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Author(s): Teräs, Marko; Silvola, Anni; Teräs, Hanna; Hartikainen, Santtu; Aksovaara, Satu; Hietaniemi, Riku; Muukkonen, Hanni

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Learning analytics for students: synthesis of two user needs studies in Finnish higher education

Marko Teräs, Tampere University of Applied Sciences

Anni Silvola, University of Oulu

Hanna Teräs, Tampere University of Applied Sciences

Santtu Hartikainen, JAMK University of Applied Sciences

Satu Aksovaara, JAMK University of Applied Sciences

Riku Hietaniemi, University of Oulu

Hanni Muukkonen, University of Oulu

Abstract

Recent research has suggested that in learning analytics research and development, students as the users of learning analytics have been left in the periphery. There is a need to engage students as the users of learning analytics. This paper presents common findings from two national level projects in higher education in Finland that focus on developing learning analytics especially for the students. Both have conducted a student-centered needs analysis in order to understand the students' learning and study experience, and their attitudes, expectations, and concerns of learning analytics, privacy and the use of their data. Data was collected with focus group workshops which combined interviews and co-creation methods. In both of the projects, data from these workshops were analyzed using thematic analysis. The results show that learning analytics development and high-quality pedagogical design should proceed in parallel. Results from these studies will be used to design pedagogically meaningful learning analytics pilots, and recommendations for the use of learning analytics in higher education.

1. Introduction

The field of learning analytics has a strong background in computer sciences. Previous research has identified a need for stronger connections with learning sciences research (Gašević, Dawson, & Siemens, 2015). According to the review of Tsai and Gašević (2017), higher education institutions are prone to identify technical challenges, but pedagogical approaches are not always considered part of the learning analytics development. Currently, research on learning analytics suggests human-centered approaches for designing learning analytics in context (Ahn et al., 2019; Buckingham Shum, Ferguson, & Martinez-Maldonado, 2019; Jivet et al., 2018). Involving the intended user groups in the design and development of learning analytics tools promotes the adoption of the tools and is more likely to result in expected changes in the behavior and practices of the stakeholders (Ahn et al., 2019). Student perspectives for learning analytics development have received limited attention in the previous literature on learning analytics (Leitner, Khallil, & Ebner, 2017). Students have often been seen merely as passive sources of data, rather than active stakeholders in LA development and use (Leitner et al., 2017; Ellis, 2013). Student benefit has often been targeted indirectly, without involving the students in the process. For instance, it has been suggested that LA could help teachers improve the pedagogical design of their courses, thus ultimately benefiting students (Lockyer, Heathcote, & Dawson, 2013). Previous research has pointed out student perspectives for student data use (Slade & Prinsloo, 2013; Pardo & Siemens, 2014), and student privacy perceptions (Schumacher & Ifenthaler, 2018). However, more attention is needed to understand the study experiences of higher education students, the contexts of studies, and the needs for digital support provided with learning analytics tools in order to design tools that support student agency as coordinators of their own study paths and learning processes.

These concerns in mind, two wide-scale research projects were initiated in 2018 by the Ministry of Education and Culture in Finland. The aims of the projects involve contextual, strategic development of LA tools, policies and practices for higher education institutions. In both projects, students have been actively involved in the process of identifying the user needs and describing the context of learning and studying in higher education institutions. Students have participated in focus group interviews, the aim of which has been to understand student needs and perspectives regarding LA tools, considering the current contexts and study experiences in which students are conducting their studies. This paper describes the methodology and findings of the student workshops and discusses the impact of the results on future LA development, focusing especially on active involvement of students in the process of designing learning analytics tools for the contexts in which they will be used.

2. The context of the study: two research projects

Project 1 and Project 2 are Finnish national-level projects that develop learning analytics for higher education. The aims and scope of the projects are complementary and the projects work in close collaboration. Both projects aim to develop learning analytics tools with existing and available institutional services, new innovation of using LA to support learning and study processes, educational practices where LA tools are used, and LA policy suggestions for Finnish higher education institutions.

Project 1 has eleven partner universities of applied sciences (UAS) from Finland. The aim of Project 1 is to develop LA together with students and teaching staff, especially to support learning and teaching. The focus of the project is pedagogical and concentrates on the course level. Project 1 has its focus on universities of applied sciences, taking into account the diverse learning environments and pedagogical practices that characterize learning and teaching in the UAS sector. Project 2 has seven partner universities in Finland. The aim of the project is to support students' fluent study paths, teaching and leadership by charting current use and availability of student register data for LA use, and to develop new learning analytics tools.

Multidisciplinary approaches to develop learning analytics are applied in the projects (Martinez-Maldonado et al., 2015). Both projects were started by mapping existing readiness and use of LA and by conducting a user needs analysis focusing on the specific targets of each projects (course level and study path level). Further on, the results of the user needs analysis will be used to identify the core processes and indicators that will be supported with LA. The results of the projects will include both new LA tools to support student engagement in high-level learning processes (course level) and tools to support students to fluently progress in their studies (study path level), recommendations of educational practices for the use of LA tools, as well as LA policy suggestions for Finnish higher education institutions.

3. Research task and methodology

The studies presented here aim to reply for the call to make LA development more human-centered (Buckingham Shum et al., 2018). The complementary studies presented in this paper aim to bridge the gap between student needs and LA development and implementation in higher education. The goal was to find out how students currently describe their learning and studying experience, in order to identify measures that would support learning and studying and brainstorm how LA could be used to facilitate them. The main research questions that guided these studies were:

- 1) How did students describe their learning and study experiences?
- 2) How did students describe their attitudes, expectations, and concerns related to learning analytics, privacy and the use of their data?

3.1 Data collection

In Project 1, user needs research focused on understanding students' learning processes and how learning analytics could potentially support them. In Project 2, user needs research focused on understanding students' current contexts and study experiences, and identifying the student needs for learning analytics development to support fluent study paths in the university. Both projects were also interested in the students' attitudes and expectations related to the collection and use of learning data, and privacy.

3.1.1 Project 1 data collection. The project objective was to get a wide picture of LA needs through various degree programs. The sample of participants was 124 students from 7 Universities of Applied Sciences from different parts of Finland (Table 1).

Degree programs	n	Approach	n	Year of study	n
Computer science and information systems	50	On campus	115	1st year students	52
Business	17	Blended	5	2nd year students	43
Engineering	16	Online	3	3rd year students	18
Social sciences	11	MOOC	1	4th year students	6
Healthcare	11			5th year students	5
Arts and Media	7				
Humanities	6				
Forestry	5				
Customer service	1				

Table 1: Project 1 sample details

The focus group workshops took place in small groups, generally with 3-7 students from the same degree program. A few partners organized workshops with up to 20 students from various degree programs in the same session. These lasted about two hours. The sessions started with a short project introduction, but no general learning analytics presentation was given: this was deliberate so to allow the students to discuss their learning experiences freely without directing or restricting their ideas with existing learning analytics solutions.

The focus group workshop had four phases:

- Describing events that supported or inhibited learning during a learning unit they remembered well on a learning curve template
- Discussing individual findings in small groups, supported with reflective questions
- Brainstorming solutions for identified challenges in learning or study processes
- Discussing opinions and expectations related to privacy, data collection and LA

The workshops were audio recorded and transcribed, and the products of the brainstorming phase were scanned.

3.1.2 Project 2 data collection. Data collection in the Project 2 project was performed at the University of Oulu with 134 students. Participating students were 3rd and 4th year pre-service teachers and 1st year electrical engineering students. Students participated in the workshops that consisted of small-group tasks (groups of 3-5 students) during which students were asked to discuss the given topics together and to write their answers on a drawn study path, mind maps and answer sheets (1 for each group). Reflective tasks were given to structure student group conversation.

Student workshops focused on students describing their current study experiences and generating new ideas to support their university studies. Student perceptions of privacy and ethical issues regarding learning analytics were also discussed. The group work of 9 small-groups were recorded for further analysis of student needs, expectations and concerns. Each workshop lasted for 2 hours. Before participation in the workshops, pre-service teachers took part in an introductory lecture about learning analytics. Short introduction to LA was presented for electrical engineering students at the beginning of the workshop. The structure of the workshops was as follows:

- a. **Study path task.** To map the current context of university studies, students were asked to draw a study path of the group. With reflective questions, students were instructed to discuss the support measures and main events and challenges during the study paths, as well as describe their expectations regarding the upcoming study path.
- b. **Idea generation.** Students were first asked to generate new ideas of how to enhance their study experience and how to solve the challenges that they had faced so far. After that, student groups drew a mind map to illustrate their vision of the campus in ten years.
- c. **Development of ideas.** After drawing a mind map, students were requested to discuss the open-ended questions and connect them to their ideas of developing campus and digital services. Students were asked to think about the possibilities of learning analytics in their idea generation, but also other solutions were included to better understand students' learning needs.
- d. **Ethical questions and privacy perceptions.** Students were asked to first read the guidelines for ethical use of learning analytics (Sclater & Bailey, 2015), and after that, to discuss their expectations and concerns related to learning analytics with the help of reflective questions. Students recorded their group answers in answer sheets.

3.2 Analysis

In Project 1, each participant UAS performed a thematic analysis and sent their findings to the main research team who then combined the findings and compiled a synthesis of the common themes. In Project 2, thematic analysis (Braun & Clarke, 2006) was conducted with Nvivo 12 -program. Students' development ideas for current university practices and services, in addition to expectations and concerns regarding LA use and privacy were analyzed (Author ref). Task products, open-ended questions about university study experiences, development ideas and learning analytics expectations and concerns were collected and documented from each working group (Author ref).

4. Findings and discussion

This paper summarizes and discusses the shared common findings from the two studies. Full results from the individual studies will be discussed separately elsewhere (see Author ref.). This section presents shared themes related to students' needs, and shared themes related to students' expectations and concerns of learning analytics, privacy and the use of their data. In the comparison of the findings of the two studies, four main themes were identified that summarize the common needs expressed by students.

4.1 Theme 1: Study planning and progress monitoring

In Project 2, students expressed the need for better availability of information that helps them to plan their studies themselves and to monitor their progress related to the individual goals and institutional

goals. These needs were expressed as suggestions about the tools that visualize their previous study paths and competences, as well as suggestions about the tools that also enable teacher tutors to monitor students' study progress in real-time. Students also expected that digital tools would better enable flexibility in studies in a way that they could study without being at a given place at a given time, and that digital tools would enable better anticipation and planning of studies.

Studying in higher education requires various aspects of self-regulated learning skills (Hadwin, Järvelä, & Miller, 2018). However, these skills are not developed overnight, but require scaffolding and guidance. Staying on top of one's study schedule, assignments, work placements, and other, often coinciding responsibilities was highlighted by the students as a major challenge. This applies both in the course level and curriculum level. In the Project 1 workshops, students brainstormed several different solutions for these needs. Students hoped they could better understand their studies as a whole, better plan ahead and to see what courses they could take. Although Project 1 aim is to study students' needs on course level, there is a clear need to develop study systems as well. This could mean visualizing the learning process. On course level, students mentioned scheduling of tasks and assessments, as well as clearly articulated course requirements. Different progress monitoring tools may be helpful in this respect. However, such tools are usually connected to a learning management system, and thus remain of little use on courses that utilize such systems to a lesser degree.

4.2 Theme 2: Feedback and evaluation of personal competence

Receiving sufficient and timely feedback emerged as one of the most important themes in the needs analysis. All too often it seems that summative assessment is over-emphasized at the cost of formative feedback. In Project 1, this was especially highlighted as the focus was on course level: students expressed an acute need for feedback to guide their studies at different stages of the course and help them to stay on track on the development of one's professional competence and skills.

In Project 2, students were asked what kind of feedback they currently receive, and what kind of feedback they would need. In their answers, students described the need for more feedback that is specific, connected to their individual learning processes and study progress, and that they would get feedback that pushes them forward to improve their skills. Additionally, students suggested that feedback should be more timely and multi-channeled. Many student suggestions included ideas of digital guidance and support. At the same time, students expected that digital tools would improve the quality of face-to-face interaction between faculty staff (e.g. teachers and academic advisors) and students.

The importance of feedback is well known and documented (Boud & Molloy, 2013). Unfortunately, it is also very work-intensive, and teachers' workload seldom allows them to provide as much personalized feedback as students would hope to receive. Harnessing digital tools and LA may be of potential in bridging the gap. However, careful pedagogical planning and learning design are required to make the most of these tools in supporting learning, not just the process of studying.

4.3 Theme 3: Scaffolding and guidance

In Project 2, students brought out the need for better support of learning and studying in several categories of the conducted data analysis. Availability of guidance services, increasing resources of teaching and student services, opportunities to have guidance in different phases of university studies and possibilities to have guidance for different purposes (e.g. study skills and planning, career choices, student well-being) from different sources were mentioned as important development goals in student data.

In Project 1, the role of learning design was highlighted. Most of the needs expressed by students were connected quite simply to a well-structured course plan, including relevant study materials as well as versatile and meaningful learning tasks, and acts of learning that scaffold the learning process

and connect theoretical knowledge into practice. Personalization is of utmost importance, as student cohorts become increasingly heterogeneous. LA solutions are potentially helpful in these endeavors, however, it should again be noted that their usefulness in scaffolding learning is directly connected to learning design. From the perspective of LA, student activity that leaves a digital mark is the key. Without digital traces of student activity, there will be no data to be used in LA solutions for scaffolding and guidance.

4.4 Theme 4: Time management and study skills

In Project 2, students brought up the need for tools that support them to manage their time, coordinate studies and support student well-being. Students wished for more tools that help them to develop their skills as learners, to monitor their own study progress, to receive feedback that helps them to develop themselves and gives them new insights on how they are doing in their studies.

In Project 1, time management was highlighted in the course-level discussion. Students attend several courses at the same time, and often struggle as the assessments and course requirements coincide. As student cohorts become increasingly diverse, students increasingly often juggle between studies, work, and family commitments. In the future, LA solutions could take into account a wider variety of factors that have an impact on students' time management abilities. Visualizations that provide an overview of both course and curriculum level progress could help identify overly busy time periods and help students to plan their work in advance. This would also be helpful for educational designers and curriculum developers.

4.5 Student attitudes, expectations, and concerns related to learning analytics, privacy and the use of their data

The area of student attitudes, expectations, and concerns related to privacy and the use of their data yielded three interrelated themes: transparency of data collection and ownership, the purpose of use, and protecting student privacy.

In general, students had a positive outlook for LA, provided that the collection and use of their data was pedagogically justified and was done to support their learning and studies. At present, most students did not know what data was collected from them and what purposes it was used for. Transparency of data collection and usage should thus be improved. Students should be seen as subjects and active stakeholders in LA, not simply objects and sources of data (Author ref.)

Concerns were raised about combining and using data from multiple sources, for example health records, activity and learning platforms. Students also pondered if such tools could distort students' progress and find false causalities, in addition to causing underachievement. Students were generally concerned how their data was stored, collected and used, but also what happened if their data was accidentally or on purpose leaked to third parties (for example companies). Some feared companies could use their data for profit, for example by selling it to potential employers, and if it could somehow then affect the students' future employment opportunities.

Research has recently highlighted the importance of ethics in developing LA and for example machine learning algorithms (Buckingham Shum et al., 2019; Corrin et al., 2019). Ethics in this context is a multifaceted concept, including aspects such as involving stakeholders, being transparent and developing principles and guidelines for using data (Corrin et al., 2019). Developing machine learning algorithms that predict students' learning progress is a new area in education. Both presented research projects have aimed for transparency with students on how their data is used and might be used in the future, in addition to communicating how important their input is for development. The message has been that these projects aim to develop student learning and study processes for them. Many times, this approach yielded a positive response from the students, and most likely it will be important in the pilot phase in order to engage the students as the stakeholders and users of LA.

4.6 Pedagogical design

Perhaps one of the clearest findings was that the needs and hopes of students are all related to aspects of pedagogical design. Instead of sophisticated measuring tools or AI solutions, students call after very foundational elements of teaching and learning. This is a sobering finding - instead of futuristic, state-of-the-art technologies, the focus is (re)directed to pedagogical design. Interestingly, the needs of teaching staff were found in another related study to mirror the student needs very closely (Author ref.).

The themes that promote or inhibit learning were often different sides (positive or negative) of the same phenomenon. For example, learning was promoted by clear goals and inhibited by unclear goals. It is also important to note that the student needs were often related to issues of pedagogical quality. Thus, it could be claimed that learning analytics solutions will not be very beneficial in supporting learning until elements of pedagogical quality and learning design are in place. When implementing learning analytics, teachers' pedagogical competences and support for pedagogical development should be equally invested in. Also, digital solutions, including the clarity and usability of educational technologies, should be seen as a part of pedagogical quality.

It must also be noted that pedagogical approaches and learning environments vary considerably between courses and disciplines. Especially in universities of applied sciences, a significant part of studies takes place in authentic work environments, rather than in classroom or institutional learning management systems. The choice and development of appropriate learning analytics solutions requires careful planning and should be done in conjunction with pedagogical design. Relying merely on the data that automatically accumulates in the LMS might be unhelpful for student needs, or, worse still, lead to misguided conclusions and undesired pedagogical changes. Understanding the complexity of learning and its contexts is key to successful and helpful LA solutions.

5. Conclusion

Students as the users of LA have received limited attention in LA research and development. Recent LA research has reported the need to engage students with user-centered research and development. This paper has presented two Finnish national level projects in student-centered LA development in higher education. The projects, one from the university of applied sciences (Project 1) and the other from the university context (Project 2), have employed focus group interviews and workshops to perform a student needs analysis. The aim has been to 1) understand what are the most important needs in students' learning and studies, and how learning analytics could support them, and 2) understand students' attitudes, expectations, and concerns related to learning analytics, privacy and the use of their data. The collected data were evaluated with thematic analysis.

Needs that students reported were related to planning and monitoring their studies, feedback and evaluation of personal competence, guidance and learning design, time management and study skills. Students' expectations and opinions on privacy and learning analytics were related to transparency, data collection and ownership, the purpose of use, and protecting student privacy. Many dimensions of the findings could be returned to better pedagogical and learning design quality.

The results of the needs analysis studies presented in this paper will be used to advise LA developments in the following phases of the projects. Project 1 will develop, implement and evaluate course level LA pilots. The needs analysis and pilot phases will inform the development of LA policy recommendations for the universities of applied sciences. Project 2 will develop LA policies for the

university context, based on the findings of the student focus group study and other sub-studies conducted in the project.

It can be concluded that LA alone is not a “silver bullet” that will automatically solve problems in higher education. On the contrary, adding a layer of learning analytics on top of dated pedagogical practice may reinforce undesired practices. LA and pedagogical design must proceed in parallel with each other. Data collection points should be connected to pedagogically meaningful steps and learning actions, which puts emphasis on upfront, high-quality pedagogical design.

In the future, LA research and development would benefit from adopting more diverse research and development methods. Approaches such as design based research and a higher degree stakeholder involvement in authentic contexts are recommended.

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