Toward Improved Professional Digital Competence: The Use of Blended Learning in Teacher Education in Norway

Greta Björk Gudmundsdottir
Institute for Teacher Education and School Research, University of Oslo, Norway
gretag@ils.uio.no

Kristin Beate Vasbø
Institute for Teacher Education and School Research, University of Oslo Norway
k.b.vasbo@ils.uio.no

Abstract: This paper provides an analysis of the implementation of a blended learning approach in a newly revised part-time teacher education program at the University of Oslo, Norway. A digital learning platform was implemented in the pedagogy component of the study and served as an extension of the compulsory face-to-face pedagogy seminars and lectures on campus. The study aims to identify how the student teachers use the modules in their learning process and how they assess the teacher education program as contributing to the development of their professional digital competence (PDC). Our main finding is that student teachers actively use the online modules to structure their studies. The students who report that they actively use the online modules assess the teacher education program as enhancing the development of their PDC whereas those who report a less active use state that the teacher education program is less valuable in contributing to the development of their PDC.

Keywords: blended learning, teacher education, professional digital competence

Introduction

Educational systems worldwide are under increased pressure to use information and communication technologies (ICTs) to provide students with the knowledge and skills they need to succeed in the 21st century (Resta, 2002). Digital technology has the potential to change how educational institutions approach teaching and learning—more specifically, how they inform and communicate with students (Watson, 2001). Technology has changed every sector of society, including our expectations of what students must learn if they are to be competitive. Restructuring curricula to address this shift will provide an educational environment that creates a more interactive and engaging learning context for both teachers and learners and changes both of their roles (Newby et al., 2000).

It is widely acknowledged that digital technology should have a significant presence in higher education, including teacher education (Selwyn, 2016). Technology provides structural measures through learning management systems as well as online platforms in order to increase collaboration and communication between students as well as between students and

faculty. However, professional digital competence (PDC) poses several challenges for teacher educators: 1) the great variation in the student teachers' PDC upon entering teacher education programs, and 2) the extent to which technology is used in the various schools where students complete their school-based practice (Berge, Gudmundsdottir, & Hatlevik, forthcoming). Together, these indicate the importance of developing student teachers' PDC within teacher education and of making it an integrated part of the core curriculum of teacher education programs.

We elaborate on the term "professional digital competence," used here as a threefold definition (Gudmundsdottir & Ottestad, 2016) as follows:

> 1) *Generic digital competence*. This cuts across disciplines and specifies general knowledge, skills, and attitudes that teachers/teacher educators and student teachers need in order to teach and learn in digital environments. This dimension is often connected to basic operational skills and the *Framework for Basic Skills* (The Norwegian Directorate for Education and Training, 2012).
> 2) *Subject/didactic digital competence*. This captures what is specific to each subject when taught with and through ICTs. This dimension exposes and thus makes observable characteristic differences in subject didactics.
> 3) *Profession-oriented competence*. This includes knowledge about various supportive aspects for teaching practice, such as communication between school and home, the psychosocial learning environment, classroom management and relational skills, and teachers' own continuous professional development in the field of ICT.

This study responds to a call for increased research on PDC and the opportunities an online blended learning platform in teacher education programs brings. With this in mind, we pose the following research questions:

RQ1: How do student teachers use the blended learning platform in their learning process within the pedagogy component in the teacher education program?

RQ2: How do student teachers develop their PDC through using the blended learning platform?

Contextual background

The University of Oslo offers several teacher education programs aimed at qualifying teachers for grades 8–13 (secondary school). The teacher education program that this study investigates is the part-time three-semester program, which consists of three main components: 1) pedagogy, 2) various didactic subjects, and 3) school-based practice. The first two components are disseminated through lectures, seminars, and various other activities on campus (such as micro-teaching, workshops on selected themes, etc.). The school practice takes place in partner schools. Approximately half of the students are practicing teachers or already have some teaching experience; the other half of them are employed part or full time in other sectors together with their studies. This influences the structure of the program, as it is clustered around intensive campus activities during school holidays and certain weeks during the semester. In addition, the student teachers have 12 weeks of school practice in three periods during the three semesters of the program. The face-to-face meetings on campus take place in the afternoon and early evening. In Spring 2015, a digital learning platform was introduced to the students as part of the pedagogy component of their study; it served as an

extension of the face-to-face pedagogy seminars and lectures on campus. The pedagogy component is structured into thematic modules. The aim of the blended learning approach is twofold: First, the pedagogical purpose is to make the learning environment more flexible as well as to strengthen the interactive communication between student teachers and the professors in between physical meetings on campus. Second, it attempts to increase students' PDC—in other words, their use of and familiarity with ICT in various aspects connected to their professional development. However, it was not mandatory that the student teachers make use of the online platform.

According to the national curriculum for knowledge promotion in primary and secondary education and training all students in grades 1–13 are to be exposed to digital skills in all of their school subjects (Ministry of Education, 2006). In *Framework for Basic Skills*, digital skills are divided into four competence areas: to search and process information, to produce digital elements and composite texts, to communicate through digital means, and digital responsibility (The Norwegian Directorate for Education and Training, 2012). The framework provides a five-step overview of the progression of each category. Digital competence is therefore an important skill that Norwegian student teachers must have and be able to adapt to their teaching subjects.

Conceptual framework

Blended learning has been defined in various ways, but generally, online learning is included as an essential part of the blended learning approach. Here, student teachers learn independently online (either at home or elsewhere) in addition to face-to-face meetings on campus. Bliuc, Goodyear, and Ellis (2007, p. 234) define blended learning as "learning activities that involve a systematic combination of co-present interaction and technologically-mediated interaction between students, teachers and learning resources." Lord and Lomicka (2008) assert that blended learning environments combine the best of two delivery methods: face-to-face meetings and online learning communities. In addition, blended learning is considered to be flexible regarding time and place of use, which is particularly suited to students who are employed part or full time in addition to their studies (Lock, 2006). For the purpose of this study, blended learning is defined as combining online learning and face-to-face meetings.

Teachers' PDC

In this study, we use PDC as defined by Gudmundsdottir and Ottestad (2016): 1) generic digital competence, 2) subject/didactic digital competence, and 3) profession-oriented competence. This conceptual understanding of PDC is highly inspired by Ferrari's (2013) comprehensive review of various frameworks on digital competence in Europe. Ferrari identifies common characteristics and contributes to the concept of a holistic framework for digital competence based on five categories. In addition to information, communication, production, and digital safety—which are recognizable aspects within the Norwegian framework for basic skills (The Norwegian Directorate for Education and Training, 2012)—and the generic digital competence in the three-pillar PDC model, Ferrari includes problem solving as the fifth category (Ferrari, 2013). The framework was recently updated by Vuorikari, Punie, Carretero Gomez, and Van den Brande (2016), which focuses on the conceptual reference model, new vocabulary and streamlined descriptors. It also includes examples of how it is actually used at national and regional levels in Europe. Another framework addressing teachers' PDC is the United Nations Educational, Scientific and Cultural Organization (UNESCO) framework. It uses a matrix to illustrate a number of aspects that are linked to and influence teachers' PDC and use of ICT in their own work,

including 1) policy formulation and framework, 2) curriculum and evaluation, 3) pedagogy, 4) competence and skills, 5) learning environments and administration, and 6) self-development and professional understanding. The matrix also includes a three-stage progression within each of these areas. UNESCO's framework states the following:

> The successful integration of ICT into the classroom will depend on the ability of teachers to structure the learning environment in new ways, to merge new technology with a new pedagogy, to develop socially active classrooms, encouraging co-operative interaction, collaborative learning and group work. This requires a different set of classroom management skills. The teaching skills of the future will include the ability to develop innovative ways of using technology to enhance the learning environment, and to encourage technology literacy, knowledge deepening and knowledge creation. (2011, p. 8)

In addition to the generic and subject-oriented PDC from the three-folded definition, one of the strengths of the UNESCO framework is that it also includes aspects of profession-oriented PDC (Gudmundsdottir & Ottestad, 2016).

Developing PDC among student teachers in many teacher education programs in Norway depends on the work of especially interested individuals and is not an integrated approach which is well defined in formal documents and processes (Tømte, Kårstein, & Olsen, 2013). Also, among the schools where student teachers complete their school practice, the focus on ICT and access to technological equipment varies greatly, but practice schools with high PDCs among the staff play an important role if they are active participants in teacher education (Tømte et al., 2013). In a forthcoming research report on PDC in student teachers' practice schools, we found great variation between practice schools in the opportunities the student teachers had to use ICT in their school based practice (Berge, Gudmundsdottir, & Hatlevik, forthcoming).

Method

This pilot study is primarily aimed at identifying and understanding how student teachers perceive and experience a particular online blended learning platform. It uses a qualitative design, and it attempts to capture the participants' perceptions and experiences (Cohen, Manion, & Morrison, 2007). We gathered our data via e-mail interviews (Kvale & Brinkman, 2009) with self-recruited students. E-mail interviews are particularly useful for researchers who study people who prefer to be interviewed online rather than face-to-face or those who are not easily accessible or geographically spread out (Meho, 2006). There are two main reasons for conducting e-mail interviews in this study. First, most of the part-time student teachers work during the day and live in a geographically spread out area, and second, the second author was on a research term abroad during Spring 2016 when the interviews were conducted.

Qualitative interviews are well suited to improving researchers' understanding of social and cultural phenomena and processes rather than to producing objective facts about reality and generalizing findings to a given population (Fidel, 1993; Pettigrew, Fidel, & Bruce, 2001; Wang, 1999). The e-mail interview method can be employed quickly, it is convenient, it is inexpensive (due to the decreased cost of transcription), and it can generate high-quality data when handled carefully (Hunt & McHale, 2007; Meho, 2006). We sent private messages through the learning management system (LMS) which is used in the teacher education program, to all potential informants. Nineteen students responded. We sent out reminders in

order to increase participation. In a later e-mail, we asked the participants to give their consent by replying to the e-mail stating that they had read and agreed to the consent form. We sent a list of questions in an attachment to each participant individually.

Some qualitative sociologists (e.g., Small, 2006) have argued that sampling in small qualitative studies should follow the logic of a case study (Yin, 2003). Case study research has been criticized for the lack of the generalizability of the findings (Cohen et al., 2000). However, Stake (1995) argues that the generalization debate is not an issue, as those who read the case study results form their own assertions, and as such, decide whether the findings appear to be truthful and generalizable within their own context. Additional data were collected from anonymous student evaluation reports on students' perception and learning outcome from pedagogy seminars because one of the questions asks how the student teachers use the online blended learning platform. We read and analyzed the replies of 152 evaluation reports in order to compare the answers with the replies from the self-recruited interview group. We analyzed the data in two steps that involved 1) the e-mail interviews with 19 students, and 2) the evaluation reports from the whole student cohort in order to grasp both a) the students' explicit description of how and for what reasons they use the modules and the resources, and b) the students' descriptions of their own PDC and explicit reflections about how the teacher education program contributes to strengthening their PDC (see Appendix: Table 1 further details about the analysis).

Findings

Two strands emerged from the analyzed data in relation to how the student teachers used the online blended learning platform. First, the platform served the students' need for framing and structuring the study, such as when seminars, lectures, and exams take place. Furthermore, structuring the pedagogy component into various thematic modules made creating coherence between the lectures, syllabus, and seminars easier for the student teachers. Second, the platform served as a tool to structure the students' learning process, as the thematic modules lead them step-by-step through the pedagogy component. Regarding how student teachers develop their PDC, we discovered that the student teachers who actively used the platform were more liable to assess the teacher education program as contributing to their PDC compared to those students who were more inactive in the platform. In the following sections, we present the findings according to the two research questions before discussing implications for further the development of blended learning environments.

RQ1: How do the student teachers use the online blended learning platform in their learning process within the pedagogy component in the teacher education program?

The e-mail interviews and the evaluation reports showed that the online blended learning platform provided a structure via its calendar function and the thematically divided modules of the pedagogy component connected to specific lectures and seminars. The students reported that because of its structure, the platform made studying more transparent and easier to cope with. Two example quotations about how students used the platform illustrate this:

> I use the modules to get an overview of the subject matter, key concepts, and curriculum; to read and understand the subject through introductory text; and to watch digital lectures. (Student teacher 8)

> I use the modules in order to get an overview of the curriculum and understand the connections. It makes the syllabus more transparent, and it makes it easier for me in a

> stressful everyday life to take my time to go through the relevant modules. The threshold is lower to enter a module than to open a whole book. (Student teacher 14).

The thematic modules helped the student teachers to gain a better understanding of the interrelationship between lectures, seminars, and syllabus. Furthermore, the modules contributed to structuring students' preparation for seminars, lectures, and exams by, for example, providing a small syllabus or an introductory text for each lecture and seminar. Structuring the pedagogy component into thematic modules seemed to reinforce the student teachers' comprehension of the pedagogy component. The provided structure helped to answer the questions "What and when will I learn?" and "How will I learn?" In the latter case, the e-mail interviews and the evaluation reports clearly showed that the student teachers used the modules to structure their study in various ways. Our findings suggest that the modules also contributed to structuring and consolidating the student teachers' individual learning process, as they reported actively using the short introductory texts in each module to help them grasp the essence of each theme, to prepare for lectures and exams, and even as preparation before reading the syllabus:

> I primarily use the subject matter accessible in the online platform as an introduction to a topic and to get an overview. It also works well when I repeat the syllabus. (Student teacher 18)

> I use the platform in order to read the PDFs of lectures, explore the modules, get an overview of the syllabus and curriculum related to themes, and find recommended readings. (Student teacher 16)

Other students found that the digital learning environment increased their motivation and created a space for reflection:

> When we used the platform in the seminars in the beginning of the semester, I experienced that it created interest and engagement. I liked to watch the small videos posted on the platform, and I think the platform worked as a motivation and did create a space for reflection. (Student teacher 12)

> The modules contribute to reflection because you can read, do activities, and explore the modules at your own pace. (Student teacher 9)

Together, these quotes underline the potential of the online blended learning platform to work both as a structuring tool/resource and as an arena for learning and further reflection. Furthermore, one student mentioned an unintended use of the question assignments that are meant to be shared with other students:

> I have done all of the reflection and discussion questions on my own without posting the answers, and I have read all the discussions and replies posted by other students. Even though I have not participated much, I have had a great advantage from using the platform. (Student teacher 15)

Notably, elements in the modules designed for sharing with others on the platform, like reflection questions and brainstorming and collaborating assignments, have the potential to work in other ways than how they are intended while still promoting reflection and further learning.

These findings highlight that the online platform supports the students in managing their studies, structuring their learning process, and providing a new space for reflection. Using the online platform is not obligatory, and even though the students describe the platform as representing a great potential for discussing various themes and sharing reflections, the majority of the students only interacted with each other through postings and discussions during a specific activity in a pedagogy seminar when they were required to.

RQ2: How do student teachers develop their PDC through using the blended learning platform?

In the e-mail interviews, the majority of the students rated their PDC as good or very good; however, they did not seem to differentiate between their general "home" use and using ICT in a pedagogical manner in their subject of teaching. Our findings indicate that the student teachers form two groups: one that actively used the online platform and a more inactive group. The active group evaluated the contribution of the teacher education program as more important than the inactive group with regard to the development of their PDC:

> Compared with before I entered the teacher education program, I now have a completely different PDC, particularly when it comes to components 1 [generic] and 2 [subject oriented]. Not very much on component 3 [profession oriented], because I have not worked as a teacher except during the period of practice. It was a surprisingly hard and uncomfortable process, but now I can do so much more with regard to ICT both in a pedagogical and didactical manner. (Student teacher 11)

> The period of practice last autumn did increase my engagement for using ICT in the classroom, and I was motivated to do research on my own practice with ICT both in terms of differentiated teaching and assessment. I have used ICT actively in the period of practice, inspired by the fall semester, and have found several areas where I think ICT works well, especially when it comes to adapting teaching to individual needs in a class. I also reflected on how I can use ICT-based tools to find evidence of learning, and I am exploring flipped classroom methods in order to engage more pupils. (Student teacher 12)

Despite positive experiences of the platform, some of the students, mainly the more inactive platform users, claimed that their PDC did not develop during their studies; they called for greater hands-on experience with various digital tools:

> My PDC did not develop through the teacher education program. It could have provided a more practical approach to ICT during the teacher education study. It is not enough that teachers just mention various ICT resources—we have to practice and use them by ourselves or university teachers have to actually use various digital tools in their teaching. I do not feel I have learned something new. I just heard that you can find various ICT resources there and there . . . In order to learn to use tools, you have to experience how they work in practice, and you have to be mentored by people who know the tools to the core. (Student teacher 3)

This quotation represents an insecurity we see among student teachers and even among those who rated their PDC as good or very good (regarding subject-oriented and profession-oriented PDC). Our findings suggest that student teachers rate their PDC as high because they do not distinguish between their generic digital competence and the more subject- and profession-oriented competences. Further, there is clearly a need among the student teachers

to have access to user-friendly arenas for trying out new technology while being guided by experienced mentors. Another question that arises is whether such ICT workshops should take place as part of the teacher education program or elsewhere.

Discussion and conclusion

The research questions guiding this paper are closely connected. The more active users assessed the teacher education program as having more impact on the development of their PDC than did the more inactive users. Based on our findings, we present four topics that we consider to be essential in developing the online blended learning design and developing PDC further in teacher education programs. First, the student teachers are expected to be 21st-century learners and teachers, which demands a twofold competence in order to engage in as well as to develop such learning environments (Newby et al., 2000). Thus, we argue that teacher education programs must involve student teachers in developing online environments in order to enhance learning and reflection about learning. As we know that the students use the introductory texts in order to plan for and structure their learning, we encourage student teachers to participate in developing these texts. Second, the blended learning designs need to be approached holistically and as an integrated part of teacher education programs. Third, making assignments mandatory will increase participation online and involve the students to a greater extent in interactive learning activities. Fourth, we consider it as necessary to carefully connect activities online with face-to-face activities in the seminars, such as by flipping more of the components in the pedagogical seminars, in order to create good coherence between the online platform and the seminars.

References

Berge, O., Gudmundsdottir, G. B. & Hatlevik, O. E. (forthcoming). *Utvikling av profesjonsfaglig digital kompetanse og lærerstudenters praksis* [Developing professional digital competence and student teachers' practice]. Oslo, Norway: Norwegian Centre for ICT in Education.

Bliuc, A. M., Goodyear, P., & Ellis, R. A. (2007). Research focus and methodological choices in studies into students' experiences of blended learning in higher education. *Internet and Higher Education*, *10*, 231–244.

Cohen, L., Manion, L., & Morrison, K. (2000). Research methods in education. *British Journal of Educational Studies*, *48*(4), 446–446.

Ferrari, A. (2013). DIGCOMP: A framework for developing and understanding digital competence in Europe. In Y. Punie & B. N. Brecko (Eds.), *JRC Scientific and Policy Reports* (pp. 1–50). Seville: European Joint Commission Research Centre. Institute for Prospective Technological Studies.

Fidel, R. (1993). Qualitative methods in information retrieval research. *Library & Information Science Research*, *15*(3), 219–247.

Gudmundsdottir, G. B., & Ottestad, G. (2016). Veien mot profesjonsfaglig digital kompetanse i lærerutdanningen [The road to professional digital competence in

teacher education]. In R. Krumsvik (Ed.), *Digital læring i skule og lærarutdanning* [Digital learning in school and teacher education] (2nd ed.). Oslo: Universitetsforlaget.

Hunt, N., & McHale, S. (2007). A practical guide to the e-mail interview. *Qualitative Health Research*, *17*, 1415–1421.

Kvale, S., & Brinkman, S. (2009). *Interviews: Learning the craft of qualitative research interviewing* (2nd ed.). Thousand Oaks, CA: Sage.

Lock, J. (2006). New image: Online communities to facilitate teacher professional development. *Journal of Technology and Teacher Education*, *14*(4), 663–678.

Lord, G., & Lomicka, L. (2008). Blended learning in teacher education: An investigation of classroom community across media. *Contemporary Issues in Technology and Teacher Education*, *8*(2), 158–174.

Meho, L. I. (2006). E-mail interviewing in qualitative research: A methodological discussion. *Journal of the American Society for Information Science and Technology*, *57*(10), 1284–1295.

Ministry of Education (2006). National curriculum for knowledge promotion in primary and secondary education and training. Oslo, Norway: Ministry of Education.

Newby, T. J., Stepich, D. A., Lehman, J. D., & Russell, J. D. (2011). *Instructional technology for teaching and learning: Designing instruction, integrating computers, and using media* (2nd ed.). Englewood Cliffs, NJ: Merrill.

Pettigrew, K. E., Fidel, R., & Bruce, H. (2001). Conceptual frameworks in information behavior. *Annual Review of Information Science and Technology*, *35*, 43–78.

Resta, P. (Ed.). (2002). *Information and communication technologies in teacher education: A planning guide.* Paris: UNESCO.

Selwyn, N. (2016). Digital downsides: Exploring university students' negative engagements with digital technology. *Teaching in Higher Education*. http://dx.doi.org/10.1080/13562517.2016.1213229

Small, Mario L. (2009). "How many cases do I need?" On science and the logic of case selection in field-based research. *Ethnography*, *10*(1), 5–38.

Stake, R. (1995). *The art of case study research.* Thousand Oaks, CA: Sage.

The Norwegian Directorate for Education and Training. (2012). *Framework for basic skills*. Retrieved from http://www.udir.no/contentassets/fd2d6bfbf2364e1c98b73e030119bd38/framework_for_basic_skills.pdf

Tømte, Cathrine, Asbjørn Kårstein, and Dorothy S. Olsen. (2013). *IKT i lærerutdanningen. På vei mot profesjonsfaglig digital kompetanse?* Oslo, Norway: NIFU.

UNESCO. (2011). *ICT Competency framework for teachers*. Retrieved from http://unesdoc.unesco.org/images/0021/002134/213475e.pdf

Vuorikari, R., Punie, Y., Carretero Gomez, S., & Van den Brande, G. (2016). *DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: The Conceptual Reference Model.* Luxembourg Publication Office of the European Union. doi:10.2791/11517

Wang, P. (1999). Methodologies and methods for user behavioral research. *Annual Review of Information Science and Technology*, *34*, 53–99.

Watson, D. M. (2001). Pedagogy before technology: Re-thinking the relationship between ICT and teaching. *Education and Information Technologies*, *6*, 251.

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage.

Appendix

Table 1

Data Sources, Aims, and Tools of the Study Research Questions and Analysis

Data	Aims	Research Questions	Tools of Analysis
Step 1: 19 e-mail interviews	1) To identify the students' experiences and actual use of the online blended learning platform. 2) To identify how student teachers experience the development of their PDC through the use of the blended learning platform.	How do the student teachers use the online blended learning platform in their learning process within the pedagogy component in the teacher education program? How do student teachers develop their PDC through using the blended learning platform?	1) The students' explicit descriptions of how they use the modules/resources and for what reasons. 2) The students' descriptions of their own PDC and explicit reflections about how the teacher education program contributes to strengthening their PDC.
Step 2: 152 student evaluation reports	To identify how the student cohort uses the modules in order to compare this use with the smaller interviewed group.	How do the student teachers use the blended learning platform in their learning process within the pedagogy component in the teacher education program?	The students' explicit descriptions of how they use the modules and the educational resources linked within the module.