competitions currently feature 77 member organizations and countries, including those included in this study. The broad aims of these competitions, which have been taking place biannually since 1950, are to promote greater awareness of the contribution of skills and high standards of competence towards individual fulfilment and also economic success.

Employers may be incentivized to offer apprenticeships when the government provides optimal sets of financial and non-financial incentives to balance employer costs and benefits. This entails supporting the training of in-company trainers, contributing to apprentice wages, or offering particular tax incentives. In most EU countries the national government offers support for training programmes aimed at in-company trainers who are responsible for delivering the on-the-job elements of apprenticeship, and in some jurisdictions having appropriately trained trainers is a prerequisite before firms are allowed to take on apprentices. Simplification of bureaucracy and regulation may also facilitate employers’ engagement with apprenticeships, especially when the system is government-led. The introduction of branding schemes that recognize and endorse firms as ‘learning enterprises’ - exemplified by the Norwegian government through its PR campaign - may also serve as a non-financial incentive. Such recognition may indirectly influence firms’ profit, as socially responsible companies are more likely to sell their products and services (CEDEFOP, 2016; Kuczera, 2017b). Govern-
ments can also ‘promote and build the brand confidence of apprenticeships’ (APPG, 2017), through effective communication with firms on the benefits and latest policy developments associated with apprenticeships. Equally important is government engagement with individuals to communicate the benefits of participating in apprenticeships, especially to those who are currently under-represented in terms of age, gender, ethnicity groups and geographical areas. Governments are also well positioned to facilitate communication between employers, VET institutions and individuals, for instance by orchestrating a public information exchange ‘marketplace’ involving the use of apps and websites. In such a marketplace, employers offering apprentice spots, institutions offering formal training, and individuals seeking training can come together to realize the potential of apprenticeships jointly.

7 Concluding remarks

Apprenticeship is a model of learning that integrates practice and theory, providing cognitive and motivational benefits, facilitating the alignment of the content of educational and training programmes with the occupational requirements, and resulting in enhanced opportunities for individual employment as well as better skills match across the national economy. Despite a growing political interest in apprenticeship globally, it remains a relatively fragile mode of vocational education (Chankseliani et al., 2017); this is largely because of its reliance on employer engagement and its low attractiveness to individuals in many different parts of the world. It was therefore important to explore what potential incentives are present for employers and individuals to engage with apprenticeship. This study explained the logic of incentives to participate in apprenticeship for both employers and individual learners using the data and literature from ten national contexts to show that individuals may be attracted to apprenticeships because of the appeal of learning through doing; the opportunities for occupational socialization; the possibility of progression to employment or to additional education; and the lure of learning while earning. Employers’ interest in offering apprenticeships are normally linked to their short-term needs of the production processes, technologies, and associated skills; longer-term benefits for the company’s staffing strategy; and the opportunity to make a contribution to the wider education and economic systems. When firms coordinate their skills investment strategies as part of their sectoral associations, they are more likely to invest in apprenticeships. However, such institutional arrangements are not in place in most international contexts and employer engagement remains a key challenge for sustaining apprenticeship systems. In many countries, apprenticeship is yet another government training scheme without taking account of the capacity and commitment of employers.

The low attractiveness of apprenticeship, to employers and to individuals, may be linked to the unclear purpose of apprenticeship in some countries. Apprenticeship is commonly seen as ‘the answer’ to a wide range of policy issues related to unemployment, skills shortages
and skills mismatch, social exclusion and economic problems. Hence, there exists a tension between wanting apprenticeship to be viewed as a rigorous, high status model of learning and also wanting to use it as a mechanism for providing second chance, social inclusion goals for young people who have not succeeded on the academic route of the mainstream schooling. Focusing on apprenticeship as a worthwhile route in its own right unlocks the true potential of enhancing the incentives and making apprenticeship genuinely attractive to learners and employers. What is clear from this study is that the development of a strong apprenticeship system requires the buy-in of both employers and individual learners, and the importance of identifying and implementing incentives effectively cannot be underestimated. Governments can play a key role in realizing the potential incentives for both employers and learners, thereby yielding benefits for all parties engaged in apprenticeships.

References


ILO (International Labour Organization). (2017). Labour force by sex and age (Thousands). Retrieved from https://www.ilo.org/iloSTAT/faces/oracle/webcenter/portalapp/pagelanguage/PortalLanguage/Page27.jsp?subject=EAP&indicator=EAP_TEAP_SEX_AGE_NB&datasetCode=A&collectionCode=Y1&afrLoop=359764306723494%26_afrWindowMode=0%26_afrWindowId=e4glstjb_42%26F%40%40%3Findicator%3DEAP_TEAP_SEX_AGE_NB%26_afrWindowId%3De4glstjb_42%26subject%3DEAP%26_afrLoop%3D359764306723494%26datasetCode%3DA%26collectionCode%3DY1%26_afrWindowMode%3D0%26_adf.ctrl-state%3De4glstjb_107


Valiente, O., & Scandurra, R. (2017). Challenges to the implementation of dual apprenticeships in OECD countries: A literature review. In M. Pilz (Ed.), *Vocational education and training in times of economic crisis: Lessons from around the world* (pp. 41–57). Cham, Switzerland: Springer. https://doi.org/10.1007/978-3-319-47856-2_3


Biographical Notes

Dr Maia Chankseliani is Associate Professor of Comparative and International Education at the University of Oxford. Maia Chankseliani’s research on tertiary education - higher education, university-based research, and VET/apprenticeships - focuses on the understanding of the societal, institutional, and policy forces that shape tertiary education and the potential of tertiary education and research for transforming societies.

Aizuddin Mohamed Anuar is a DPhil in Education student at the University of Oxford. Within the field of comparative and international education, his research interests include education and inter/national development, postcolonialism, rural education and cultural studies in science education.

Acknowledgments

This work was supported by Qatar Foundation. We are grateful to Peter Brookes for his comments on an early version of this article.
The function and institutional embeddedness of Polytechnics in the Indian education system

Sebastian Schneider and Matthias Pilz*

University of Cologne, Chair of Economics and Business Education Herbert-Lewin-Straße 2, 50931 Köln

Received: 02.12.2018, Accepted: 25.06.2019, Published: 19.12.2019

Abstract

Purpose: India’s Polytechnics are a fundamental part of its (vocational) education and training system but are largely ignored in VET research. Understanding the status quo and potential of India’s (vocational) education landscape requires an understanding of the role played by the Polytechnics, particularly in view of the Indian government’s major efforts to implement a functioning VET system. Because little is known about the function and embeddedness of the Polytechnics the article therefore aims to examine how polytechnics are embedded in the Indian education and training system and what functions they perform for the actors within the system.

Methods: The article begins by describing the systemic embeddedness of Polytechnics in the Indian education system and demonstrates their role and function in relation to a range of stakeholder groups (individuals, employers, society and the economy). Problem-centred face-to-face interviews were conducted with the principals of 14 Polytechnics in Bangalore, Delhi and Mumbai, among other cities. Semi-standardized interview guidelines were used to conduct the interviews. The interviews were analyzed by qualitative content analysis.

Results: The results show that polytechnics perform various functions in the Indian education system. The Polytechnics teach both theoretical and practical skills, which is a special feature of the Indian system at this level. Qualification takes place at an intermediate level,

*Corresponding author: matthias.pilz@uni-koeln.de

ISSN: 2197-8646
http://www.ijrvet.net
which means that graduates have the opportunity to enter a company after graduation, where they can hold a kind of supervisor position. It is precisely these employees that are increasingly being sought by Indian companies. In addition, polytechnics provide a pathway to higher education, so students can use the opportunity to switch to a college once they have their diploma at the Polytechnic. Furthermore, the Polytechnics offers its graduates a good opportunity to become self-employed through the wide range of specializations and the practice-oriented skill development. In addition, the Polytechnics offer numerous opportunities to promote socially disadvantaged groups.

Conclusion: The survey findings illustrate the importance of Polytechnics to the various stakeholder groups, demonstrating their “multidimensional bridging function” within the Indian education and training system.

Keywords: Polytechnic, India, institutional role, vocational education, skill development, vocational education and training, VET

1 Introduction

India faces a severe skills gap (King, 2012). Although trends in education have produced a substantial increase in the number university graduates, there is still a shortage of well-qualified mid-range workers (Majumdar, 2016). Employers are unable to find workers with the necessary skills and job seekers struggle to find a suitable job (Pilz, 2016). According to official data, 90% of companies are unable to meet their requirements for skilled workers and 89% complain that this prevents them from fulfilling their market potential (Agrawal, 2012).

Saini (2015) warns that “India’s demographic dividend can rapidly convert into a demographic nightmare” if the Government fails to give the labour force relevant skills. Large numbers of young people cannot find a job because they lack the required skills, with a potential detrimental effect not only on the economy but also on society (FICCI, n.d.).

This forms the background to this article, which focuses on a key component of the Indian education and training system, the Polytechnics (abbreviated here to PTs). In purely quantitative terms, PTs are an important part of the Indian system as Mehrotra (2016) and Venkatram (2016) note, but little is known about their embeddedness and function. The article therefore considers how they are embedded within the Indian education and training system and what functions they perform for the actors within the system. Specifically, it seeks to establish which functions the institution performs for the actors (function) and where it sits within the vocational education system as well as how it is integrated into the Indian system (embeddedness). The article contributes to international research in three ways. First, it applies the theory of institutionalism to the Indian vocational training context: institutionalism provides a good explanatory pattern for the function and embeddedness of institutions in
the area of VET. Second, it addresses the debate around the relevance of educational institutions, illustrating the relevance within the Indian system of the institution being considered (PT) and what role the institution performs within the system. Finally, the article widens the current research by focusing on PTs and the differences between them and, for example, Industrial Training Institutes (ITIs), which were not included in the study. This intensive focus on PTs thus contributes to furthering the research base.

The article begins with an overview of India’s VET system, putting the PTs in a broader educational context.

It then outlines the research study, describing its theoretical framework and methodological approach. The findings shed light on the role of the PTs and on their embeddedness in the system. The article concludes with an evaluation and discussion of the findings.

2 An overview of post-secondary education and vocational training

The Indian education system comprises primary education, secondary education, upper secondary education and higher education. Both secondary and upper secondary education (classes 9 to 12) last two years, but secondary education is solely school-based, whereas upper secondary education is provided “either in schools or in junior colleges” (Gupta et al., 2016). The secondary and upper secondary stages of education are considered very important, as this is when students must decide whether to undertake vocational training, start work or embark on higher education (Gupta et al., 2016).

The Indian VET\(^1\) system has two levels, the school level and the purely vocational level. At school level, VET\(^2\) starts at the upper secondary level (classes 11 and 12) in schools providing general education and lasts two years. School-based vocational education is the responsibility of the Department of School Education in the Ministry of Human Resource Development (Venkatram, 2012; Agrawal & Indrakumar, 2014) 160 vocational courses in “agriculture, business and commerce, engineering and technology, health and paramedical [care], home science and science and technology” are taught at around 10,000 schools in India (Agrawal & Indrakumar, 2014; Gupta et al., 2016). From an international perspective, this kind of education has a much more pre-vocational orientation than exclusively vocational orientation (Gupta et al., 2016; Pilz et al., 2014).

---

1 For a detailed account of the Indian VET system, including training, see Wessels & Pilz (2018).
2 Although the terms vocational education and vocational training have different meanings in India, they are often used interchangeably in the literature. This article will follow suit and make no distinction between the two terms.
3 School-based VET is usually referred to in India as vocational education.
2.1 Industrial Training Institutes

At the purely vocational level, VET\(^4\) is mostly provided by government-run ITIs and private Industrial Training Centres (ITCs)\(^5\) (Agrawal, 2012; Venkatram, 2012). The Directorate General of Training (DGT)\(^6\) in the Ministry of Skill Development and Entrepreneurship\(^7\) is in charge of the vocational training within higher education level. Training is provided under two schemes, the Craftsmen Training Scheme (CTS) and the Apprenticeship Training Scheme (ATS) (Agrawal & Indrakumar, 2014; Gupta et al., 2016).

Under the Craftsmen Training Scheme, which was launched in 1950, ITIs were set up to meet the needs of the labour market (Sodhi, 2014). Following economic reforms, there was a great increase in their number in the 1990s, with the number of ITIs almost doubling between 1990 and 2000 from 2,137 to 4,274. Since 2000, the number of ITIs has grown even more rapidly. Most newly established institutions have been privately run ITIs whose number more than doubled from 2,772 in 2001 to 6,498 in 2010 (Joshi et al., 2014). The increase in government ITIs was not so marked, going from 1,727 in 2001 to 2,189 in 2010 (Joshi et al., 2014). By 2015, India had 11,964 ITIs (2,284 government-run ITIs and 9,680 private ITIs) offering training courses in 126 trades (DGT, 2015).

The duration of training offered by an ITI ranges from one to two years, depending on the course (DGT, 2015). Admission requirements stipulate that students must have completed either 8 or 10 years of school (Gupta et al., 2016). ITI courses are characterised by the dominance of theoretical over practical instruction. Some other quality problems like the low level of competence of teaching staff and out of date equipment were detected in a number of ITIs (Tara et al., 2016; Zenner et al., 2017).

On completion of the training programme, students receive National Trade Certificates (DGT, 2015). ITIs train “semi-skilled workers” (Venkatram, 2012). In order to be considered a skilled worker, ITI graduates must then complete an apprenticeship (Venkatram, 2012).

2.2 Polytechnics

PTs in India have attracted little attention from researchers despite their importance within the system. Most PTs in India offer courses in mainstream disciplines, such as civil, electrical and mechanical engineering, but over the last two decades, many PTs have started offering courses in other disciplines, including electronics, computer science, medical lab technology, hospital engineering and architectural assistantship. Many single technology institutions also

---

\(^4\) Within higher education, VET is usually referred to in India as vocational training.

\(^5\) In the literature, the terms government ITIs and private ITCs are used interchangeably. This article will follow suit and make no distinction between the two terms.

\(^6\) Former Directorate General of Employment and Training (DGE&T) (DGT, 2017).

\(^7\) Former Ministry of Labour and Employment (DGT, 2017).
offer diploma programmes in areas such as leather technology, sugar technology, printing technology etc. (Goel, 2011). Programmes in civil, electrical and mechanical engineering are, however, the most important and relevant, in terms both of student numbers and of their profile (Rao et al., 2014). The qualifications they offer are very important, as PTs are strongly associated with the ‘diploma’. For example, in official statistics, PTs are often categorised as ‘diploma-level technical institutions’ and those completing courses are referred to as ‘diploma holders’ or, for example, as ‘diploma engineers’. Most programmes – basic diploma courses – run for three years and are broken down into six semesters, but there are also many specialised programmes running for shorter periods. These programmes offer sub-degree diplomas, postgraduate diplomas and advanced diplomas, for example, along with part-time courses for students who are in employment. Students can complete the basic diploma and then immediately enrol for an advanced diploma, but other post-secondary students can also take the advanced diploma.

Admission to a PT requires successful completion of 10 years of general education or of a lower secondary TVET programme (UNEVOC, 2018). This means that the average age of entry is 16. Candidates also need to have passed the Secondary School Certificate (SSC) or its equivalent with an aggregate mark of at least 35% (Rao et al., 2014). Selected programmes may also require 12 years of general education.

Training is mostly theoretical, but curricula also include practical elements, which enhance students’ profile for vocational occupations. These practical elements are delivered, for example, in workshops within the institution and are intended as a way of practically applying the theoretical knowledge acquired 8.

Following completion of a course and the award of a diploma, students are able to demonstrate specific skills, such as understanding and interpreting technical drawings, making cost calculations, or repairing and maintaining machinery (Goel, 2011).

India currently has 3,239 PTs (MHRD, 2018), a figure that has risen sharply over recent years as the government has placed increasing emphasis on vocational training (MoLE, 2017). More than 1.5 million students are enrolled at PTs, 83% of them male and 17% female. Student numbers are currently increasing substantially year on year (MHRD, 2016b), providing further evidence of the scale, relevance and importance of these institutions. PTs are relatively evenly distributed across states, although urban regions and metropolitan areas tend to have considerably higher proportions of such intuitions than rural regions (MHRD, 2016a). Special ‘Community PTs’ have been created to support the teaching of technical skills in rural areas and to promote development in these areas (MHRD, 2009). ‘Women’s PTs’ are another special form of PT and focus on providing technical training for women. They often have a more specialised profile than mainstream PTs and aim to meet women's specific needs

8 For model curricula, see: https://www.aicte-india.org/education/model-syllabus#.
and aspirations, for example, they focus on labour market relevant subjects for women like design, fashion and beauty (Goel, 2011).

As higher education technical institutions, Indian PTs are structurally affiliated to the Ministry of Human Resource Development (MHRD). The All India Council of Technical Education (AICTE) administers and accredits PTs (AICTE, 2017), but the institutions themselves sometimes operate very differently from one state to another. The reasons include the federalist principle that underpins the Indian Union and the differences between states in terms of economic structure and training needs. The State Boards of Technical Education play an important part here, as they coordinate the activities of PTs within individual states. They also oversee final examinations and issue diplomas (Singh, 2011; Norric, 2006). Standardised federal-level accreditation by the AICTE does, however, mean uniformity in key aspects of the design of PTs. The AICTE also oversees curriculum design and standardisation of syllabuses (Mehrotra, 2016).

In terms of financing and legal status, there are three main groups of PTs. Some are private and finance all their costs themselves, meaning that they have to charge higher student fees. Others are trusts funded by non-profit or religious bodies; some of these PTs do not have AICTE recognition or accreditation because of poor quality, and their status is, therefore, marginal. A distinction is also made between government and government-aided PTs. Government-aided PTs have private status but receive substantial public sector funding, whereas government PTs are in public ownership and all their costs are met centrally.

PTs have a long history in India and were initially influenced by the British education system because of the country’s colonial past. Following the 1937 Abott-Wood report, technical and vocational education in India was reorganised, with a drive to develop and expand the PTs. The first PT was set up in Delhi in 1941 (Singh, 2011). Over the years, there were then further reforms of PTs (including in 1959 by AICTE), with the main objective of improving quality. Over time, the number and breadth of courses on offer also expanded. Further major reforms included the introduction of post-diploma courses (Singh, 2011).

Vocational training in India faces a number of different challenges and problems related to PTs (Kotamraju, 2014). In some cases, for example, their equipment and infrastructure are inadequate to meet demand. Depending on their legal status, their financial basis is sometimes insecure and, in some instances, is inadequate to enable them to provide high-quality teaching. Inadequate training for teachers and other staff and outdated curricula are major problems for the Indian VET system and the PTs in particular. This makes it difficult to compare individual PTs with each other: the quality they offer is very different (Goel, 2011).
2.3 Colleges and universities

Higher education institutions in India fall into three major categories – universities, colleges and stand-alone institutions – and over recent years, their number has risen rapidly (MoLE, 2017; Khare, 2016). The majority of Indian students are enrolled at one of more than 39,000 colleges, which are affiliated to a university and award degrees from that university. Some universities have several hundred affiliated colleges, which are, however, relatively autonomous in terms of what they teach and have only an administrative link with the university in question (DAAD, 2017). A distinction also exists between public and private universities (Khare, 2016).

The degrees awarded are Bachelor’s, Master’s and pre-Doctoral and Doctoral degrees (Wessels & Pilz, 2018). There are marked differences between educational institutions in terms of quality (Khare, 2016). While, for example, Indian Institutes of Technology (IITs) carry out cutting-edge research, many other universities lag behind their international competitors.

Students wishing to gain admission to a tertiary-level educational institution must successfully pass the All India Entrance Exam. Most school-leavers attempt the test on completion of 12 years of education. Access to higher education continues to depend largely on socioeconomic status and tends to be confined largely to those living in urban areas (Wessels & Pilz, 2018).

3 Research focus and theoretical approach

As noted above, the PTs are of great relevance to India’s system of formal vocational education and training. Despite this, however, there is a shortage of research into this form of training. Understanding the role of PTs is central to appreciating the status quo and potential of India’s (vocational) education and training landscape, particularly against the backdrop of initiatives to reorient and restructure the country’s VET system. Policymakers and training experts regard this system as a key factor in reducing social inequality and improving the effectiveness of the Indian private sector (Majumdar, 2016). In this respect, the PTs can also contribute a part to the human-centred development of India with its implications, e.g. in relation to human rights, well-being and empowerment (McGrath, 2012).

This article therefore analyses the roles and functions of the PTs in relation to a range of groups within India’s VET system. It also sheds light on the relationship between the formal part PTs play in the system and their systemic role.

In terms of systemic embeddedness, the focus is on the education system itself. This perspective differs from the immediate perspective of individual stakeholder groups. The systemic embeddedness of PTs brings together the claims and aspirations of all stakeholder
groups with regard to the institution. The actual form of the institution also reflects the influence and power relationships of the stakeholder groups involved (see below). At the same time, the current education system reflects historical structures and therefore illustrates the negotiation processes through which stakeholder groups have passed (see below).

This line of argument reflects the tradition of “historical institutionalism” and is discussed in detail by Thelen (1999), Pierson (2004) and Bulmer (1998). On an eclectic basis, historical institutionalism explicitly addresses the origins, transformation and functions of institutions.

This shows that functions play a central role in historical institutionalism and help to answer the research question. In this school of thought, institutions are defined by their functions for rational and self-interested actors. Institutions exist, therefore, because they provide efficient solutions for actors. And this means that institutions arise, exist and evolve for a reason and fulfil a specific function with a specific benefit to actors. However, this may change over time as a result of interaction between actors. Interaction between actors and institutions is therefore central to considering institutionalism (Steinmo & Thelen, 1992) (Historical) institutionalism argues that actors act according to their own self-interest. However, they do so within a previously defined framework of social institutions and norms. Social norms influence the preferences of the actors and, thus, their actions (Hall & Taylor, 1996). In the Indian context in particular, social norms play a prominent role.

Furthermore, the origins of institutions are analysed primarily in terms of path dependency (Pierson, 2004), while change is addressed predominantly in terms of critical junctures (Mahoney & Thelen, 2010). Both approaches offer insights into the formal attribution of functions to PTs.

Thelen (2004) turns the spotlight of historical institutionalism on skills development, which is helpful because, as vocational schools, Indian PTs form part of the country’s skills development system. Thelen argues that skills development underpins development of other systems: “Vocational training institutions occupy a central role in most characterizations of the various political-economic systems [cited above] – and for good reason. Skills are associated with a variety of outcomes of interest to political economists” (Thelen, 2004, p.8). Thelen has also investigated the institutional origins of skills development in a range of countries (Thelen, 2004).

Busemeyer (2014) uses Thelen’s historical institutionalism approach and refines it by combining it with the partisan approach, to sharpen the focus on the roles of institutions. He establishes an even more explicit link between the stakeholders within an institution and the functions of that institution.

The approaches outlined above illustrate clearly the fundamental importance of stakeholders in the origins and development of an institution as well as in its future functions.

To enable us to survey the stakeholders within PTs relevant to our research question, the article uses the approach of stakeholder analysis as part of stakeholder research (Fullan, 2007;
The function and institutional embeddedness of Polytechnics

Pilz, 2012). Specifically, it uses an analytical stakeholder model (Berger & Pilz, 2009), which explicitly portrays the benefit and function components of a range of target groups specifically in the context of vocational training. This stakeholder model enables the functions of the PTs to be assigned to stakeholders and facilitates the description, formulation and evaluation of data collected. This model introduces the four stakeholder groups listed below, which form the basis for application of the typology to the Indian PTs.

**The individual**
Vocational training is a key component in an individual’s financial independence and success. The individual benefits from robust training in terms of securing a good income and positive prospects for the future (CEDEFOP, 2011a).

**Employers**
Employers need workers with vocational skills to enable them to sell their products or deliver their services. They therefore benefit substantially from vocational training, which gives them access to knowledge, competencies and expertise that will add productive value to their company (CEDEFOP, 2011b).

**Society**
Vocational training is a practical way of reducing social inequality. It also develops general social values that encourage individuals to play an active part in social development (CEDEFOP, 2011b).

**The economy**
An efficient system of skills development and, hence, a functioning vocational training system are key to a nation’s economic development. Skills development is one of the keys to the development of other, related, systems (Thelen, 2004), and the stability of an economy relies on having an effective skilled workforce (CEDEFOP, 2014). PTs are a basic part of India’s vocational training system.

4 Methodological approach

The data collection approach may be described as qualitative and exploratory (Flick, 2014). Structured and problem-centred face-to-face interviews were conducted for the study. A total of 14 interviews were conducted over a period of four weeks with the principals of 14 local PTs. Principals were the obvious subjects to interview, because their management role gives them an overview of their institution and the interests of the stakeholders involved. Moreover, as intermediaries between the state agencies that set regulations and the teaching staff who have to implement these regulations, they bring together a number of aspects.
Most of the interviews were in urban centres (including Bangalore, Delhi and Mumbai), where most PTs are based. The team also visited a rural PT and three Women’s PTs in Delhi and Bangalore. The PTs included in the study were located in a range of states, taking account of the differences between states. The specific selection of PTs locally was determined by the willingness of the institutions to take part. Access to the institutions was organised in cooperation with local research partners.

To balance the responses of the PT principals and to contextualise them, two interviews were also conducted with the relevant authorities and State Boards in Bangalore and Delhi.

To guide and steer the interviews and discussions, a semi-standardised set of interview guidelines was drawn up in line with theoretical models, enabling interviewees to speak openly on the areas under discussion but also to expand on areas they considered important (Flick, 2014).

The guidelines were structured into three main categories, with several subcategories. Category A included a range of general questions about the PTs under consideration, such as their legal status and funding basis, the number of students they taught, and the educational programmes they offered. Category B included questions on the content orientation of PTs, their functional aims, and the socio-economic background and employability of their students, such as “Which careers do your graduates choose after graduation?” Category C, finally, focused on the embeddedness of the PTs and their comparison with other Indian educational institutions, asking questions such as “What are the specific structural characteristics of PTs in comparison to ITIs or colleges?”.

The principals participated voluntarily in the survey, with no material incentives to do so.

The interviews were recorded electronically so that a verbatim record could be obtained of the interviewees’ responses. Most interviews took between 50 and 90 minutes, depending on how informative each interviewee was. The interviews were conducted in the principal’s office as part of a visit to the PT, and in some cases, other faculty were present during the interviews. Interviewees were able to express themselves clearly in English, so the interviews were conducted in that language without the need for an interpreter. The guidelines were scrutinised by several local experts with regard to the cultural component.

Mayring’s (2000) open analytical tool was used to analyse the data gathered and devise categories on the basis of qualitative content analysis.
5 Findings on functions and institutional embeddedness

This section of the article sets out the findings of the interviews with PT principals in line with Mayring's (2000) approaches to qualitative content analysis. The categories (graduates' skills mix; graduates' skills level; PTs as a path to higher education; skills development for self-employment; a broad range of specialisation; and integration of socially disadvantaged groups) are derived from the material (semi-structured interviews with principals) and represent a simplification of the data to a manageable basic form. The categories reflect the major interview findings and help to extract relevant information from the responses given by PT principals.

The categories enable statements to be related to the various stakeholder groups (the individual, employers, society and the economy). The statements made by interviewees are assigned to the stakeholders from the stakeholder model. The statements made by interviewees, the categories and the stakeholders addressed enable the functions of the PTs to be categorised according to stakeholder group in a subsequent stage. This then leads finally to identification of the embeddedness of PTs within the education and training system.

5.1 Graduates' skills mix

The principals reported that diploma holders, like ITI graduates, are considered blue-collar workers but actually carry out a supervisory role. They have an understanding of problems and a critical view of their profession:

“They can express and communicate, but they also have hands-on skills.”

(DP4: PT principal from Delhi)

These hands-on skills are, according to the principals, what distinguish PT graduates from engineers with degrees and make them very attractive to potential employers. Companies need employees who not only have a solid theoretical foundation but can also operate the machinery. The principals also argued that diploma holders have an advantage over college graduates, whose knowledge is wholly theoretical, because the practical elements in their curriculum are a key building block. The State Boards maintain contact with representatives of industry and adapt PT curricula to the needs of employers. The problem orientation that helps diploma holders to take a practical approach to solving complex technical problems is a further aspect distinguishing them from ITI graduates, said the principals: the mix of solid theoretical knowledge and practical know-how gives them a decisive edge. This suggests some conclusions about the status of PTs within the education system: they are viewed as part of vocational training because they teach practical vocational skills but they also teach
Schneider, Pilz

Theoretical knowledge and so provide a (pre-)academic training. Most PT graduates find employment in small and medium-sized companies:

“The practical part really adds to the profile of diploma holders compared to others.”

(MP4: PT principal from Mumbai)

PT principals also alluded to the abilities of diploma holders to learn and adapt on the job. The assumption is that after two or three years’ experience in industry, they are just as productive as college graduates. From companies’ perspective, recruiting a diploma holder offers the further advantage that these individuals have lower salary expectations than degree-level engineers yet perform very well.

**Functions from a stakeholder perspective:**

The responses of the principals illustrate the added value for the individual of a PT training in terms of acquiring both theoretical and practical vocational skills.

Indian companies also benefit from this skills mix. This combination of high-level theoretical and practical knowledge is unique within the Indian education system (see Norric, 2006) and is a valuable resource in practice: PT graduates serve as a crucial interface within a company and bridge the gap between college graduates in management roles and manual employees with ITI qualifications. Employers have a particular interest in PTs because these institutions equip workers with both theoretical and practical knowledge.

**Systemic embeddedness:**

The PT produce graduates with both theoretical and practical knowledge, a unique characteristic at this level of the Indian education and training system. ITIs teach almost exclusively practical skills – and at a low level – while colleges teach solely theoretical academic knowledge (Mehrotra et al., 2014).

**5.2 Graduates’ skills level**

Interviewees regarded the PTs as a link between different parts of the education and training system and saw their role as that of producing trainees with a competency level above that of those with ITI qualifications. ITI trainees carry out standardised craft roles or basic industrial roles, whereas the focus in PTs is on developing higher-level blue-collar skills. Once employed in companies, diploma holders can take on supervisory positions, reflecting their superior place in the hierarchy over ITI graduates. Interviewees argued that diploma holders are responsible for monitoring and supervising production processes and, therefore, the work of subordinate ITI graduates. In the internal hierarchy, diploma engineers occupy
a superior position to ITI graduates but rank below college graduates, who tend to focus on planning, organisation and management roles.

In the view of the principals interviewed, the aim of the PTs is to produce employees with high skills levels. Those who have undergone PT training should demonstrate not only practical skills but also an awareness and understanding of problems that helps them critically to deploy the specialised skills required for their role. And this, the principals argued, distinguishes diploma holders from ITI graduates:

“The education in an ITI is on a lower level than [in a] PT. The ITI wants to educate semi-skilled workers for the shopfloor while diploma holders work on a supervisor level.”

(MP1: PT principal from Mumbai)

Nevertheless, argued the principals, Indian society persists in its view that academic training can provide high-level skills – what Indians still regard as the “measure of all things” (Jambo & Pilz, 2017). As a result, there is evidence of a push towards academic training, with PTs being regarded as second-best, especially in the area of engineering. Despite this, the competency levels of diploma holders confer a range of advantages on the labour market, according to the principals:

“They work with [their] hands, which is not possible with degree graduates from College because they work as white-collar [workers].”

(MP1: PT principal from Mumbai)

Functions from a stakeholder perspective:

Individuals with PT qualifications benefit by being able to select a training institution that offers them an opportunity to develop intermediate-level skills. The skills and expertise they acquire at a PT enable them to find appropriate employment in a company.

Companies’ needs for employees with skills profiles tailored to their activities are, therefore, being met through the skills that PT graduates bring to the labour market. PTs supply Indian companies with mid-range skills that enable these companies to meet their production or service requirements. The companies therefore view the PTs as a source of skilled labour.

Systemic embeddedness:

Statements made by the principals show clearly that in terms of its ability to train workers for the labour market, India’s VET system has three levels of skills preparation. This is borne out by the work of Rao et al. (2014). Low-level manual shopfloor roles are filled by unskilled or semi-skilled workers with ITI training, while college graduates fill white-collar roles. Bridging the gap between these two groups are those who have a PT training. No other
5.3 Polytechnics as a path to higher education

The principals interviewed argued that many trainees regard PTs as merely a way-stage on the path to a college education, noting that increasing numbers of young people are taking up this route:

“Many students go to engineering college after they graduate here.”

(BP2: PT principal from Bangalore)

The principals identify a number of reasons. First, society continues to regard academic training as the “gold standard”, with vocational education viewed as second-best. The reasons for this lie in the nature of Indian society and have been the subject of intensive debate (Mehrotra, 2012).

The VET system in engineering also offers some porosity. As a result of their upward mobility, diploma holders can enter directly into the second year of an engineering degree course (MSDE, 2016). The original pattern of 10 + 2 + 4 years (general secondary + higher secondary + college (degree)) therefore becomes 10 + 3 + 3 (general secondary + polytechnic (diploma) + college (degree, with direct entry to year two) as students skip the senior secondary examination, usually taken after 12 years of education, and move to a PT after 10 years and the SSC. Once at a PT, students acquire initial theoretical and practical training in engineering, preparing them better for a college course in engineering than the typical 10 + 2 + 4 year pattern (MSDE, 2016):

“I recommend to do 10 + diploma, then degree [from] second year. We give them a lot of hands-on experience which doesn’t come in 10 + 2 – physics, chemistry, experience in engineering and other things.”

(DP3: PT principal from Delhi)

Functions from a stakeholder perspective:

The statements from PT principals show clearly that individuals benefit particularly from this approach. By attending a PT, graduates acquire not only a vocational qualification but also the opportunity to switch to a college once they have their diploma. This function of PTs also illustrates the potential porosity between training courses and routes. Smooth transitions between different types of training underpin a functioning education and training system that benefits not only the individual but also society generally (Tuck, 2007).
Against the background of institutionalism theory, the results clearly show that actors act according to their self-interest: individuals maximise benefits to themselves by achieving the highest educational attainment, which is recognised and valued within their social environment. This demonstrates that PTs are increasingly perceived as a route to higher education and less as a means of obtaining a supervisor-level job in the labour market.

**Systemic embeddedness:**

The responses of the principals demonstrate that successful students have the opportunity not only to access the labour market but also to move to a higher training institution (a college). This gives PTs a bridging function and enables diploma holders to go on to further academic training. Those successfully completing an ITI course can also move on to a PT.

### 5.4 Skills development for self-employment

The PT principals made it clear that alongside employment in a company or further study at a higher education institution, graduates have a further opportunity. Many PTs view their role as training students to move into self-employment. Graduates, too, see self-employment as a realistic and meaningful option on completion of their diploma. Trainees at other types of institution, and even those without formal qualifications, can of course opt for self-employment, particularly in India’s sprawling informal sector, but diploma holders see this route to running their own business as particularly meaningful because of the broad practical and theoretical training they receive (see above), which makes them highly competitive commercially and opens up long-term market opportunities:

> “Many students choose to be self-employed after they leave our PT. They can easily use their skills which they acquired from us on the market.”
> (BP3: PT principal from Bangalore)

This is particularly relevant to courses delivering skills that lead relatively easily to self-employment, such as courses at women’s PTs in interior design, beauty culture and tourism:

> “Lot of girls want to be self-employed, because the courses they choose match well with self-employment.”
> (MP4: PT principal from Mumbai)

Running their own business is also, however, a popular choice for both male and female PT students. The particular emphasis of PTs, which offer a range of courses and link theoretical and practical knowledge, makes it especially attractive for PT graduates of both genders to pursue self-employment.
Functions from a stakeholder perspective:

Two main stakeholder groups benefit from skills for self-employment. The first is individual students: self-employment represents a further option on the Indian labour market, which is particularly important given the country's large informal sector (Pilz et al., 2015; Pilz & Wilmshöfer, 2015, Schneider & Pilz, 2018). The solid theoretical and practical training that PT graduates receive enables them to earn an adequate income from self-employment, unlike many who are self-employed within India's informal sector (Pilz et al., 2015).

This aspect also benefits the economy as a whole. Self-employment brings graduates onto the labour market and helps reduce high levels of youth unemployment (ILO, 2016) as well as creating new (micro-)businesses that contribute to India's economic development.

Systemic embeddedness:

Other types of institution, such as ITIs, also claim to build skills for self-employment. However, PT graduates appear to benefit from improved prospects of success if they embark on this route. This may reflect the link between theoretical and practical skills, which is particularly important for self-employment. As noted above, this link is much less marked in both ITI and college courses.

5.5 A broad range of specialisation

Indian PTs offer a wide range of specialisation, including hotel management, food production, banking management and renewable energy. By providing training for staff in a range of sectors, the PTs are helping to keep the private sector flexible:

“We offer courses in our PT no-one else is offering in this area.”

(BP1: PT principal from Bangalore)

If the private sector has access to a pool of staff with differing areas of specialisation, it will be able to react to the changing face of the economy. The relatively short duration of courses (mostly three years) means that companies can react quite quickly to economic change, and PTs are often the only institutions to offer certain specialised training. They also specialise in target interest groups (e.g., women). Nevertheless, the most popular courses at PTs remain those in technical, mechanical and electrical engineering, although the principals interviewed alluded to a tangible change in demand for non-technical vocational courses:

“We feel that there is a shift in the economy to the service sector. We [have been] offering courses in business and services for a long time and are able to widen them.”

(MP3: PT principal from Mumbai)
Meanwhile, courses are now being offered in highly-specialised fields, such as ceramics technology and photography, to meet growing niche requirements from the private sector.

**Functions from a stakeholder perspective:**

The diverse range of courses on offer within PTs benefits the private sector and employers particularly. Unlike other training institutions, PTs often operate within training niches and are an important source of skilled labour for private sector companies. Without the skills of graduates in this wide range of subjects, companies in many specialised areas would struggle to recruit trained staff. Indian employers benefit, too, from significantly shorter induction and on-the-job training times.

**Systemic embeddedness:**

PTs offer the Indian training system a wide range of specialised courses that are not available in other institutions. College courses, for example, are often more general and have a less specialised focus, so induction periods for college graduates are longer.

**5.6 Integration of socially disadvantaged groups**

India’s PTs help to integrate a number of different social groups, such as those living in rural areas. The Community Development through PTs (CDTP) programme has set up a number of PTs whose profile is tailored to the needs of rural populations with the stated aim of improving their skills and promoting rural development (MHRD, 2009).

The country also has many Women's PTs, whose profiles are tailored to female students and take account of gender-specific occupational profiles and needs, for example through courses in areas including early childhood education, fashion design and library sciences. As part of the data collection for the study, the project team visited a number of different Women's PTs. The individual profile of these institutions, argued the principals, promotes development among female students and helps them acquire a solid training in areas not offered elsewhere (Goel, 2011):

“Our [Women's] PT helps the girls to develop sufficient skills in the fields of their own interest.”

*(DP1: PT principal from Delhi)*

Statements by the principals make it clear that many students from the lower and middle social strata attend PTs. Many PT graduates are also the first in their family to enter higher
education, which — say the principals — promotes porosity between social classes and social integration:

“Many of our students are the first in their family to be at a higher education institute.”

(DP2: PT principal from Delhi)

PTs therefore help to support a range of socially disadvantaged groups in their development by offering them opportunities to acquire solid vocational skills.

**Functions from a stakeholder perspective:**

Individuals from diverse marginal social groups are advantaged by having the opportunity to attend a training institution such as a PT.

Meanwhile, integrating diverse population groups also strengthens social cohesion. PTs enable students from a range of social classes and groups to obtain good training, helping to integrate them in society.

**Systemic embeddedness:**

In a fragmented society like India in particular, where membership of a particular religious group, caste or gender can result in substantial disadvantage (Bhagavatheeswaran et al., 2016), the role played by PTs in social integration is vital. There is some limited evidence that ITIs also contribute to social integration, but little evidence within colleges. Unlike these other types of institution, PTs offer particular opportunities to socially disadvantaged groups, such as through community and Women’s polytechnics. Moreover, while colleges formally set out to integrate a range of socially disadvantaged groups, this often proves difficult, for example self-selection by students (Arulmani & Nag-Arulmani, 2006).

6 Discussion: are Indian Polytechnics the “hidden champions” of the education system?

To systematise these findings as functions of PTs requires recapping some of the key factors of the education and employment system in India. The first is the trend towards higher-level qualifications. Completing a course of academic study enjoys very high recognition in Indian society, whereas vocational training is regarded as second-best or even discounted entirely (Agrawal & Agrawal, 2017).

Second, manual occupations are associated in India with dirty and dangerous working environments, poor pay and poor prospects (Tilak, 2002). These jobs tend to be reserved for individuals from lower castes (Arulmani & Nag-Arulmani, 2006).
Third, India has an exceptionally large informal economy, in which skills development is also often very informal (Sodhi, 2014; Sodhi & Wessels, 2016) but that, in the case of larger employers, can require a certain level of specialist expertise.

Against this backdrop, PTs fulfil a kind of “multidimensional bridging function”. Firstly, they bring together vocational training with elements of academic education, helping to reduce social stigma and signalling a valuable social reputation and recognition by companies and employers. Secondly, however, by linking practical and theoretical learning, they also meet the needs of Indian employers, who depend crucially on a supply of well trained and skilled workers with intermediate-level qualifications (Goel, 2011). Thirdly, the PT graduates themselves benefit, of course, but so too, particularly, SMEs because – unlike large companies – they cannot afford their own internal skills training systems (Mehrotra et al., 2014). The fourth and final aspect of this bridging function is that PTs offer their graduates excellent opportunities to set up a successful business within the informal economy on the basis of the skills a diploma gives them. This applies not only to young people from a privileged social background or higher castes but also to socially disadvantaged groups. By attending PTs, these groups are able to set up their own business, earn a living and rise up the social ladder.

A range of stakeholder groups therefore benefit from the existence of PTs. As described in the institutionalism approach, the various functions illustrate the interests of different individual actors. However, institutional change also manifests itself when the preferences of an interest group change. From a historical perspective, it can be said that individuals are currently the dominant and most lasting influence on the transformation of functions through their choices concerning the use of PTs as a route to higher education.

The historical development of this decision by individuals therefore means that greater use is being made of PTs as a route into academic training to the detriment of their role as providers of skills for employers and the labour market.

The demand for PT education is steadily growing, as evidenced by the rising numbers of students, but potential applicants increasingly have a different focus, and their ambitions are changing. Loftier ambitions on the part of individuals can be explained by the improvement in opportunities as a result of political reform – including for socially marginalised groups – and the rapid pace of social change as well as the strong focus on status and on an academic education as the “gold standard” in Indian society.

At the same time, there are indications that employers are seeing a decline in their influence on PTs, as they are increasingly having to compete for graduates. From the employers’ perspective, one solution to this problem is to intensify contacts between employers and PTs, e.g. through the provision of internships or the increased inclusion of compulsory internships in companies in the curricula. This could strengthen both the influence of employers on the PTs and the role of PTs as a source of skilled labour. This illustrates that the functions
described from a historical institutionalism approach are constantly changing as stakeholders’ preferences evolve.

Despite the change in functions over time, the findings set out above clearly show that this kind of “multidimensional bridging functions” is confined to the PTs. Against a backdrop of systemic embeddedness on the one hand and the lack of social and academic regard for the PTs on the other, these institutions can truly be regarded as the “hidden champions of the Indian education system”. Detailed analysis of statements by PT principals shows, however, that they make no differentiation in terms of the type of skills taught. At international level, schools have the role of promoting talent and careers (Ballantine & Hammack, 2012), yet the principals interviewed did not touch on this area. The internationally recognised functions of education processes – e.g. selection, legitimation and socialisation (Meyer, 1977; Fend, 2002; Cheng, 1996) – are also missing, even indirectly, from the statements made by the principals despite the fact that the interview guidelines made provision for discussing these aspects. It also became clear during the study that principals take a very positive view of the form of their own institutions and do not mention critical aspects and problems, despite these being well known from the literature and despite the interview guidelines offering scope for critical comments (see 2.2). This can be explained by the fact that the principals want to defend their own school form and therefore avoid negative statements in front of researchers in order to avoid unfavourable changes in the school form from their point of view. This paradox has already been evident in other research projects in India (see Jambo & Pilz, 2017, inter alia).

According to the principals interviewed, the central purpose of a PT is to provide skilled workers for the labour market. Meanwhile, before they begin their training, the majority of students want to gain rapid access to the labour market and quickly to be in a position to support their families financially, while many prefer to go to college after completing their studies at a PT.

The fact that the principals largely ignored the more general functions of the education system may well be attributable to the fact that their working routines require them to focus solely on the micro-level of local needs of stakeholders rather than, more abstractly, on the macro-level of the education and training system (Jambo & Pilz, 2017).

7 Conclusions

The findings permit some conclusions regarding the embeddedness and functions of PTs within India’s VET system. It is clear, for instance, which functions PTs perceives for the actors (function), where the PTs are classified in the vocational training system, and how they are integrated into the Indian system (embeddedness).
The stakeholder model was used to provide detail in the study, to analyse, structure and attribute the findings to the relevant actors and to establish the relationship with the theoretical approach of historical institutionalism. Nonetheless, the study cannot claim general validity because of its limited sample size. The sole focus on PT principals is a further limitation: it would be desirable to survey all stakeholder groups to broaden the basis. On the other hand, the study provides valuable insights into the PTs as an institution, enhancing understanding of them by presenting their functions from the point of view of different stakeholders and their embeddedness in the Indian VET system.

Principals felt that, overall, PTs fulfil a range of functions for a range of stakeholder groups. In this regard, they are systemically unique because of the “multidimensional bridging function” they fulfil. Against the backdrop of their low social and academic status, they can then be recognised as the “hidden champions of the Indian education system”.

The findings described here are of interest not only to India but also, potentially, to other countries where the education system has similar structural and/or stakeholder functions.

The findings also demonstrate a need for further research, for example longitudinal studies, to generate detailed analysis of successful transitions by PT graduates to the Indian employment system.

References


Gupta, V., Raman, C., & Krisanthan, B. (2016). Secondary (9-10) and higher secondary (11-12) education: Preparation for the world of work. Secondary and higher secondary education in India. In M. Pilz (Ed.), *India: Preparation for the world of work* (pp. 41–64). Wiesbaden: Springer VS.


The function and institutional embeddedness of Polytechnics

Khare, M. (2016). Higher Education / University: Taking the skills march forward in India – Transition to the world of work. In M. Pilz (Ed.), India: Preparation for the world of work (pp. 103–140). Wiesbaden: Springer VS.


Majumdar, S. (2016). Foreword: Reflections on opportunities and challenges of skills development in India. In M. Pilz (Ed.), India: Preparation for the world of work (pp. 7–14). Wiesbaden: Springer VS.


Pilz, M. (2016). Introduction: Why India’s focus on preparation for the world of work is highly relevant. In M. Pilz (Ed.), India: Preparation for the world of work (pp. 15–23). Wiesbaden: Springer VS.


The function and institutional embeddedness of Polytechnics


Biographical Notes

Sebastian Schneider, M.Sc. is a research assistant and PhD candidate within the Chair of Economics and Business Education at the University of Cologne. His research interests include international VET research with the focus on India as well as the perceived value of vocational education and training.

Prof. Matthias Pilz holds a qualification in commercial education and is Professor of Economics and Business Education at the University of Cologne. He is Director of the German Research Center for Comparative Vocational Education and Training (G.R.E.A.T.). His major research areas include international comparative research into vocational education and training, transitions between training and employment, as well as teaching and learning.