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Between school and work: Vocational students' experiences of using digital multimodal logbooks as boundary objects

Ann-Britt Enochsson & Nina Kilbrink

Karlstad University, Sweden

(ann-britt.enochsson@kau.se)

Abstract

The aim of this study is to illuminate the way learning across workplace and school is shaped, by focusing on students' experiences of their teachers' efforts to work with subject-specific vocational knowledge at school. The study builds on theories of boundary crossing, and in this specific example, the students use a digital multimodal logbook as a boundary object connecting the two learning arenas school and workplace. Four teachers from an upper-secondary vocational programme and their 14 students were interviewed and a multilevel boundary crossing framework was used for the analyses. The results show that, compared to their teachers, the students understood the purpose of the digital logbook differently and did not see its connection to learning outcomes. When confronted with this purpose at the end of the interviews, the students presented their own ideas on developing the logbook. Most disagreements occurred at an interpersonal level, that is, teachers and students did not engage in enough discussion to understand each other's views. A conclusion drawn from this result is that a more fundamental discussion is needed between teachers and students on the purpose and use of logbooks in order to exploit their full potential.

Keywords: vocational students, vocational teachers, boundary objects, educational technology, boundary crossing

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Introduction

In many vocational school systems, upper-secondary students are supposed to learn their vocations at both schools and workplaces. In fact, previous research has shown that this is a critical part of vocational education (e.g., Choy et al., 2018; Kyndt et al., 2021). However, many students have problems connecting what they learn at school to what they learn at workplaces, and vice versa, and experience what has been called a gap between these two learning arenas (Tuomi-Gröhn & Engeström, 2003). Moreover, students often have to struggle on their own to connect what they learn (e.g., Mårtensson, 2020). To bridge this gap – or gaps in the plural as Enochsson et al. (2020) claim – different kinds of *boundary objects* may be used (Akkerman & Bakker, 2011, Kilbrink et al., 2021; Tynjälä et al., 2016).

The concept *boundary object* was introduced by Star and Griesemer (1989). In their study, the boundary objects were physical artifacts. The concept has thereafter developed. Fox (2011) shows how also ideas about the artifact matters. Hence, a boundary object can, for example, be language, digital technology, or a combination of ideas and artifacts. Since teachers are responsible for providing boundary objects, our own previous research has focused on teachers' experiences of using digital technology as a boundary object for students in vocational education (Enochsson et al., 2020; Kilbrink et al., 2021). Cattaneo et al. (2021) as well as Riis and Brodersen (2021) have also demonstrated the educational possibilities of designing for integration and boundary crossing between learning arenas in vocational education by using digital technology as boundary objects. However, very little is as yet known about the relation between teachers' expectations and students' experiences of using digital technology to connect the two learning arenas – school and workplace – of vocational education.

In this study, teachers in an upper-secondary vocational programme tested a digital multimodal logbook in order to create a more complete learning experience for their students. The digital multimodal logbook functioned as a boundary object between school and workplaces. The logbook included assignments related to the learning outcomes, designed so that the students could use different modes – text, voice recordings, videos, etc. – to communicate what they had learnt and to enable interaction between them and their teachers. Thus, the logbooks allowed the vocational subject teachers to understand what learning content each student met at their workplace. The digital mode facilitated logging during the work-placement period, which made it possible for teachers to intervene if necessary.

The aim of this study is to illuminate the way learning across workplace and school is shaped, by focusing on students' experiences of their teachers' efforts to work with subject-specific vocational knowledge at school.

Previous research

To develop relevant vocational knowledge, students need to integrate knowledge from different learning arenas (Tynjälä, 2008; Tynjälä et al., 2021). One of the most central and recurring questions in vocational education is how such learning arenas can complement each other and form a cohesive whole in students' learning (e.g., Aprea et al., 2020; Baartman et al., 2018; Kyndt et al., 2021). Although the fact that the learning arenas are different holds potential, various studies have highlighted that students have difficulties seeing this coherent whole (Baartman et al., 2018; Mårtensson, 2020). Eiríksdóttir (2020), who studied recent vocational school graduates, found that they did not experience the programme as a coherent whole, due to a lack of systematic communication and collaboration between those responsible for the different learning arenas. Teachers and work-placement supervisors showed significant variations in their perspectives on the integration between learning arenas. Both groups had a more positive view of the arena they themselves represented, while former students thought both arenas important to their learning. Similar results were shown by de Vos et al. (2022), who studied workplace educators by observing them and following up with stimulated recall.

A well-known problem connected to this type of educational organisation is what is usually referred to as a gap between learning arenas and students' difficulties in integrating them (e.g., Baartman et al., 2018; Mårtensson, 2020). Some researchers use the metaphor of a boundary that has to be crossed in one way or another (e.g., Akkerman & Bakker, 2011; Akkerman & Bruining, 2016). Others use concepts such as transfer, transformation, integration, or contextualisation to describe the phenomenon of learning between these different arenas and highlight the associated problems that need to be addressed (e.g., Baartman et al., 2018; Kyndt et al., 2021; Tuomi-Gröhn & Engeström, 2003). Akkerman and Bakker (2011) define these boundaries as sociocultural differences leading to discontinuities in action and interaction. Irrespective of the concepts used, the gaps or boundaries are not always explicit. The gaps vary in type: from concrete gaps, like geographical distances, to more abstract gaps, like pedagogical gaps due to different views of education (Enochsson et al., 2020; Kilbrink et al., 2020).

Regardless of the concepts used, the problem remains that students often find it complicated to bridge the gap or cross the boundaries, and thereby integrate knowledge from the different learning arenas (e.g., Choy et al., 2018). Berner (2010) calls this *boundary-work* and distinguishes two main types: reaffirmation, when boundaries are accentuated, and reconstruction, which instead involves blurring the boundaries. These differing attitudes to boundary-work lead to various methods, although they similarly aim to help students overcome the boundary – or gap – and to integrate what they learn in different arenas. Billett (2018) promotes the thorough preparation of students before work-placement

periods. This preparation should for example include information about purposes, clarification of expectations, as well as preparing the students to be agentic and able to contest what they see. Follow-up is as important, and may include facilitating the sharing of experiences, explicitly linking to what is learnt at school and workplaces, respectively, as well as generating a critical perspective on work and learning processes.

However, communication between teachers and supervisors at workplaces is important in creating a complete learning experience across learning arenas (e.g., Choy & Sappa, 2016; Kilbrink, 2013; Mazereeuw et al., 2018; Tynjälä, 2008). Choy et al. (2018) draw the conclusion that there must also be pedagogical – or as they write 'teacherly' – interventions if different learning arenas are to be integrated. They claim that 'integration needs to be problematised in a reflective way to understand the challenges with arranging rich learning opportunities for students' (p. xvii). Similar conclusions are drawn by Aarkrog (2005), Baartman et al. (2018), and Berner (2010) when claiming that conditions need to be created for learning where school and work can complement each other and contribute to both broadening and deepening students' learning. It is also important to support the students in applying their knowledge in new contexts in a changing world (Kilbrink, 2013; van der Baan, 2024). An important factor for integrating knowledge from both learning arenas and developing relevant vocational knowledge is creating conditions that facilitate the learners' reflection (Almalki, 2020; Ulvik et al., 2018; van der Baan, 2024).

Digital technology has been found useful as boundary objects (Aprea et al., 2020; Cattaneo et al., 2021; Kyndt et al., 2021; Riis & Brodersen, 2021), meaning that the technology in different ways can help students to bridge the gap between learning arenas. However, such bridging does not happen automatically (Enochsson et al., 2020; Kilbrink et al., 2021). Boundary objects have to be used with a clear purpose. With deliberate use, conditions for reflection can be created, for example, through logbooks or other multimodal documentation. Thus, the way in which the teacher chooses to use digital technology is significant (Catteaneo et al., 2021). Furthermore, teachers and supervisors may have divergent views on learning or service production, which could also lead to discontinuities (Bouw et al., 2021; Khaled et al., 2021; Sappa et al., 2021). Not only is there a lack of research focused on digital technology as a support for reflection in this context, but also of studies examining this phenomenon from multiple perspectives – those of teachers, students, and supervisors.

Based on the body of research presented above, we need more in-depth studies to fully understand in what ways digital technology can be used as boundary objects in vocational education as well as if – and in what ways – students' experiences meet their teachers' expectations of the digital multimodal logbook. As stated above, the aim of this study is to illuminate the way learning across

workplace and school is shaped, by focusing on students' experiences of their teachers' efforts to work with subject-specific vocational knowledge at school. A two-fold research question is central to the analysis:

What do the vocational subject teachers expect to achieve by using the multimodal logbook at school and workplaces, and how do students experience connecting school and workplaces by using the multimodal logbook?

The question allows us to analyse if – and in what ways – students' experiences meet their teachers' expectations.

Theoretical framework

This study draws on theories of boundary crossing, where boundaries are defined as 'sociocultural differences between practices leading to discontinuities in action or interaction' (Akkerman & Bruining, 2016, p. 243). Hence, in our study, the view of learning is rooted in a perspective that regards learning as the result of interaction with the environment – people or things – with or without artifacts. The important artifacts in the present study are for example digital tools and multimodal language.

In vocational education where students do periods of work placement, they work on the boundary between these different learning arenas and try to connect what they learn from both of them. They do this by using different kinds of artifacts, here also seen as boundary objects, of which digital technology can be one – as a complement to language which is also seen as a boundary object (Akkerman & Bakker, 2011). In a review of 181 studies, Akkerman and Bakker defined four different *dialogical learning mechanisms* of boundary crossing: identification, coordination, reflection, and transformation. While identification may be seen as a prerequisite for boundary-work, the other three mechanisms have been found to occur in a hierarchical order (Enochsson et al., 2020). In addition, teachers' pedagogical aims are qualitatively different depending on the learning mechanism and the most developed form, transformation, is less common than the others (Kilbrink et al., 2021; van der Baan, 2024). From dialogical learning mechanisms identified in the review (Akkerman & Bakker, 2011), Akkerman and Bruining (2016) developed a multilevel boundary crossing framework, showing that learning mechanisms can occur at three different levels (Figure 1). At the intrapersonal level, a person participates in two or more practices; at the interpersonal level, action and interaction occur between actors from different practices; and at the institutional level, action and interaction occur between organisations or organisational units.

Multilevel Boundary Crossing Framework

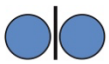
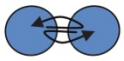
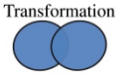
Learning Mechanism	*At the Institutional Level (Action and Interaction Between Organizations or Organizational Units)*	*At the Interpersonal Level (Action and Interaction Between Actors From Different [Institutionalized] Practices)*	*At the Intrapersonal Level (Participation of a Person in Two or More [Institutionalized] Practices)*
Identification 	Organizations or units come to (re)define their different and complementary nature.	People come to (re)define their different and complementary roles and tasks.	A person comes to define his or her own simultaneous but distinctive participatory positions.
Coordination 	Organizations or units seek means or procedures for institutional exchange and cooperation.	People seek shared means or procedures for exchange and cooperative work.	A person seeks means or procedures to distribute or align his or her own participatory positions in multiple practices.
Reflection 	Organizations or units come to value and take up another's perspective to look at their own practice.	People come to value and take up another's perspective.	A person comes to look differently at his or her own participatory position because of the other participatory position.
Transformation 	Units face a shared problem space and start collaborative work or merge institutionally.	People face a shared problem, start collaborative work, and may build group identity.	A person develops a hybridized position in which previously distinctive ways of thinking, doing, communicating, and feeling are integrated.

Figure 1. The multilevel boundary crossing framework (Akkerman & Bruining, 2016, p. 246).

The multilevel boundary crossing framework holds the potential to give a nuanced view of students' learning when moving between learning practices during their vocational education. In the present study, we analyse what the vocational subject teachers expect to achieve by using the multimodal logbook at school and workplaces, as well as students' experiences connecting school and workplaces by using the multimodal logbook. By using the multilevel boundary crossing framework we thereafter analyse students' experiences in relation to their teachers' expectations of the logbook to make possible discontinuities visible. Hence the theoretical framework allow us to analyse if – and in what ways – students' experiences meet their teachers' expectations.

Method

This case study focuses on an upper-secondary vocational programme on animal care in Sweden. Students were selected because they had used digital logbooks in order to bridge the gap between school and workplaces. The logbook comprised three assignments: (1) recording a video showing daily routines at the work placement; (2) using photos and words to show how the workplace promotes enrichment of the animals' environment; and (3) recording a podcast in which the animals' outdoor environment is described. The assignments in the logbook were created in collaboration with the research group to relate to the course content. The teachers as well as the students were trained specifically in the use of the digital tools.

We selected four teachers from this vocational programme to participate in the study. Due to the Covid-19 pandemic, access to the school was restricted and the researchers could not follow the project *in situ*. The teachers were therefore interviewed individually via a video conferencing system (teacher interviews 1–4). After the students' last work-placement period had ended and the school had opened up again, fourteen students from one of their classes were interviewed groupwise (in six groups) about their experiences (student interviews 1–6). These interviews were conducted in a classroom at their school. Two teachers as well as the principal who had approved the project were no longer working at the school at this time, and a follow-up interview was conducted with the two remaining teachers (teacher interview 5). All interviews were sound-recorded (totalling 6:12:31 of material).

The interviews focused on the students' and teachers' intentions with using the logbooks from their respective perspectives. The questions concerned three topics: (1) the general aim as well as details of the assignments; (2) doing the assignments – their content and the use of digital tools; (3) feedback and assessment. The questions were kept as open as possible to allow participants to mention aspects relevant to them, but also to include topics the researchers had not considered.

Ethical considerations

The study follows the ethical recommendations of the Swedish Research Council (2024) and has undergone a local ethical review in accordance with guidelines at Karlstad University (2023). Participating teachers and students (all over the age of 18) were informed orally and in writing about the aim of the study and that participation was voluntarily. All informants have signed a written consent. For ethical reasons, the names of the participants or the school are not mentioned.

Analyses

Transcripts of the interviews were analysed in several steps. First, a reflexive thematic analysis was conducted, following Braun and Clarke (2006, 2021), and trying to be as open-minded as possible to the data. Accordingly, the data were thoroughly worked through by generating codes and generating initial themes (Braun & Clarke, 2021). Second, the identified themes were organised around the same three topics as the questions. Third, within each topic the themes were reviewed and analysed based on the multilevel boundary crossing framework described above (Akkerman & Bruining, 2016). As a fourth step, to understand their respective views, statements from the teachers and the students were analysed at each level and the themes were defined and named (Braun & Clarke, 2006, 2021). In order to answer the two-fold research question, focus was on agreements and disagreements between the teachers and the students. The result

highlights their different understandings and shows at which level of the multilevel boundary crossing framework the discontinuities occurred within each topic.

Findings

The findings are organised around the three topics: (1) the assignments in general, (2) doing the assignments, and (3) feedback and assessment. Each topic shows what teachers and students talked about and highlights disagreements between the two groups as well as the level at which these disagreements occurred. Quotes are labelled with 'teacher interview 1–5' and 'student interview 1–6' to highlight the different groups. The multilevel boundary crossing analysis showed that most of the discussions concerned the dialogical learning mechanism *reflection*, but at different levels: the intrapersonal, interpersonal, and institutional levels. In general, the intrapersonal level was not much mentioned.

The assignments

The teachers saw the role of the assignments as promoting learning through reflection and helping students to develop their self-assessment. They noticed that students used more trade expressions and included more details than before in their descriptions. The teachers reported considering the logbook as a way to connect theory and practice, and saw the assignment as a meaningful activity to occupy students when they did not know what to do. Teachers regarded downtime (Swedish *dötid*, literally 'dead time') as a general problem during work placements.

In general, the students were positive to the assignments; they appreciated the freedom of the video format and gave examples of how they completed the assignments. Some of them used advanced video applications to cut footage and add music. Some preferred not to talk themselves and used subtitles for descriptions, sometimes accompanied by video and sometimes with still pictures added to a film. Even if they liked the format, they were not aware of the aim of the assignment. Contrary to the teachers, the students did not report experiencing downtime. They regarded finding the time to do the assignments as a bigger problem. Work-placement supervisors were not always aware of the assignment, and using mobile phones was not always seen in a positive light, regardless of the purpose.

When comparing what the teachers and the students reported, we identified disagreements within some of the themes, which are presented in Table 1. These disagreements were mostly between the teachers and the students, but the work-placement supervisors were also indirectly involved. The teachers had the idea that the assignments could be an activity to occupy students when they had

nothing to do. The students' view was that they were overloaded with work and had difficulty finding the time to do the assignments. When they did find time to do the assignments, their work-placement supervisors were unhappy, because they were unaware of the assignments. An example is shown in the quotes below (the excerpts are from different interviews):

> Teacher: Sometimes it can be difficult to find work tasks when there's a bit of downtime, 'Ok, then it fits that you sit down with the assignment now because now you can't be with us for 30 minutes.' (Teacher interview 3)

> Student: Information [about the assignments] should go to the workplace as well. That they know about it. Because then I think everything would be easier. Then you would have time to write and film and so on. Then they can plan which day you can do it. But it's really that I think almost all assignments would work as long as you get time to do it. (Student interview 1)

While the teachers saw the logbook as a way to connect theory and practice and to reflect on this connection, the students did not understand the teachers' aim in this respect. The students saw more practical aims in connection to assessment, that is, how to carry out specific tasks. The disagreements noted here were at the interpersonal level and also involved the work-placement supervisors. The teachers tended not to regard work placements as learning environments for content, and instead thought this could be handled at school with the available animals. The students on the other hand wanted to show what they had learnt during their work placements.

Table 1. Topic 1: The assignments.

Themes regarding the logbook assignments in general, from interviews with teachers and students, respectively. (Disagreements marked in bold and italics)	
Teachers	**Students**
• Learning through reflection • Students' self-assessment	• Generally positive to the assignments
• Students used more trade expressions and noticed more details	• Appreciated the freedom of video format
• ***A way to connect theory and practice***	• ***Unclear aim***
• ***A meaningful activity when students have downtime***	• ***Difficulties finding the time to do the assignments*** • ***Supervisors not always aware*** • ***Workplace culture could pose a problem***

Doing the assignments

When discussing doing the assignment, the teachers claimed that students had difficulties handling the technology. They wanted to be able to prepare the students better, for example by offering training in using the technology, meaning they did not want the students to face any problems.

The students did not see technology as their greatest problem; rather, it was that the work-placement supervisors had not been prepared and were unaware that students were going to make videos. This group had to finish their videos during the first week of their three-week work placement, which they did. However, if the deadline had been more flexible and the supervisors had been aware of the assignment, the students could have planned to make videos showing specific actions or work. When presenting the videos to the teachers, some of the students uploaded the videos directly on the course platform and others used free online services for uploading, since it was easier to upload large files somewhere else, and posted a link on the course platform. An example of different views is shown in the excerpts below:

> Teacher: I think it's a little different for different students, that for some it's been the technology and for some it's been the way of working… they have a little more trouble with the technology and with the digital stuff. (Teacher interview 1)

> Student A: We filmed with the phone and then we edited it on iMovie.
> Interviewer: Did you have any start-up lesson – before you went to the workplace – where you practised this filming and…?
> Student B: No, no. We just got this: 'Well now you're going out to the animals and like… practise [filming]'. (Student interview 2)

Within this topic there were disagreements regarding all themes (Table 2). Like the earlier disagreements, these also occurred at the interpersonal level showing a lack of communication. The teachers and the students had relaxed relations, but the students nevertheless did not take any initiative to express their needs regarding technology use, and their teachers did not ask.

Table 2. Topic 2: Carrying out the assignments.

Themes regarding doing the assignments, from interviews with teachers and students, respectively. (Disagreements marked in bold and italics)	
Teachers	**Students**
• ***Students unable to handle technology well enough***	• ***No problems making the videos***
• ***Difficulties to prepare the students***	• ***Students reported that work-placement supervisors were unprepared***

Feedback and assessment

Feedback and assessment were very important to the teachers. They thought they had a better basis for assessing students through the assignments. They also appreciated getting glimpses throughout the work-placement period, which does not always happen otherwise. Receiving this information during the work-placement period made it possible to intervene early if there was a problem. However, the teachers claimed that the students did not always care about the feedback they received. According to the teachers, the students shared experiences when they were back in school to conclude the work-placement periods.

The students agreed on the importance of the assignments regarding assessment. The assignments enabled them to give *their* view of what they were doing, and the grades they received did not only depend on their work-placement supervisors' reports. This was even more important if they did not get along with the supervisor. Although this did not seem to occur often, they all knew of such cases and regarded it as a potential risk that could happen any of them. Students reported that they expected greater contact with the teachers and wanted more discussions when back in school.

Table 3. Topic 3: Feedback and assessment.

Themes regarding feedback and assessment, from interviews with teachers and students, respectively. (Disagreements marked in bold and italics)	
Teachers	**Students**
• Assessment became more secure	• The logbook could present the teacher with a more complete picture of what they had been doing
• Glimpses throughout the work-placement period, which are usually impossible to get • Possible to intervene early if things do not work	• The logbook could become very important if somebody does not get along with the supervisor
• ***Students did not always care about the feedback given***	• ***Students expressed expecting greater contact with the teacher***
• ***Students shared experiences when back in school***	• ***Students wanted more discussions when back in school***

On this topic, the teachers' views of feedback clearly disagreed with those of the students, which are presented in Table 3 and in the following excerpts:

> Teacher B: There were incredibly good reflection discussions after the work-placement period when we simply sat with the course syllabi and videos and the other assignments. (Teacher interview B)
>
> Interviewer: Did you discuss these films when you came back to school?
> Student 4: I don't remember….no I don't think we did.
> […]
> Interviewer: You didn't watch each other's films either?
> Student 4: No […] it would have been fun to hear what others did and so, but we never did that. (Student interview 4)

This may be regarded as a misunderstanding between the teachers and the students and hence a disagreement at the interpersonal level, but in the follow-up interview with the teachers, they claimed that a lack of time is part of the problem. Therefore it should be seen as a disagreement at the institutional level. The teachers did not regard this as something they could influence.

Summary

The results show that the students understood the aim of the digital logbook differently than their teachers did, and they did not see the connection to learning outcomes. When confronted with this aim at the end of the interviews, the students presented their own ideas on developing the logbook. Most disagreements occurred at the interpersonal level, that is, teachers and students did not engage in enough discussion to understand each other's views. Some disagreements occurred at the institutional level, that is, according to the teachers some problems could be solved, if only they could set aside more time for such discussions with their students. No disagreements at the intrapersonal level were noted, but while the teachers regarded the logbook as a tool for learning through reflection, the students did not mention the learning potential of the logbook.

Discussion

The findings of this study show many similarities to previous research. Like Eiríksdóttir (2020), we found that teachers and students have different views. They do not always agree on what the problem is, that is, they identify different gaps or boundaries (Enochsson et al., 2020; Kilbrink et al., 2020), which can lead to experiences of discontinuity. While the teachers for example regarded the technology as too complicated for students, the students did not see technology as a problem at all.

The teachers participating in this study wanted to prepare their students and discuss the work placement more in advance. The students also wanted more discussions in advance, but further wanted to share experiences when returning from their work placements. Billett (2018) also regards this as part of essential

preparation, but for some reason it did not seem to work as intended in the case studied here. The students also thought their supervisors should be involved and better prepared for what their teachers expected from them. So what was the problem? At first glance, it seemed as if all problems could be resolved by teachers and students talking to each other, which is also something both groups said they wanted. Discussion is certainly an important activity.

A conclusion is that even if the teachers and the students enjoy a good relation at a personal level, they do not meet to discuss education and learning. The final interview with the teachers revealed more. The teachers claimed to have insufficient time to do what they thought was necessary. Wärvik and Lindberg (2018) have shown that less time has been allocated for such work in the Swedish school system over the years. This project had been initiated by a former school principal, and the new one did not give it the same priority. Staff changes provide a partial explanation for the disagreements between teachers' aims and students' experiences.

Previous research has found that teachers choose different digital tools depending on their pedagogical aims (e.g., Akkerman & Bakker, 2011; Kilbrink et al., 2021), but a study on student teachers – who were less experienced – found that they had difficulties matching their pedagogical aims with suitable digital tools (Andersén et al., 2021). The tool they chose did not always serve their pedagogical purpose and sometimes complicated their work. As the teachers in our present study were still new to teaching, they might not yet have fully understood how to utilise the full potential of the logbooks.

When analysing this study's data using the multilevel boundary crossing framework (Akkerman & Bruining, 2016), another explanation was found as to why students and teachers did not fully understood each other. Regarding the use of digital technology as boundary object to connect learning at school with learning at the workplace, the teachers mainly aimed at coordination. At the same time, they also wanted the students to reflect, and they indicated seeing the logbook as a way to connect theory and practice. The student interviews showed that they only saw the logbook as precisely coordination, which to them meant showing how they achieve learning outcomes. This points at the importance of the teachers taking an active role (see Choy et al., 2018). As is shown in the results, the work-placement supervisors were not always aware of the students' assignments. It is clear that the teachers had pedagogical goals (see Choy et al., 2018), but they also think students can learn the trade itself with the animals at school. This material therefore gives rise to questions on the work-placement supervisors' role. It is unclear whether they are really part of the vocational programme, or if they are considered to be mere caretakers for some weeks. Maybe the vital communication between teachers and supervisors, highlighted in previous research (e g., Choy & Sappa, 2016; Kilbrink, 2013; Tynjälä, 2008), also

needs to concern the assignments the students are expected to do, as well as the way in which they are expected to complete them, for example by using a mobile phone to take pictures for a logbook. Then all actors could work together as a team concerning the students' education.

Since this is a single case study, no general claims can be made. In addition to the study's limited scope, the Covid-19 pandemic introduced unforeseen challenges that disrupted the original research design, which had included observational components. Nevertheless, the multilevel boundary crossing framework allows a nuanced analysis of students' learning when moving between learning arenas in their vocational education by highlighting the disagreements, which also may be seen as 'weak points' in the system leading to experiences of discontinuity. The results point to several issues related to the interpersonal level, that is, teachers and students do not communicate about their expectations, but take some things for granted. Teachers organise talks and explanations about the work placements, but it seems they do not follow up and check that students have really understood. One highlighted issue is that the teachers claimed there is a lack of time to do this, which is an issue at the institutional level, but it is important to analyse how to best use extra time when any is allocated. The results seem to indicate that more time should be used to deepen the discussions rather than to add more content.

Conclusions

The results from this study are relevant for understanding how learning across workplace and school is shaped. Based on vocational students' experiences from using digital multimodal logbooks, our results show that such boundary objects can contribute to teaching and learning in vocational education which take place in two different learning arenas. The results of this study highlight the perspectival differences between teachers and students, which can lead to students' experiencing discontinuity in their education. Work-placement supervisors also need to be included in the aims of workplace assignments. Students are given access to a boundary object with the aim of connecting learning in the two arenas. However, teachers and students must discuss the purpose and use of the logbooks in order to exploit their full potential. More studies are needed to widen the knowledge base and to view the field from different perspectives.

Notes on contributors

Ann-Britt Enochsson is Professor in Educational work at Karlstad University, Sweden. Enochsson has a long record of research on digital technology in

educational settings in general, specifically on communication with technology. Vocational education is one of the areas of research.

Nina Kilbrink is Associate Professor in Educational work at Karlstad University, Sweden. Kilbrink had her PhD 2013 on a thesis concerning the connection between school and workplace learning in technical vocational education (Lära för framtiden: Transfer i teknisk yrkesutbildning). Her research interests concern for example vocational learning; ICT in education; school workplace relationships, professional learning, learning studies, and narrative research.

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