“BINGO!” DO WE HAVE A WINNER?

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This design case details my efforts as an instructor to combat the fact that my students were not completing assigned readings. The first step in addressing the issue was recognizing that my students had legitimate reasons for neglecting the assignments and that this was not a situation of me against them. The design solution was based upon the Buzzword Bingo game, a game designed to mock the catchphrases so common in the world of business, and some of the subversive nature of the game carried over into the classroom. This led to students trying to game the system, resulting in tension for me, the instructor, who had to remember that he welcomed these challenges to his authority into the classroom. The increased engagement—which I wanted—required me to become comfortable with the reduced level of control.

Although implementation required minimal technology support and was initially piloted using only a standard discussion board, I iterated through multiple rounds of software enhancements to improve ease of use and make it easier to provide quality feedback to my students. These changes resulted in unexpected benefits as they enabled me to perform analytics on the captured responses resulting in a deeper sense of their progress and an ability to tailor my instruction to the student's needs.

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THE SITUATION

Wow! Not a single hand?

My question had been a simple one: raise your hand if you read the assigned chapter, and it came after an awkward moment of blank stares from the 17 students in my class when I failed to elicit the name of the company in the featured case study.

This was the sixth week of class, so they'd had ample time to obtain the book, and it wasn't their first—or longest—reading assignment.

Unfortunately, this wasn't too surprising because I had had the same experience the last time I had met them. I had hoped that reminding them of the importance of completing the reading assignment would improve the situation, but it did not. Now, only two days later, not a single student had arrived prepared for class?

But it was *my* job to help them get prepared, wasn't it?

This time, I asked my students why they didn't do the reading, and initially, many blamed themselves for being irresponsible. I blamed them, too, but that was unhelpful, so I pushed further, and my students observed that the readings are:

- Too long
- Too difficult to understand
- Too boring
- Not connected to class

I thought the readings were interesting because it drew upon authentic examples that I had experienced. They provoked thoughts and raised important questions in ways that could not be ignored, given the central conversations within the field. Some offered novel approaches to problems common to practitioners. How could I make sure they were exposed to this information?

ABOUT ME

I am, first and foremost, a designer. Currently, a professor on the faculty of the Department of Technology and Society

at SUNY Korea¹, I have worked professionally doing project-based consulting first as an enterprise software developer and, most recently, as an instructional designer. I have designed and deployed solutions (training and otherwise) in the realms of higher education, financial services, healthcare, media, and more—I have earned the descriptor *eclectic*.

It cannot be forgotten, as well, that I have formally been a student for more of my life than not. I have experienced 27 years of instructors assigning readings just as my students were experiencing now. It wasn't hard to remember times when I had found I had re-read a paragraph five times only to realize that I still had no idea what it said or why it was important. My instructor had assigned it, and so I tried, but as the minutes dragged on into hours, I began to think maybe I would never understand why she had assigned them. There were times when I woke up in the middle of the night on top of pages warped by drool—pages I had apparently napped my way through. And then, there were the readings I *knew* I would only understand when the instructor explained them and so I spared myself the pain of trying. Embarrassingly, there are even instances of my having gone back to re-read texts on my own time and found myself truly enjoying works that had previously been a chore.

Could these perspectives help me help my students?

INFLUENCES

When the term 'gamification' rose to prominence in the public consciousness, I studied it and delivered presentations explaining the phenomenon and how to apply it. Specifically, gamification is the incorporation of game elements into a non-game experience in an effort to capitalize upon the strengths of games (Hamari et al., 2014; Smith-Robbins, 2011). These strengths can include:

1. Motivation
2. Competition
3. Structure
4. Clear goals
5. Progress towards goals
6. Direct feedback on performance
7. Providing a framework for interaction

It is a new lens on what professional instructional designers have been doing for years to spice up their training materials; disguising a quiz as a Jeopardy™ game is one example of a common gamification treatment.

¹ I have since moved to Mount Saint Mary College in Newburgh, N.Y.

FIGURE 1. The author's personal website which extends the metaphor of a home

The gamification approach is distinct from game-based learning in a few key ways. In game-based learning, the game mechanics themselves impart an understanding of the intended concepts or content, while the game mechanics in a gamified situation are not connected to the content itself. In effect, gamification is content-agnostic and, with thoughtful design, can be broadly applied to achieve types of learning goals without deep consideration of what students are intended to learn (Kamasheva et al., 2015; Nicholson, 2012). However, this loose coupling often lends these efforts a gimmicky feel.

Gimmicky is acceptable to me as a designer. It was a gimmick that guided the 2001 iteration of my personal website (<http://www.csh.rit.edu/~micah> see Figure 1). Recognizing that I had neither the tools nor the talent to design an aesthetically beautiful website, I opted instead to revel in my lack of skill. I drew my home on the web using only my mouse and the tools available in the day's version of Microsoft™ Paint. However, these low-tech. images were supported by a thorough treatment of the 'home' metaphor that still garners compliments today. I view those compliments as positive engagement, which is a goal of mine in my classroom.

INTERROGATING THE PROBLEM

The primary questions for me as an instructor whose students do not complete assigned readings: Are these readings really necessary? If so, why?

I had inherited this textbook selection from an instructor who'd taught this course before me, and it didn't directly match the in-class activities I had planned. The class was

Application Software for Information Management and, while I approached the course from the perspective of a developer, the previous instructor is an MBA who took a management view. My students, majoring in Technology Systems Management, will be expected to navigate both the technical and management worlds. They did not need to memorize the text or regurgitate details, but they would need familiarity not only with common concepts but also with the language used to discuss them in both worlds.

So, yes, the readings are necessary. All the more so, given my own background and the resulting slant of my perspective. The book must stay.

My reflections on the textbook highlighted a number of the problems my students faced. Similar to the difference in instructor perspectives between management and development, the language of the book was different from that which I used in class. My students noted they rarely heard the exact language of the text in the classroom.

Furthermore, it occurred to me that the authentic case studies were drawn primarily from the United States over the past decade. My students were undergraduates in South Korea. While the names and issues were meaningful (and therefore interesting) to me, my students did not share the same context—they did not yet understand why this information was relevant to them. Developing such an understanding is, after all, a major reason why they were in my class.

Given the above, how could these students have any level of confidence that they were prepared for class after having read the material? How could they know if they had understood or even noticed the main point? How could they know they were getting some value in return for their effort? How could I expect them to know when I, their instructor, failed to do the same when I was in their shoes?

It seemed that my students might be helped by any of the following:

1. Make the objectives clear.
2. Make it clear when they'd achieved those objectives.
3. Draw connections between the book and the classroom.
4. Provide opportunities to experiment using the two languages (i.e., software development and business management).
5. Help them develop a context for understanding the material.
6. Provide short term positive feedback for putting in an appropriate level of effort.

Goals 1, 2, and 6 aligned directly with gamification strengths 3, 4, 5 & 6 (see Table 1). Perhaps careful design could make sure that 3, 4, and 5 were met as well.

	INTERVENTION GOALS	ALIGNED STRENGTHS
1.	Make the objectives clear.	Structure (3) Clear goals (4)
2.	Make it clear when they'd achieved those objectives.	Progress towards goals (5) Direct feedback on performance (6)
3.	Draw connections between the book and the classroom.	
4.	Provide opportunities to experiment using the two languages.	Structure (3) *
5.	Help them develop context for understanding the material	
6.	Provide short term positive feedback for putting in an appropriate level of effort.	Direct feedback on performance (6)

*Indirectly aligned strength

TABLE 1. Alignment of Intervention goals with strengths attributed to gamification.

THE CONCEPT

Having spent many years as a professional who had attended many jargon-infused meetings and presentations, I was amused by the game *Buzzword Bingo*. I was first introduced to it during the dotcom era when it seemed there were new technologies and acronyms emerging daily. It is a corporate take on the classic game of bingo, but instead of placing numbers in the boxes on the grid and hoping for yours to be called, you choose from a list of catch phrases and buzzwords and wait for your manager or colleagues to mention them during the next meeting. Winners often disguised their claim of 'Bingo!' behind a coughing fit to avoid letting the speaker know their overuse of jargon and predictability was being mocked.

If you search your smart device's app store for 'buzzword bingo,' you'll see that there are numerous takes on the application that support networked mobile play. I didn't play because it was time-consuming to set up, but when I did, it was fun, and it felt subversive just to talk about it.

When I began to think of possible solutions to the problem I was having in my class, *Buzzword Bingo* came almost immediately to mind—I don't recall considering any alternatives. This seems to align with Darke's (1979) concept of the *primary generator*—an idea that bubbles up initially

Bingo!

How to play:

- Post concepts/terms and definitions in Blackboard
- Draw up your Bingo card before class
- Listen for me to discuss the topic or mention the word
- If you get five in a row, yell: BINGO!
- Explain each term you used

Bingo scoring

Individual:

- 1 point for posting 10 concepts/terms to Blackboard the night before class
- 1 point if you win (including explanations)

Group:

- 1 point for posting 25 concepts/terms to Blackboard the night before class
- .75 points for winner and .5 for each group members

At the end of the year, I will round grades up.

Concepts/terms

Must:

- Be related to the day's topic
- Not be generic:
 - Is
 - Of
 - Server
 - Hardware
 - Etc.

If I say it's too generic, you must replace it with an alternate.

I'm the final judge.

be the most important terms from the readings. I could then evaluate these terms and return a list of viable terms consolidated from the entire class's entries. The students could then place some of these terms on a Bingo board and play a version of Buzzword Bingo in class. If they won, I could give them some form of participation points or extra credit. This could offer them bounded structure for the reading requirements, an opportunity to practice with the terms by recognizing them during class, and reward (in grade points—the currency of the classroom) at the same time. The game felt a bit childish and simple, but easily learned and accessible to all. I was nervous the students might feel condescended to and reject the effort. Still, I hoped that a thoughtful implementation could carry some of the fun and a sense of the subversiveness that drew me in, even though it was being pushed by the authority figure being mocked in the corporate analog?

ITERATING

I planned to consider the Bingo idea for the rest of the semester and try something in the next. I was nervous about changing the running course. What if this introduced new problems? However, a week later, I was convinced the risk was low, and I couldn't justify waiting, given how much I felt the students were missing out on through not reading.

Alpha

My quick fix came two weeks after the eye-opening class when I realized that no one had done the assigned reading, but in the interim, wary of making a big change with no warning, I let my students know I was working on something and that it would be coming soon. Students come to develop a set of expectations regarding the classroom (Shulman, 2005) and I was about to try to change them. I put together a set of rules and presented them to the class in the form of a Bingo board template, together with a few slides with fun creative commons imagery to explain their

new activity (see Figure 2):

Two days before we were due to discuss a reading in class, students would post to the (Blackboard-based) discussion forums the related terms they felt to be most important along with definitions of those terms in their own words.

In the intervening two days, I would:

FIGURE 2. The initial set of slides used to introduce the intervention. Image in top slide courtesy of Conrad Poirer (Public domain), via Wikimedia Commons.

and which maintains its role as a central source of inspiration and guidance throughout the design process. I wanted a fun way to get my students to provide me with evidence that they had engaged with the reading assignment, and a form of Buzzword Bingo seemed to offer that.

I could give my students the measurable task of evaluating and submitting a specified number of what they believe to

- Remove duplicates (searching for misspellings, plurals, incorrect names, etc.)
- Remove any terms that were invalid:
 - Incorrect
 - Too obvious (e.g. 'information' in the 7th week of a class on information management)
 - Not relevant (e.g. 'deciduous trees' in a class on information management)
 - Too generic (e.g. 'the')
- Post a distilled list of concepts for their Bingo! boards.

In reviewing the submitted terms, I took an approach of actively trying to give them as much positive and constructive feedback as possible rather than searching for opportunities to tell them they were wrong. Therefore, invalid terms were few and far between.

Upon receipt of the distilled list, they were to select the 24 concepts they felt were most relevant write them in as they wished on a Bingo! board and bring their board to class. In class, they were to listen for discussion of the concepts on their board and to mark off the concept if it should come up. Upon achieving 5 in a row, they were to *immediately* stand up and call out 'Bingo!' at which point they would explain the terms they crossed off and how they were relevant in class. If they got a Bingo! in class, I gave them extra credit.

I decided that Bingo! would run as long as the class had come up with at least 24 unique concepts across all the submissions. If only 24 terms were available, Bingo! boards would still vary based upon the placement of individual terms.

In addition, because of my desire to promote effective collaboration, I added a collaborative option. If a group chose to work together, they got a discount on the number of terms they had to turn in. For example, if a student working alone was expected to submit 10 key terms, a team of four would be expected to submit a combined total of 40. However, if they opted to work together, they need only submit 25 words—if they split that equally, this meant less than seven words apiece! Furthermore, all team members could choose to play and, if anyone won, they could call on their team members to help them explain the terms and, in return, the extra points would be increased and shared. I expected that coordinating discussions and quality checking activities would offer students further opportunities to practice with the ideas.

Initial launch

The semester was already half-finished when I rolled out the game, and I was nervous that it would flop. Submitting their terms was mandatory, but the game play was optional, and if no one played, then I was just tacking on an extra assignment. I was afraid this would feel like a punishment for not

having read the book, which seemed unfair since I felt that I shared in the blame.

I actively promoted the game for the next few classes, and I don't know how many students actually played during that period, but within three weeks, I had my first winner. As the semester progressed, I found myself with opportunities to gently correct a misunderstanding made evident by a student's explanation, but I was pretty lenient with Bingo! wins. If a student claimed a concept that wasn't actually discussed, but gave a good explanation (or gave me an opportunity to explain the difference between similar ideas), I would give it to them. It also seemed that some students were tentatively trying to steer the conversation towards words on their boards. They were asking more questions than they had previously, but one or two questions seemed to reveal some odd misunderstandings. I tried to hide my surprise while gently clarifying. I would later understand this feeling differently when using the next (*Beta*) version of the system.

Room for Improvement

The initial run, which lasted the remaining six weeks of the semester with five opportunities to play, was enough of a success that I wanted to continue the experiment. There were only a few wins, but I knew they were at least trying to complete the assigned readings in the form of lists of student-identified key terms with definitions. However, the process of collecting the words was rather cumbersome and error-prone. Accessing the discussion boards was slow, and they were never meant for this purpose. This meant that it was frustrating for the students to enter their data in, and everyone entered it in different ways. This was complicated by the fact that students almost always submitted as teams but often forgot to include the name of the team. I set up distinct discussion forums for each reading, but in a number of cases, students accidentally posted to the wrong forum, and this often went unnoticed until they lost points for having missed the assignment. I spent too much time copying and pasting, and searching for duplicates was incredibly tedious. I found that I didn't even pay much attention to the definitions they provided.

Beta

The next semester, had students in two classes enter their terms into Google Forms designed for this purpose. Students entering data were asked whether they were doing it for themselves alone or for a team, and the form branched appropriately to request the correct number of terms. One of the classes was an iteration of a course from the previous semester, while one was brand new, with entirely different content and a different textbook. Fortunately, because the gamification treatment is content-agnostic and they would be reading about concepts expected to be new to them, I noticed no meaningful difference beyond considering

whether it applied and how many terms to require per reading (I kept this the same).

Successes

This time around, there were more wins. It was often the same students playing, and now there was no doubt that they were actively directing the conversation towards the information they wanted to hear. In a few cases, the terms they recognized and marked off were, arguably, not accurate. The stickler in me sometimes began to feel taken advantage of as I was giving out points that might be undeserved. However, their 'taking advantage' resulted in our discussing topics I would not have touched upon otherwise and doing so in response to their efforts at engagement.

I also noticed that there was a decided lack of blank stares when I asked questions. I could speak with confidence that my words were understood by my audience because they were properly prepared. This may have been enhanced by the fact that they'd completed the reading and had the information floating around in their heads for at least two days prior to the discussion in class. The fact that they seemed so much better prepared also emboldened me to introduce more activities to the classroom, as I was no longer nervous, my students would be unable to engage. I had to remind myself that I had got them beyond just paying attention in class, to the point of being actively engaged.

My shock regarding some odd misunderstandings on my students' part during the *Alpha* evolved during the *Beta* into the impression that my students were maneuvering for more points. For example, when I was discussing how UPS uses GPS data from their trucks to optimize their delivery routes in unintuitive ways, a student might ask if the truck operator was an example of a *Business Driver*? I would then explain the true meaning of the term, and we'd move on. Later *Business Driver* would show up on that student's winning Bingo! board. These experiences always left me feeling conflicted. It was uncomfortable to feel manipulated by my students, but when I stepped back and reflected, I had to admit that my being manipulated was leading to greater success for me as an educator. Perhaps this is the form the subversive feeling I had hoped to achieve needed to take in the classroom? After all, the more they gamed the system, didn't they wind up winning more than just points? They were engaging and more likely to take away useful knowledge.

An unexpected benefit of the new activity was my increased insight into my students' growing understanding. The data I was collecting went beyond simply evidence that my students were now putting forth some effort regarding the reading task. I also got to see what they found important in each reading, and I found myself adapting my classes to take advantage of this information.

My students seemed to be responding well to the structure offered by Bingo! game play. Not only did they seem to be reading the book, but now they were more actively contributing in class and making connections. It had also added a bit of a playful atmosphere as they tried to game the system: when I caught them doing it, I would try to respond to their question without explicitly saying the word they were looking for, and that often got an amused reaction from the class as everyone caught on.

Continuing Room for Improvement

I did receive a few negative comments about Bingo! in mid-term course evaluations. Specifically, a comment akin to "[n]o more Bingo" appeared in response to two separate questions. I believe this was attributable to a single student (though I do not know who), but the complaint was not descriptive, and I can only guess as to what the student or student(s) did not like. Perhaps they were annoyed by the additional (keyword submission) task? Maybe they did not appreciate the disruptions of wins or the attempted tangents students promoted in order to mark off words in their own boards? It's possible they may have resented playing such a simple and somewhat childish game as undergraduates in college. This would be surprising since the actual Bingo! game play was optional, and wins did not happen in every class. Maybe they were lamenting the fact they could no longer safely skip the readings altogether? It is possible there were cultural factors at play since the classroom represented at least five different nationalities, and many had spent years studying abroad. I do not have deep knowledge or sensitivity to the concerns of all of them. Fortunately, there were few such responses, and others were playing enthusiastically.

Also, the Google Forms output was still cumbersome to work with, and I found that I rarely reviewed the definitions they were providing; they certainly didn't get direct feedback on this task. It was difficult to track who had submitted what or the quality of their work or depth of their understanding. Also, I was still getting students submitting to the wrong form or, in some cases, multiple people from one team submitted the same batch of words twice. Finally, I was encountering some uncomfortable edge cases that my simple rules did not handle. For example, I had a team with only three students asking why they needed to enter 25 words just like a team of four—shouldn't their load be reduced to 19? I wasn't sure what I would do if I ever wound up with a team of five. Making such a change would quickly present a big challenge for me to keep track of who was doing their assignments properly.

STEP	FEATURE	SCENARIOS	CREATED	REVISIONS	LAST REVISION
1	Submit candidates—individual	5	4/07/2017	1	9/26/2017
2	Submit candidates—group	9	4/07/2017	11	9/26/2017
3	Complete candidate review	9	4/11/2017	12	9/26/2017
4	Students review bingo terms	6	4/17/2017	6	9/26/2017
5	Admin bingo	3	4/03/2017	6	9/26/2017
Total		32		36	

TABLE 2. Software development effort statistics regarding the behavior-driven tests.

Version 1.0

The first two versions of the game proved too tedious to continue. The students completed the task without complaint, but I was spending hours copying and pasting text around and spending little time evaluating the quality of their work—much less providing feedback. I decided it was time to build a custom system. Fortunately, as a scholar-designer, I developed and used [CoLab.online](http://colabonline.org/), a platform to help instructors use collaborative group projects to support the development of students' collaborative skills (see Modell, 2013, for a full design case). This system, already in use by my students, provided valuable infrastructure. It was an appropriate fit.

Design & development approach

Having learned from past mistakes, the CoLab platform was built (largely) using a behavior-driven development (BDD) approach using the Cucumber tool (<http://www.cucumber.io>). Under BDD, all development begins with the documentation of the features the system must-have in the form of testable interaction scenarios similar to use cases (see Table 1). Only once tests exist for all functionality did I begin to author code to enable the system to support these features. The scenarios are executable and serve as tests that the system actually works. Inevitably tests fail, indicating a bug of some sort, and I iterate until all scenarios pass the tests. In addition to offering protection against regression bugs (re-introduction of previously resolved problems), this approach causes me to thoroughly consider every detail of how my students would interact with the system—and the ways these interactions could go wrong—before committing to a particular interface or workflow.

The revisions in Table 2 indicate the number of times I made changes to the files containing the testing scenarios for each of the features comprising Bingo! To place the 36 revisions into context, they constitute less than 5% of the 728 total revisions I went through to complete the Bingo! functionality (making those tests pass). This shows that spending time to think through the details of the design upfront lent the design stability through development.

It is easy to forget that instructors, too, are users and that our experience is important as well. Looking at row five, these values also show that I got lazy when it comes to the administrative web interface used for creating, configuring, and reviewing these new Bingo! activities. The *Admin bingo* feature only accounts for 3 of the 36 scenarios used to test the Bingo! functionality.

Crafting the user experience

Many of the development decisions that served as strengths of the project were made before Bingo!'s inception. CoLab itself was written using Ruby on Rails (<http://guides.ruby-onrails.org/v4.2/>) because it offers a developer-focused approach to web-application development, meaning that its design decisions are guided by what would be most intuitive for a skilled developer. In addition to including support for common web application needs such as database access, email, and internationalization, it also boasts a thriving ecosystem of free and open-source add-ons (called gems), which allow developers to quickly add specialized functionality (e.g., authentication or text processing) to their systems.

CoLab is cloud-based, being deployed using the Heroku platform (<http://www.Heroku.com>), which allows students to access the system from anywhere with web access and for me to easily check on my system without having to think at all about the hardware it's running on. I can even add more resources quickly if I find the system is getting slow. It also offers a simple, automated process for publishing my application that often consists of executing only a single command, which means I'm not reluctant to apply even small fixes to the system—I can be more nimble and responsive to student feedback.

Finally, the JQuery Mobile front-end framework (<https://jquerymobile.com/>) renders a touch-friendly interface that consistent across platforms. It may not be gorgeous or flashy, but it is simple, mature, and stable. This was a welcome trade-off for me as I could trust the framework's active community of developers to find and fix problems that might affect my users.

FIGURE 3. Subset of the CoLab data model which directly supports Bingo!

The screenshot shows the 'CoLAB: EDIT A BINGO! GAME' administrative interface. It includes fields for 'Topic' (Data Modelling - revisited), 'Description' (a paragraph about Data Analysis), 'Terms per individual' (10), 'Days for instructor prep' (3), 'Group submissions allowed?' (checked), 'Percent fewer terms if working in a group' (35), 'Source of project groups' (Answering questions with data), 'Start date' (08/27/2017 12:00 AM), and 'End date' (09/28/2017 11:59:59 PM). A note at the bottom states: 'Note: This game occurs in the Seoul time zone and all dates reflect this.'

FIGURE 4. The administrative screen used by the instructor to configure the game.

The screenshot shows the 'CoLAB: CANDIDATE TERMS FOR REVIEW' interface. It displays 'Topic: Types of Information Systems', 'Description: I&L 9, 10, 11, 12', 'Status: 48%', and 'Close Date: Tue, Sep 26 at 11:59pm KST'. A table of terms is shown with columns for '#', 'Term', and 'Definition'. The first term is 'Supply Chain' with a definition: 'a network of a process which includes an acquisition of raw materials needed for the production, transformation of materials into middle stage of the production and distribution of the final product to the customers'. The second term is 'Bullwhip Effect' with a definition: 'A previous problem that occurs again in the supply chain'. A dropdown menu for 'Acceptable' is open, showing options like 'Definition: Incorrect', 'Definition: Insufficient', etc. A 'Show/Hide columns...' button is also visible.

FIGURE 5. The candidate entry screen used by students.

These decisions, previously made, allowed me to focus my efforts primarily on the interaction logic.

Initiating a game

While many of the administrative features were straightforward (e.g., start date, end date, topic, etc.) building a system pushed me to consider further the collaboration features and instructor preparation time. Bingo! games would be attached to *courses* that already existed with the system (see figure 3). This allowed me to tap into the existing course *roster* of students and student *group* memberships within the context of course *projects*.

Given the challenges I encountered when faced with fairly incentivizing collaboration with teams of more or less than four students (see the Continuing Room for Improvement section), I required an adaptive mechanism for incentivizing collaboration. After thinking through my goals, I settled on offering teams a *group discount* (see Figure 4). Instructors choosing to allow group play are asked to specify a percentage by which the total number of required words will be reduced if they choose to collaborate. For example, if each individual is required to submit 10 words, but there's a group discount of 25% in place, a team of four that chooses to collaborate will be asked to submit 30 words instead of 40 (10 from each of the four individuals).

Additionally, while I felt that two days between submission and class time was rather tight, I was nervous that taking too much time to process their terms would give them time to forget what they'd read. I just didn't know how long to take for this task, so I ultimately decided not to decide. Instead, I let the instructor tell the system how many days they'd need for *instructor preparation*.

Students submit lists of candidates

The most common activity in the system would be students submitting their lists of candidate terms with definitions. Therefore, I wanted this to be as simple as possible. At the top of the display, they see a reminder of the topic and a description of the resources (I usually place citations here) from which the terms should be drawn (see Figure 5). If group play is enabled, they will also see a link to request collaboration from their team. If they do, the rest

CoLab : Complete the te... x

localhost:3000/candidate_lists/d...

Apps Bookmarks Research infos o6 Banking SUNY Other bookmarks

CoLAB : COMPLETE THE TERM LI...

It is literally true that you can succeed best and quickest by helping others to succeed. (Napolean Hill)

Topic: What is collaboration?
Johnson, R. T., & Johnson, D. W. (1994). An overview of cooperative learning. In J. Thousand, A. Villa, & A. Nevin (Eds.), *Creativity and collaborative learning* (pp. 1–21). Baltimore: Brookes Press.

Description:

For: Modell, Micah [Invite your teammates in SuperStars to help?](#)

Game date: Wed, Oct 11 at 11:59pm KST

Please read up on the topic above, being sure to go through the assigned readings, as well as to find your own materials. Make a list of what you believe to be the most important and/or salient terms and enter them, along with definitions, below. Be sure to provide the definitions in your own words.

Terms

#	Possible Duplicate	Term	Definition
1	*	The Group Dynamics	How members of a group work together
2		Cooperation	Two or more entitites applying their skills towards achieving a common goal
3	*	Group Dynamics	The nature of how group members interact with one another
4		Group	
5		Group Process	The methods and techniques a group follows
6		Team	A bunch of people working together
7			
8			

Home Profile Diversity Support About

Admin... Logout

FIGURE 6. The screen instructors use to evaluate submitted terms and definitions

of their team members will be asked to agree, and if they do, all work done on the assignment today by all individuals in the group will be merged into a single list that they can continue to work on. The new list will be shortened to account for the group discount, but no one's work will be lost—if a group of four had already entered 40 terms, the list would be 40 long. If anyone declines, the request will be reset but can be initiated again. This means that collaboration is optional,

and I'm protecting student privacy by not telling the team who requested, accepted, or declined collaboration—if they want to know, they must talk to one another.

This collaboration structure allows individuals to contribute terms at their own convenience, as they all have access to the same list. Students can keep making changes until the entry period is finished, so they don't have to coordinate an explicit decision to finalize their lists—they just save their work as they go. While this simplifies coordination of group efforts as compared with previous, fully manual iterations, it also effectively hid some challenges, increasing the risk of problems, and this would soon become apparent and will be discussed shortly.

Instructor review and feedback.

Once the entry period ends, an email goes to the instructor(s) on the course summarizing how their students performed (i.e., how many of the required words they entered) and letting them know their work is ready to be reviewed. When the instructor opens the task, they see a listing of all the words, the provided definitions, feedback options, and a field to specify the *concept*. Recently, I have added the option to see who submitted the words which I use when I notice a repeated problem that I might be able to address, such as when one student repeatedly provided (and cited) the book definitions—going against my goal of student synthesis. However, I avoid looking at the authors so as to avoid developing or showing bias.

The concept specification field is important because it allows me to standardize spellings and formatting. The system removes extra spaces and capitalizes all words, but my human input is needed to make sure 'Business System,' 'Business Systems,' 'The Business System,' and 'The System used by the Business' all present a single concept. This is particularly important because after I have reviewed their work, students are presented with a listing of

the unique concepts to copy onto their Bingo! boards for play in class.

The most important addition I made, though, was the mechanism for providing students feedback on their efforts. The inability to offer students direct feedback on their submissions in a timely fashion was causing me a great deal of stress. Now I could easily review each term and indicate

FIGURE 7. Students use this screen to see their instructor's feedback on their task performance.

whether it was *Acceptable* or not. If not, I could now let a student know the term they listed was *too obvious* or *irrelevant* to the topic at hand. Alternatively, maybe the term was OK, but the definition was *insufficient* as it missed a crucial detail, or perhaps it was written in such a way that it was *not*

experience, as evidenced by the fact that most students are completing the task on a regular basis.

² I have since assigned point values to the different feedback options designed to reward effort. For example, an irrelevant term yields 0.1 points to recognize minimal effort while a relevant term with a plagiarized definition earns half credit and a satisfactory explanation of an key term will receive full credit.

understood by me. Finally, I am able to sort terms and see all the definitions next to one another, making it very easy to detect similarities and mark those entries as plagiarized².

Students get a list of concepts for Bingo!

Because I wanted to provide students as much time as possible to review the concepts available for the week, when I mark the review as completed, the system emails all affected students to let them know the list is available. From that time through the day of class, students have a new task available, and accessing it reveals all of the available concepts from the entire class for that week. This list is very simple and provides only the topic, the date of game play, and the list of concepts. They can then select a set of those words and enter them on Bingo! boards to play in class.

Evaluation.

It was valuable for me to experiment using the tools at hand in my university's LMS before sinking time into development as I learned that the students were receptive to the game and it gave me some insight into how much work it would be to add this to my class (reviewing and collating terms, etc.) before committing to it fully. Iteration improved upon the initial implementation, as has my own experience with the method. As is always the case when implementing something new, there are both unexpected challenges and benefits. The interface has now been in use for about six months. So far, I have received some bug reports and some requests for enhancement—all of which I have tried to address as quickly as possible. An early bug emerged when a student entered an unexpectedly long definition that didn't fit in the database. In another instance, students requested an indicator of possible duplicate entries to make it easier for team members to collaborate without overlapping one another. This took the form of a star next to items in the entry form that looked like duplicates. However, on the whole, students seem satisfied with the

Challenges.

For instance, the initial run didn't provide students any form of access to the feedback I now required myself to provide. I created a statistics page that is accessible from a student's *Activity History* in the Profile. It is currently fairly simple, providing them with details of how I rated their efforts. I expect this will evolve over time, but for now, it is sufficient. I don't use these numbers as direct inputs into student grades, but rather as an indicator of participation and progress.

Development never seems to be complete as I keep coming up with ways of improving the experience.

Additionally, as alluded to earlier, since the system now automatically aggregates collaborative contributions, no student is required to manually review the group's submissions, and this increases the risk of duplicate candidates. As a result, in addition to the ability to sort, the system now compares all the terms that have been saved and marks likely duplicates in the student interface so they will notice and fix them. This analysis is not comprehensive or complex, but it will catch glaring mistakes.

While deployment is simple, changes take time to implement and test. I have also noticed that, although no one has complained, the platform is becoming rather slow. I have more people using it now and more data to search through. I hope I can optimize it before my students get annoyed. Even seemingly simple ideas can lead to complex implementations that require maintenance.

I have also faced some challenges around classroom norms: many students seem reluctant to announce their Bingo! win—much less to interrupt me to do so. I want them to engage and interact, and their wins serve almost as a teach-back for the class. After reminding them and pushing them to do so numerous times, I finally instituted a new rule: the game expires when class ends—if you haven't claimed your credit by the time class wraps, there will be none. I'm still rolling out this change, but the students in my classrooms (in Incheon, South Korea) tend to be respectful of their teachers, and they seem averse to speaking up in class, much less to interrupting. Using my past experience teaching in undergraduates in the United States, this may vary from one culture to another. I suspect I have still more work to do on this, but perhaps an interactive version that is played on a student's own computing device but which communicates with my server might actively inform me of a win.

I had expected students to be strategic about which words they chose and where they placed them on the board. There is a free spot in the center of the board and some locations on the Bingo! board can benefit from it while others cannot. I figured that over time they'd develop a feel for what would be important and what less so and that this would be

reflected on the boards. This may be happening, but I see no evidence of it.

Benefits.

The Buzzword Bingo activity brought with it a number of unexpected side effects. I particularly like to see my students steering the conversation towards the concepts they placed on their boards. It is sometimes difficult not to resent the feeling of being manipulated, though. I often have to remind myself that this is a form of them engaging and that they are doing what I had hoped they would. Similarly, I have been careful to make it clear they should be listening for concepts rather than expecting me to say the exact words written on their boards—the language I use is often different. This means they show genuine misunderstandings, which have led to a number of explanations that are a bit of a stretch or that need correction or clarification. However, this, too, shows that they are applying their minds to the ideas and refining their own understandings of them.

Another unexpected consequence regards my own confidence in the classroom. There had been a number of instances when I had scrapped activities on the fly because it seemed evident that my students weren't prepared to complete them. I felt the need to re-explain concepts they should have got from the readings and, as a result, the class was more stressful for me and quite boring as well. I avoided the fun stuff because I was afraid it would fall flat. Now I find that fear has dissipated. Perhaps this is also attributable to my own development, but I see real value in having evidence that students possess the base knowledge required.

SUMMARY AND CONCLUSIONS

This design case details the efforts of an instructor to help his students to find value in completing a course's assigned readings. Initially, I had a difficult time framing the problem productively and avoiding a *they need to do it because I said so* approach. It was difficult not to continue to dig in my heels and assign full responsibility to them, but when I accepted that none of my objectives were to have them simply obey, I found an approach that adds value to my classrooms.

The solution I have designed offers students clarity on how much reading is enough reading. The fact that students are playing the game in class indicates that some of them appreciate the rewards and are motivated by them. They are practicing with the concepts both at home and in the classroom, and even drawing some rather creative connections in an effort to win points. I also have evidence that my students are doing the task assigned to them, and that sets my mind at ease—though I didn't realize I had been craving this.

My biggest surprise was my lack of attention to the instructor experience. I am generally happy with the outcomes, but it seems all too easy to consider the students as the only

users and neglect the instructors, even though the instructors are important gatekeepers to intervention success. If a system is too difficult for instructors to use, students will never even see it; this became very clear to me as an instructor.

Finally, a part of me wonders: might another idea have met my needs even better? At the very least, having an alternative would have allowed me to compare and more objectively evaluate this solution. However, this method was implemented on the fly to meet the needs I perceived in my own classroom and, as such, it only had to satisfy my own needs and be accepted by my students. Is it reasonable to expect the benefits of a more formal design process under such circumstances?

Next steps

My work on Bingo! is far from over. There are a number of avenues for further exploration and extension of this method.

Bingo! board generation³

There is value in having students manually enter concepts onto their Bingo! boards as it serves to encourage them to consider their word choices. However, I doubt students will accept that for long. CoLab has all the data, and the task of writing down the concepts is a bit tedious. I'm exploring Bingo! board generation interfaces that will enable students to configure the boards the way they want them—I'm still hoping to see them exercise strategy in doing so.

Mobile game play.

Similarly, if students were able to play online, new avenues of possibility would open up. First, I have thought I might be able to use this system to co-opt mobile devices during class. If they are playing Bingo! on their device, it will be tricky for them to use it for other things. With significant effort, clickers (single-purpose mobile devices) were positively received by students (Crouch & Mazur, 2001) in the past, and it seems reasonable this success might easily be replicated with Bingo! Second, as alluded to above, the system might serve to pre-validate a Bingo! win and then inform me when it happens and give me the list of marked words for more of an interactive experience. Finally, if the system records student actions, I gain insight into what my students think they heard me say—and how well they are actually paying attention. This is an area of active development, focused on the human-computer interaction design perspective.

Analytics⁴

I am collecting a great deal of information about how my students make sense of these materials. I am currently making use of some of this to provide feedback on student performance, and even to guide the topics I focus on in class, but the potential is much greater. I could look at the most common concepts in a class or in a given assignment. Further, I could take a look at the ones students have the most difficulty in defining properly and use this to make sure to focus on explaining some of these more thoroughly. I could take a look at how well performance correlates with their understanding of the concepts. Do my classes select and/or define words more accurately as the semester progresses? Alternatively, I could focus on individuals that might need additional help in synthesizing the materials they read as evidenced by high incidences of incorrect, insufficient or outright plagiarized definitions.

Instructor tools⁵

As the majority of my effort went into crafting the student experience, the instructor experience remains minimal. Instructors could benefit from a tutorial to understand how Bingo! might be used in class as well as interactive demonstrations to allow them to show the functionality to their students. On the less visible side, autocomplete for assigning concepts would save instructor time, while some form of AI pattern-matching to allow the system to guess at likely concepts could make evaluation even easier. Additionally, a friendlier interface for Bingo! activity configuration could make it easier for colleagues to try it out with their own students while the ability to make a copy of a course from one timeframe to another would make it easier for instructors to repeat sections of a course from one semester to the next without having to go through the tedium of entering each reading assignment from scratch each time.

Investigate learning effects

It seems to me that my students are more engaged, and that ought to lead to more effective learning. I also feel like I'm better prepared to walk into the classroom since I have greater insight into my students' understanding. However, I don't know if this has any measurable effect on learning. It would be interesting to study whether students using this method exhibit any increase in retention or ability to apply the content over time. Additionally, is there actual learning value in the Bingo! gameplay or are any effects the same even if students only complete the keyword listing task? This

³ At the time of this revision, I have built Bingo! board generation, downloadable as printable PDFs as well as student preparatory Bingo! worksheets built from acceptable submitted definitions.

⁴ I have since built performance reports that show calculated scores and a graph plotting performance on all Bingo! assignments and a trend line depicting progress over time.

⁵ Interactive demonstrations of Bingo! functionality have been built and are available now for instructors to walk through in class and for students to explore on their own.

could be tested using a simple quasi-experimental set up with a pre- and post-course test.

More words for deeper content

I have already used this in a number of relatively practical undergraduate courses, and it seems to offer value. However, I wonder if this sort of method is useful in a headier graduate course? This game focuses on language and vocabulary as representations of concepts, but can this go deep enough to offer value at the graduate level? Would increasing the required word count cause students to engage more deeply with the texts? Does recognizing the language necessarily represent a sufficient start at the understanding of complex and challenging ideas?

More users

Finally, this method has only yet been used by me with my own students and that limits the avenues for feedback and improvements. I would like to hear from others using the method (I would certainly recommend using [CoLab](#) to do so). What problems do they run into, and are there opportunities to address them? If this somehow achieved widespread acceptance, would it retain its value?

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NOTE

Subsequent to writing this design case, the author has established an LLC to subject the ongoing development of CoLab.online to market forces and shape the product in accordance with user community needs.

REFERENCES

- Crouch, C. H., & Mazur, E. (2001). Peer Instruction: Ten years of experience and results. *American Journal of Physics*, 69(9), 970. <http://doi.org/10.1119/1.1374249>
- Darke, J. (1979). The primary generator and the design process. *Design Studies*, 1(1), 36–44. [https://doi.org/10.1016/0142-694X\(79\)90027-9](https://doi.org/10.1016/0142-694X(79)90027-9)
- Hamari, J., Koivisto, J., & Sarsa, H. (2014, January). Does gamification work?—a literature review of empirical studies on gamification. In *2014 47th Hawaii international conference on system sciences* (pp. 3025–3034). Ieee. <https://doi.org/10.1109/HICSS.2014.377>
- Kamasheva, A. V., Valeev, E. R., Yagudin, R. K., & Maksimova, K. R. (2015). Usage of Gamification Theory for Increase Motivation of Employees. *Mediterranean Journal of Social Sciences*, 6(1), 77–80. <http://doi.org/10.5901/mjss.2015.v6n1s3p77>
- Modell, M. G. (2013). Iterating over a method and tool to facilitate equitable assessment of group work. *International Journal of Designs for Learning*, 4(1), 39–53. <https://doi.org/10.14434/ijdl.v4i1.3283>
- Nicholson, S. (2012). A User-Centered Theoretical Framework for Meaningful Gamification. *Games+ Learning+ Society*, 1–7. http://doi.org/10.1007/978-3-319-10208-5_1
- Shulman, L. S. (2005). Pedagogies of uncertainty. *Liberal Education*, 18–25.
- Smith-Robbins, S. (2011). "This Game Sucks": How to Improve the Gamification of Education. <https://er.educause.edu/articles/2011/2/this-game-sucks-how-to-improve-the-gamification-of-education>