
Evaluating the Relationship Between Course Structure, Learner Activity, and Perceived Value of Online Courses

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Abstract

Using aggregated Learning Management System data and course evaluation data from 26 online courses, we evaluated the relationship between measures of online activity, course and assessment structure, and student perceptions of course value. We find relationships between selected dimensions of learner engagement that reflect current constructivist theories of learning. This work demonstrates the potential value of pooled, easily accessible, and anonymous data for high-level inferences regarding design of online courses and the learner experience.

Author Keywords

Learning management system; learning analytics; student evaluation of teaching; engagement

ACM Classification Keywords

K.3.1 Computer Uses in Education - *Computer-managed instruction (CMI); Distance learning*

Introduction

All educational institutions generate and store large volumes of information about learners, learning and teaching, but few have explored the data they collect or used what they have learned [1][2]. Learning analytics

(LA) research may allow higher education to better leverage the increasing availability of sets of 'big educational data' and the analytic and interpretive affordances of fields such as educational data mining, statistics, machine learning and the learning sciences [3].

The Society for Learning Analytics Research¹ (SoLAR) defines the goals of LA as "understanding and optimizing learning and the environments in which learning occurs". To date, most LA research has focussed on individual learner performance and Learning Management System (LMS) data (c.f., [4]). In this exploratory project we seek to analyze additional kinds of 'big educational data' from our institution to advance our understanding of how learning unfolds in online courses, and to use this information to improve design and increase engagement.

Our work is underpinned by the 'Community of Inquiry' theoretical framework [5]. This model proposes that successful learning experiences occur when a virtual learning environment supports three inter-related "presences": Social, Cognitive, and Teaching. Here, we are specifically interested in using analytics to investigate *the learning environment*, with a focus on a core element of 'teaching presence': "the design of the educational experience" [5]. We are exploring available metrics of this 'course design' element, and investigating their relationships with learner activity in the course and learner perception of course value (as indicated by scores in Student Evaluations of Teaching (SEOT)). SEOT scores are multi-dimensional and valid indicators of teaching performance [5] but their use for

assessment of teaching performance remains contested. In this study, however, we re-direct attention to the potential value of selected SEOT scores as indicators of course design effectiveness and the student learning experience.

Research Questions

Our work seeks to evaluate whether course-level aggregate data can be used to evaluate relationship between different dimensions of course engagement: course and assessment structure, online activity, and perceived value (see Figure 1).

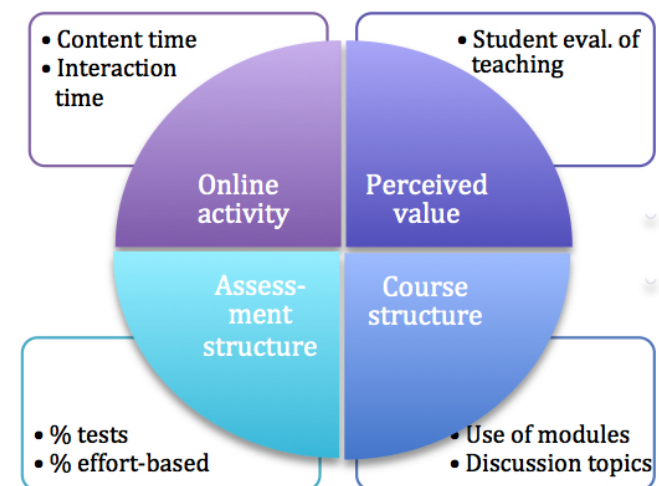


Figure 1: Dimensions and metrics of engagement.

We used aggregate course-level data, rather than individual learner data with the goal of making such approaches generalizable across higher education institutions, while avoiding use of sensitive personal information.

¹ <http://www.solaresearch.org>

Method

Our analysis includes data from all undergraduate online courses offered by one faculty in a large university during a single academic term. To prevent inter-dependencies, we randomly selected single sections from multi-section courses, leaving us with $N=26$ courses. The average number of students per course was 35 ($SD=18.3$).

Next we operationalized each of the dimensions identified above. **Online activity** was assessed using three metrics: Overall time per student per week, in minutes ($M\pm SD$: 168 ± 97); Time on content pages per student per week (73 ± 49); Time on peer interaction activities per student per week (discussion forums and chats; 63 ± 45). Notably, we only looked at data from weeks 2–12, as the first and last weeks of the term are less typical. **Course structure** was assessed using the following two metrics: Number of learning modules (7.5 ± 3.1) reflects instructor choices to structure course materials into smaller, more manageable, units; Number of discussion topics (20.4 ± 17.0) shows the number of different discussion threads established by the instructor. **Assessment structure** was operationalized as the weight of two components of the final grade: Tests, including final exam ($37\pm 24\%$); and Effort-based Activities, e.g. required participation in discussions ($14\pm 16\%$). Notably, we only had reliable assessment structure data from eleven courses.

Perceived value was evaluated using a single item from institutional SEOT scores: "Considering everything, how would you rate this course?" Students answered this question on a 5-point Likert Scale. There are several reasons for using SEOT scores. First, unlike course grades, SEOT can be used to compare courses. Second, it is a relatively robust measure. For instance,

this specific SEOT item is not associated with number of students ($r=0.10$) or response rate to the SEOT survey ($r=0.10$). Somewhat surprisingly, SEOT scores correlated significantly and negatively with average grade – that is, courses with higher grades were rated *more poorly* by students: $r(20)=-0.49$, $p=0.03$. Only 20 courses in the sample set have SEOT data.

Results

We first evaluated the relationship between engagement activity and course value. There is a positive, yet insignificant relationship between time-on-task and course value: $r(20) = 0.34$. Interestingly, this is driven mainly by peer interactions. The correlation between weekly time spent on peer interaction activities (within the course framework, almost exclusively on the discussion board) and perceived value is $r(20)=0.42$, $p=0.06$. While only marginally significant, this correlation reveals that 18% of the variation in SEOT scores is explained by variations in average weekly time in the discussion forum.

As expected, the course structure, as determined by the instructor, has an effect on students' choices with regard to engagement and perceived value. Courses with more built-in discussion topics also tend to have more interaction in them: $r(26)=0.51$, $p<0.01$. However, there is no direct relationship between number of discussion topics and perceived value, $r=0.0$. That is, while instructor-initiated discussion threads were associated with increased volume of interaction, this was not the interaction that was associated with perceived value. On the other hand, organizing course materials into sequential learning modules is associated with increased perceived value, albeit insignificantly: $r(20)=0.35$.

Last, the assessment structure offers additional insights into student engagement. There is a strong association between the weight of effort-based grades and perceived course value: $r(9)=0.38^2$. Notably, these effort-based grades require higher overall time on task: $r(11)=0.76$. There is no association between the weight of tests and perceived value, $r(9)=0.0$.

Discussion

This study offers preliminary results describing the association of different aspects of learner engagement in online courses, namely, perceived value, online activity, and structure. Courses in which students spend more time on peer interaction activities (mainly the discussion forum) receive higher evaluation scores, while the relationship between time spent on content pages and perceived value is not as clear. Although the number of discussion threads is associated with increased interaction, it does not necessarily promote valued interaction. Having an emphasis on effort-based assessments, on the other hand, is associated with valued interactions. Results also show that organizing the course in modules is associated with higher perceived value.

It is important to emphasize that correlation is not causation. For example, it is unclear whether students value more courses with much interaction, or interact more in courses that they value. Moreover, our study has several limitations: results were determined using a small number of courses, and we did not correct for multiple comparisons. Overall, however, this study demonstrates the promise of using different dimensions of learner engagement, even in aggregate format.

² Due to the small N, no significance values are calculated.

Specifically, our analysis suggests that courses whose activities and assessments are more demanding of learner time are, in fact, associated with increased perceived value, especially when students use their time in the course to interact with peers. Results also show that course structure can contribute to productive interactions, but not as simply as one would think.

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