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Enhancing social and health care educators' competence in digital pedagogy: A pilot study of educational intervention

Iina Ryhtä[1], Imane Elonen[1], Mari Hiekko[1], Jouko Katajisto[2], Terhi Saaranen[3], Marjorita Sormunen[3,4], Kristina Mikkonen[5], Maria Kääriäinen[5], Tuulikki Sjögren[6], Hilkka Korpi[6], Leena Salminen[1,7]

[1] Faculty of Medicine, Department of Nursing Science, University of Turku, Turku, Finland; [2] Department of Mathematics and Statistics, University of Turku, Turku, Finland; [3] Faculty of Health Sciences, Department of Nursing Science, University of Eastern Finland, Kuopio, Finland; [4] Institute of Public Health and Clinical Nutrition, University or Eastern Finland, Kuopio, Finland; [5] Research Unit of Nursing Science and Health Management, University of Oulu, Oulu, Finland; [6] Faculty of Sport and Health Sciences, University of Jyväskylä, Jyväskylä, Finland; [7] Turku University Hospital, Turku, Finland

Iina Ryhtä, PhD candidate, MHSc, Faculty of Medicine, Department of Nursing Science, University of Turku, FI-20014 University of Turku, FINLAND. Email: iikrry@utu.fi

Abstract

The purpose of this pilot study was to explore connection of an educational intervention on the competence of health care educators and educator candidates (n=11) in digital pedagogy as a part of national TerOpe project. An educational intervention, Basics of Digital Pedagogy was developed by the TerOpe project's experts. The participating educators and educator candidates of the educational intervention were recruited from the universities and university of applied sciences, which were involved in TerOpe project. All the participants of the educational interventions were invited to take part in this study. The educational intervention was conducted during spring 2019. Pre- and post-tests were implemented digitally by using an Educators' and Educator Candidates' Competence in Digital Pedagogy self-assessment instrument (OODI), which was developed for this study. The OODI includes 32 items divided in six digital competence areas professional engagement, digital resources, teaching and learning, assessment, empowering learners and facilitating learners' digital competence. The data was analysed statistically. The self-assessed level of overall competence in digital pedagogy and competence in all competence areas of digital pedagogy increased statistically significantly during the intervention. The educational intervention used in this study seems to increase educators' self-assessed competence in digital pedagogy. We recommend that all educators be encouraged to conduct continuous education on the basics of digital pedagogy.

Keywords: digital competence, digital pedagogy, delivery of health care, educational personnel, educator candidate, education, continuing

Introduction

Digital technology has changed higher education significantly [1,2,3]. Information and communication technologies (ICT) skills are a necessity in 21st century education [4], working life and society [5]. Spring 2020 showed that everybody needs to have the basic skills when it comes to digital pedagogy. COVID-19 forced all levels of education to adapt in a new situation, and the majority of countries shifted their education entirely online. [6] It is not enough that educators have competence in digital pedagogy; educators face a growing demand to help their students reach digital competencies needed in working life [4,7,8]. All of this requires the development of educators' competence in digital pedagogy [7], which is one of the central themes of 21th century education [1,4].

Competence in digital pedagogy is defined as having the knowledge, skills and attitude to plan, produce and evaluate teaching and learning via digital technologies. It is combining pedagogical and digital skills in a relevant way. [2,3] In this study, competence in digital pedagogy was operationalised by the European Framework for the Digital Competence of Educators [7], which guided researchers to develop and implement the intervention and instrument used in this study.

Background

The use of digital technologies in teaching has been studied, but studies about the competence of digital pedagogy of educators is scarce. It is recognised that educators should have the ability to use digital technology in teaching [9], but the integration of ICT in teaching and learning requires pedagogical competence and commitment from the educators [10].

Digital technology enables the use of new teaching methods in education and offers opportunities for collaboration among students [1,11]. It is stated that combining digitalisation with teaching is more satisfying for learners, compared with traditional learning strategies [12]. In addition, digital technology has resulted in a positive impact on the outcomes of student learning [10,13] and increased diversity in the learning experience [2].

It has been acknowledged that digital competence and digital technology used in teaching have been reported to be at a low-level, even though educators find digital technology effective and interesting in teaching [2,10,14]. Educators have further reported that they do not know how to implement student-centred pedagogy via digital learning environments [14], and they feel they need more continuous education in digital pedagogy [15]. Moreover, educators need more knowledge about students' thoughts, interests and the way of interaction when choosing the effective teaching strategies with different students [16]. Research on educator competence in copyright and creative commons licences is scarce, but there is some evidence, that continuous education is needed [17,18]. More research is needed on educators' competence and continuous education in digital pedagogy. Therefore, this study focuses on the competence of social and health care educators' in digital pedagogy and exploring the connection of continuous education on the competence in digital pedagogy.

The aim

The aim of this quasi-experimental study was to explore connection of an educational intervention on the competence of health care educators and educator candidates in digital pedagogy. The research question was: What is the connection of educational intervention on the self-assessed

competence of health care educators and educator candidates in digital pedagogy?

Material and methods

Research design

A quasi-experimental, pre- and post-test design, without control group, was used in this pilot study.

Educational intervention

The educational intervention used in this study was *Basics of Digital Pedagogics for Health sciences, Social services, and Rehabilitation Education* (BDE), a two ECTS (European Credit and Accumulation Transfer System) online study unit on Moodle-environment. The study unit was designed to be used on Master's level education (European qualification Framework, European Qualification Framework level 7) and as professional continuing education for educators. BDE was open for six weeks during February to April 2019 and the participants had a possibility to complete it on their own schedule.

BDE was developed by the TerOpe (blinded) project's experts, consisting of social and health care professors, lecturers, researchers and educator candidates. Based on the initial findings of a literature review [19] and discussions in the project group, the European framework for the digital competence of educators (DigCompEdu), [7] was chosen to be the framework of this intervention. The goals of the educational intervention were 1) to enhance the understanding of the role of digital competence in education, 2) to increase knowledge of the main concepts of digital pedagogy, 3) to apply evidence-based digital pedagogy knowledge in teaching and 4) to practice the use of digital environments and applications [20]. DigCompEdu is designed to enhance competence in digital pedagogy on several grades of education. DigCompEdu defines an educator's digital competence through six competence areas: 1) professional engagement, 2) digital resources, 3) teaching and learning, 4) assessment, 5) empowering learners, and 6) facilitating learners' digital competence (Table 1). BDE consisted of six modules aligned with the competence areas of DigCompEdu [7]. The teaching methods used varied during the intervention, depending on the content and the tasks e.g. group work, discussions, lectures, individual written assignments, peer evaluations and practical assignments.

Table 1. Description of digital competence areas [7].

Digital competence area	Content description
Professional engagement	• Communication and collaboration within and between organisations • Professional continuing development related to digital pedagogy • Reflective practice
Digital resources	• Selecting, creating, modifying, managing, protecting and sharing digital resources
Teaching and learning	• Teaching and guiding learners • Collaborative and self-directed learning
Assessment	• Different strategies for assessment • Learning analytics • Planning the assessment • Giving feedback
Empowering learners	• How to assure inclusion and access • Differentiation and personalisation of teaching and learning • Learner engagement and activating learners
Facilitating learners' digital competence	• Role of information- and media literacy in digital learning • Communication in digital environment • Creating content in digital environment • Responsible use of digital resources and responsible behaviour within digital environments • Problem solving in digital environment or using digital resources

The participants for this educational intervention were recruited from the universities and university of applied sciences, which were involved in TerOpe project. All the participants of the educational intervention were invited to take part in this study.

Instrument

The instrument *Educators and Educator Candidates' Competence in Digital Pedagogy (OODI)* used, was developed according to the DigCompEdu theoretical framework [7] and previous literature [19] for this study. An expert panel (n=8) was used to ensure face and content validity of the instrument and the instrument was further developed based on their comments. [21] The instrument consists of 32 items describing digital competences, divided into six competence areas, aligning the modules of educational intervention (Table 1.). The number of items per competence area varied from three to ten (Table 2.). Participants self-assessed their competence using the Likert scale, from 1 (very weak) to 5 (very good). The comprehensibility of the instrument was pretested by educator candidates (n=13) who did not participate in the educational intervention [21]. Changes and modifications proposed were discussed in the research group and the instrument was developed based on group's consensus.

Data collection

The data was collected in spring 2019 using an e-questionnaire consisting of *Educators and Educator Candidates' Competence in Digital Pedagogy (OODI*) instrument and background factors about participants' age, gender, profession, working experience and previous participation in continuous education. In addition, participants' self-assessed competence in digital pedagogy and the level of

interest in utilising digital technology in teaching was measured via two questions with ordinal scales 1 (very weak) to 10 (very good) [22]. The pre-tests were conducted prior the educational intervention. The questionnaire was sent to 35 participants who gave permission to contact them. Participants were asked to create a personal identification number, enabling researchers to connect pre- and post-test questionnaire data without being able to connect the data to the participants [23]. Post-tests were sent after the participants had completed the education.

Data analysis

The data was statistically analysed, using IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. -software. Descriptive statistics were used to describe educators' background information. The identification number enabled researchers to connect pre- and post-tests [23]. The nonparametric Wilcoxon signed-rank test was used for analysing the background information: self-assessed grade of competence in digital pedagogy and interest in utilising digital technology in teaching [24]. Prior to commencing the data analysis, the data was assessed for normality [24,25]. Differences between pre- and post-variables showed normal distribution in every category. According to normal distribution and numerical variables, paired-samples t-tests were used to compare the participants' self-assessment competence in digital pedagogy in every module before and after BDE. The level of significance was set at p-value 0.05. Cronbach's alpha was used to measure internal consistency and reliability of the instrument and the values varied from 0.78 to 0.94 in every competence area of the questionnaire, so ordinal variables were meaningful to combine and form to numerical sum variables [21] (Table 2).

Ethical considerations

This study was conducted in accordance with the ethical standards regarding research [26]. Research permission to recruit social and health care educator candidates was applied from department heads in participating universities according to the Finnish research legislation [27]. A research invitation was sent to each participant via e-mail. Participation was voluntary and participants were able to withdraw from the study at any point without giving a reason. A privacy notice from the data was made in line with regulations of GDPR [28] and the Data Protection Act [27]. The data will be stored for ten years in computer-coded files in the corresponding author's university.

Results

Participants

Out of the 54 enrolees, 42 completed the BDE. The questionnaires were sent to participants who had given permission to use their contact information for research purposes. Pre-questionnaires (n=35) were sent a week before, and post-questionnaires (n=26) right after the BDE followed by two weekly reminders. The pre-measurement response rate was 69% (n=24) and post-measurement response rate was 65% (n=17), only 11 participants responded to both questionnaires.

Participants of this study were health care educators (n=7) and educator candidates (n=4). All were females with the age of 42 years (SD 7.8, range 29-54), and having working experience in teaching eight years in the field (SD 7.7, range 0.25-23). Two educators had participated in continuous education of digital pedagogy before this study.

Before BDE, participants' self-assessed interest in using digital technology was, on average, 7.7

(SD=1.2, Median 7.0) and after BDE, 8.6 (SD=1.2, Median 9.0), revealing a statistically significant increase in interest (p=0.039). According to the Wilcoxon signed-rank test, the interest of eight participants increased and one of the participant's interest remained the same. The interest of two participants was reduced when compared to the time before BDE.

Connection of the educational intervention and self-assessed competence in digital pedagogy

In the pre-test prior to BDE, the participants' self-assessed overall competence in digital pedagogy mean was 4 (SD=1.4, Median 4.0) and the post-test mean was 6.5 (SD=1.5, MD 7.0). The change was statistically significant (p=0.003).

The competence of the participants increased in all six areas of the digital pedagogy competence areas (p<0.006), the most in the areas of digital resources and empowering learners and the least in the area of assessment (Table 2).

On the item level, a positive change was observed in each of the competences. Using learning analytics in student evaluation had the most notable change in mean values. The weakest positive change in mean values on the item level was in evaluation of the digital competence of work community (Table 3).

Table 2. The competence in digital pedagogy of the participants before and after the educational intervention.

Paired samples statistics		**Mean**	**SD**	**95% Confidence Interval of the Difference**		**Sig. (2-tailed) p-value**	**Cronbach's Alpha**
Competence areas (number of items per competence area) items N=32				Lower	Upper		
Professional engagement (n=5)	PRE	3.13	0.51				
	POST	3.73	0.26	-.96550	-.23450	0.004	0.783
Digital resources (n=10)	PRE	2.51	0.60				
	POST	3.37	0.40	-1.17913	-.54814	<0.001	0.918
Teaching and learning (n=4)	PRE	2.93	0.69				
	POST	3.70	0.67	-1.53063	-.42482	0.001	0.935
Assessment (n=3)	PRE	2.36	0.89				
	POST	3.52	0.72	-1.88310	-.41993	0.006	0.898
Empowering learners (n=4)	PRE	2.34	0.52				
	POST	3.43	0.45	-1.53063	-.65119	<0.001	0.883
Facilitating learners' digital competence (n=6)	PRE	2.62	0.58				
	POST	3.42	0.63	-1.17714	-.42892	0.001	0.890

Table 3. Competences with most notable and weakest positive change in means.

Competences with the most notable positive change in means **Competences in digital pedagogy**	**Pre-test Mean (SD)**	**Post-test Mean (SD)**	**Change in Mean**
Use of learning analytics in student evaluation (Module 4, Evaluation)	1.82 (0.75)	3.27 (0.91)	1.45
Using licenced online resources appropriately (Module 2: Digital resources)	2.18 (0.75)	3.55 (0.93)	1.37
Protecting own digital resources with appropriate licences and copyrights (Module 2: Digital resources)	1.45 (0.52)	2.82 (0.75)	1.37
Supporting students in responsible creation of digital content (Module 6: Facilitating learners' digital competence)	2.18 (0.75)	3.55 (0.82)	1.37
Differentiating teaching in digital environment (Module 5: Empowering learners)	1.73 (0.79)	3.09 (0.70)	1.36
Competences with the weakest positive change in means.			
Evaluating digital competence of the work community (Module 1: Professional engagement)	2.91 (1.04)	3.36 (0.67)	0.46
Using digital technology for communication (Module 1: Professional engagement)	3.36 (0.51)	3.82 (0.41)	0.46
Acknowledging the background of the learner group when choosing digital resources (Module 2: Digital resources)	3.36 (0.81)	3.82 (0.41)	0.46
Preparing digital learning materials based on the learning goals of the learner group (Module 2: Digital resources)	2.91 (1.04)	3.45 (0.82)	0.54
Supporting student collaboration in a digital environment (Module 6: Empowering learners)	2.91 (0.94)	3.45 (1.13)	0.55

Discussion

The aim of this pilot study was to explore connection of an educational intervention on the competence of health care educators and educator candidates in digital pedagogy. Overall, the competence increased. There was variability within the estimates in both pre- and post-test phase. The reduction in average deviation in post-test compared to pre-test may indicate that participants with a lower level of competence in digital pedagogy before BDE had a greater benefit from BDE when comparing to participants who had a higher level of competence [29]. More-advanced educators did not gain as much new knowledge and skills as the less advanced. Hence, it appears that the intended basic level of the educational intervention is accurate. In the future, it might be beneficial to widen and differentiate BDE to better coincide with the needs of the educators on different starting levels.

The most notable positive changes were detected in the areas of digital resources and empowering learners. The results do not give direct answers as to why the improvement was highest in these two competence areas. However, in these two areas, the participants seemed to have more similar starting points, which was deduced from the narrow range in both the pre- and post-phase. The level in these competence areas at the beginning of the educational intervention was also somewhat lower than in other areas. This supports the inference of these being the areas that experienced and novice educators were equally familiar with. This may indicate that digital resources and empowering learners were the areas with the

most novel knowledge. These areas are also crucial when speaking of digital pedagogy solutions in teaching. In addition, assessment was similar with the above-mentioned two competence areas regarding range and mean values, but the low number of items measuring this competence area affected the significance of the change.

Competences related to using learning analytics, copyright policies and intellectual property improved the most. Copyright issues taught during the educational intervention included measures to take in securing the authors' own rights and using resources under intellectual property regulations, but also guiding students to oblige the rules and ethics of intellectual property. These issues are scarcely studied in the field of health care educator education, but our results are aligned with the previous studies [17,18], and they show, there is a call for enhancing the intellectual property competencies. Apart from intellectual properties, competence in guiding students in the responsible production of digital resources and differentiation of education in the digital environment were also among the most improved competence areas. Differentiation and personalisation of teaching and learning resources are important tools to empower and improve the learning experience of the students. [7]

The variability within tasks and methods improves the inclusion and accessibility of learners [7]. Parigi et al. [30] suggest that at the centre of individual learning are the skills of educators using digital learning environments in meaningful way. Educators can also support individual learning [10] and accessibility by allowing learners to progress at an individual pace and use different methods and materials to complete learning tasks [7]. Most of the participants assessed their skills as good in providing accessible digital teaching.

The weakest positive change on competence was reached in evaluating digital competence of the work community, using digital technology for communication, acknowledging the background of the learner group when choosing digital resources, producing digital learning materials with consideration of the learning goals of the students, and supporting student collaboration in a digital environment. Since, the mean scores were just below and above three in these items, we may conclude that these subjects were not addressed comprehensively or sufficiently during the educational intervention. In addition, the standard deviation was rather high in all of these items, which means there was significant variation between the perceived competencies after the educational intervention.

Digital competence in its entirety requires proficiency in several competence areas in teaching [2,7]. Noteworthy in this study was the improvement of competence in each of the competence areas of the DigCompEdu framework [7]. BDE supported the participants' proficiency in digital pedagogy. Most likely, educators are more capable of responding to the need of students by accomplishing continuous education as the earlier literature shows [8,31], and it may have a positive impact on the professional identity and growth [32].

Competence in digital pedagogy and the use of digital technology in teaching have been at a low-level, even though educators find digitalisation interesting and useful in teaching [2,10]. In our study, the pre-test showed that educators were relatively interested in using digital technology in teaching, but they assessed their overall competence in digital pedagogy as weak. This study strengthens the notion that interest in digital pedagogy and earlier experience with digital technologies might have a positive effect on competence

in digital pedagogy [33]. Furthermore, the interest and attitude towards continuous learning and professional progression in general affect motivation and the ability to learn new things [2,10]. BDE was built to provide both theoretical knowledge and practical skills in digital pedagogy. The participants were encouraged and required to practice and use several digital resources during the learning tasks, providing a good opportunity to gain experience in using digital technology. [20] This especially may have been a significant factor in the improvement of the estimation of the competence level, as some of the educator candidates did not have experience in teaching or in creating learning materials.

The heterogeneity of the sample was significant in means of age, working experience and level of education. The mean age of the participants in this study was 42. In earlier studies focusing on Finnish health care educators, the mean age has been on average 50 years. [34,35] The relatively low mean age may have been affected by the inclusion of educator candidates as participants and younger educators being more motivated [2] to learn digital pedagogy in education. A slight connection between educators' age and working experience with competence in digital pedagogy has been previously noted [8], although it was not proven statistically in this study. Having work experience as an educator might ease the adoption of new methods and techniques, but younger generations may have an advantage in digital literacy [2]. Most students today have a predilection for technology [8]. As From [2] states, competence in digital pedagogy is an entity, which is assumed to mature with the more experience an educator has.

Despite the small sample size and narrow extent of the study unit (2 ECTS), the results are well in line with previous studies regarding educators' competence in digital pedagogy [10,36]. Integration of technology into teaching is necessary [2,9,7,37] as the spring 2020 with the Covid-19-induced leap into distance education in a majority of countries [6] has shown. Without appropriate training and professional development in digital pedagogy, educators may lack competence to support the students appropriately in online learning environments [33,37,38]. Still, quite little is known about health care educators' competence in digital pedagogy [8,4,37,39], but our study supports the previous studies that educators benefit from continuous education in digital pedagogy [8,33]. The study about BDE indicates, that even compressed study units about digital pedagogy may be beneficial to educators and educator candidates, but to verify that studies with larger sample are needed.

Limitations and reliability

This study has some limitations. Despite trying to motivate and remind the participants of the BDE to participate also in this study, we had a small sample size, and a large drop-out rate consisting only of 11 participants. The discontinued participants might have felt negative effects from the intervention, and it is possible that this study will lead to more positive outcomes than the results actually show. There is also a possibility that participants have self-assessed their competence in digital pedagogy to be better than their objective competence is. In addition, the voluntariness of BDE might have had an effect on the results, and it has to be taken into consideration.

The OODI instrument was used for the first time in this study. Because of the small sample size, the psychometric testing of the instrument was not possible, and further validation needs to be done with a larger sample. Moreover, the BDE was developed for both health and social care educators and educator candidates, but in this study, all the

participants were educators and educator candidates from health care. In the future, we aim to gain knowledge also the connection of BDE with the educators and educator candidates of social care. BDE and the OODI instrument have been developed based on the same framework, which increases the reliability. In addition, the content validity experts were used while developing the instrument.

The results need to be weighed with consideration of the small sample size. This study was conducted as a part of the wider TerOpe (blinded) project [20] and drew strength from the involvement of a group of experienced researchers.

Conclusions

It can be said that the self-assessed competence of participating health care educators and educator candidates in digital pedagogy improved. Results reflect the connection of BDE in enhancing the digital pedagogy competence of educators and educator candidates. Therefore, this course can be recommended to all educators Different levels of digital pedagogy education would support educators' competence, which, in a retrospective manner, will enhance student learning. Further development of the educational intervention, allowing advancement on different levels, should be considered and tested in the future.

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Conflict of interest

No conflict of interest has been declared by the authors.

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