MFA Review: Project Two

Custom Courseware Analytics

Flash-based Tool With a .NET Powered XML Backend
Professional Project Developed Before my Time at SCAD
2007

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MFA 45-Hour Review

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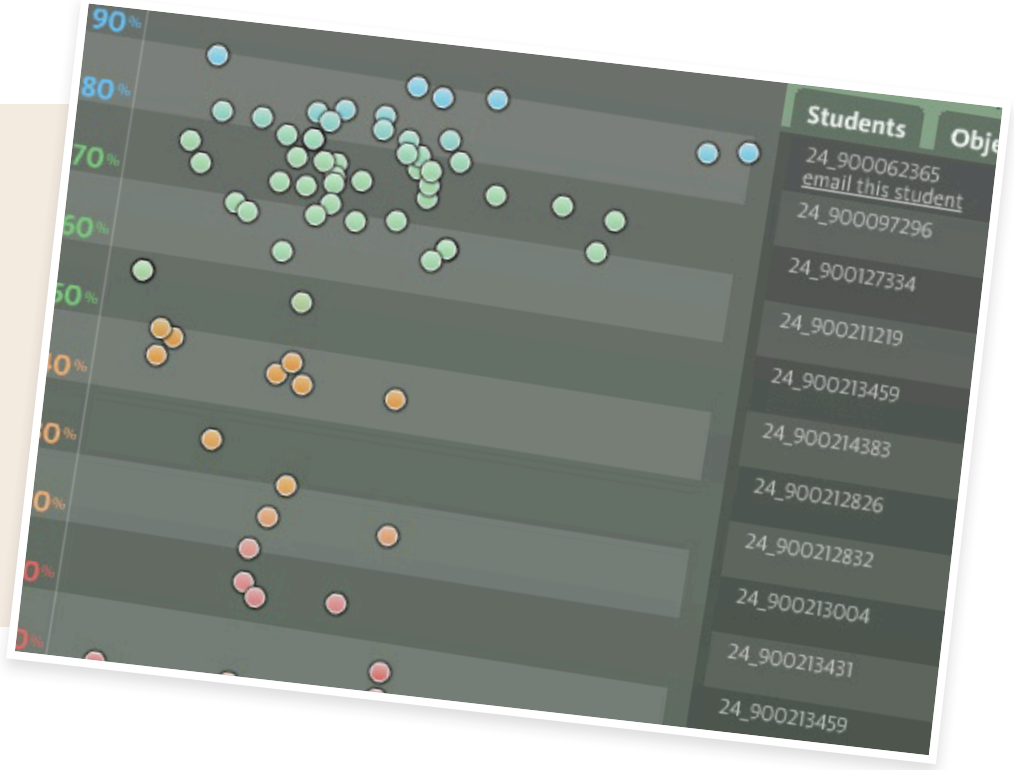
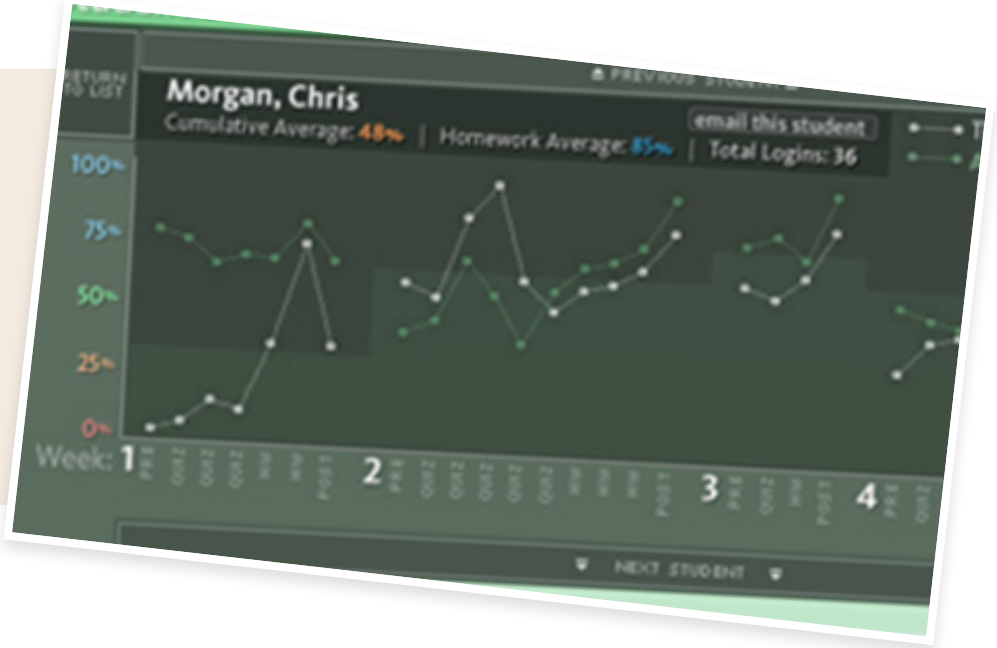


Custom Courseware Analytics: Overview

A professional project completed before my time at SCAD. Flash-based dashboards used by instructors of classes with 1000+ students to discover trends and reach out to struggling students.



Custom Courseware Analytics: The Problem

Custom Courseware is an interactive textbook with embedded multimedia and assessment designed to address the unique needs of extremely large college-level courses. The content of this interactive textbook is a tailored mashup of other source textbooks. Instructors provided high-level learning objectives. Our instructional designers worked with subject matter experts to determine which source textbooks, assessment and media corresponded to those high-level learning objectives. Then, the subject matter experts expanded those objectives into granular goals. Our subject matter experts then mapped textbook content, multimedia and individual assessments to those granular goals. This allowed us to offer powerful study guides that customized themselves to students based on their performance in the embedded assessments.

Our team conducted ethnographic research with institution administrators, instructors and students and realized students were not the only ones who struggled in these large classes.

Instructors consistently shared that they had a hard time discerning which content students were struggling with. Because of the nature of the courses, the only real indicators of which topics students needed help with were performance on tests and exams. They also saw struggling students consistently falling through the cracks. Administrators were worried about low retention rates for their large courses. They were also concerned that they had no way of knowing which topics their adjunct instructor needed coaching in.

We decided we needed to leverage the same learning objective mappings that were leveraged for the student study guides to completely rethink the role of the grade book in exceptionally large courses.

Custom Courseware Analytics: The Solution

Instructors reported that extracting trends from traditional assignments was difficult. To make matters worse, they also reported that this often didn't provide actionable insight, and they rarely were useful in identifying exactly what the sticking point on a particular subject was for students. We decided to create a course performance dashboard to augment the traditional grade book. This dashboard would leverage the existing learning objective mappings to provide real-time reports to instructors on aggregate performance against learning objectives as well as allow them to drill down into specific students to find those who were struggling the most.

I set out to design the analytics for the dashboard. I worked with a developer to identify what data we could extract from the existing system and discovered that nearly everything we needed was already being captured. I engaged in research into what key usage patterns were correlated with poor performance. Much to my surprise, I discovered that time-on-task (the amount of time a student spent in the system reading and doing work) was not correlated to performance. Instead, I discovered that total number of logins was highly correlated to performance. I decided that this was a key metric.

Obviously, performance against specific learning objects was another key metric. After meeting with instructors, I determined that they rarely needed to see an overview of the entire course. Instead, they often thought in terms of weeks. When prepping for a given day's class time, they would look through student performance on material that week to determine what they needed to emphasize in the next lecture. They would not, necessarily, look at performance over the entire course. So, I decided that performance on learning objectives would be filtered down to the week level.

I quickly sketched a handful of iterations while also checking what the real data looked like in different displays using Excel. Once I had a basic set of analytics I liked, I began designing in Photoshop and Illustrator. Once I arrived at a design I liked, I did casual hallway testing to get feedback and iterated.

Next, I began developing the analytics in Flash. I used ActionScript's ability to pull in XML in order to pass the large amounts of data into the Flash widgets. I took existing data and manually created these static XML files. Then, I pulled all of them together into an HTML file. Finally, I worked with a developer to use .NET to power the XML.

After the initial launch, we iterated on designs for the ability to drill down into more granular student performance. Our plans, however, were shelved with a company-wide reorganization forcing us to focus our attention elsewhere.

Custom Courseware Analytics: Results

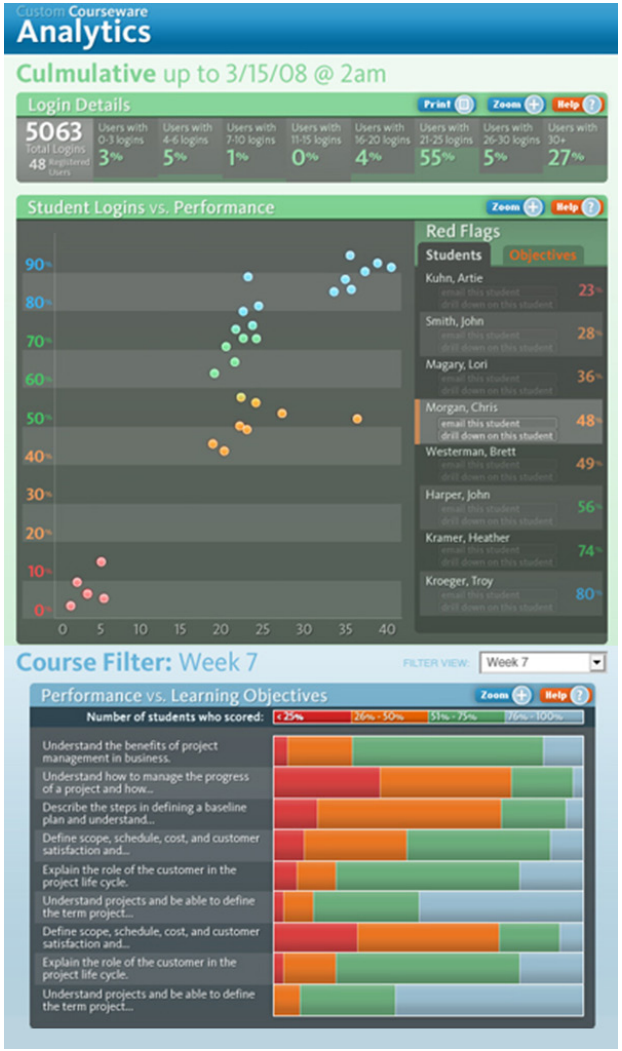
The analytics were used by all of the Custom Courseware adoptions have received high praise from instructors and administrators. In sales calls with potential customers, they were often the component that "sealed the deal" and were "light bulb moments" for instructors skeptical of how online tools could improve their traditional courses.

Within the company, they served as a model for how we could use learning objectives and curricular mappings to actually improve outcomes for our customers.

Within my team, we've used it as an example of how asking, "what is the problem we're trying to solve?" rather than "how can I mimic what's gone before?" results in innovative solutions.

Personally, much of my work up until this point had been traditional web and interaction design. This project opened my eyes to how powerful and useful data visualization could be. During this project, I was sent to an Edward Tufte seminar. While I was familiar with his work from my undergraduate studies, I learned a lot from the seminar.

Custom Courseware Analytics: Results (continued)

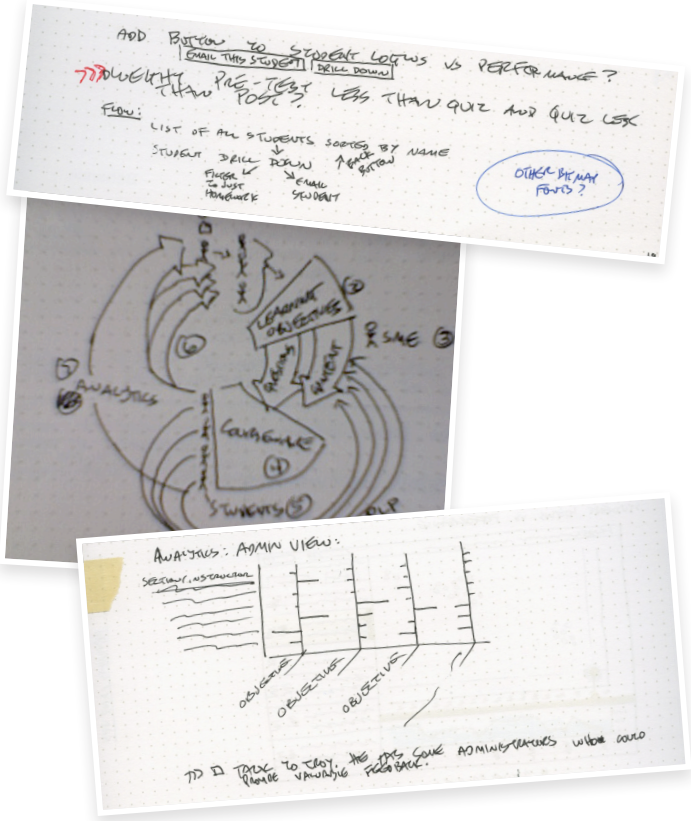


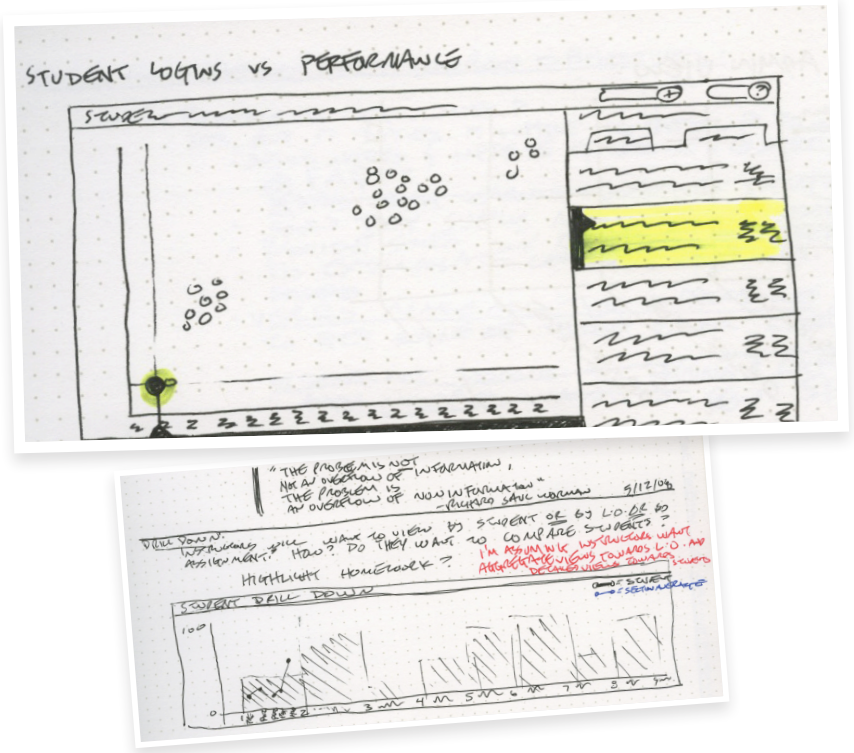
The final interface. NOTE: Because product contains sensitive student information, a live demo is not available.

Custom Courseware Analytics: Process

Initially, we were just planning on adding small multiples and sparklines to a traditional grade book. Another sketch was of student performance mapped over time. We quickly realized we needed something more meaningful and helpful. This was still too centered on individual student performance rather than trends in the entire course. This sketch took the conversation in a different direction. The idea was that what really mattered was aggregate student performance against learning objectives. Above, individual weeks could be expanded to learning objectives embedded within them.

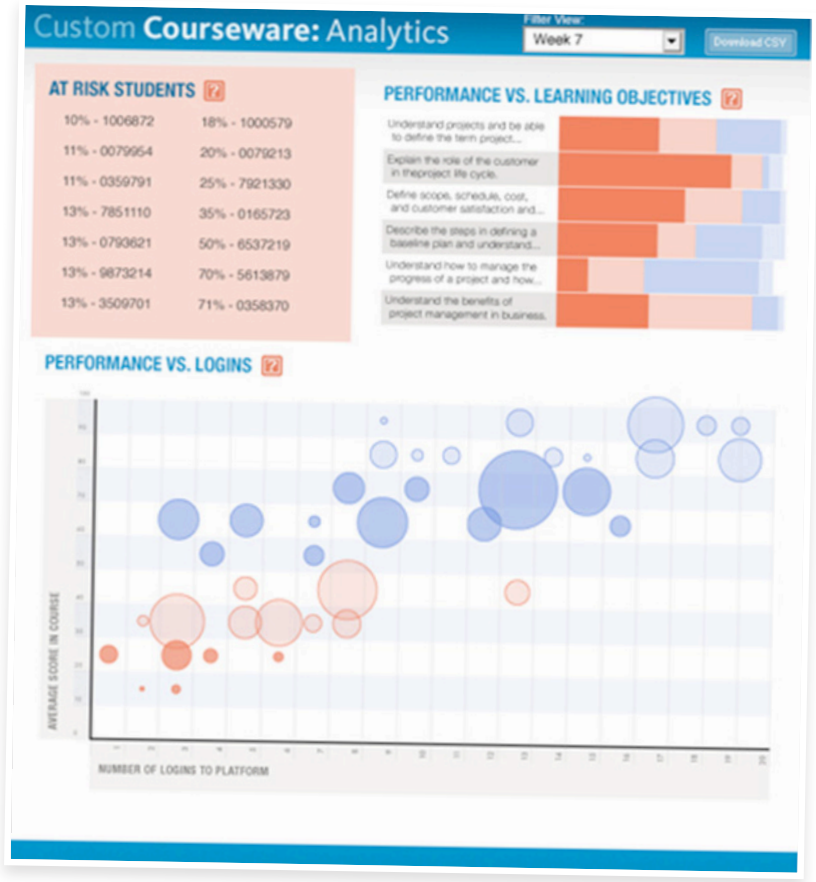
Custom Courseware Analytics: Process





After analyzing existing usage patterns and student performance, I wrote up a creative brief for approval. Once approved, I began sketching with this learning objective-centric vision. These were used for simple hallway user testing. Along the way, I used live usage and performance data to test my assumptions and make notes of how performance could be weighted to help reveal important trends.

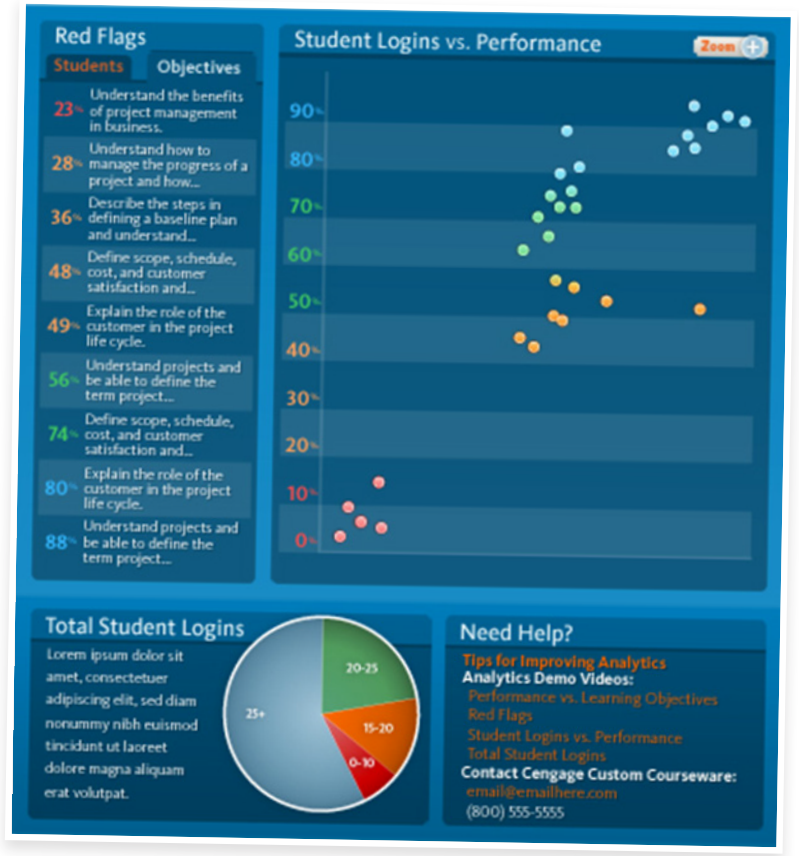
Custom Courseware Analytics: Process



Using the sketches as a guide, I began working on the first illustrator comps. Colors were designed to match the existing platform. I wanted to highlight students who were at risk as well as learning objective performance. Along the bottom would be a bubble chart of individual student logins vs. performance.

The size of the bubbes would be how many that was true for.

Custom Courseware Analytics: Process



Ultimately, I felt like the initial comp had some strong ideas, but was anemic. I completely reworked the color scheme and design. While I really liked this change in direction, there were a couple of key problems. First, the pie chart didn't make much sense. It was supposed to be measuring what percentage of all users were logging into the system more than a given amount. My hallway testing showed that this was quite confusing. This design also was missing the performance against learning objectives. Finally, while I liked the colors, they didn't match the existing product.

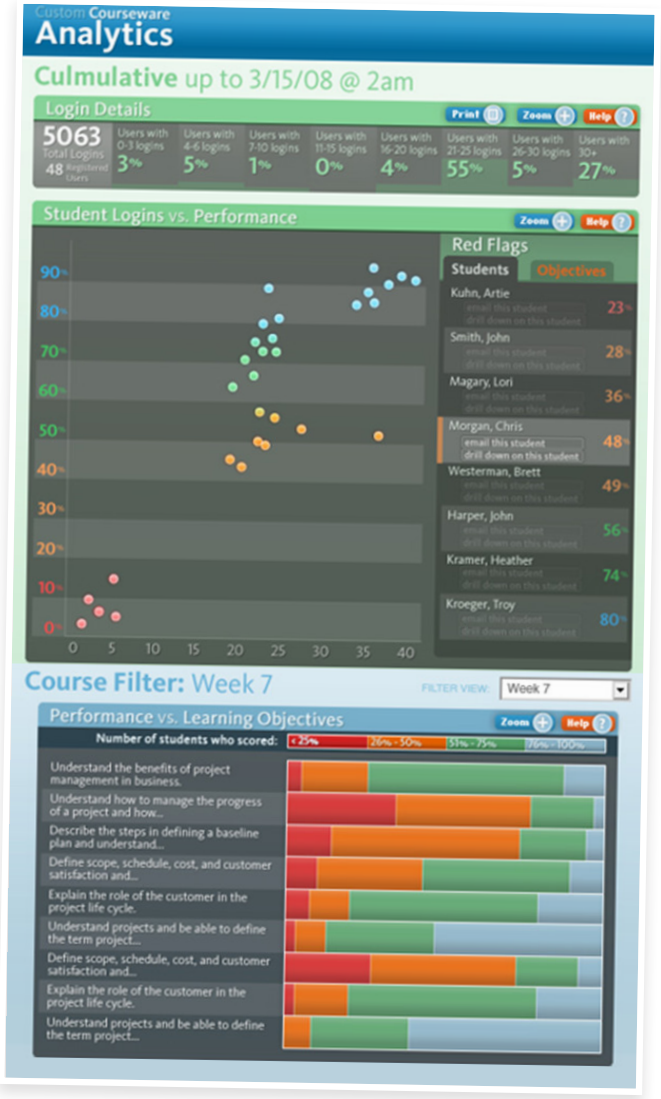
Custom Courseware Analytics: Process

Then, I came up with this finalized design. I broke the page into two main areas. In the green, cumulative information about the entire course up until the moment the dashboard was accessed was displayed. Below, in blue, I displayed week-by-week filters of specific learning objectives.

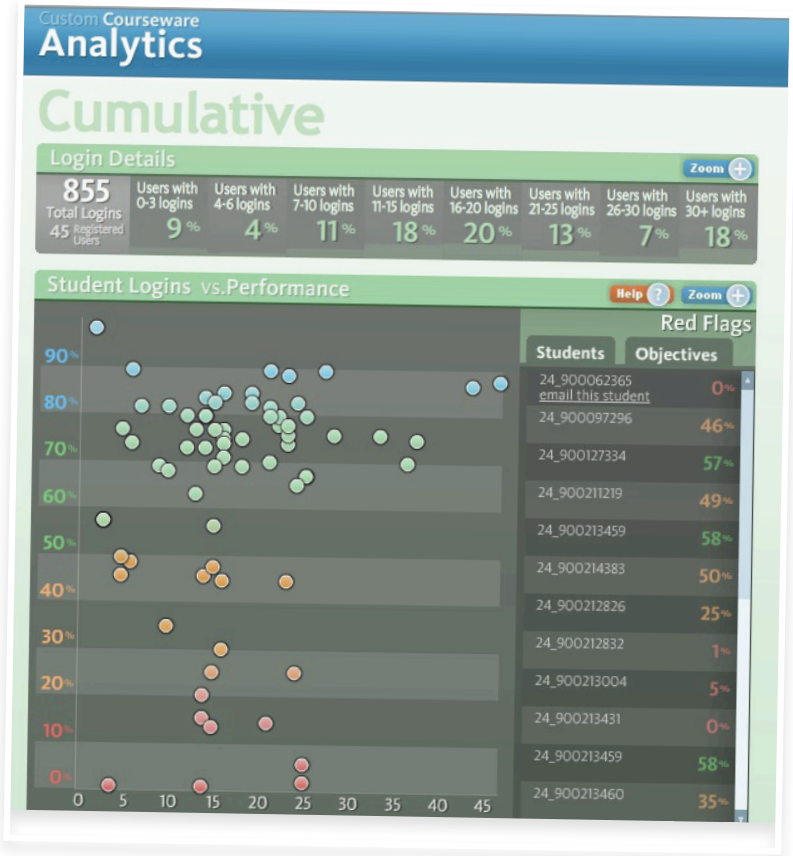
I changed the pie chart into a very faint bar chart with specific numbers overlaid on top. This allowed instructors to see how the distribution of logins into the platform was looking. When talking to instructors, this was often a proxy for how engaged students were with the material.

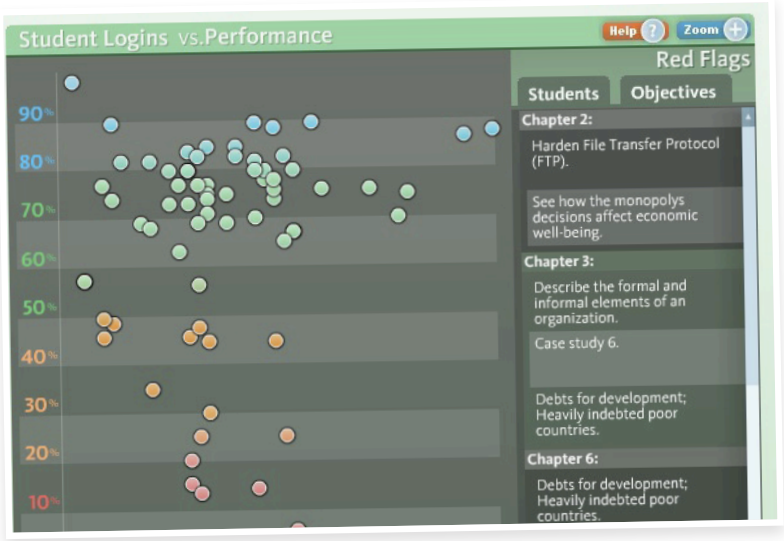
In the large widget in the middle, I chose to display all students as individual dots. Performance was the y-axis and logins was the x-axis. Rolling over individual dots would scroll a list to the right of the student that dot represented. Rolling over the student would also highlight the relevant dot. Instructors could then email students directly from the interface if they were struggling. Often, we found that simple registration and login problems were identified by the instructor using this tool. Directly to the right of the students with red flags was the objectives. We displayed the worst performing objectives in the entire course in a simple list.

Finally, in the last visualization, instructors could see how students were performing against specific learning objectives, organized by week.



Custom Courseware Analytics: Process

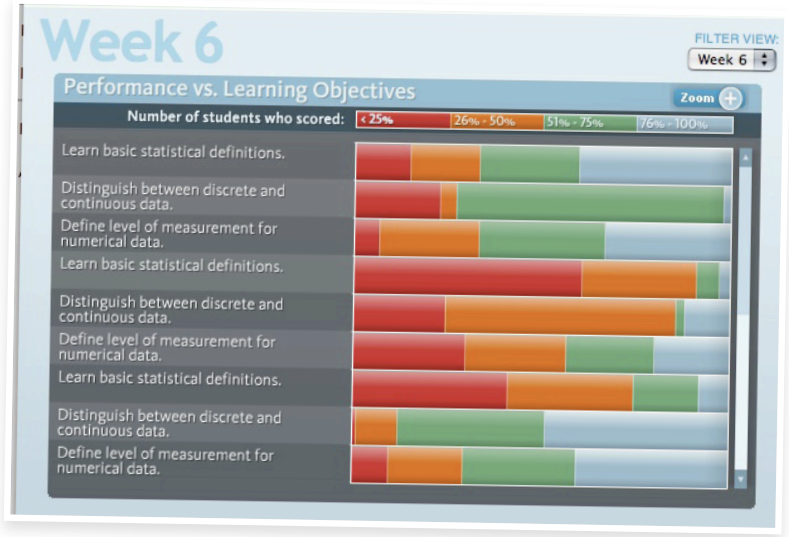




Once the comp was approved, I got to work programming the individual components in Flash. I worked with a backend developer to have core data extracted from our database into XML files. The SWFs would then read these XML files to render the data. In some courses (above) with strict implementation of FERPA laws, student names had to be removed and replaced with their unique identifiers in our system. While this allowed instructors to view aggregated performance, it severely limited their ability to reach out to struggling students.

Red flag learning objectives could be toggled as well (right). This was helpful to get a high-level view of the entire course.

Custom Courseware Analytics: Process




As noted earlier, people must make choices because scarcity exists. Because our seemingly unlimited wants push up against limited resources, some wants must go unsatisfied. We must therefore *choose* which wants we will satisfy and which we will not. The most highly valued opportunity or alternative forfeited when a choice is made is known as opportunity cost[3]. Every time you make a choice, you incur an opportunity cost.

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0:46 / 1:40

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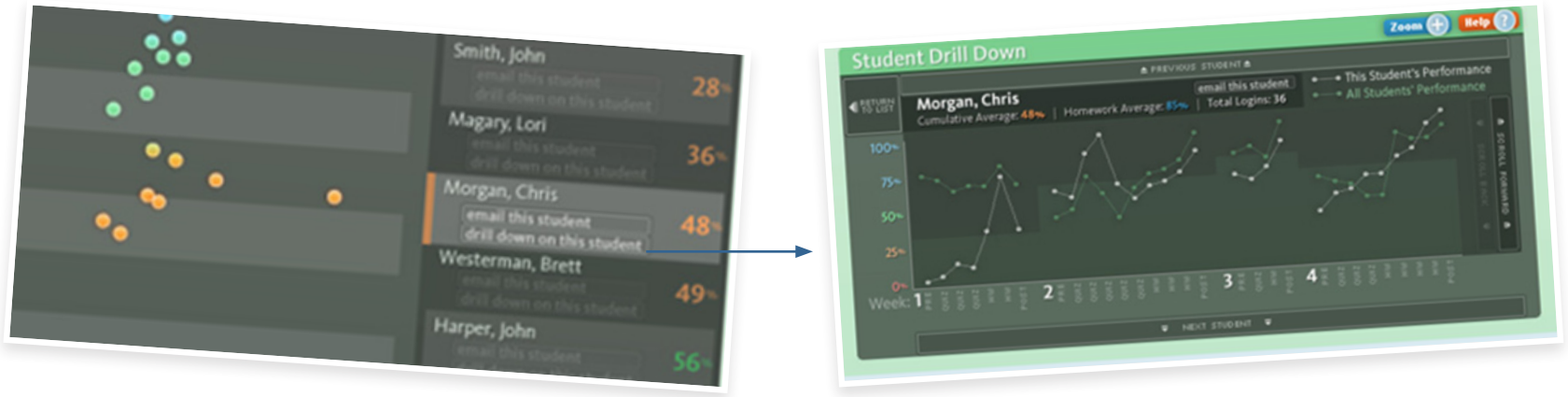
We found that the view that allowed instructors to drill down into specific learning objectives was the most used tool in the analytics. Instructors reported that they often consulted it before a class in order to identify anything from the previous class that needed to be reviewed. They also used it to point students to specific spots in the textbook (right) that they recommended consulting.

Custom Courseware Analytics: Process

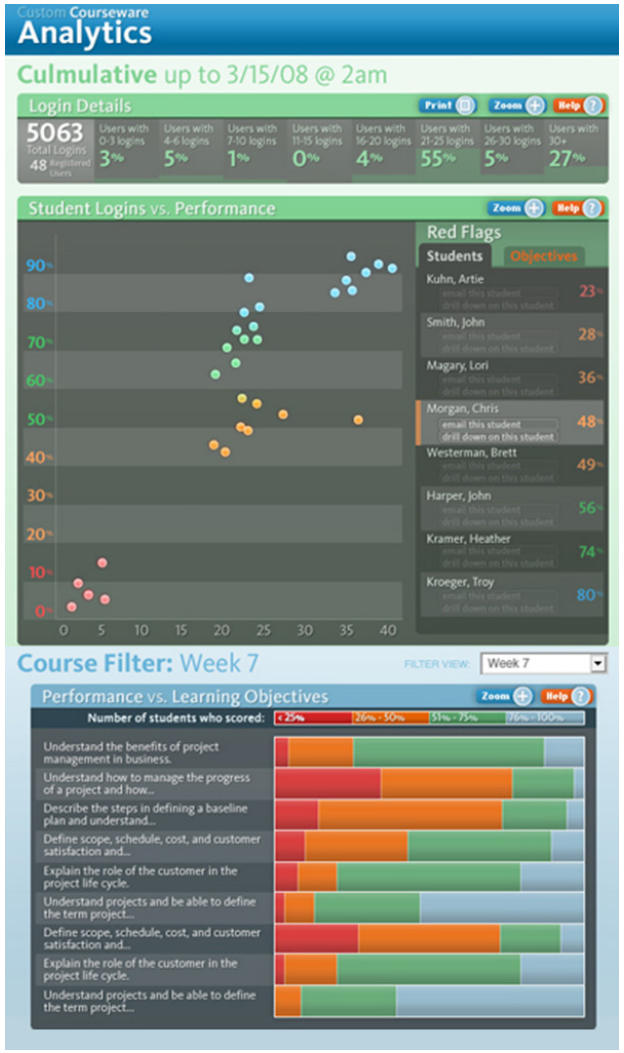


After the success of the analytics, our team decided to allow instructors to drill down into specific students' performance. While these widgets were designed and proof-of-concepts were built in Flash, the development effort was cancelled due to a strategic reorganization of the division.

In this example, an instructor has clicked the button to drill down on the student Chris Morgan. Chris' specific performance would load below. Here, an instructor could compare Chris' performance on embedded assessment (white lines) against the class's aggregate performance (green lines). An average of Chris' performance for a given week would appear in the background as a bar graph.

In many ways, this was a return back to the traditional grade book. However, by providing this information in context of the overall objectives, instructors could help zero in on specific problem areas for a given student. Again, sadly, this component was never launched.

Custom Courseware Analytics: Process



The final interface.