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Experiences of Educational Content in Swedish Technical Vocational Education: Examples from the Energy and Industry programmes

Abstract: In this study, teachers and workplace supervisors in two vocational programmes at a Swedish upper secondary school were interviewed about their experiences of what is important to teach and learn during vocational education. The interviews were analysed thematically by the qualitative method analysis of narratives concerning what the informants talked about concerning the educational content. The told experiences of educational content concern five themes: *basic knowledge, assessment, different educations, interest* and *integration of theory and practice*. These themes relates to different levels of knowledge, from basic knowledge to learning to learn.

Keywords: Educational content, Employability, Experiences, Technical vocational education, Qualitative methodology

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INTRODUCTION

In relation to technical vocational education there are different interests and expectations concerning the content of the education. The various stakeholders such as future workplaces, students, schools and society can have different perspectives and different learning arenas. For example, schools and workplaces offer different kinds of learning (Aarkrog, 2005; Gulikers, Baartman, & Biemans, 2010; Iannelli, & Raffe, 2007; Johansson, 2009). It has also been stated that there is a gap between learning at school and the workplace that needs to be bridged (e. g. Illeris, 2009).

In Sweden, a trial apprenticeship scheme was run between 2008 and 2011 in order to bridge the gap between school and workplace learning. In this trial, the upper secondary vocational programmes were conducted in both learning arenas, that is, both school and the workplace. During the three year education, vocational students spent half the time at school and half the time at a workplace under supervision from other workers at the workplace (Sveriges Riksdag, 2009). In 2011, new syllabi came in in

Sweden; since then, this dual system has been fully implemented as an eligible alternative to the traditional programmes, which include only 15 weeks in the workplace (Regeringskansliet, 2008).

The teachers and workplace supervisors in this study taught in two different vocational programmes, known in Swedish as *energiprogrammet* (“the Energy programme”) and *industriprogrammet* (“the Industry programme”) and were involved in creating opportunities for learning. This study aims to broaden understanding about what these educators choose to emphasize as regards learning content and what they consider needs to be thought and learnt in vocational education. The research question in this study is:

- What do teachers and supervisors experience as important to teach and learn in these two technical vocational programmes?

The study was part of a three-year project called the *LISA* study (Learning In Several Arenas), where experiences of teaching and learning in the energy and industry programmes in a Swedish upper-secondary school were in focus.

EDUCATIONAL CONTENT

Today’s society is changing and technological development is moving rapidly. It is important to discuss the content of technical vocational education in order to offer well-functioning and relevant educational programmes. Learning in the workplace often includes more than what is stated in the syllabi; the focus is on learning for life in general and for working life in particular (Baartman & de Bruijn, 2011; Berglund, 2009; Lindberg, 2003). Fejes and Berglund (2009) discuss the concept of employability from different perspectives and writes that making students employable is an important aspect of planning vocational programmes. Johansson (2009) also emphasises the connection between learning and usability in vocational education. Furthermore, Johansson mentions the general lack of teaching material, which gives the vocational teachers an important role in choosing course content. Previous research has also addressed the issue of assessment, looking at *what* should be assessed in vocational education, and how to ensure a comparable education among schools and countries (Gulikens et al., 2010).

Previous research also stated that different learning arenas offer learning of different kinds of knowledge (Aarkrog, 2005; Illeris, 2009). Illeris writes that the mixed school/apprenticeship model offers opportunities for socialisation and practical

learning in the workplace in addition to the more theoretical learning and generic skills that can be developed at school. Furthermore, Illeris writes about different learning and knowledge types in vocational education and argues that even if some learning processes and knowledge types are more complex and demanding, they should not be seen as better than other types of knowledge; instead, they should be seen as complementary. Illeris argues that all types of knowledge are vital to “build up the capacities and competences of an individual” (p. 144). There has also been a discussion about how work-specific the learning content in vocational education should be. Lindberg (2003) writes that there is a difference between what vocational teachers see as vocational knowledge and what knowledge should be focused on in vocational programmes. The upper-secondary vocational programmes are also too short to provide students with all the skills they need for the future. Lindberg’s study recommends that vocational programmes prepare students for their future vocations, while assisting them to become citizens and to develop an ability to learn.

Previous studies have looked at how some generic vocational skills – such as cooperation, flexibility and responsibility – might be learned in vocational education (Illeris, 2009). When it comes to problem-solving, however, Middleton (2002) states that it is hard to create an educational programme that prepares students for the problems that they will be confronted with in the future, since problems are often not generalizable. In dealing with the demands of the future, many studies focus on the importance of learning to learn (Bransford & Schwartz, 1999). Bransford and Schwartz point out the risks involved with an exclusive focus on learning to learn, including the possibility of schools not taking responsibility for learning content and leaving students to prepare themselves for the future. Researching what is experienced as important to learn by those working in vocational programmes can provide valuable information.

A QUALITATIVE METHODOLOGY

The ontological point of departure in this study is the phenomenology of the *lifeworld* (Bengtsson, 2013). The assumption is that the world is experienced differently, depending on one’s perspective, position and previous experiences. The focus of research with the lifeworld as ground is the world as it is experienced, making both empirical data and a qualitative research method necessary in the examination of different phenomena (Bengtsson, 1999). The narrative method used in this study is seen as providing access to lived experience (compare Kilbrink, 2013). The point of departure in narrative research is that for every phenomenon studied, there are different voices to be listened to (Clandinin & Connelly, 2000). In the vocational

system focused on in this study, both teachers at school and workplace supervisors are involved in creating opportunities for learning. In order to reach teachers' and supervisors' experiences, semi-structured, qualitative interviews were conducted (Cohen, Manion, & Morrison, 2000) and their narratives were analysed thematically (Lieblich et al., 1998).

Selection of Informants and Ethics

The informants all participated in the *LISA*-project. *LISA* stands for *Learning In Several Arenas* and in the project we focused on teaching and learning in school and workplaces in two Swedish vocational programmes. The Energy programme educates future plumbers, while the Industry programme educates future workers in industry. These vocational programmes were parts of a dual school system where half of the programme consisted of workplace training. Vocational teachers were responsible for the program specific education at school and at the vocational workplaces the students had a supervisor who was working as a plumber or as an industrial worker. A deliberate selection process was used (Cohen et al., 2000) with the informants all involved in the Energy or Industry programmes. In this study, the focus is on the teachers' and the supervisors' experiences. The Swedish Research Council's research ethics were followed in the project (Vetenskapsrådet, 2002) and all informants have given their written consent to participate in the study.

In order to be able to answer the research question, four group interviews with teachers and supervisors and six individual interviews with two teachers and four supervisors in the Energy and Industry programmes were conducted and these serve as the empirical basis for this study (see Table 1 below). All informants have been given fictive names. The two teachers are called Erik (from the Energy programme) and Ivan (from the Industry programme) and the four supervisors are called Ernst and Evert (plumbers) and Ingemar and Ingvar (industrial workers). The first letter refers to the programme they taught in.

Table 1 Interviews and Informants

Interviews and informants	Length (min)
Group interview: Energy program (Teacher Erik and supervisor Ernst)	87
Group interview: Industrial program (Teacher Ivan and supervisors Ingemar and Ingvar)	54
Group interview: Supervisors (Ernst from the Energy program, Ingemar and Ingvar from the Industrial program)	64
Group interview: Teachers (Erik from the Energy program and Ivan	60

from the Industrial program)	
Two individual interviews with teachers (Erik from the Energy program and Ivan from the Industrial program)	52, 27
Four individual interviews with supervisors (Ernst and Evert from the Energy program and Ingemar and Ingvar from the Industrial program)	40, 68, 31, 20
<i>Total amount of time for interviews</i>	503

The interview questions were designed to ascertain what the informants thought was important to learn at school and in the workplace and what knowledge and skills they considered important in vocational programmes. The interviews were semi-structured, and the questions were formulated in a way that allowed for the interviewees to talk about their concrete experiences. The answers were followed up with further questions, and so the interviews evolved differently, depending on what the teachers and supervisors chose to tell. The experiences they related are seen as narratives (compare Kilbrink, 2013). The interviews were audio recorded and thereafter transcribed.

Analyses of narratives

The interviews have been analysed using *analyses of narratives*, the aim being to find different themes in the informants' narratives (Lieblich et al., 1998; Polkinghorne, 1995) concerning the important content of vocational education. During the analysis process, the audio-recorded interviews were listened to and the transcripts were read several times. As a support for the initial structuring of the data, an analysis model was used (Table 2). This model was inspired by Lieblich et al. (1998) and Mishler (1997) and was also used in, for example, Kilbrink (2013) and Kilbrink and Bjurulf (2013). Themes that emerged from the data were noted in the first column. An initial overview of similarities and differences between different themes could be seen in this analysis phase.

Table 2 Analysis Model

Theme	Educational content	Interview
The theme, to which the educational content relates	What educational content is discussed as important in the interviews?	Which interview, who and where in the interview?

However, in order to not get stuck in the initial construction of themes, the researchers¹ also went back to the audio recordings and the transcripts while analysing the data. The themes were also discussed with research colleagues and in seminars and reconsidered. The themes are presented in the result section below, starting with a summary of the result. The results build on what the informants related in their narratives in the interviews. Direct quotes from the interviews have been interwoven into the description of the themes and marked with quotation marks.

Trustworthiness and limitations of the study

In a qualitative study such as this, the results do not claim to present a general picture of experiences of educational content; rather, they show one possible interpretation of a small group of teachers and supervisors. The ontological point of departure also emphasises that the researcher will interpret the interviews based on his or her experiences, starting right from the interview situation. The results should be seen as a co-production of knowledge between the informants, the researchers and later by the reader in the interpretation of this article (Bengtsson, 2005, 2013). An awareness of these different levels of interpretation, together with a clear description of the analysis process, as well as the inclusion of informants' own words in the results makes the trustworthiness of this study apparent. In order to get a broader picture of experiences of important educational content, interviews with more groups of people learning and working in vocational education needs to be done.

RESULTS

In this section, five themes that emerged from the data are described: *Basic knowledge, Assessment, Different educations, Interest* and *Integration of theory and practice*. These are introduced by way of following summary:

The results present experiences related by two teachers and four workplace supervisors in technical vocational education in Sweden. The informants related what they experienced needed to be taught and learnt in Swedish upper-secondary vocational programmes, in particular the Energy and Industry programmes. One way to measure if students had acquired necessary skills and knowledge during their education was their employability. In order to acquire the knowledge necessary to become employable, they needed to be active and show an interest, especially during their workplace training. Even if interest was not being assessed in itself, it was an important yardstick for the workplace supervisors who tended to look out for potential

¹ I refer to Kilbrink and Bjurulf, who were the researchers collecting data and conducting the initial analysis.

employees. Before their workplace training, students needed to have acquired basic knowledge and skills in school. Many students who undertake vocational programs were tired of school and wanted to work with their hands. Through the cooperation of teachers at school and supervisors in the workplace students could better see the whole picture and better understand how study broadened their understanding.

Basic Knowledge

According to informants in the study, plumbing students and industry worker students need certain basic knowledge in order to be able to function effectively in the future. The workplace supervisor Evert said that “it is good if the students know some basics at least” when they enter the workplace for the first time. These basics might be “measuring, for example, with an ordinary folding rule” according to Evert. The teacher Erik and the supervisor Ernst agreed that being able to “think three-dimensionally” was one such basic knowledge and that being able to “read drawings” was another. Furthermore, being able to count was important. “If they are not able to count, they are out [of the game], in principle,” said the teacher Ivan. Ivan added that it is also important to “be able to measure and to be accurate” especially where tools and measurement instruments are concerned. Ernst said that knowledge about different materials is also necessary. “For example, you never use an iron pipe for fresh water” because “fresh water contains a lot of oxygen” and then the iron pipe would “get rusty” Ernst said.

The teacher Ivan said that students “get the basics at school”, while the workplace supervisor Ingemar said that “if they have the basics, the theory, they can easily start working”, because companies have not got the time to teach the basics to the students. The teacher Ivan said that “the basic programming code is the same in all different kinds of machines”. He could teach them to programme with help of this basic code, although, since control systems differ he could not give the students “an exact education”, because then he would “need to have all the control systems in the world at the school, and that is impossible”. Students, Ivan said, need to “be able to build further on their knowledge” at the companies, where the machines are.

Assessment

The teachers told that they are the people grading the students, but they also collect information from the workplace supervisors as a basis for the assessment when setting grades. According to the teachers Erik and Ivan, this information mostly concerns the students’ behaviour and participation, rather than the work they have done. Both teachers said that they were in the process of developing better tools for assessment of

students' workplace training. Ivan said that if he had a matrix for the companies, "then it would be easier for the supervisors to see what is missing in relation to the course". The importance of the students showing an interest and taking an active part was pointed out by both teachers and supervisors in relation to assessment. However, Ivan said that according to the curriculum, these are not things that he can take into consideration when he grades the students. He explained that if a student scored full marks on the exam, "then he has to get a grade according to the result". Erik, however, interpreted the curriculum somewhat differently, taking it to mean that "if you are active during the workplace learning and ask questions", it would help your grades.

The workplace supervisor Ingemar said: "We usually talk about employability when they have left school. It is a pretty good measuring rod." Ivan agreed. He said that employability is a good measurement of whether the student has "passed". In relation to employability, Ingemar said that there are higher demands on the students' social skills today, to which Ivan concurred: "No matter how good you are, if you don't fit in with the other workers, then it is a disaster".

Different Educations

Depending on where and in what school the students take their education, the educational content differs, according to the teachers. The syllabi are somewhat vague, Ivan said, and could be interpreted differently "depending on my judgment at our school and on somebody else's judgment on another school". Unfortunately, the reform of the syllabi in 2011 does not help on this point, he said. There have been discussions about vocational programmes being comparable "no matter where they are", Ivan said, "but they aren't, since [the syllabus] is a matter of interpretation." Erik said that what teachers focus on "is so exciting, while it is so different". He said that the school where he works "wants to do a quality assurance" by using a "theoretical test" in order to assure equivalent standards all over the country. "But then there would also have to be a practical test", if standards in vocational education were to be comparable, wherever in Sweden you do your education. Workplaces also differ. The teacher Ivan says to Erik that "you seldom have your [plumber] students in the same location; they are out on different jobs". He added that for his industry worker students, "it is the assembly of machinery" during their workplace placement "that directs which courses they study". Ivan also said that he thought that the Industry programme would change over the coming 10-year period. "The Industry programme will not be sustainable as it is today." For Sweden to compete, work will probably be automated and robotized, he said, and "then we will need a completely different type of education".

Depending on external conditions, education and educational content could differ. The industrial workers talked about how a “down period”, resulting from a down-turn in the economy, allowed companies to pay students more attention during their workplace training. Students could participate “from raw material to a completed product and go the whole way”, workplace supervisor Ingemar said. Normally, things did not work this way, because companies did not have this sort of time to spend.

Interest

It is important that the students show an interest in what they are doing during their workplace training, according to the informants. Workplace supervisor Ingemar said that the “basic criterion is that you are interested”. Teacher Ivan said that students “must be interested and dare to ask the machine operator, ‘what did you do just now’?”. “The student, even if he finds it difficult, if he is interested, he will make it anyway,” Ivan said. But if they do not show any interest and “pick up their mobile phone and keep their hands in their pockets”, supervisor Ernst said, there is no use for them participating in workplace training. “It has happened that I have sent students home,” Ernst said, and then the teacher “has to take care of it – he probably have more pedagogy about that than me”. Supervisor Ingvar said that it is “really hard” to “try to teach a student who is not interested. They do not absorb what you tell and show them”. Ingemar thought it a “waste of time” and said that “time does not exist”, to supervise a student who is not interested.

Integration of theory and practice

According to the narratives, in educational programmes, there is a division between reading and studying, and working with your hands. Supervisor Ernst said: “Many students, who choose the Energy programme /.../are a bit tired of school, tired of studying”. They are not interested in taking history for example, he said, “but they can use” their hands. Supervisor Ingemar said that many students “have trouble studying, unfortunately”. Nevertheless, they need to study in order to understand “the theory” Ingemar said, although it could be hard to include the theory in a way that made sense to the student. Ingemar said: “The best way is when they get stuck, because then they have to study”. When students discover for themselves the need for study, and thereby make progress, then their self-confidence could improve. When they “see why they have to do it”, then it “becomes natural for them”. The students need to see the whole picture in order to understand why they are supposed to study theory.

DISCUSSION

Research in the *lifeworld* tradition generates empirical themes, and the strength of these results is to discuss the themes in relation to other empirical studies and theoretical research (Bengtsson, 2013). Therefore, the themes will be discussed and related to previous research below. The themes constituting the results concern themes of experiences that were apparent from the informants' narratives and therefore aim to display told experiences. There may have been further experiences about what educational content is important to teach and learn during technical vocational programmes, but this study can only say something about what was actually expressed in the interviews.

Previous research has pointed out that it is not possible to cover all educational needs in a vocational programme and that it is important to create conditions for students' future learning (Kilbrink, 2013). According to Middleton (2002) it is difficult to find generalizable complex problems that the students can expect to meet in their future working lives, and the speed of change in society makes it hard to find educational content that is stable over time (Bransford & Schwartz, 1999; Lindberg, 2003). The informants in this study also talked about change and about differences between workplaces, which makes it hard to establish educational content that responds to the students' future working duties. The duration of vocational programmes is short, and it is not possible to cover the entire knowledge base needed for future employment. This might explain why the results of this study only partly cover actual subject-related content, and why the rest of the results relate to behaviour and social skills (for example, showing that one is interested or fitting in with the group at the workplace socially) or to building a foundation for future learning.

There are two factors which determine educational content – the syllabi and employability. However, our study shows a clear focus on employability, from both supervisors' and teachers' perspective. Indeed, employability seems to have more influence than the syllabi, even though the syllabi are the basis for how vocational education should be conducted and how students should be assessed. Only the teachers mentioned the syllabi, although they are frustrated at the fact that the syllabi are so open to interpretation and that their content does not always relate to what the teachers think is important for the students in order to gain employment. Just like Fejes and Berglund (2009) and Johansson (2009) write about the importance of employability and usability in their studies, the informants in this study emphasise the importance of creating learning conditions for students in vocational programmes to become employable in their chosen vocations. For example, the informants talk about need for

basic knowledge for their trade, social skills and to understand the theory behind their work processes, which they mention prerequisites for employability.

The five themes appearing in the empirical material are: *Basic knowledge*, *Assessment*, *Different educations*, *Interest*, and *Integration of theory and practice* and only one theme – *Basic knowledge* – concerns the subject-related content of the programmes. There are no obvious definitions of what this basic knowledge is; the informants seem to relate basic knowledge to the students' future employment, and it differs depending on what and where this employment is expected to be. Some examples, like mathematics, reading instructions and knowledge about materials and tools are mentioned. As in Al-Ali and Middleton (2004), the cooperation between schools and workplaces in order to secure worthwhile content from the employer's point of view is one important aspect emphasised in our study. Nevertheless, other points of view need to be taken into account, for example the students' need to learn more than the explicit branch-specific skills (Berglund, 2009; Kilbrink, 2013; Lindberg, 2003), which is given little attention by the informants in our study.

Other studies have discussed other kinds of knowledge than subject-related content, such as becoming a functioning citizen (Lindberg, 2003). Being able to participate socially at work is mentioned as important in our study, and again, the main focus for the informants is on employability. These results are similar to those in Berglund's (2009) study, where branch-specific knowledge is ranked higher than good performance at school. Problems can arise if vocational programmes are too specific and a particular industry has too much sway, since vocational programmes can differ between countries, while students changing careers might find that their skills are not transferable to other industries.

Assessment is a central issue for the teachers in the interviews, when it comes to what is important to learn during a technical vocational education. Previous studies have identified a problem in assessment in vocational education (Gulikers et al., 2010; Markowitsch, Luomi-Messerer, Becker, & Spöttl, 2008). The teachers are responsible for the overall evaluation, but are more or less only present during the part of the education that the students spend in school. The focus on employability can also be in conflict with what the teachers are supposed to assess according to the syllabi. However, the two teachers in this study have different interpretations of the syllabi, where one teacher's interpretation of assessment includes social skills and being engaged, and the other teacher's interpretation only allows him to use written tests for assessment.

External conditions also influence the students' education and also what the students can study. Due to changes in technology, work duties also change. If students get stuck in their work during their education, this can also be an issue motivating them to study in order to try to understand theories behind what they are working with (compare Kilbrink, 2013). This can also be a path to learning to learn.

Just as Illeris (2009) points to different levels of knowledge that are necessary to learn a vocation, the experiences in the themes in this study can be related to different levels of knowledge:

1. Basic knowledge
2. Holistic learning
3. Learning to learn

The first level is related to what the students do at school. The next level is related to what the students are supposed to understand when they use their basic knowledge and see how things are connected to the workplace. The third level is related to things that the students are supposed to learn in order to solve future problems, using their previous knowledge and experience. The first level is specific for their trade, but the other levels concern more transferable knowledge and learning (compare Bransford & Schwarz, 1999; Illeris, 2009; Kilbrink, 2013; Lindberg 2003). The main focus in these interviews is, however, the basic knowledge for student's future trades as well as their employability.

In this study, the themes evolved from the empirical data, but the results show some similarities to Illeris's (2009) different levels of knowledge. This is something that could be further elaborated on in future studies of different kinds of knowledge and learning processes in vocational education. The aim in this study was not to study the educational system as such, but since the dual system of study and apprenticeship entails close cooperation between school and the workplace, the influence of workplaces and the keen focus on employability could be viewed as relating the system's reliance on workplace learning. This is also something that could be further studied.

CONCLUSION

In relation to what is important to know after taking part in a vocational education, the results in this study show that it is knowledge and skills other than just content-related

knowledge that are emphasised. The results point to three levels of knowledge: 1) basic knowledge, 2) holistic learning and 3) learning to learn.

Employability is clearly ranked higher than the national curriculum, pointing to a gap between the school system and other stakeholders. Schools act as a bridge between the curriculum and the workplaces that will eventually be employing the students. However, this bridge does not always function properly.

As previous research has shown (e. g. Kilbrink, 2013; Lindberg, 2003), it is obvious that differences between programmes, between workplaces, syllabi open to interpretation, and changes in technology and society lead to a focus on learning to learn in vocational education. Yet clearly, there is some branch specific content as well as basic knowledge that form the foundation for vocational programmes. Continuous, close cooperation between school and workplace is vital if students are to receive a comparable, up-to-date education that is both branch-specific and sufficiently general to prepare students for an unpredictable future.

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