

What do students want? Towards an instrument for students' evaluation of quality of learning analytics services

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ABSTRACT

Quality assurance in any organization is important for ensuring that service users are satisfied with the service offered. For higher education institutes, the use of service quality measures allows for ideological gaps to be both identified and resolved. The learning analytic community, however, has rarely addressed the concept of service quality. A potential outcome of this is the provision of a learning analytics service that only meets the expectations of certain stakeholders (e.g., managers), whilst overlooking those who are most important (e.g., students). In order to resolve this issue, we outline a framework and our current progress towards developing a scale to assess student expectations and perceptions of learning analytics as a service.

CCS Concepts

• **Human-centered computing** → **Accessibility design and evaluation methods**

Keywords

Service quality; action research; learning analytics

1. INTRODUCTION

In recent years, Learning Analytics (LA) movements within the domain of higher education have been growing. As a result, students are becoming immersed in a new culture where greater feedback and insight into their learning are readily available. From small-scale LA implementations designed to monitor fluctuations in emotions [29], to large-scale LA initiatives at institutions such as the Open University UK that aim to improve retention rates [5], there is an underlying commitment to “optimize learning and the environments in which it occurs” [1]. In other words, LA can be conceptualized as a service that aims to provide students with educational support during their learning. Thus, by thinking of LA in this way, it thereby creates a commitment for higher education institutes (HEIs), as service providers, to meet student expectations.

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Up until now, however, any research concerned with student expectations has focused mainly upon ethical and legal issues [8, 12, 14, 28, 31]. Nevertheless, these authors have recognized important issues that can facilitate the development of an evaluation framework for future LA services. On the other hand, a student's expectation of a LA service will not simply relate to whether ethical practice is followed. Rather, ethical and privacy issues will only reflect a handful of expectations, in what could be considered a plethora of expectations that students' will hold towards LA as a service. The latter is exemplified by [39], who stress the challenge of creating LA outputs that are meaningful to the student population. If an issue such as the latter arose in a large-scale implementation of LA, how would this be fed back so that the system could be redesigned to meet students' expectations of and improve their experience with LA? Without a resolution, this missing link between the running of a LA service and the incorporation of student feedback could jeopardize what could effectively be quality analytics.

It would be an oversight to suggest that evaluation procedures have not received sufficient attention in LA research [3, 27]. Existing studies have sought to acquire feedback on LA tools that have been introduced. However, for a continuous improvement of institutional LA services, a broader approach needs to be undertaken that explores student expectations and experiences with the LA services on offer. In so doing, discrepancies in student expectations and actual service provision can be readily acknowledged and solutions introduced, which should lead to an improved quality of service for students.

In this short paper, we intend to outline our on-going work towards the development of a scale that aims to assess students' expectations and perceptions of LA services. Section one briefly discusses the topic of expectations and service quality. Section two focuses on the current gap within the LA literature of only a limited amount of attention being paid towards service evaluation. In section three, we introduce our hypothesized model of how service quality can be included within the continual evolution and development of LA systems. Finally, section four provides readers with a summary of our progress towards creating a LA service quality scale.

2. SERVICE QUALITY

Judgments of service quality are believed to be based on a user's subjective assessment of the extent to which their needs or expectations were met [24, 41]. As a result, organizations become reliant upon providing a good quality of service, as it can be the pivotal factor towards enticing service users to utilize their service over and above those offered by competitors [26]. Furthermore, these

user evaluations of service quality are not only constrained to face-to-face organizational settings, but extend to online service provision [25, 41], and even the online or offline services offered by HEIs [2, 16].

Student evaluations of teaching and general student experience surveys are commonly used as approaches to collecting students' feedback on quality of service in higher education [33]. Although such surveys are commonly tailored for individual institutions, in some countries there are national initiatives. For example, in the UK, the National Student Survey (NSS) has become an important measure of service quality that allows final year undergraduate students to provide feedback as to their overall satisfaction with a course [13]. In conjunction with helping prospective students make informed decisions about where they choose to study, these results also assist HEIs in bringing about positive changes. Thus, HEIs are thereby engaging in the process of quality assurance to make sure that standards in their provision of education are continually met.

The process of exploring students' expectations and perceptions of HEIs services is important. Without such procedures in place, there is a possibility that an ideological gap could persist [18]. This particular gap can be thought as a clear separation between student expectations of the university's service and what the HEI believe the service they are providing should be [2, 19]. Without identification or resolution of such gaps, it can be readily assumed that dissatisfaction with the provided service will entail.

Going beyond using only institutional and national surveys to understand student opinions of the service delivered by a HEI, researchers have sought to explore potential discrepancies between stakeholders by using alternative measures. A popular approach taken has been the use of SERVQUAL [26], which measures service quality across five dimensions of Tangibles, Reliability, Responsiveness, Assurance, and Empathy. This scale can, depending upon the time between assessments [20], explore expectations and perceptions of a service [42]. Perceived quality is then assumed to be the difference between expectation and perception scores [26]. Alternatively, the perception-only scale of SERVPERF has shown to capture more of the variance in service quality, whilst also supporting the view of service quality as being an attitude [9]. Commonly, in practice, organizations apply the expectation disconfirmation theory (EDT) to assess user satisfaction [21, 38], through the use of SERVQUAL. In other words, a user's level and direction of satisfaction with a service is based upon whether the performance aligned with their initial expectations or not [22].

When applied in HEI settings, both the aforementioned variations in scales (i.e., expectations and perceptions together, or perceptions alone) have shown utility in measuring service quality [36, 42]. As [36] found SERVQUAL enabled them to go beyond simply identifying issues with the syllabus. Rather, this scale allowed the authors to emphasize the importance of abstract features in education that often go overlooked (e.g., teaching staff being more responsive to the need of students). Thus, stakeholders within HEIs can utilize the findings from such measures to effectively identify service issues that may remain unnoticed, and introduce strategies designed to provide resolutions to any gaps identified. Therefore, it can be expected that by improving the services offered, HEIs could improve overall student satisfaction. Conversely, without implementing the practice of assuring quality in a service, dissatisfaction in the student population may ensue.

In the case of LA, it too can be regarded as a service provided by a HEI, as the underlying foundation of the field is to support students during their learning. As a result of it being conceptualized

in this way, LA as a service should then be subject to quality assurance measures. Otherwise, it is plausible to assume that without a continual evaluation of the LA services that are in place, problematic features may endure without resolution. This will certainly result in HEIs ignoring ideological gaps that would effectively jeopardize the quality of the LA service they are providing.

3. SERVICE QUALITY AND LEARNING ANALYTICS

Expectations can be defined in terms of the user's pre-trial beliefs about a service [23]. In the context of LA, those who use the service can be considered as part of the following stakeholders groups: learners, teachers, managers, and policymakers [7]. Each of these respective stakeholder groups will have different expectations of LA as a service. For example, a teacher may expect to be provided with real-time updates on how their students are performing in a course. Whereas, a manager would expect feedback on how a handful of modules are running. A potential outcome of this variability in needs across stakeholders is a LA service that mainly satisfies the expectations of one group above the rest.

Perceptions, in contrast, are defined as the user's judgement of how the service performed in reference to their prior expectations [26]. This post-usage comparison reflects what is known as disconfirmation, where the user determines whether performance exceeded, met, or fell below what was expected [21]. The outcome of a user assessing whether performance aligns with expectations or not can subsequently determine their level of satisfaction with the service provided [21]. This conceptualization of service quality through the perspective of EDT has been important in health care settings. For example, [4] assessed whether patient's expectations of health care had been met. Through the use of a pre-visit questionnaire composed of expectation items, and a post-visit questionnaire made up of perception items, this enabled researchers to identify discrepancies in the health service provided. With these findings, organizations are able to assess the quality of service and gain valuable information as to how they can make improvements.

The LA community does consider the student population to be the most important stakeholders in any form of LA service [10]. Research efforts, as well, have kept students in mind, from designing visualization to monitor progress [15, 27], to creating software aimed at regulating metacognitive abilities [40]. In spite of how beneficial this research will be for students, LA has seemingly overlooked the importance of student expectations and perceptions of the service provided. Instead, LA services have seemingly been implemented in a top-down fashion directed by the beliefs of researchers, managers, and policymakers without much consideration of what students expect from such a service. Thus, LA is not facilitating the evolution and development of the services it could offer to students, as evaluation processes are rarely being implemented.

It would, however, be incorrect to suggest that evaluations of LA tools in general have been overlooked, as [30] developed a framework of quality indicators by working with experts in the field. Although, the limitation here is that these indicators are helping to establish a standard by which LA tools should be measured, as opposed to investigating what students expect from a service. In the same way, when various research efforts have incorporated evaluation procedures, these have been directed towards an assessment of a tool's utility and value [3, 27]. Therefore, to some extent the LA community has not ignored the importance that evaluative processes can have in the design and implementation of LA

tools and services. On the other hand, these are not addressing how students perceived the quality of the LA service provided to be.

As it stands, we posit that a movement towards developing and understanding how LA services can be regulated in a quality assurance framework should be supported. Irrespective of size (e.g., university-wide LA service, or a LA service confined to one module/course/degree programme), a LA service cannot be naively assumed as being unproblematic. Inevitably, there will be gaps between what students expect from and perceive the service to be. It then becomes the responsibility for the LA community to introduce measures that will identify such issues and suggest resolutions that will facilitate re-developments of a LA service that is considered high in quality. Without the adoption of this approach, it can be assumed that students could become dissatisfied with the service as their needs are not met, and inevitably decrease the usage of LA output in their learning.

4. CONCEPTUAL MODEL

To address the issues discussed in the previous section, we propose an evaluation framework that can allow for student perceptions to feedback into the continuous evolution and development of LA as a service. To achieve this objective of assimilating evaluations of service quality into the development and implementation of LA service, we posit that an action research approach should be undertaken. This was decided upon as the evaluative process are carried out by those involved in the LA service (e.g., teaching staff, managers, etc.) with an aim to improve the service offered [6]. In addition, the process should be cyclical in nature, going from planning, acting, observing, and reflecting [6]. Put differently, we view the practice of assuring quality in LA services as an enquiry that encourages LA practitioners to engage in a process of investigating and evaluating their work [17].

To illustrate this approach in practice, take a LA service offered to students that provides real-time updates about their studies through a dashboard. Those LA practitioners who designed and setup this service may hold a preconceived belief that this dashboard would address all students' needs and help improve academic performance. Log data can be used by the LA practitioners to investigate whether students are making use out of this particular tool. However, this approach naively assumes that the LA service is catering to the needs and expectations of the students. When, in actuality, students' may be expecting less frequent updates as to prevent themselves from being overloaded by information. Thus, this method of introducing a LA service from a top-down perspective can effectively create an ideological gap. As practitioners are holding beliefs about what they think a service should be, without acknowledging what students expect the service to be like. This both perpetuates the ideological gap and creates a risk that students could become dissatisfied with the LA service.

Under our proposed action research approach, the practitioners would follow the procedure of planning and implementing the LA service. Following this, there is a need to observe of how the service is running, which can be accomplished through the use of a service quality self-report measure. Theoretically, this should allow the LA practitioners to gain an insight into student views about a service en masse. As up to now, evaluations taken from small groups of students are not going to reflect the divergent opinion towards a service held by the general population of students. These results can then be fed back to the practitioners, who can then reflect and decide how the LA service can be altered to meet the expectations of the student population. This then brings the process back round to start the cycle again.

As previously mentioned, there are scales available that can measure service quality [2, 26]. In the case of SERVQUAL, the wording can be adapted to fit a particular environment. However, as LA is a relatively new field, and there has been no research to explore student expectations of LA as a service, we first explored how issues discussed in the literature relate can relate to service quality. On completion of this step, we felt it was more appropriate to create a new scale that could measure service quality in LA.

5. SCALE DEVELOPMENT

For the application of an action research approach aimed at assuring quality in LA services, a scale is required that can measure service quality. Researchers have incorporated evaluation processes into their methodologies [3, 27], but these were limited to small groups testing out new LA tools. What is required is a scale that can assess student expectations and perceptions of LA as a service offered by an institution. In doing so, it can provide the foundation for HEIs adoption of LA to be subject to regulatory measures.

The initial step taken to create a new scale that would measure LA service quality was to conduct a review of the LA literature. Attention was paid towards articles discussing ethical and legal issues in the field of LA [14, 31], or frameworks on how to assimilate LA into HEIs [32, 39].

A number of themes emerged from this review that we believe would be important for measuring service quality. These themes can be grouped as followed: Ethics and Privacy, Meaningfulness, Agency, and Intervention. Ethics and Privacy expectations cover a multitude of topics that have been continually debated within LA, such as reassuring students that their data is kept securely. Meaningfulness expectations center on the need for LA feedback to be both relatable and clear so it can be effectively incorporated into students' learning. Agency expectations are the degree to which LA should be student-centered, so that students themselves decide how to interpret and use any feedback provided. Finally, Intervention expectations are concerned with what students expect LA interventions to be aimed at (e.g., the development of academic skills, or emotional support).

The design of the items for this scale was motivated by the EDT model proposed by [21]. As the objective of this scale was to measure disconfirmation between expectations and perceptions, the questions were phrased to reflect these. It is important to note, however, that we have only considered expectations as reflecting what a user wants from a service (e.g., the level of service I expect to happen in reality). The issue here, according to [37], is that this conceptualization of expectation creates a situation whereby user satisfaction would result from a poor service if they expected this to occur. To compensate for this problem, the authors deconstructed expectations into predictive (i.e., a user's pre-usage belief of what they anticipated the service would achieve) and desired (i.e., a user's pre-usage belief of what they wanted in a service; e.g., I hope for this ideally). In doing this, they were able to extend the EDT by showing that satisfaction was the result of desired expectations being met. Feelings of indifference, however, were caused by predictive expectations being met; whereas, dissatisfaction occurs under circumstances when these predictive expectations are not met. This approach of using predicted and desired expectations has been used by [4] in the context of health care settings. They found that this deconstruction of expectations offered more explanatory power than using one type of expectation alone. With this in mind, we believed using desired and predictive expectations would be more beneficial for our LA service quality scale.

Taking into account the abovementioned findings and identi-

fied themes, we developed a scale containing 79 items. These items were broken down into two subscales (e.g., predictive and desire expectations). This questionnaire was then subject to peer review by two LA experts. The opinion of these experts centered on making the questions more focused and reducing the number of items as there were instances of overlapping topics. These comments into consideration, we refined the number of items in the questionnaire to 37 (Appendix), each of which contains two subscales (e.g., predictive and desire expectations).

In the next methodological step, we will be running a pilot study on a small group of students. This pilot will allow for students to provide feedback about the questionnaire to identify any issues with it (e.g., the clarity of wording used). Next, the pilot questionnaire will be distributed to a larger sample. The collected results will then be subject to reliability analysis, with items being removed if an improvement in coefficient alpha is possible. A factor analysis will then be run on the remaining items to extract the underlying factor structure. This should then leave us with a final questionnaire, which will be distributed across various universities so we can explore student expectations and perceptions of LA as a service.

The overarching aim of this research is to develop a framework by which students' perspective of service quality and satisfaction in LA services can be assessed. Various EDT measurement methods have been proposed to calculate quality of a service [11]. The most prominent of which has been exemplified by SERVQUAL, where perceived quality is the difference between the perception and expectation ratings of each item [26]. As an approach, however, it is problematic due to not measuring disconfirmation directly [35]. Thus, a decision was made to adopt the additive difference model as used by [34]. The first step in this method is to calculate the average score across the items of three scales (i.e., predictive and desired expectations, and perceived performance; Appendix). Next, participants answer questions measuring desires congruency (e.g., difference between what I desired and what I received) and expectations congruency (e.g., how good or bad is this difference?). For each item on this scale, individuals are asked to make a subjective assessment of whether the performance aligned with the desired/predictive expectation, and if this difference was good or bad. The scores on these two respective scales for the desired/predictive expectation items are multiplied for each item and then averaged, which provides average congruency scores (i.e., desires congruency and expectations disconfirmation). As in [34] research, we will also introduce items relating to satisfaction (e.g., overall, how do you feel about the learning analytic services you received?), and overall service quality (e.g., overall, what is the level of service quality you received from learning analytics services?). A decision to incorporate these items were based upon the findings that desires are predictive of satisfaction, whilst predictive expectations indirectly affect judgements of service quality through perceived performance [34]. Thus, the abovementioned points provides a foundation to develop a model that will enable practitioners to understand how expectations and performance affect students' satisfaction with LA services and their judgements of overall LA service quality.

6. CONCLUSION

LA is a valuable service in education, from being a tool to improve a HEIs retention rate, to guiding students down the optimum learning pathway [32]. An examination of the literature, however, does show an important gap within the field of LA itself, which is to develop measures of quality assurance. As with any other service, there is a need to meet the needs and expectations of users. If these

are regularly overlooked, it may perpetuate ideological gaps where the service providers are promoting their expectations over and above their users' needs.

As HEIs are increasing their use of LA services, it becomes imperative for practitioners to start considering how quality assurance can be guaranteed. To resolve this issue, we have suggested the use of an action research framework that allows for a continual evaluation of the LA service in place. In addition, we outline our current progression towards developing a scale that will measure the expectations and perceptions of LA as a service. It is intended that this will deter complacency and stress the importance of engaging in continual evaluations and re-developments of the LA tools and services in place.

7. APPENDIX

Pilot Questionnaire Link: <http://bit.ly/LASQE>

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