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Students' Expectations of Learning Analytics in a Swedish Higher Education Institution

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Students’ Expectations of Learning Analytics in a Swedish Higher Education Institution

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Abstract—The potential of learning analytics (LA) to improve learning and teaching is high. Yet, the adoption of LA across countries still remains low. One reason behind this is that the LA services often do not adequately meet the expectations and needs of their key stakeholders, namely students and teachers. Presently, there is limited research focusing on the examination of the students’ expectations of LA across countries, especially in the Nordic, largely highly digitalized context. To fill this gap, this study examines Swedish students’ attitudes of LA in a higher education institution. To do so, the validated survey instrument, Student Expectations of Learning Analytics Questionnaire (SELAQ) has been used. Through the application of SELAQ, the students’ ideal and predicted expectations of the LA service and their expectations regarding privacy and ethics were examined. Data were collected in spring 2021. 132 students participated in the study. The results show that the students have higher ideal expectations of LA compared to the predicted ones, especially in regards to privacy and ethics. Also, the findings illustrate that the respondents have low expectations in areas related to the instructor feedback, based on the analytics results. Further, the results demonstrate that the students have high expectations on the part of the university in matters concerning privacy and ethics. In sum, the results from the study can be used as a basis for implementing LA in the selected context.

Keywords—learning analytics, adoption, higher education, students’ expectations.

I. INTRODUCTION

Learning analytics (LA) can improve student learning and teaching. Yet, despite the increased access to student (digital) data, the rapidly growing interest in LA worldwide, and substantial research efforts performed, there is still little empirical evidence of impact on practice that exhibits the effectiveness of LA [1]. The use of LA methods offers objective ways of measuring students’ learning. The analysis of student data can inform teachers and learning designers on how students absorb information, how they engage in various learning activities, and how they navigate in their digital learning environment/s. This understanding can in turn offer a sound ground for improved teacher support, improved study results, better study techniques, and more [4].

Analysis of the student data may be of interest to several stakeholders in higher education, including students and teachers. In this study, we focus on students in the context of a Swedish higher education institution.

Learning Analytics (LA) refers to the collection, measurement, analysis and reporting of big data about students in their learning environment/s for the purpose of understanding and optimizing learning and the settings in which it occurs [27]. In addition, LA can be used to give students or others in their vicinity (e.g., teachers) the opportunity to continuously follow their learning progress and provide in-time feedback. As a result, we can gain more accurate insights into what the student’s learning process and learning environment look like, and assist reflection on study performance, improve study results, or discover the students who need additional support [6].

LA is a relatively new, increasingly growing research area with a considerable record of publications. One of the key stakeholders in LA are students. Studies performed have focused on what visualizations of students’ academic progress could look like to provide the most benefit [7], how to best identify students at risk of underperforming and/or failing their courses [8], and how LA can help develop students’ ability to self-regulate their learning activities [9]. All this is important for improving students’ conditions for learning.

Yet, to meet students’ needs adequately, we need to pay attention to their related expectations of LA. Considering the importance of students’ expectations for design and implementation of LA in practice, and the fact that they may differ across countries, they have not been explored well across countries, with few exceptions [e.g., 10, 11, 12]. Scholars highlight that LA implementation is highly dependent on contextual factors [20]. To our knowledge, there is no similar study conducted in the Nordic context of higher education.

This study builds on previous research [13,14] about what students' attitudes and expectations of LA are and focus on students’ expectations of LA in the context of Swedish higher engineering education. More specifically, it explores what students’ expectations of LA are, and whether there is a consensus about what attitudes prevail. Thus, the following research question has been posed:

What are Swedish students’ expectations of learning analytics?
II. BACKGROUND

A. Learning Analytics in Higher Education

Over the past ten years, LA as a research area has grown, especially in the setting of higher education. More than a thousand studies with the keywords “learning analytics” and “higher education” were published. In about a third (35%) of the research, there was evidence that LA improves learning support and teaching in higher education, but in only 9% of the research showed evidence that LA actually improves students’ study results [4]. In the same study, it is noted that only 18% of all studies on LA in higher education mentioned any ethical aspects at all [4]. This can be considered problematic as (student) data collection, use and analysis are linked to integrity and ethics, which are central parts of trust in institutions.

B. Users’ Expectations of Information Systems

When an information system (e.g., a LA tool) fails, one cause can be linked to the limited body of knowledge in terms of key stakeholders’ expectations of LA. This is stressed by [15], “once cause may be its [an information system’s] inability to meet the expectations of its stakeholder group” [p.493], in the context of LA – students. Further, [16] underlines that user expectations are placed between pre-implementation factors (i.e., the variables that may influence the realism of user expectations) and two indicators of information systems success, user perceptions (i.e., satisfaction) and user performance (i.e., decision quality). Scholars also stress that user expectations or information systems should be at a realistic level: users’ unrealistic expectations can lead to users showing low satisfaction and systems being at a realistic level: users’ unrealistic expectations can lead to users showing low satisfaction and usage [17]. Therefore, in this study there is a focus on differentiation of the students’ ideal and predicted expectations of LA. Differentiation between them allows researchers and practitioners to better understand what students realistically expect from LA services (e.g., in terms of the functionality of the system and potential privacy concerns), whilst also being attentive to what students wish [14]. Garcia et al. [19] stress that while “ideal expectations are desired outcomes based on the individual’s hope, predicted expectations are realistic beliefs about what is perceived feasible” [p.174].

In this study, student expectations of an information system (e.g., a LA service) refer to “a set of beliefs held by the targeted users of an information system associated with the eventual performance of the IS [information system] and with their performance using the system” [15, p. 494].

C. Students’ Expectations of Learning Analytics

In the past, limited research has been performed on the role of key stakeholders in decision-making in LA, and their expectations of LA [14]. However, there are some examples across countries.

The studies demonstrate that despite the students’ overall lack of awareness of what constitutes LA [12], students in higher education overall exhibit positive attitudes towards and expectations of LA [e.g., 10, 11, 14, 18]. Hilliger et al. [11], for instance, examined among others, students’ needs for LA adoption in Latin American universities. The results exhibited that students need quality feedback (i.e., timely and individualized feedback beyond the grading as a form of formative evaluation) and data-driven support from teaching staff to improve their learning results; most students (88%) expected their educational data to be used to inform support interventions. Others [12] investigated students’ expectations of the collection and use of student data for LA in the context of Australian higher education, and found that while students are largely comfortable with the use of their data, they are worried about the use of demographic data, location data and data collected from wireless networks, social media and mobile applications. The results have also highlighted a need for transparency to support informed consent and that the personal-professional boundary is critical. In another recent study, [14] explored students’ expectations of LA services in the setting of the Dutch higher education. Whereas the prevailing part of the studies examining students’ expectations toward LA have approached their samples as homogeneous student groups, the authors used a three-step approach to latent class analysis to understand whether students’ expectations of LA services can be segmented. Their findings reveal that students’ expectations of ethical and privacy elements of a LA service are consistent across all identified student groups, but their expectations of the LA service vary. Garcia et al. [19] have recently examined the stakeholders’ expectations of LA in a Brazilian higher education institution, and found that overall, there is a high interest in using LA for improved learning and teaching; the students’ ideal expectations have been found higher compared to the predicted ones.

In several studies [e.g., 11, 14, 20], scholars have employed the Student Expectations of Learning Analytics Questionnaire (SELAQ) as a research instrument – developed by [13]– to examine the stakeholders’ expectations of LA. The development of SELAQ was divided into three parts. In the first part, they developed 79 different questions and conducted a pilot study, to then retain 37 of the questions and conduct another preliminary study, resulting in the final 12-question form, also employed for the purposes of the current study (Table 1). Of the 12 statements, five focus on student expectations in terms of ethics and integrity, and seven focus on the student expectation in terms of LA service’s functionality. For each statement, it is evaluated how the student hopes that it will be (his/her desired ideal expectations) and how the student believes that it will actually be (his/her realistic or predicted expectations thought).

This study complements the aforementioned studies, with a perspective from another country, Sweden, in which such studies have not been performed before.

Table 1: SELAQ [14].

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The university will ask for my consent before using any identifiable data about myself (e.g., ethnicity, age, and gender)</td>
</tr>
<tr>
<td>2</td>
<td>The university will ensure that all my educational data will be kept securely</td>
</tr>
<tr>
<td>3</td>
<td>The university will ask for my consent before my educational data is outsourced for analysis by third-party companies</td>
</tr>
<tr>
<td>4</td>
<td>The university will regularly update me about my learning progress based on the analysis of my educational data</td>
</tr>
<tr>
<td>5</td>
<td>The university will ask for my consent to collect, use, and analyze any of my educational data (e.g., grades, attendance, and virtual learning environment accesses)</td>
</tr>
<tr>
<td>6</td>
<td>The university will request further consent if my educational data are used for a purpose different to what was originally stated</td>
</tr>
<tr>
<td>7</td>
<td>The learning analytics service will be used to promote student decision making (e.g., encouraging you to adjust your set learning</td>
</tr>
</tbody>
</table>
### III. METHODS

#### A. Participants

The study was conducted with a sample of students at an engineering university in Sweden. The selection of participants was made among students who at the time (Spring 2021) of the study participated in three engineering courses, all offered in Swedish. Overall, the study participants, at the moment of this study data collection, had no experience of LA.

There were 132 participants in this study, enrolled in four different educational programs. A total of 54% of those who received the questionnaire invitation, provided their informed consent and participated in the study.

#### B. Study design

The survey instrument used is based on the 12-items survey tool used in [13, 14]. In the present study, SELAQ was translated into Swedish [see 21]. The translated version was piloted among a smaller group (5-6 persons) of students. Great emphasis was placed on keeping the statements neutral - without value-laden words and terms. Also, an introductory text explaining and exemplifying LA was introduced at the beginning of the survey.

The participants were asked to answer the online version of SELAQ (see Table 1). For each statement ($n=12$ in total) the respondents answered according to the five-point Likert scale: from 1 (do not agree at all) to 5 (fully agree).

The original SELAQ instrument uses a seven-point Likert scale. However, this can be considered a too fine-scale grading to decide on, as it can be more difficult - and take longer - to make assessments the finer the scale is [22]. As there was also a risk that the participants would think that the survey was too time-consuming and choose to not participate in the study, we decided to adapt the scale to the 5-point Likert scale.

Each statement had two different ratings, one for how the respondent would like it to be, and one for how the respondent thinks it will be realized in practice. In this study, these are hereafter referred to as ideal expectations and predicted expectations.

#### C. Analysis of Data

For each of the 12 statements in the questionnaire, mean, median and standard deviation could be obtained for both ideal expectations and predicted expectations. The data for each statement could then be compared and grouped based on various factors such as grade, gender, educational program, and age. This allows us to compare expectations between these groups.

#### D. Ethical Considerations

In this study, we have followed the guidelines offered by the Swedish Research Council. In particular, these research ethics principles consider: 1) the information requirement, 2) the consent requirement, 3) the confidentiality requirement and 4) the utilization requirement [21]. The information and consent requirements were met as the participation in the study was voluntary and it was possible to withdraw at any time without any effects. Participants were asked to provide informed consent before responding to the questionnaire. The confidentiality requirement was met as no personal sensitive data were collected. Finally, all information collected about the participants was used solely for research purposes and therefore the use requirement is also met.

### IV. RESULTS

#### A. Participants

The respondents were 132 students. Of these, 84 were men, 46 women and 2 respondents answered "other/do not want to indicate". The participants were aged 19–34, with a mean age of 22.1 years, and a standard deviation of 2.6. The median age was 22 years. All respondents were in the bachelor part of their five-year engineering program: 51 students in first year, 45 students in year two, and 36 students in the third year.

A summary of the answers is displayed in Table 2. The table shows, among other things, that statement 2 received the highest average value for Ideal expectation and statement 11 received the lowest. Statement 1 got the highest predicted expectation and statement 11 the lowest. Table 2 also show that the standard deviations for the statements are generally low, indicating a consensus on the subject.

#### TABLE I. MEAN VALUES, MEDIAN VALUES AND STANDARD DEVIATIONS FOR IDEAL EXPECTATION AND PREDICTED EXPECTATION

<table>
<thead>
<tr>
<th>Statement</th>
<th>Ideal expectation</th>
<th>Predicted expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>1</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>4.3</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>4.9</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>4.4</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>4.1</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>4.4</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>3.6</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>3.7</td>
<td>4</td>
</tr>
</tbody>
</table>

A comparison can be made between the mean values of ideal expectation and predicted expectations for each statement (Figure 1). As expected, the answers for ideal

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expectations are higher than for predicted expectation for each of the 12 statements in the survey. From Figure 1, we can observe the distances between ideal expectation and predicted expectations for each statement, and which statements the respondents most and least agreed with. Statement number 10 apparently has the longest distance between ideal expectations (4.4) and predicted expectations (2.2). The shortest distance between ideal expectation and predicted expectations has statement number 1, which has averages of 4.8 and 4.4, respectively. For each statement, the distribution of answers and the number of respondents answered to each SELAQ statement on the Likert scale are presented in Figure 2.

In Figure 2, we can see that for Swedish students’ ideal expectations, there is clearly a ceiling effect for the most of the statements (1–10). A ceiling effect means that there is an upper limit that makes it impossible to perceive any differences over a certain limit. In sum, they exhibited very high ideal expectations of LA.

The results also exhibit that that Statement 2 (The university will ensure that all my educational data will be kept securely) has the highest proportion of respondents with factor 5 (totally agree) on the Likert scale for ideal expectations, and that there are a couple of statements (1 & 6), where no one answered, "Disagree completely".

In addition, we can observe that Statement 10 (The teaching staff will be competent in incorporating analytics into the feedback and support they provide to me) has the most responses with low factors on the Likert scale for predicted expectations, that is many respondents do expect teachers to be competent enough to provide relevant in-time feedback, based on the analytics’ results from the LA service or tool.

We also compared the mean values distributed based on year, gender, educational program, and age. However, the data
showed that there was no significant difference between these subgroups. This indicates consensus between the subgroups.

V. Discussion and Conclusions

The present study has explored the students’ expectations of LA in on higher education institution in Sweden. In general, the results show students exhibit overall positive and high expectations of LA. It was mostly clear in respect to the expectations towards ethics and privacy. The students’ ideal expectations in this regard were considerably higher (mean 95%) compared to their predicted ones (50%). This suggests that ideally LA designers and researchers should carefully consider the students’ concerns and expectations in terms of protecting and enhancing their privacy in the LA settings, which is in line with earlier research [24]. In this, it is essential to define privacy, since it could be perceived differently by different stakeholders in different contexts [25]. Given the complexity of the privacy concept, LA researchers and practitioners may start from the already existing definitions of privacy established in the other, more mature fields (compared to LA), such as the information systems field, in which privacy aspects have been extensively studied [e.g., 26].

Further, as in the case of the earlier related research [e.g., 11, 12, 14, 19], Swedish students’ ideal expectations of LA are higher compared to their predicted or more realistic expectations in terms of the related functionality of the LA service. This is important to consider and strive for. Yet, scholars have earlier pointed out that the stakeholders’ predicted expectations are more important to pay attention to in the first hand in terms of the realistic implementation of the information system in practice [15]. In this regard, the implementation of the LA service can be a rather challenging task, and its ‘ideal’ performance may not be expected in the first hand, since as in the case of any other information system tool, several design rounds are often needed to meet the stakeholders’ needs and to achieve their satisfaction with the tool.

The findings of this study show that some statements have averages for ideal expectations and predicted expectation close to each other and others have these far apart. From this, we could draw some speculative conclusions, e.g., if a statement has an average value high on the Likert scale and also a predicted expectation very close to the ideal expectation, it indicates that the students have a great deal of trust in their university. If the mean values for ideal expectations are high and the mean values for predicted expectations are low, this may indicate a low level of confidence in the university.

Another interesting result regards the students’ lower expectations of that the teaching staff would be competent in incorporating analytics into the feedback and support they provide to me (statement 10). Their ideal expectations were at 4.4 and their predicted expectations were 2.2 (Likert-scale); this is the longest distance between the different kinds of expectations of all the statements in the survey. This is in line with earlier related research [e.g., 19], and can have two possible explanations. Either the students expect less guidance from the teacher overall in the near future (i.e., they may expect a more technology-assisted feedback solution), or they do not believe that the teacher has enough skills (e.g., in terms of data literacy and feedback literacy) to provide adequate in-time feedback.

Furthermore, Statement 2 (The university will ensure that all my educational data will be kept securely) has the highest average value for ideal expectations, i.e., the respondents really value that their data is stored securely. However, the statement does not have the highest average value for predicted expectation, which indicates that the respondents are not as sure that their data will actually be stored securely. This suggests that the university needs not only to work on making related practices transparent for the LA stakeholders.

The results from this study generally show similar findings as previous studies (see Section II C 2) where they used the same research instrument [9, 10]. The previous studies show that the used survey tool, SELAQ gives us good insights into what expectations students have of LA, which this study also does. Yet, we would suggest that there is need to further develop this instrument in terms of separating stakeholders’ concerns in regard to privacy, informed consent, security and trust.

In this study, all participants were students from one and the same technical university. Thus, its results should in the first hand, inform the future LA practices in the chosen context. Further studies are should include students from other types of universities.

Future research

Future studies need to be performed in more countries, and in other parts of the world. Different countries and cultures may have different perceptions of different related matters, such as what an interaction between the student and the teacher should look like (e.g., in terms of power distance), and what values they for example, consider when reflecting upon privacy and ethics. Also, since there are individual differences in students, their perceptions and expectations may also differ within one sample. This suggests a need to further explore and apply individual-centered approaches, including Latent Class Analysis [e.g., 14] to meet individual students’ expectations of LA in a satisfying way. Moreover, the results of the qualitative analysis should be complemented by qualitative studies (e.g., interviews), which could provide further in-depth explanations and more clarity to the findings.

The results from the study can be used as a basis for developing LA services in the selected context and for further research, preferably on a larger scale and in more countries.

References


