Learning Analytics Case Study in Blended Learning Scenarios

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Abstract. In this paper we present a case study that provides a learning analytics tool to 53 course rooms on the learning platform in a higher education institution in Germany. The case study objective was to observe in which ways the teaching staff would use the learning analytics module while performing other teaching activities within the course room on the learning platform. We collected raw data from three different sources to examine the hypothesis of the case study in a quasi-experimental setting. The analyzed results showed that over the course of the study, in 40 courses the teaching staff used the learning analytics module at least on one occasion; in 25 courses the teaching stuff used the learning analytics module more than five times; and in 36 courses, the teaching staff has used the learning analytics module on multiple occasions within the same session while conducting teaching activities on the learning platform. As part of the data collection strategy for the case study, we conducted a two-part anonymous survey to collect qualitative feedback about the features and the user interface of the analytics prototype. The results of the survey revealed that the teaching staff used the analytics prototype mainly to observe the learning resources in their respective courses and be aware about the student behavior in their courses on the learning platform. Overall, we concluded that Learning Analytics should be an integral part of the provisioned e-learning services in higher educational institutions; the place for delivering Learning Analytics is the virtual course rooms on the learning platform; and that the teaching staff (if provided) would use it on regular basis in short while doing their day-to-day teaching activities on the learning platform.

Keywords: Learning Analytics, Case Study, Evaluation

1 Introduction

In blended learning scenarios, the teacher still holds the central role that influences student learning and motivation. Teaching is an acquired mastery, and educators should use all means at their disposal to provide the best learning setting and resources for their students [2, 17]. In other words, teachers should design an appropriate pedagogical approach and choose fitting learning design; create suitable and diversified learning resources; incorporate and carry out assessment within their pedagogical approach; provide timely and appropriate feedback back to the students; and be aware of student

engagement in the learning process. If the teachers want to enact continuous enhancement and adaptation of their teaching, they need to receive feedback and information about their teaching, analyze and reflect upon their work [5, 17]. Furthermore, teachers need to be aware of how students perceive and behave in the learning setting on the learning platform. This way they can identify which learning resources work well; discover with which resources or assignments students struggle; identify and categorize learning patterns and strategies; understand which platform features are more effective within their pedagogical approach and setting; be able to identify and adapt materials to address the students' needs; and guide the students to become successful and better learners [10]. These teachers' activities are well within the scope of teaching and are crucial for providing high quality education. Nevertheless, most learning platforms still do not support teachers in this respect and do not provide such analytics features that helps them to improve their teaching practices, even though analyzing this data can shed light to unseen behavior, provide visibility to pieces of information and insight that could not be observed before, and would go unnoticed and be unactionable [6, 15]. In the context of this research, we understand the development and exploration of methods and tools for visual analysis and pattern recognition in educational data to permit institutions, teachers, and students to iteratively reflect on learning processes and, thus, call for the optimization of learning designs on one hand and aid the improvement of learning on the other as learning analytics [4].

Despite numerous and extensive advances in the research field of Learning Analytics, wide adoption and successful implementations of learning analytics as a service is still not present [11]. The added value of Learning Analytics (LA) for learners and educators is clearly recognized and identified, but there has been little research done to provide conclusive evidence that the LA tools have desirable effects on the learning processes [18]. As part of developing the strengths for scaling up and deploying LA within the learning processes, this research aims to investigate the effects of providing learning analytics prototype on the learning platform where the teaching staff is applying blended learning scenarios. The scope of this paper concentrates on the context of where analytics should be provided; to support the different learning scenarios implemented in a selection of courses; and to develop an understanding of teachers' use and incorporation of analytics and statistics tools/interfaces in their day to day teaching activities within the learning platform. The underlying idea of this research is the teaching staff can freely explore the analytics prototype, while conducting their online teaching activities in blended learning scenarios. The result will provide understanding about how teachers accomplish teaching tasks with the learning platform and explain how they incorporated analytics within their daily activities. The hypothesis that we investigated was that teachers while doing teaching activities within the course would also use the analytics module on regular basis, in the same session on the learning platform. This assumption is derived from the fact that the analytics prototype would be seamlessly integrated within the course on the learning platform, and teachers would be compelled to use it to get a glimpse of what is going on in their course.

2 Method

We used a case study research method to examine the hypothesis because it enabled us to closely examine the usage of the learning analytics prototype within the context of blended learning scenarios in higher education institution [14, 19]. The case study consisted of deploying an analytics prototype to a small number of courses (53 courses) on the learning platform. It fits well in a case study scenario because on this learning platform there are around 3000 courses per semester, and these 53 courses are ~1,5% of the number of running courses per semester (small sample). The context of the study was the technology aspect of the implemented blended learning scenarios in real courses on the learning platform to grasp more realistic understanding of how analytics would be used within the learning platform. For the data-triangulation aspect, three types of data collection mechanisms were built to collect case study data to provide corroborating evidence to explain the observations and results of the case study [14]. For this purpose, we collected anonymous log data on the usage of the analytics prototype, collected log data on the users' activities within these courses on the learning platform, and conducted a two-part survey. The survey consisted of questions that collected qualitative feedback about the analytics prototype, and a seven-point Likert scale usability questionnaire based on the ISO 9241/10 international standard [9].

3 Study Setting and Design

We randomly selected and contacted a wide audience of professors and teaching assistants of different faculties at our university via email to offer them to participate in the case study. Professors and teaching assistants of 53 courses agreed to participate. 33 courses were a lecture connected with an exercise, 15 courses were practice oriented laboratory courses, and five courses were seminar courses. Regarding the course distribution among different faculties, 17 courses were from the Faculty of Mathematics, Computer Science and Natural Sciences; six courses were from the Faculty of Mechanical Engineering; three courses were from the Faculty of Electrical Engineering and Information Technology; 11 courses were from the Faculty of Arts and Humanities; 15 courses were from the School of Business and Economics; and one course from the Faculty of Medicine. The number of students participating in each course varied from 20 students to 2200 students. In retrospection, one can conclude that although the number of courses is small in regard to the total amount of courses per semester at our university, the courses were distributed among six faculties (out of nine), the course types were the three most common course types at our university, and according to the number of students per course, the sample size contains courses with small number of students, and very large courses with more than 2000 students.

3.1 Insights – Learning Analytics Prototype

The **Insights** analytics prototype builds upon a knowledge gained through previous research on different Learning Analytics prototypes [7, 8, 16] developed and provided

as pilot projects at RWTH Aachen University. The visualizations (indicators) in the prototype visualize how the students use the different aspects and modules of the course rooms on daily basis. Such examples include, how many different students show up in the course room; what kinds of devices they use; what are the most popular learning resources; or which collaboration techniques they prefer. The visualizations themselves are interactive and enable the user to filter out specific parts and select and zoom-in on other parts of the visualizations. The main idea of the prototype is by providing descriptive statistics and analytics to each course to inspire teachers to reflect upon and possibly improve their teaching in the learning process [7, 8, 16].

The analytics prototype was available for the study participants by the end of April 2017 as an integral module inside their courses on the learning platform. After activating the Insights module, all participants received instructions and explanations about the module via email, descriptions about the visualizations, what kind of data is visualized, and guidelines about possible (valid) interpretations of the represented data within the visualizations. We did not provide special instructions about when and how they were supposed to use the module, but rather try to incorporate in their daily activities. They also received information that the module activities would be observed by automatic logging tools, and towards the end of the pilot phase they would be given an online survey about their experiences with the Insights module. The survey itself was non-binding, meaning that the participants were not obliged to fill it in. The Insights module was never deactivated from the courses, so the teaching staff could still use it in their (expired) courses. However, only the period between the availability of the Insights module and the end of the semester has been considered for the analysis of this case study.

3.2 Analytics prototype replication (with other learning platforms)

The prototype we used in this case study was built based on available data from the learning platform at our university. The analytics prototype was built on anonymized collected data from the learning platform following the concept of data minimalism [3]. Therefore no personal data was collected that was not necessarily needed to provide analytics as a service, which in Germany can be very challenging due to stringent data privacy laws. For this reason, we developed privacy conformant data collection strategies that anonymized the requests from the individual users, and the only openly identifiable element of the request was the course in which the activities were made. The collected raw data arrived in the form of seven different parameters identifying a single HTTP request made to the learning platform. These seven parameters, presented in Table 1, come from the HTTP protocol definition by the World-Wide Web consortium [12].

Table 1. Structure of the anonymous logs of the learning platform

Log Time	Client IP Address	Client Agent	Processing Time	Operation	URI	Result Code

The first parameter is the exact date and a timestamp when a specific HTTP request was generated from the user. The second and third parameter identify the client in the HTTP request. The client IP is the anonymized IP address of the user's device from which this HTTP request originated, while the client agent identifies from which device the HTTP request was made to the learning platform. The fourth parameter is the processing time for each request to the learning platform, or how much time it took to process the action from the learning platform. The fifth parameter is the HTTP operation method, or whether the activity was a simple read/view activity (GET), or it was a create/edit activity (POST) in any of the modules of a course on the learning platform. The sixth parameter was the URI, or the unified resource identifier of every item/resource/page on the platform. The URI identifies the resource upon which the request is to be applied. In our case, the URI is built in such a way to identify the semester, the course, the module, and the item which was requested or created by the user activity. The last parameter is the HTTP status code, which conveys information how each request was completed [12].

However, the learning platform in use at our university is a closed-source custom solution created for support and implementation of the different blended learning scenarios. However, many German universities do not have the resources nor the expertise for developing a bespoke learning platform for supporting their students and teaching staff in their teaching and learning processes. For this reason, the universities use an open source learning platform, such as Moodle, or ILIAS. Both learning platforms provide activity logging and learning data collection which can be used as basis for providing learning analytics services in their respective learning scenarios. However, the data that is collected with their built-in data collection techniques cannot be used as-is, because it is highly personalized. Furthermore, the personal raw data is stored for an indefinite amount of time and can be used to pinpoint individual users and observe their various daily activities within their courses on the platform. These two aspects are not conformant with the current data privacy law rules and regulations.

Table 2. Structure of the logs of the Moodle learning platform

Time	User Full Name	Affected User	Event Context	Component	Event Name	Description	Origin	IP Address

Table 2 shows the structure in which the data collection methods are logging the users' activities on the Moodle learning platform. However, Moodle is a modular and open source platform and the data collection mechanisms can be changed and updated to be conformant with the data privacy laws to provide data which can be used as a basis for providing data privacy conformant learning analytics. The developers and providers of learning analytics services should develop plugins (methods) that pseudomize or completely anonymize the entries in fields "*User Full Name*", "*Affected User*", and "*IP address*" of the collected log data. Furthermore, they need to develop raw data deletion strategies that delete the collected personalized logs after the privacy transformation and delete the pseudomized (anonymized) logs after the conducted analysis on the data. The pseudomization of these fields will not remove the semantics of the logs, nor reduce their value for providing learning analytics, and the provided analytics will

be on the same level as the analytics provided by the Insights module. Additionally, the pre-processed raw data should be analyzed with different application (and preferably on a different physical layer), so that the user experience and performance is unaffected by the computational-heavy data analysis. Figure 1 shows an outline of a privacy con-

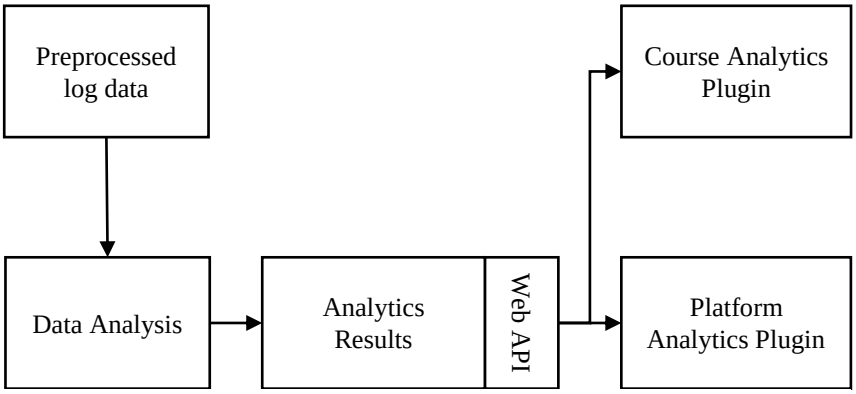

Fig. 1. Proposed Learning Analytics Framework

formant learning analytics framework for the Moodle learning platform. The log data is pre-processed to be privacy conformant, and then different analytics methods analyze the data, produce and save the analytics results. Which analysis methods should be incorporated into the data analysis module are context dependent, and they are influenced by the implemented learning scenarios, the questions that the teaching staff has, and the requirements for the learning analytics prototype. After the analysis these results are available for representation and visualization via a predefined RESTful API. The Insights learning analytics prototype has a very similar architecture with one notable difference for delivering the analytics results. The Insights prototype is a standalone web application which can be embedded in different courses on the developed learning platform, while in Moodle the analytics results would be delivered via a Moodle plugin. As a last step towards providing analytics as a service, an automation process should be developed that automatically triggers every step from the process: data collection and pre-processing; the data analysis and saving the results; providing them in the appropriate courses on the learning platform; and removing them completely from the system with accordance to the pre-defined course lifecycle. By implementing this framework, fellow researchers can develop learning analytics components, experiment with them in different blended learning scenarios like the case study in this research work, and potentially scale them up and provide them as a service in their institutions.

4 Results and Discussions

The case study results provided sufficient amount of raw-data and feedback to conclude that the teaching staff used the Insights module. Overall, during the time of the case study, 40 courses from the 53 that had agreed to participate in the case study have

used the Insights module at least on one occasion. The usage frequency of the Insights module during the study was not evenly distributed, presented in Table 3.

Table 3. Insights usage distribution among courses

Number of Courses	**Number of uses**
15 courses	More than ten times
10 courses	Between six and ten times
9 courses	Less than five times
13 courses	No usage detected

We conducted descriptive statistics by calculating the mean with standard deviation, and the median. The average usage frequency is 15.5 times per course with standard deviation of 22, and the median is seven. In this case, the average usage frequency and the standard deviation do not depict the real outcomes, because the standard deviation is larger than the mean. For this reason, we calculated the coefficient of variation (CV = 141), which means that the usage frequency data was spread across widely around the mean. The median is more descriptive and suitable for the analysis because the median separates the higher half from the lower half of the module's usage frequency data. In other words, the median shows that in half of the courses, the teaching staff has used the Insights module on multiple occasions (median=7).

In Figure 2 can be observed how the usage frequency of the Insights module developed over the course of the case study. On the *x-axis* is the time-span of the study, while on the *y-axis* is the number of different courses from which the Insights module was ac-

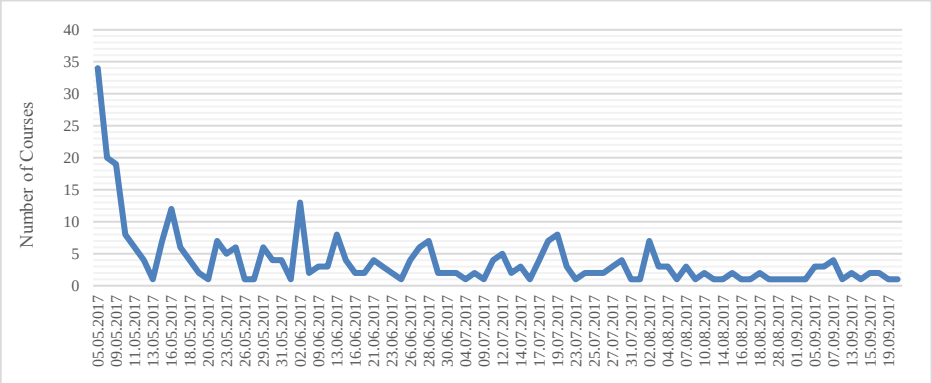

Fig. 2. Number of courses per day in which the Insights module was used

cessed over the time-period. After the initial peak of usage when the Insights module was available to the teaching staff, regular weekly peaks of the module's usage can be identified; troughs on the weekends; and the activities in the Insights module decrease towards the end of the semester. What we found interesting in the weekly distribution of the Insights module usage was that although the lectures had ended, the number of courses in which the Insights module was used, had increased in the last three weeks of

July. In August and September, the number of courses in which the Insights module was used, steadily decreased.

4.1 Analytics prototype usage results

We also inspected whether the teaching staff logged in on the learning platform to explicitly use the Insights module, or they used it as part of their daily teaching activities. For this purpose, the collected log data from the learning platform used for providing analytics and insights about the students' activities within the course was re-purposed and re-analyzed to identify and aggregate the teaching activities within the course rooms on the platform. We wanted to discover whether within the same session[1] on the learning platform, the teaching staff have performed teaching activities while they have used the Insights module. The teaching activities covered with the analysis were chosen based on their relevance and influence on the learning processes within the course. Hence, bureaucratic and technical activities within the course room that have no influence over the students and their learning, were disregarded and were not analyzed. The teaching activities that were taken into consideration for the analysis were divided into four major groups: *(1) information distribution activities*, *(2) course organization activities, (3) distribution of learning resources*, and *(4) formative assessment activities*. In total, in 36 courses the teaching staff has performed a teaching activity whilst using the Insights module. Here follows the teaching activities distribution in more details:

(1) The teaching staff can distribute this information either by posting an online announcement or send out an email to the students. The correlation of the log-data analysis showed that in 17 courses when the teaching staff used the Insights module within the same session they have posted an announcement, and in 17 courses have used the Insights module within the same session when they had sent an email to the students. Combining the two course lists to remove redundancy, overall the teaching staff of 26 courses had distributed various information, within the same session when they had used the Insights module.

(2) The correlation of the log-data analysis showed that in two courses when the teaching staff used the Insights module have also created or edited course events in the calendar, and that in one course the staff has created/edited a survey in the same session when using the Insights module.

(3) The correlation of the log-data analysis showed that in 22 courses when the teaching staff had provided, or uploaded learning materials has also used the Insights module. In four courses they have uploaded or embedded lecture videos, and in three they have provided online resources as hyperlinks. Combining all course lists, overall the teaching staff of 24 courses had provided learning resources within the same session when they had used the Insights module.

[1] The term "session" is used in the context of an interaction session, when the user has logged in onto the system via a web browser and has performed different activities and interactions within the system.

(4) The correlation of the log-data analysis showed that in six courses when the teaching staff provided or edited an assignment has also used the Insights module. In three courses, the teaching staff used the Insights module when correcting student submissions. Combining the two course lists, resulted in total of seven courses where the teaching staff had performed activities within the formative assessment modules within the same session when they had used the Insights module.

4.2 Anonymous survey results

The two-part anonymous survey provided qualitative feedback about the Insights module, and a usability questionnaire based on the ISO 9241/10 standard was performed to assess the usability of the prototype [13]. In total, eight participants have filled in the survey. The first part of the survey collected feedback about what were the (1) positive aspects of the Insights module; (2) what were the negative aspects or experiences with the Insights module; (3) which features and visualizations of the Insights module were useful the most to the participants; and (4) what would the participants wish to see in the Insights module to better fulfill their needs and expectations.

(1) According to the answers, the possibility to have an overview about which learning materials are mostly used over time within the course room; the possibility to see whether the students have used the provided media and the lecture recordings provided by the teacher; and the possibility to observe how the students' behavior developed over time in the course room are among the positive aspects provided by the Insights module. On one occasion, the teacher could infer with certainty when and how the students worked on the assignments and their submissions.

(2) The negative experiences with the tool were mainly concerned with the data representation and visualization. The answers included statements about glitches in the zooming functionality and unfitting representations of the data on the charts' axes; and the lack of help and description of the visualizations. An interesting claim marked as negative experience was that the participant's fears that the students always studied and looked at learning resources just before the exam, were confirmed.

(3) According to the answers, the highlighted features of the Insights module were the ones that showed analytics and information about activities within the learning resources modules. The participants could see which the most popular learning materials and resources within the course room were. One participant mentioned, that his expectations about the students' behavior was confirmed and that he can use the tool to adapt his learning offerings and teaching behavior.

(4) As possible improvements, the participants suggested a provision of help and guidelines about how to interpret the visualizations; smoother and clearer visualizations with better zooming functionality. There was also requested the possibility to be able to combine and export the visualized data for offline analysis and usage, and to provide the tool available outside the university's network.

The goal of the second part of the survey was to collect feedback and information about the usability of the Insights module. Usability can be broken down in these goals: effective to use (*Effectiveness*), efficient to use (*Efficiency*), have good utility (*Utility*), easy to learn (*Learnability*), easy to remember how to use (*Memorability*). In the survey there were a set of questions that covered each of these goals. The questions themselves were created based on the ISO 9241/10 standard [13]. The seven-point Likert scale ranged from "Strongly Disagree" to "Strongly Agree" (1-7) and was used as a ranked order across all 16 questions with the aim to receive more consistent results. The raw results of the survey have the nature of ordinal data because the Likert scale uses order (or rank) and one cannot consistently and correctly define the distance between the categories. For ordinal data analysis, it is recommended to use methods that preserve the ordering of the data so that there is no loss of power, such as computing the median and the mode [1]. In Table 4 the analyzed results of the usability survey are presented. The table columns represent the five usability goals, while each row represents the median and the mode of the scale number for each question's answer from the survey.

Table 4. Results summary of the usability survey

	Effectiveness		Efficiency		Utility		Learnability		Memorability	
	Median	Mode	Median	Mode	Median	Mode	Median	Mode	Median	Mode
Q1	4.5	4	5	4	5.5	5	5.5	6	5	4
Q2	5.5	6	5.5	6	5.75	6	6	7	5	5
Q3	6	6	6	6	6	6	6	7	6	6
Q4	-	-	6	7	-	-	-	-	6	7

The results in general show that the participants in the survey have positively rated the tool on the five usability goals, because the lowest value on a question was four, the highest seven. Out of the five categories, the ones that fared the best was *Learnability* with the highest median and mode followed by *Utility*, *Efficiency*, and *Memorability*. The goal that fared the poorest was *Effectiveness* with the lowest median and mode.

5 Findings

The goal of the case study was to find out whether the teaching staff in blended learning scenarios would use learning analytics tools on regular basis and incorporate them in their daily teaching activities within the learning platform. The underlying hypothesis of the case study was that teachers while doing teaching activities on the learning platform, would also use the analytics prototype within the same session. The case study itself can be labeled as quasi-experiment because the participants were not randomly assigned to the conditions of the tool; the usage of the Insights module was not randomly sampled among the teaching staff because as a study in the field the environment conditions and factors could not be controlled. However, the presented results in the previous section show that the experimental design provided sufficient control and provided substantial evidence that the goal of the study was fulfilled.

5.1 Findings regarding the usage analysis

According to the presented results, almost in half of the courses the teaching staff explicitly used the Insights module on multiple occasions. This statement is corroborated with the median of the number of usage per course (median = 7), meaning that at least in half of the courses the teaching staff has used the Insights module on multiple occasions. In the usage data of the Insights module there are regular weekly peaks and troughs on the weekends. The analysis also showed that towards the end of the semester the number of courses in which the Insights module was used, steadily decreased. What was unexpected was the fact that the in the weeks right after the lecture ended, the number of courses in which the Insights module was used started increasing. One possible explanation for this could be that the teaching staff wanted to observe and evaluate the students' behavior over the span of the entire semester within the course room.

The findings presented in the previous paragraph were summative because they dealt with the overall number of courses over the given amount of time. This means that there was a possibility that within the weekly usage peaks there could have been many courses with incidental usage (although such requests and usage were filtered out from the raw data). The usage data analysis showed that the Insights module was used intentionally especially whenever there was peaks in the number of different courses. This finding associates well with the first part of the goal of this case study, namely that the teaching staff would use analytics tool on regular basis within their course on the learning platform.

5.2 Using analytics results together with teaching activities

The results of the analysis also showed that the teaching staff in 36 courses have performed various teaching activities whilst using the Insights module within the same session. In 24 courses the teaching staff had performed activities that provide various learning resources (materials, slides, media, etc.) to their students. In 26 courses the teaching staff had performed activities that distributed various course information to their students, and in seven courses they corrected assignments, or provided new ones within the same session. This is a strong indicator that the teaching staff used the Insights module as part of their teaching activities and confirm the second part of the goal of the case study and its hypothesis. Considering the results that confirmed the goal and the hypothesis of the study, it is safe to conclude that the correct place for providing learning analytics solutions and visualizations in blended learning scenarios is the course room on the learning platform. The teaching staff would use learning analytics tools and results in their teaching activities while conducting their learning scenarios. Nonetheless, this corroborated outcome does not provide evidence of whether the teaching staff understood, observed, or even acted upon of the visualizations and analytics results while using the Insights module. These findings show only that the teaching staff used the Insights module on regular basis.

5.3 Anonymous survey findings

The two-part anonymous survey collected information and its analysis provided qualitative feedback about the features and the user interface of the Insights module. In total, only eight participants from the case study decided to participate and provide their feedback and answers to the survey. In comparison with the usage frequency and number of participating courses, the response rate was comparatively low. The results from the qualitative feedback showed that the teaching staff used the visualizations and analytics to get an overview about how the learning resources were used and be more aware of the student behavior in the different modules of the course room on the learning platform. Despite the inconsistencies with the data representation and the lack of help and documentation to guide them through the interface, they were aware of what was happening in their course, and their assumptions about intermittent learning were confirmed by the Insights module. The suggested improvements about the tool were directed towards improving the data visualization and interface, rather than providing new data and different analyses. To better understand their perspective about their qualitative feedback in the survey, analysis on the session duration, showed that the time the teaching staff spent on the Insights module ranged from 60 seconds to seven minutes. Additionally, in relation to the time of day (in the morning, or in the afternoon) when they had used the Insights module is (almost) normally distributed, with a slight advantage to the afternoon. The teaching staff had relatively short sessions while using the Insights module, and during these short sessions they tried to get an overview, or detect trends within the visualized data. This finding implicates the design of the visualizations and the data representation. Their feedback about concentrating on improving the provided visualizations and analytics representations further supports this finding. The usability survey showed that the insights module was easy to learn to use and had good utility. However, the effectiveness of the Insights module was rated the poorest. This indicates that in the Insights module there is a need to consider the feedback for improvements and become better at providing analytics in their courses.

5.4 Study Limitations

This case study provided a comprehensive description of the interaction dynamic of a learning analytics module in blended learning scenarios at a higher education institution. However, the study was in its essence a quasi-experiment because of the lack of control. As such, the study can allow the existence of other hypotheses, and different explanations and interpretations of the observed results. Moreover, this case study was not immune to the three major concerns with case studies: the research/methodological rigor, the subjectivity of the researcher, and the external validity and generalizability of the results [14]. Considerable effort was invested in designing the case study so that can be easily reproduced, and the methodological rigor to base the acceptance the hypothesis of the study based on quantitative data. As mentioned before, the data collection for analysis was automatically collected, cleaned, and analyzed, to remove the influence of human error. Nonetheless, the methods how to analyze and interpret the results from the study in relation to the goal of the study and its underlying hypothesis

were still subjected to the personal interpretation of the researchers. The case study setting and implementation can be reproduced, and carried out again with different courses. However, since the environment and conditions are not controlled, it is not possible to predict the behavior of the participants, without observing their behavior. Hence the results would be limited to describing the phenomenon at hand, rather than predicting future behavior of the participants. In other words, there is no quantifiable certainty that by repeating the case study the results would be the same as they are in this case study. One way to remedy this situation is to involve repeated observations of the same variables (or participants) over longer period of times, so that enough longitudinal data could be generated and analyzed.

6 Conclusion

Learning Analytics should be an integral part of the e-learning services in higher education institutions. We conducted a case study in which we provided a learning analytics prototype in 53 courses with the objective to see whether the teaching staff would use the analytics module while doing teaching activities within the course. The case study results provided ample amount of raw-data and feedback to confirm the objective and the hypothesis of the case study, and that in at least half of the courses the learning analytics module was used on regular basis and on multiple occasions. Furthermore, the analysis of the case study data showed that in 36 courses the teaching staff used the learning analytics module in the same session, while performing teaching activities within the different modules on the learning platform. We also discovered that their usage sessions with the analytics prototype ranged from one to seven minutes and during these sessions they tried to get an overview and understand the behavior of the students in their course rooms over the course of the semester. As part of the case study's data collection, we also conducted a two-part survey to collect qualitative feedback data about the different features and visualizations of the learning analytics module, and its usability. Although the response rate was comparatively low, the qualitative feedback showed that the teaching staff was mostly interested in insights about the students' behavior within the learning resources modules. The second part of the survey provided feedback and knowledge that the analytics module was easy to learn to use, but that it had poor effectiveness. Overall, the results of the case study confirm that the place to provide learning analytics is within the courses on the learning platform, and that the teaching staff (if provided) uses it on regular basis while doing their daily teaching activities on the learning platform. The results of this case study provide enough evidence to go continue forward on the path of providing analytics as a service and evaluating its value and impact on a larger scale. The next concrete steps for us are to provide the Insights module to a larger audience (~500 courses), and to evaluate the value and effectiveness of the analytics results on the teaching staff in blended learning scenarios in higher education institutions.

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