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MOOCs as open online learning tools for developing competences related to digital health and social care services for multidisciplinary students

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Abstract

Digital health and social care services are increasing worldwide, and the rapidly changing nature of the world is creating a need for new competences among health and social care students and professionals. The purpose of this paper is to describe the pedagogical solutions of the SotePeda 24/7 national educational development project and to explore especially the massive open online courses (MOOCs) related to digital health and social care services as open (CC BY-SA 4.0) and flexible opportunities for developing the competence of multidisciplinary students and professionals. The data were collected via an online questionnaire from 266 Finnish University of Applied Science (UAS) students participating in the 20 MOOCs piloted during the spring 2020 semester. The majority of the participants (87.6%) came from the health and social care fields. From the 913 registrees, 562 (62%) completed the MOOCs. While piloting the MOOCS, the COVID-19 pandemic influenced heavily, and this may have increased the number of participants in the MOOCs, but also affecting the MOOCs in decreased retention and increased number of dropouts. To motivate students to actively complete the MOOCs, most were offered as 1-ECTS credit courses. Shorter study units were used as they were considered more flexible than longer ones, allowing students to find time to complete them more easily. The data were analysed using nonparametric quantitative methods. According to the results, the MOOCs were very successful in offering students flexible and open online learning opportunities and tools for developing their competences. MOOCs can potentially be efficient tools also in developing professionals' competences and pursuing lifelong learning. There is a fruitful ground in Finland to utilize open online learning opportunities as tools for developing competences because the already wide usage of digital tools and solutions in the country.

Keywords: distance education, professional competence, informatics, multidisciplinary

Introduction

Digital health and social care services are increasing worldwide [1]. Digital technology has changed the nature of work, as well as customer service; therefore, the competences required of the professionals in the multidisciplinary fields of health and social care are also changing [2-6]. The biomedical and health informatics (BMHI) curriculum [2] and HITCOMP competences [3] are the largest competence structures in building the digital health and social care digital competences in national level [4]. Also, according to the competences 2035 vision for future work, competences and expertise related to digitalization, such as the utilization of digital solutions and platforms, will become important for all professionals [7]. Based on the Digital Economy and Society Index (DESI), Finland is the most advanced country to use digital services in the European Union (EU). On average, 85% of EU citizens use the Internet, 60% use video calls and 11% take online courses, while 22% of Finnish people take online courses. It has been argued, that people's digital skill levels are strongly influenced by sociodemographic factors. For example, individuals with higher formal education levels have better digital skills. [8.] According to Finnish studies, attitudes towards technology—not age—correlate to digital skill levels [6]. Good digital skills for all professionals [7] and good facilities for digital work [8] are part of the common language that are needed for multidisciplinary development work [9] to create digital health and social care services.

The Finnish population will be ageing significantly in the coming years; the share of retirees will increase, and those starting education will decrease [10]. Simultaneously, the need for health and social care professionals is increasing as many professionals in these fields are retiring [11]. Moreover, the rapid changes in the types of competences that health and social care professionals need [4] are creating demands for flexible lifelong learning and competence development opportunities alongside work [12]. There will also be geographical changes, and, in 2030, only the metropolitan area will be a migration-winning municipality. This brings difficulties in terms of how regional education policies can meet regional employment and training needs. Furthermore, it is challenging to offer the same education in every municipality; online learning opportunities could provide a solution to this problem [10]. Online education, e.g. massive open online courses (MOOCs), is a rapidly growing way of offering support, knowledge and opportunities for competence development to many professionals and students [13].

Study context and aim

The context of this study is an educational development project called SotePeda 24/7. The project (2018–2020) aims to improve the future digital and co-creation skills and competences of multidisciplinary developers of health and social care services. The project mission is to provide an open learning environment and pedagogical solutions for collaborative and flexible cross-curricular learning [14]. The open learning environment was built on a Moodle-based online learning platform called Digi-Campus [14]. The pedagogical framework of the project draws from the idea of microlearning based on cognitive psychology and learning theory, in which learning contents are divided into pedagogically meaningful small 'chunks' containing one learning outcome [e.g. 15], and the learning by developing (LbD) model, which draws from inquiry-based learning and Dewey's pragmatism [16]. In the LbD model, the starting point is an authentic development situation that is solved in collaboration with students and working life representatives.

Furthermore, the three metaphors of knowledge creation—monological (MKC, the acquisition metaphor, within mind approach), dialogical (DKC, the participation metaphor, interaction approach), and trialogical (TKC, the knowledge-creation metaphor, developing collaborative shared objects and artefacts)—are consulted in the project [17]. The pedagogical solutions in the project include 1) micros and 2) MOOCs (their contents are based on 12 competence areas defined in SotePeda24/7 project) (see Figure 1) [4], 3) virtual puzzle rooms, and 4) virtual living lab. The pedagogical solutions are co-created by multidisciplinary groups of teachers and experts from several Finnish higher education institutions [4,18].

Micros are pedagogically meaningful small 'chunks' of open online material from the 12 competence areas [4], such as a video, an image, a text, an assignment or an assessment-related item, which are ready to be utilized by teachers as part of their teaching [18]. MOOCs, which are built from the micros, are targeted to specific audiences for specific goals, such as professionals for their competence development or students for their degree studies. MOOCs are commonly defined as continuous and flexible learning opportunities that use digital learning environments and materials, and they are open and available to anyone with Internet access. In addition, given the open nature of these courses, a main characteristic of MOOCs is their large number of participants. Furthermore, they are usually in the form of a course meaning that they are entities limited in time and/or subject matter. However, there are different variations of MOOCs; two of the most common are extended MOOCs (xMOOCs) and connectivist MOOCs (cMOOCs). [18–23]

The 12 competence areas in SotePeda24/7 project
Basic information and communications technology (ICT) competences
Interactive online competences
Service competences in digital health and the social care sector
Person-centred guiding competences in a digital environment
Competences to monitor health and well-being in a digital environment
Health and social care informatics competences
Multi-stakeholder service co-development competences
Ethical competences
Service design competences
Knowledge management competences
Research, development, and innovation competences
Societal competences

Figure 1. The 12 competence areas based on the definitions of health care and social welfare informatics competences [4].

The MOOCs in the SotePeda 24/7 project are not purely xMOOCs or cMOOCs, but they are defined, based on the objectives set for them [20,23], as openly available courses, regardless of time and place, of one to three ECTS (1 ECTS = 27 hours of student work) credits from several topics in the project's competence areas [15,18]. The project aim was to create several dozens of micros and over 20 fully open MOOCs licensed with an open publishing Creative Commons license CC BY-SA 4.0 (Attribution – ShareAlike) [24].

In creating these MOOCs, there were basic principles and guidelines in the project to guide the MOOCs to be mostly similar pedagogically, methodologically, and in visual appearance. There were, however, some variation in how the MOOCs were created. The guiding principle was to offer flexible and open online study opportunities for as many people as possible without requiring a large amount of teachers' working time. This meant that the MOOCs were created to be automatically assessed. In automatically assessed MOOCs, the main assessment tools are quizzes and tests with automated scoring. Tools following the progress of the students were also utilized as automated assessment methods. The teachers constructing the MOOCs created the automated testing activities so that the students could receive automated feedback about their answers. In addition, peer discussions and peer feedback were utilized not only to offer various perspectives and feedback to the students without teacher involvement but also to enrich students' views through dialogues about the themes they were learning and increase the retention in the MOOCs [12]. However, providing feedback was not the main objective in creating the MOOCs, even though it was considered an important pedagogical issue. In addition to automatically assessed assignments (MKC) and assignments involving peer learning (DKC), some learning assignments were structured so that the students could consult or involve their workplace or work practice community or health and social care service providers to gain a wider understanding and enable shared knowledge creation (TKC) [see 17].

Currently, nearly 400 micros and 20 of the 22 CC-licensed MOOCs has been developed and piloted. The MOOCs were offered via the CampusOnline digital portal to all students of Finnish University of Applied Sciences (UAS) and those studying open UAS studies in these higher education institutions.

The purpose of this paper is to describe the pedagogical solutions of the SotePeda 24/7 national educational development project and to explore especially the MOOCs related to digital health and social care services as flexible tools for developing the competences of multidisciplinary students and professionals. This study is not about evaluating training programmes or the development of certain competences per se, but we explore the MOOCs to gain a wider understanding of the possibilities they could offer as tools for competence development experienced and evaluated by the participants in the MOOCs. We aim to explore the degree to which participants find the MOOCs favourable, engaging, and relevant to them, and how confident and committed they are in applying what they have learned in their studies and jobs. This approach is in line with the four levels of evaluating training model, which is widely used and recognized model [25].

More specifically, our research question was as follows:

> *How do students experience MOOCs related to digital health and social care services as an open online learning opportunity and a tool for developing their competences?*

Materials and methods

Data were gathered via an online questionnaire from 266 voluntary participants who were students in the 20 MOOCs piloted during the spring 2020 semester. It is important to note that the data collection occurred at a time when the COVID-19 pandemic was heavily influencing the learning opportunities in the UAS sector [26]. The participants were asked to provide feedback about the MOOCs they had completed. Specifically, the participants were asked to report their field of study and their home institution and then answer items related to four themes: 1) general feedback about the course, e.g. how well the MOOC was experienced suit to be studied online; 2) materials and assignments; 3) the assessment experience; and 4) usability and technical solutions. The questionnaire items used a five-point Likert scale (1 = totally disagree, 2 = disagree, 3 = neutral (neither disagree nor agree), 4 = agree and 5 = totally agree). There were also two open-ended questions regarding the assessment and feedback received in the MOOCs and general feedback about the MOOCs. The answers to these open-ended questions were not analysed in this study.

IBM SPSS software was used to analyse the data, including calculating frequencies, means and percentages and making group comparisons. Given the non-normal distribution of the data, nonparametric methods, such as the Kruskal-Wallis test equivalent to one-way ANOVA, were used [27,28]. Effect size was calculated using Pearson's r, which is recommended for nonparametric tests [28].

Results

As of the end of the spring 2020 semester, 20/22 MOOCs had been developed and piloted. There were 913 registrees (see Table 1) in these MOOCs, and 562 (62%) completed the MOOCs. The percentage of students completing each MOOC varied between 0% and 87%; however, the completion rate was 60% or more in over half of the MOOCs. Altogether, 266 (47%) participants of the 20 MOOCs answered the questionnaire. The percentage of students who provided feedback after completing the MOOCs varied between 0% and 87,5%. In one MOOC, the percentage was 154,5%; the reason for the over 100% result is that feedback was also given by students who had not yet completed the course. The percentage of students giving feedback in each MOOC varied from 0% to 11,7% from all feedback given.

There were participants from 19 different Finnish UAS, as well as a few participants outside the UAS. The majority of the participants (87,6%, see also Table 2.) came from the health care and social care fields. There were also participants from business; computer science and technology; and other fields, such as hospitality management and service design, emergency services and arts and design.

Table 1. The number and percentage of students registering, completing, and giving feedback about the MOOCs.

Name of the MOOC Credit = cr (Course language: English = E, Finnish = F, Swedish = S)	Number of registrees	Number of students completing the MOOC	Percentage of students completing the MOOC	Number of students giving feedback	Percentage of students giving feedback	Percentage of feedback from all feedback
Guiding a Health and Social Care Client Online, Basics, 1 cr (F)	85	59	69,4%	17	28,8%	6,4%
RoboSote (Robotics in Health and Social Care) 1 cr (F)	60	50	83,3%	26	52,0%	9,8%
SoteData (Data in Health and Social Care) 1 cr (F)	54	47	87,0%	18	38,3%	6,8%
Ethics in Health and Social Care 1 cr (F)	67	45	67,2%	30	66,7%	11,3%
Introduction to Finnish Social and Health Care Legislation 1 cr (F)	59	45	76,3%	30	66,7%	11,3%
Flexible Digital Transaction Services 2 cr (F)	84	43	51,2%	12	27,9%	4,5%
Introduction to Service Design 1 cr (F)	61	38	62,3%	31	81,6%	11,7%
Cost Awareness in the Field of Health and Social Care 1 cr (F)	56	37	66,1%	22	59,5%	8,3%
Guiding a Health and Social Care Client Online, Applied, 1 cr (F)	46	33	71,7%	1	3,0%	0,4%
Adventuring in the Health and Social Care Service Jungle 1 cr (F)	40	31	77,5%	11	35,5%	4,1%
Citizens in the Flow of Digital Services 1 cr (F)	52	26	50,0%	19	73,1%	7,1%
From Shafts to Digital Inclusion 1 cr (F)	34	25	73,5%	14	56,0%	5,3%
Knowledge Management 3 cr (F)	45	24	53,3%	5	20,8%	1,9%
Data Protection and Security in Digital Services 2 cr (F)	52	20	38,5%	6	30,0%	2,3%
Evidence-based Knowledge in the Health Care Services 1 op (F)	37	11	29,7%	17	154,5%	6,4%
Wearables 1 cr (E)	15	9	60,0%	0	0,0%	0,0%
eHealth Introduction 1 cr (E)	32	8	25,0%	0	0,0%	0,0%
Secondary Use of Information in Social and Health Services 1 cr (F)	21	8	38,1%	7	87,5%	2,6%
Wearable Technology 1 cr (S)	10	3	30,0%	0	0,0%	0,0%
Multi-stakeholder Collaboration in Development Communities 1 cr (F)	3	0	0,0%	0	0,0%	0,0%
Total	**913**	**562**	**62,0%**	**266**	**47,0%**	**100,0%**
Adopting Electronic Service Systems in Social and Health Care Sector 1 cr (F)	MOOC not piloted yet					
Sensors 1 cr (F)	MOOC not piloted yet					

Table 2. Participants in the MOOCs.

Field of study	Percent
Health care	60,2%
Social care	27,4%
Business	4,5%
Computer science and technology	4,1%
Other	3,8%

Students from 16 MOOCs responded to the questionnaire. In general, the feedback received about the MOOCs (see Table 3) was very positive, with means varying between 2,82 and 4,77. For the general feedback theme, the students agreed or totally agreed with all of the items, with means varying between 4,15 and 4,77. The highest scores indicated that the MOOCs were suitable for online studying (mean 4,77) and proceeded logically (mean 4,55), and that the students would happily recommend the MOOC to other students (mean 4,52). Furthermore, the students agreed with the idea that the MOOC supported them in applying the knowledge learned (mean 4,47).

The feedback for the materials and assignments theme was not as unanimous. The students agreed or totally agreed that the instructions in the MOOC supported their learning (mean 4,43), helped them use the learning materials (mean 4,51) and complete the learning assignments (mean 4,55); they also agreed or totally agreed that the learning materials were up to date (mean 4,61). On the other hand, the means of the items related to the feedback received from the learning assignments varied between 2,82 and 3,25. The students were quite neutral about the usefulness and amount of feedback they received, and, in general, they were not looking for more versatile feedback than what was given to them. However, there was a statistically significant difference between the health care and the computer science and technology students ($p > .05$); in general, the computer science and technology students were more satisfied with the amount of feedback received about the learning assignments than the health care students. The effect size of this difference was small ($r = 0.20$). There were no other statistically significant differences based on the field of education.

According to the results, the students agreed that the assessment in the MOOC they were studying was clear (mean 4,23) and that the criteria were presented clearly (mean 4,24). However, the students did not agree as strongly about the continuous nature of the assessment (mean 3,67) or about the MOOC being in line with the assessment criteria (mean 3,71).

Table 3. The N, means, and standard deviations of the items in the questionnaire.

Theme	Item	N	Mean	Std. Dev.
General Feedback on the MOOC	The MOOC was well-suited for online studying.	266	4,77	0,666
	It was easy to outline the MOOC right from the start.	266	4,41	0,924
	The MOOC responded to what was promised, e.g. learning outcomes, content.	266	4,48	0,887
	The workload of the MOOC corresponded to the number of ECTS credits received from the MOOC.	266	4,15	1,141
	The MOOC proceeded logically.	266	4,55	0,855
	The MOOC supported me in applying the knowledge learned.	266	4,47	0,852
	I would be happy to recommend the MOOC to other students.	266	4,52	0,861
Materials and Assignments	The instructions supported me in completing the assignments in the MOOC.	266	4,55	0,638
	The instructions supported me in using the learning materials in the MOOC.	266	4,51	0,764
	The learning materials in the MOOC were up to date.	266	4,61	0,766
	The assignments in the MOOC supported my learning.	266	4,43	0,926
	The assignments in the MOOC were appropriate.	266	4,47	0,924
	Returning the assignments of the MOOC was easy.	266	4,37	1,219
	I received useful feedback about my assignments.	266	3,25	1,448
	I got enough feedback about my assignments.	266	3,20	1,477
	I would have wanted more versatile feedback about the assignments in the MOOC.	266	2,82	1,544
Assessment in the MOOC	The overall assessment in the MOOC was clear.	266	4,23	1,200
	The assessment criteria of the MOOC were clearly visible.	266	4,24	1,162
	The assessment in the MOOC was continuous.	266	3,67	1,530
	The assessment in the MOOC was in line with the assessment criteria.	266	3,71	1,593
Usability and Technical Solutions	The technical requirements of the learning environment used in the MOOC for my own devices were easy to understand.	266	4,55	1,009
	It was easy for me to use the learning environment used in the MOOC with my own devices.	266	4,60	1,001
	The learning materials of the MOOC were easily accessible.	266	4,52	1,061
	The learning materials (links, pdf, videos, etc.) were technically functional.	266	4,45	1,129
	The learning environment functioned without technical problems (downtime, saving assignments, etc.).	266	4,52	1,075
	There were clear instructions for technical problem situations in the MOOC (contact information, contact channels, schedules, etc.).	266	3,79	1,618
	The visual appearance of the MOOC was pleasant.	266	4,26	1,090
	The visual appearance of the MOOC supported my learning.	266	4,23	1,093
	The learning environment of the MOOC could be used without the guidance of technical personnel.	266	4,64	1,001

The items regarding usability and technical solutions received high scores with means varying between 4,26 and 4,64 in all but one item. The students agreed that the learning environment was easy to use with their own devices (mean 4,60) and without the guidance of technical personnel (mean 4,64). It also functioned well without technical problems. However, the students did not agree as strongly that clear instructions were provided for technical problem situations (mean 3,29). Furthermore, the learning materials were considered easy to access (mean 4,52), and the students experienced that the visual appearance of the MOOC supported their learning (mean 4,23).

Discussion

There is an increasing demand for health and social care students and professionals to develop competences related to working with digital services [2-6]. According to our results, the MOOCs created in the SotePeda24/7 project were experienced to be very

successful in offering students flexible and open online learning opportunities and tools for developing their competences. The students strongly agreed that the MOOCs were suitable for online learning supported them in applying the knowledge learned, thereby helping them develop competences in digital health and social care services. The experience from the MOOCs was very positive and in general, the students would happily recommend SotePeda24/7 MOOCs to other students. However, the students did not agree as strongly about the feedback received from the learning assignments. Even so, they were not looking for more versatile feedback than what was given to them. This was a somewhat expected result, as personal feedback was not the main objective in creating the types of MOOCs offered by the SotePeda24/7 project, even if it was considered a pedagogical issue that is very important when constructing MOOCs. Related to feedback, there was one statistically significant difference among the students according to the educational field; in general, the health care students hoped for a bit more versatile feedback than the computer science and technology students. This is interesting as health care is commonly considered a safety-conscious educational field since patients receive safe and evidence-based care, and the professionals use evidence-based guidelines [12]. However, since the effect size of this difference was small, this result should not be emphasised too much.

Regarding the limitations of this study, the data may be too unilateral, more strongly representing students from the health and social care field than those from other educational fields. Therefore, generalizations should not be made based on the educational fields. Another limitation might be the number of dropouts in the MOOCs. Altogether, there were 913 registrees, mostly UAS students, in the 20 MOOCs, and 562 (62%) completed the MOOCs. The large number of dropouts in online courses, including MOOCs, is a known phenomenon, and dropping out can be caused by many reasons [e.g. 13]. To minimize the number of dropouts and support students' activity and motivation related to completing the courses, 19 of the 22 MOOCs were 1-ECTS credit wide. In the SotePeda24/7 project, it was considered that students and, especially professionals would benefit from shorter study units, as it is easier to find time to complete them than longer ones. The participants of the MOOCs in this study were students from different educational fields. The MOOCs are, however, being piloted during summer 2020 also with health and social care professionals. The comparison between experiences of the students and the health and social care professionals should be explored in future studies. Furthermore, collaborative learning, e.g. peer discussions and peer feedback, were used as a learning activity in many of the MOOCs, as this method has been shown to increase the retention in online courses [13]. Moreover, the COVID-19 pandemic heavily influenced the UAS students' learning opportunities and might have affected their participation in the MOOCs. While the pandemic might have increased the number of participants, it might also have been a reason why students dropped out or did not complete the MOOCs, as due to the lack of personal interaction in the online learning environment, some of the students did not experience online learning to be motivating [25].

Our results revealed that even when students are offered the ability to complete their studies at any time and place, it is possible to create automatically assessed, openly available MOOCs that enable besides monological, also dialogical and trialogical knowledge creation [16,17]. This was achieved, for example, by formulating the learning assignments so that peer learning, e.g. peer discussions, could

be utilized to enrich students' views about the themes they were learning and to provide possibilities for learning via dialogue. In addition, some learning assignments required the students to consult or involve their workplace or work practice community or health and social care service providers, thereby offering them a pragmatic way to develop their competences during work and to combine their practical and academic knowledge to achieve shared knowledge creation [16,17]. This study offers important insights and understanding on how to create good learning experiences for students in an online learning context and how to build courses that support students' versatile knowledge creation for continuous competence development [16].

All in all, our results are in line with previous study that discovered that the amount of online education is growing fast and that online education can be an efficient way to offer support and opportunities for competence development to many professionals and students [13]. Although the participants in our study were mostly degree students, MOOCs could be efficient tools for developing professionals' competences. Given the wide usage of digital tools and solutions in Finland, this country is a favourable environment for using online learning, e.g. MOOCs, as a tool to develop students and professionals' competences related to digital health and social care services, alongside their work [5,6,8]. This is also a good starting point for Finnish higher education institutions to develop open (CC BY-SA 4.0) and flexible online learning opportunities. It is important to make joint development work effective and provide the same possibilities for all professionals regardless of their geographical location [10]. Furthermore, the fast growing number of older people in the population [8] and the declining number of available professionals [11] require the active introduction of multichannel services and support for citizens so that they can take a more active role in their own wellbeing and the use of digital tools and services [4,11]. It has been identified that active digital interaction in general increases individuals' competences and positive attitudes related to using digital health and social care services [6]. This study yielded encouraging results for the use of online learning in the health and social care sector. In the future, MOOCs could also be used more widely to enhance knowledge creation in dialogues between health and social care professionals and customers.

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Conflict of interest

The authors declare that there are no conflicts of interest.

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