Aarreniemi-Jokipelto, P. (2021). Learning Analytics as a Part of Design for the Learning Process: How Can Learning Analytics Benefit Learners? In E. Langran & L. Archambault (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 1117-1122). Online, United States: Association for the Advancement of Computing in Education (AACE).

What do Students Find Important, When Studying in a Learning Management System? -Could Learning Analytics Benefit Students' Learning?

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Abstract: The purpose of the study is to highlight what is important for students when they study in a learning management system (LMS), as well as if learning analytics (LA) can support students' learning in a LMS. The research questions were: 1) What do students find important when they study in a LMS?, 2) Are teachers using and enabling LA functionalities in a LMS? and 3) How can LA usage improve the usage of LA? The study was conducted through an online survey and interviews. According to the findings, the ability to do assignments at one's own pace and whenever one wants is highly valued by students. Students stated that tracking one's own progress in an LMS is important, and they would like a summary or an overall picture of their studies, including deadlines, the accumulation of tasks for certain weeks, and the time required for the tasks.

Introduction

Teachers had to transition from face-to-face teaching to online processes in conditions where the design principles of quality e-learning were not met (Green et al., 2020). The transition was not only a challenge for those who had not previously utilized learning management systems (LMS). Instead, the speed, vagueness, and unpredictability of the transition also posed challenges for those who were already familiar with e-learning (Armstrong-Mensah et al., 2020). Blended learning has been trendy for years, but the change to a purely online mode occurred overnight and totally unexpectedly, which caused challenges for teachers and educational institutions. The COVID-19 pandemic has continued over a year, so it is important to better understand what students value in their studies via an LMS. Student engagement affects learning; therefore, it is important to understand how learning environments support student engagement (Toro-Troconis et al., 2019). This study aims to understand what students value while studying in an LMS, and if learning analytics (LA) could bring added value.

Online teaching in LMSs and usage of LA

Online courses can be divided into two categories based on the level of education. First, higher education institutions (HEIs) and schools organize formal online courses for their students as a part of an established curriculum, and second, massive open online courses (MOOCs), which are a relatively recent development in continuing education (Aarreniemi-Jokipelto, 2020a). The number of MOOC participants may be in the hundreds or even thousands of participants, far more than is typically found in formal education.

Technological infrastructure, Internet penetration, and teachers' competencies in utilizing digital, distance, and mobile learning techniques have varied in different parts of the world (Aarreniemi-Jokipelto, 2020b). During the COVID-19 pandemic, these have affected the launching of e-learning solutions in LMSs. LMSs have been widely used before the COVID-19 pandemic, but often HEIs and schools have used LMSs in conjunction with contact teaching, meaning different forms of blended learning. Typically, learning materials are stored in an LMS, but versatile use of the existing functionalities of an LMS has often been limited. The COVID-19 pandemic changed the situation overnight. There was no other way to provide teaching than going fully online, often via an LMS. The rapid transition from face-to-face to online teaching has not been a smooth process, and it has required extreme effort from teachers and educational institutions. There is a lack of general competency when it comes to developing online lesson plans and teaching remotely. Besides that, teachers and students have had limited access to the Internet and lack of devices and tools. However, there are already several emergent studies that support the use of online

teaching as an alternative to face-to-face lessons during the COVID-19 pandemic (e.g., Lei & Medwell, 2021, la Velle et al., 2020; Robinson & Rusznyak, 2020).

Two simultaneous trends have boosted the usage of LA in educational technology: first, the increase of LMSs in education, and second, the expansion of data mining techniques (Agudo-Peregrina et al., 2014; Sun et al., 2018). The Society for Learning Analytics states that LA "is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (The Society for Learning Analytics, 2020). According to Hernández-Leo et al., (2018), LA analyzes how data on students' interactions can increase the understanding of learning experiences. The research on educational technology has named several impacts of LA. LA has improved students' learning experiences (Ellis et al., 2017) and improved students' success (Dietz-Uhler & Hurn, 2013; Mor et al., 2015). Mor et al. (2015) states, "Sharing analytics with students enhances their opportunities for self-assessment, whereas opening up design for learning provides a way to share the quality principles that govern education".

Methodology

This study employs an educational design research methodology. The term *design science* can be traced back to the 1960s, and several design science research genres exist (Peffers et al., 2018). Similarly, design-based research in education is not so much an approach as a series of approaches to produce new theories, artifacts, models, and practices that account for and potentially affect learning and teaching in naturalistic settings, for example, as in Barab and Squire (2004) or Plomp (2013). According to Hevner et al. (2004), design "describes the world as acted upon (processes) and the world as sensed (artifacts)". Educational design research applies to developing research-based solutions for complex problems in educational practice (Plomp, 2013), and an important reason for this study's methods comes from the complex nature of educational reforms worldwide (van den Akker et al., 2006). The shift from traditional teacher-centered contact learning to learner-oriented online learning is a huge practical educational reform, which requires the development of an optimal solution to complex problems in practical terms. Design research is a holistic approach that does not emphasize isolated variables (Plomp, 2013). Rather, "while design researchers do focus on specific objects and processes (interventions) in specific contexts, they try to study those as integral and meaningful phenomena. This context bound nature of much design research also explains why it usually does not strive toward context-free generalizations" (van den Akker, 1999). Typically, design research has a loop iterated several times before the final design artifact is generated (Markus et al., 2002). In this research, the aim is to build the first version of a model that illustrates LA, its purpose, and its role in the university in which the study is conducted.

Study

The study aims to highlight what is important for students when they study in a LMS, as well as if LA can support students' learning in a LMS. The research questions were: 1) What do students find important when they study in a LMS?, 2) Are teachers using and enabling LA functionalities in a LMS? and 3) How can LA usage in Haaga-Helia University of Applied Sciences (UAS) improve the usage of LA? The students participating in this study are pursuing their degrees at the Haaga-Helia UAS in a Moodle LMS, with a variety of courses and majors represented. Forty-six students participated in the survey, and seven students were interviewed. The first part of the study was conducted via the online survey tool Webropol, which included both multiple choice and open-ended questions. The survey consisted of six sections: 1) biographical information, 2) study information, 3) learning environment, 4) learning analytics, 5) functionalities of the LMS and 6) motivation. Content analysis was utilized to analyze open-ended questions. To receive a better understanding of students' LA needs, there were also seven online interviews, which were recorded. The interviews were needed to confirm the results of the survey.

Results

The average age of the survey participants was 36, so they are adults with work experience. We wanted to understand what students find important when they study in a LMS. The survey included the question: "What are the main benefits for you to study in a LMS?" Students were asked to choose the three most important reasons to study via a LMS, or to name them if they were not listed. The answers are illustrated in Figure 1 below. The most important

reason was to do assignments at their own pace, whenever they wanted. Also, the possibility of going through learning materials as often as they wanted, the ease of submitting assignments through an LMS, and the possibility of finding learning materials in the LMS were valued.

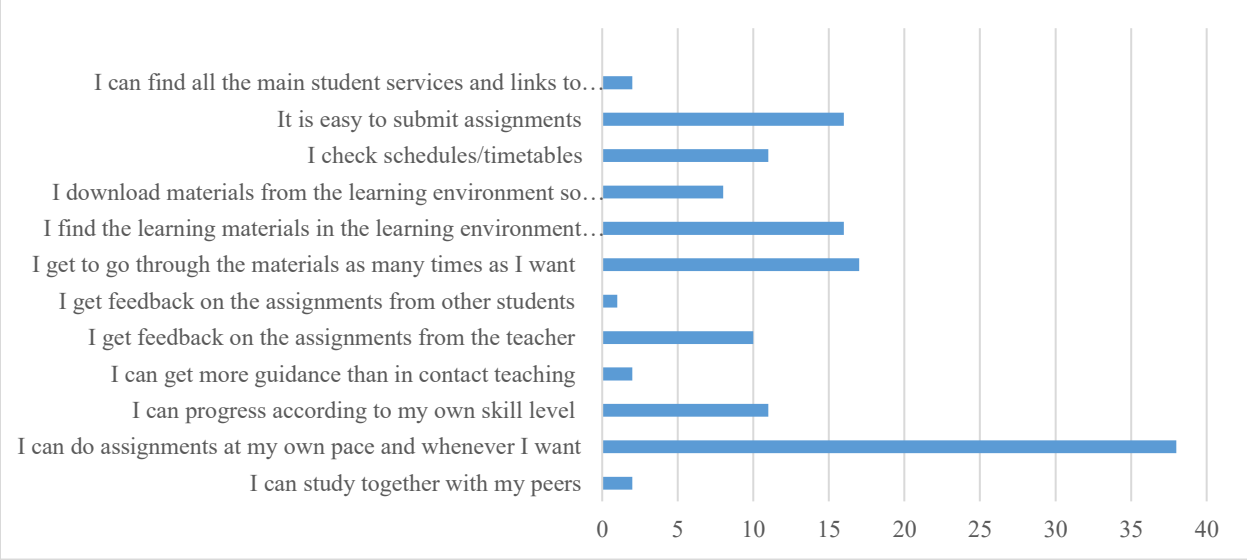

Figure 1: Important functionalities or features in a LMS

There was also a need to understand the usage of LA functionalities in the LMS. According to the results, 65% of students had never discussed LA in their studies, and 28% of students stated that they were not sure if LA had been discussed or not. Most students could not define LA when it was requested. Students were also asked an open question: What motivates them to study in an LMS? They stated that interesting and useful subjects, especially from an on-the-job perspective, motivation, the desire to learn, good scores, and graduation are motives to study. Clearness in learning materials, assignment instructions, and learning objectives were frequently mentioned. In the survey, LA functionalities, such as an overall picture of the course since the beginning of the teaching process, the follow-up of the progress of the studies, and the status of studies were raised by participants. Students were also asked how useful they would find a summary or an overall picture of their studies, where they would see, for example, deadlines, the accumulation of tasks for certain weeks, and the time required for the tasks. In the replies, 76% of students answered that it would be either very useful or quite a lot useful. When students were asked if they find it necessary to get information about their progress compared to other students, 59% found it not important and 26% doubted the need for information. Because it was not known beforehand if students are familiar with the concept of LA or not, there was also a question in which we asked if their LMS included functionalities mentioned in Table 1. These functionalities are typical in LA. In total, 60% of students indicated that their course included a tracking of one's own studies functionality. Only 15% to 28% of the students stated that their Moodle course included the other functionalities mentioned in Table 1.

Table 1: LA functionalities included in the LMS

LA functionalities included in the LMS, %	Moodle n = 46	
	Yes	No
Assessing your competences at the beginning of a course	28	72
Defining your own learning goals in the course	24	76
Planning the progress of your own studies	26	74
Planning your own schedule in the course	22	78
Self-assessing the development of your own competence at different stages of the learning process	20	80
Reflecting on what you have learned	39	61

Tracking your own studies, so you can see the tasks you have done, and which are assessed in one place	60	40
Tracking your feelings during the course	15	85

In the interview there was a table that included three columns: 1) follow-up of one's own learning and progress, 2) guidance in a LMS and 3) prediction of one's own learning. There was a list of activities and functionalities in each column. Interviewees were requested to choose the three most important activities or functionalities they would value in a LMS. Follow-up on one's own progress was the most chosen functionality. Also, reminders of assignments and deadlines were extremely popular. Gained competencies versus learning objectives were also mentioned. Also, the following were named as potentially valuable functionalities: recommendations in which order to study the course, a tracker how much time a student has used in different activities and a list of assignments or learning material, in which the student has spent a large amount of time on or had challenges with.

There are several implementation models of LA (Ranjeeth1et al., 2019). In this research, the aim was also to build the first version of an implementation model that illustrates LA, its purpose, and its role in the university in which the study is conducted. Chatti et al. (2012) designed a reference model of LA, which has been adapted to illustrate the LA in the Haaga-Helia UAS. "What" in the picture defines the source of data that can be used for analysis. In practice, it is the data received from the Moodle LMS and feedback received via the feedback system. "Why" defines the objectives of the LA to be achieved. Progress of the studies comes from the results and personalization, as well as guidance from curriculums and strategies of the university. "Methods" define the ways for the researcher to analyze the collected data, and statistics and data visualization can be used. Students, teachers, and the university will benefit from the usage of LA, so they are the "Who".

Typically, design research has a loop iterated several times before the final model. The created version is first version of the model. The next step of the study is to evaluate the model in practice and continue with a new loop.

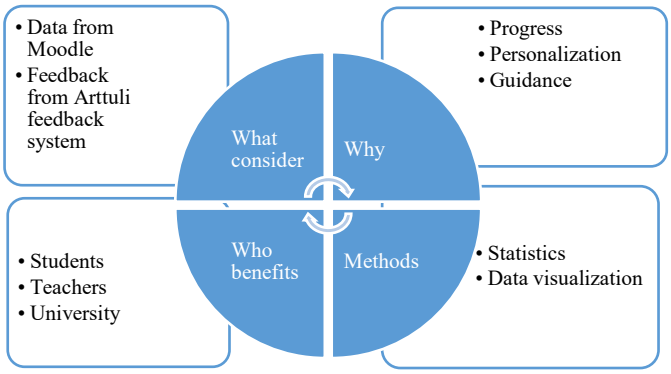

Figure 2: LA implementation model at Haaga-Helia UAS

Discussion

According to the study, the ability to do assignments at one's own pace and whenever one wants is highly valued by students. Students are adults, and often have work and family duties in addition to their studies, so freedom to learn at their own pace is important. Easy access to learning material and opportunities to go through them as often as needed were also appreciated. The pandemic has also influenced things, because in many homes work, social relations, hobbies, and studies have all moved online (Aarreniemi-Jokipelto & Aaltonen, 2021). Thus, simultaneously with one's studies, the other family members are also studying, working, socializing, and participating to online exercise classes at home. The time slots for studies are more fragmented than before the pandemic; thus, tools like progress trackers and assignment reminders are even more appreciated than in so-called "normal" situations.

The results show that students are not familiar with LA, as it has not been discussed in their studies. However, 60 % of students stated that their course included the tracking of one's own progress, and 76 % would like to have a summary or an overall picture of their studies, including deadlines, the accumulation of tasks for certain weeks, and the time required for the tasks.

There are differences between LMSs: namely, what LA functionalities are enabled. Unfortunately, Moodle has a limited number of LA functionalities. The results also show that not all teachers are using the existing LA functionalities of Moodle. There can be several reasons for that; teachers are partly lacking in the competencies to utilize LA, and teachers did not have enough time to design for courses via an LMS due to the change to online mode overnight.

The LA implementation model built for this study defines the purpose and usage of LA in Haaga-Helia UAS. According to the results, students are not familiar with LA and LA functionalities are not in use. However, students found LA functionalities useful for their studies. Haaga-Helia UAS has the quality criteria for online implementations, but LA is not included in the criteria. A recommendation from the study is to include the LA implementation model to the quality criteria to improve the usage of LA as a part of the design process of an online course. Teachers can design learning processes that produce LA data on e.g. whether students are struggling and need tutoring and facilitation.

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Acknowledgment

This research was supported by Svenska Kulturfonden.