



Patterns in Blackboard Learn tool use: Five Course Design Archetypes

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This study was driven by the following research questions:

1. Are there systematic ways that instructors use LMS tools in their courses that span instructors and institutions?
2. What recommendations can be drawn for faculty, instructional designers, and other academic technology leaders seeking to increase the impact of LMS use at their institution?

In Blackboard's data science research practice, we've been investigating how faculty and students use Blackboard Learn, and the relationship between that use and student achievement. In a previous study, we found a large variation in that relationship that was difficult to understand by common indicators like activity, enrollment, or other measures (Whitmer, Nuñez & Forteza, 2016a). We have also discovered some interesting differences in this pattern based on how students use specific tools in Blackboard Learn (Whitmer, Nuñez & Forteza, 2016b).

As academic technologists we know that tool use doesn't occur in a vacuum. Tools are part of a broader course context defined in terms of a wide array of possible instructional goals. To pursue this research thread, we conducted analyses based on the relative student time spent using different tools in Learn courses, taking tool use as a proxy for course design.

This question has been answered previously by scholars in conceptual studies (Janossy, 2008; Dawson and McWilliam, 2008), but has only been analyzed empirically in one study (Fritz, 2016), and has never been investigated in a multi-campus study. These approaches assume that course design evolves through a process of incremental adoption: begin with content dissemination, add forums or other functionality that replicates on-ground learning environments, then progress into more complex uses. This account is intuitively compelling, but it could be that reality is a little more messy given the nature of academic technology adoption.

The aim of this study was to discover archetypes of course design across institutions that have some consistency with these conceptual studies, but that also advance our understanding with details about the specific proportions of courses in each category. A deeper implication of this work is that it will allow us to more richly explore how courses falling into one of several categories can make most effective use of the LMS to increase student engagement. There might not be a single best way to make use of a learning management system, but there might be a set of best practices that govern effective course design by type. This work is an important step toward understanding how learning management systems are used in reality on order to support high quality instructional design in a way that also embraces diversity.

A crucial point underlying this research is that course designs, like any other use of academic technology, are only valuable insofar as they help to achieve pedagogical outcomes. Simply applying these designs without reconsidering learning and teaching goals will not result in improved outcomes, as we've learned clearly from the 'No Significant Difference' literature (Russell, 1999).

Methods and approach

The data sample for this study included 70,000 courses from 927 institutions, with 3,374,462 unique learners using Blackboard Learn during Spring 2016 in North America. All of this data was anonymized at the individual and institutional levels; only aggregate data was used for analysis.

We also filtered for criteria that indicated courses that could provide a meaningful educational experience and give enough data for statistical analysis: between 10 and 500 students, a mean course time of at least 60 minutes, and use of the gradebook. After filtering, the data set included 601,544 learners (16.25%) in 18,810 (26.87%) courses.

The data set was aggregated at the course level, and included the time spent using each tool. We normalized this data by course enrollment and length. Within these parameters, we calculated the raw time each student spent using each tool and the proportion of their total course time spent using each tool. These calculations enabled us to look at the total activity within the course, as well as the relative activity of one tool in comparison to others. We included some additional course information as well such as enrollment, total time spent, and average grade.

Against this data set, we conducted k-means cluster analysis. This is a statistical technique that looks for patterns between observations with a large number of variables. We began by conducting this analysis on a few courses and identified patterns, which we then validated and refined against a larger data set, before applying the technique to all courses in the sample. Once all courses were categorized, we analyzed these courses for broader features and academic use implications. This broader analysis included characteristics not present in the data used for categorization, such as course enrollment, total time spent, and others.

Findings: Course design patterns

Overview

There were five course patterns that emerged out of the k-means cluster analysis. These patterns have clear distinctions between them. The distribution of these patterns is illustrated in Chart 1. The majority of courses are in the “Supplemental” cluster, with the second largest amount in the “Complementary” cluster. These courses account for over three-quarters of the courses analyzed, and primarily use the LMS to provide students with access to course materials.

Chart 1: Course counts by archetype

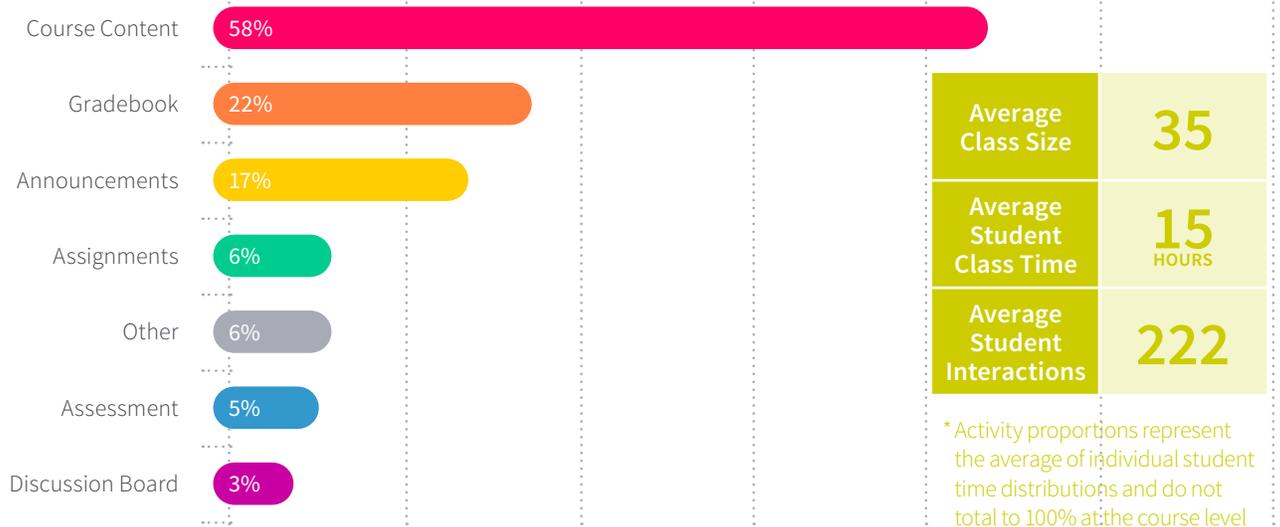
COURSE ARCHETYPE	COUNT (%)
Supplemental Content-heavy. Low interaction	9,909 (53%)
Complementary One-way communication through content, announcements, and gradebook	4,588 (24%)
Social High peer-to-peer interaction through discussion board	2,130 (11%)
Evaluative Heavy use of assessments	1,832 (10%)
Holistic High LMS activity with balanced use of assessments, content, and discussion	351 (2%)

The “Evaluative” and “Social” archetypes have a much larger amount of student engagement with Learn, whether calculated as time spent or as clickthrough interactions. Information about each course category follows, and more comprehensive data is available in the appendix.

Course archetypes



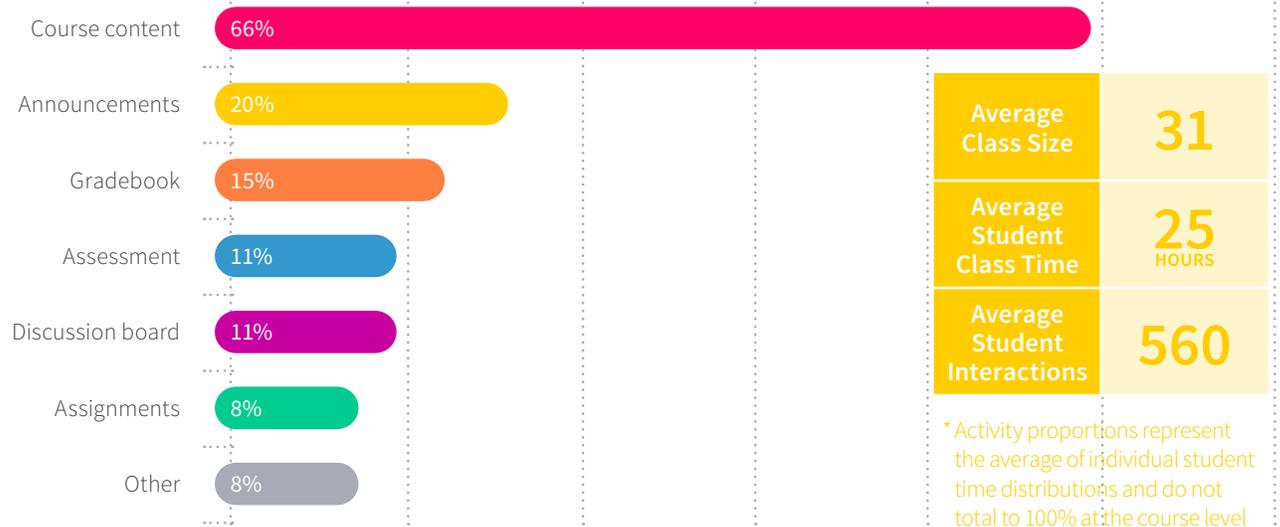
Supplemental Proportion of course time by tool used*



Instructors adopting the Supplemental course design archetype use the LMS primarily as a way to augment a traditional face-to-face course. These environments see relatively little student engagement, as they are primarily used for posting grades and as a repository for digital course content.



Complementary Proportion of course time by tool used*

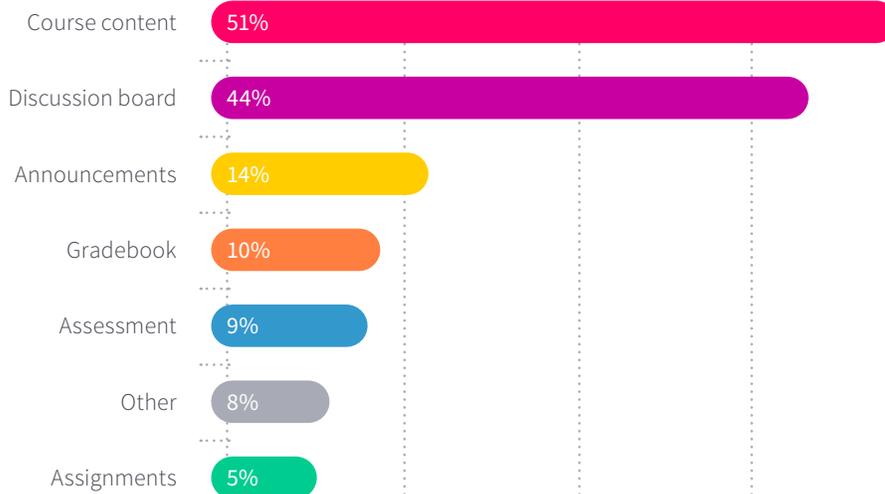


The Complementary course design archetype has almost twice the activity as the Supplemental archetype, and is used largely as a one-way communication tool from instructor to students. In addition to using the environment as a way to distribute course content and grade information, instructors using the LMS in this way also make significant use of announcements. They may take advantage of discussion board and assignment functionalities, but the relatively small amount of time that students spend in each of these tools suggests that most interaction is taking place between teacher and student rather than between peers.



Social

Proportion of course time by tool used*



Average Class Size	25
Average Student Class Time	39 HOURS
Average Student Interactions	1,348

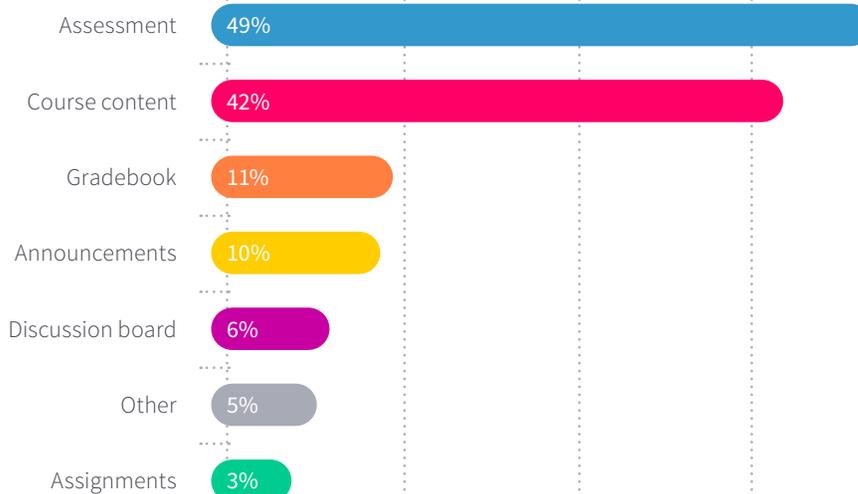
* Activity proportions represent the average of individual student time distributions and do not total to 100% at the course level

The Social archetype finds students highly engaged in the digital course environment, spending an average of 17 hours in the discussion tool over the course of the term. Used in this way, the digital course environment begins to look a lot like an online version of a small seminar, with a strong emphasis on critical engagement with course content through peer-to-peer discussion. The small seminar feel is further supported by the fact that, at 25, the Social archetype has the lowest average class size.



Evaluative

Proportion of course time by tool used*



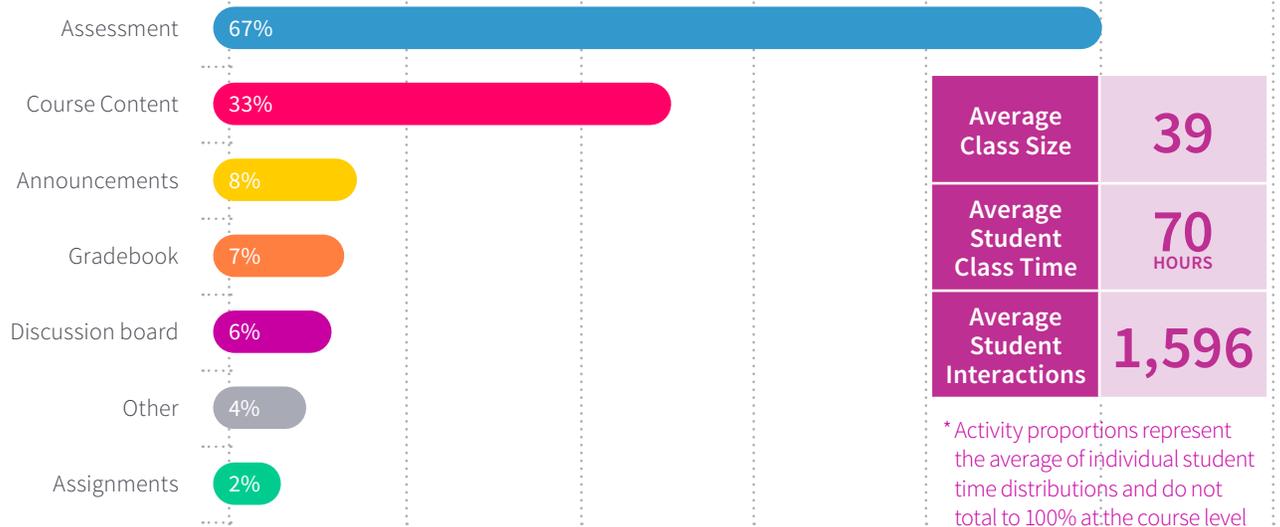
Average Class Size	33
Average Student Class Time	38 HOURS
Average Student Interactions	808

* Activity proportions represent the average of individual student time distributions and do not total to 100% at the course level

The Evaluative course design archetype is heavily focused on testing. Instructors using the LMS in this way appear to use the environment in such a way as to support content mastery through regular quizzing and testing. In fact, students in courses designed in this way spend nearly half of their time in assessments, which translates into about 19 hours over the course of a given term.



Holistic Proportion of course time by tool used*

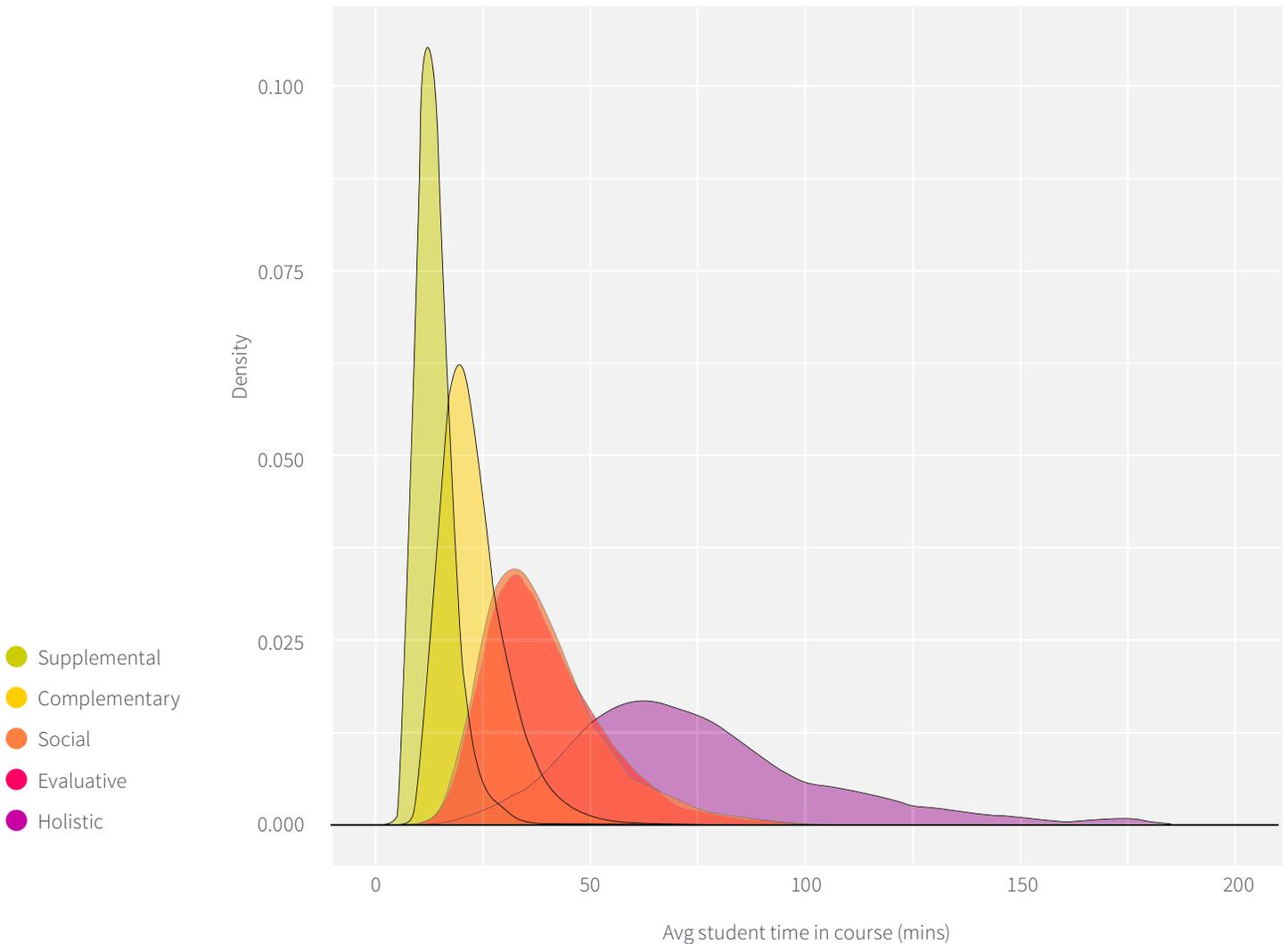


As with the Evaluative archetype, the Holistic archetype makes extensive use of assessments. In spite of the fact that the proportion of student course time spent in other tools is relatively low, the fact that students in this course archetype spend significantly more time in the digital course environment in total means that they also spend more actual time in course content and grades than in any other archetype. We also see more discussion board activity in this archetype than in any other except for Social. While we don't see significant differences in time spent in either assignments or announcements compared to other archetypes, the nature of these tools is such that we would not expect to see radical differences between archetypes.

Engagement in courses by archetype

We also analyzed the time distributions for courses within each category. Chart 2 plots the average time/student for courses within each archetype.

Chart 2: Distribution of time by course category



This chart demonstrates that there is increasing amounts of activity across the course archetypes—with the exception of the Assessment and Social archetypes, which largely overlap in their distributions despite the relatively larger amount of interactions in the Social courses. Given the large number of courses included in this sample, the separation of these curves is strong evidence that student engagement is very different between these course types.

Implications

Through this analysis are clear patterns in Learn course design that correspond to known educational uses of the LMS. These archetypes cannot be divorced from the deeper educational goals underlying these course patterns, and should be considered within that broader context. However, there are several implications for practice from this research for faculty and campus leaders seeking to increase student participation in Learn.

- The majority of Learn courses are primarily used to access Course Content, and have a small amount of student activity. However, even these courses have substantial use of the gradebook and announcement tools.
- The Assessment and Social courses have much more time spent than courses without these elements. This may be true by definition, but is interesting to see the degree to which student activity is increased in courses with these items.
- Use of these tools could provide instructors with in-person class time for interactions with students and ad-hoc discussions. It is possible that assignments have a similar effect, but due to limitations of Learn logging we cannot determine how much time students spend on assignments submitted through Learn.
- Courses making extensive use of Discussion forums have a substantially smaller enrollment than courses in other archetypes. This finding reinforces faculty calls to limit course enrollment for high-quality student experiences, or advance strategies for effective forum facilitation in large enrollment courses. Our prior research did not find a relationship between enrollment and course activity considered independent of course design.
- Courses in archetypes with a larger amount of student use continue to have a large amount of activity in course content in raw numbers, but proportionally have a large amount of activity in other tools. It appears that courses often “top out” at a certain amount of online resources and then expand into other types of activities.
- Courses with the largest amount of student activity take advantage of a diverse set of tools; campuses should identify and investigate these leading courses as sources for best practices and examples that can be adapted by other faculty in their courses.

Next steps

Our next area for research is to examine the relationship between these use of Learn and student achievement (e.g. course grade), comparing the results across archetypes. One might assume that as more students use Learn, there is a greater opportunity for learning, or perhaps a greater amount of student effort put into learning, and therefore there will be a stronger relationship between Learn use and grade in the course archetypes with deeper use of Learn.

Works cited

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Appendix: Detailed course category information

	Supplemental	Complementary	Social	Evaluative	Holistic
Course count	9,909	4,588	2,130	1,832	351
Percent total	53%	24%	11%	10%	2%

Course Summary (Avg.)

Enrollment	35	31	25	33	30
Time in course	15	25	39	38	70
Activity in course	222	560	1,348	808	1,596

Activity by Tool (Avg. hours/student)*

Course Content	8.7	16.2	19.5	15.3	21.4
Assessment	1.0	3.0	3.8	19.4	48.4
Discussion	0.6	3.1	17.4	2.8	4.0
Grades	3.0	3.5	3.8	3.8	4.6
Announcement	2.3	4.6	4.8	3.4	4.6
Assignment	0.9	2.1	2.0	1.2	1.2

Activity by Tool (Avg. % of course time/student)*

Course Content	58%	66%	51%	42%	33%
Assessment	5%	11%	9%	49%	67%
Discussion	3%	11%	44%	6%	6%
Grades	22%	15%	10%	11%	7%
Announcement	17%	20%	14%	10%	8%
Assignment	6%	8%	5%	3%	2%

* Tool calculations are averages of individual students and do not total to 100% or total time at the course level

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