MOTIVATING STUDENTS TO LEARN: TRANSFORMING COURSES USING A GAMEFUL APPROACH

Ronit Ajlen, Benjamin Plummer, Evan Straub, and Erping Zhu

A brief history of gameful learning at U-M

The development of gameful pedagogy at Michigan dates back to 2008, emerging from Arthur F. Thurnau Professor Barry Fishman's (Information and Education) course on video games and learning. Arthur F. Thurnau Professor Mika-LaVaque Manty (LSA Political Science and Philosophy) was a key contributor to early thinking about gameful pedagogy. Caitlin Hayward, then a Master's student in the School of Information, conceived the idea for a technological tool that could make it easier to implement gameful learning, which grew to become GradeCraft. The Center for Academic Innovation, particularly Caitlin Hayward and Rachel Niemer, provided support for implementation and helped establish an initial learning community of instructors using gameful pedagogy, which CRLT then helped to expand to the broader U-M community. Gameful pedagogy and GradeCraft have received generous support from across U-M, including the Learning Analytics Task Force, the Center for Academic Innovation, CRLT's Faculty Development Fund, the Gilbert Whitaker Fund, and the Provost's Third Century Initiative.

What is gameful pedagogy?

Gameful pedagogy is "an approach that takes inspiration from well-designed games to create learning environments that support student motivation" (Holman, 2018, p. 1). According to Self-Determination Theory (Ryan & Deci, 2000), students are intrinsically motivated when their basic psychological needs for autonomy (the need to make meaningful choices), competence (the need to master optimally difficult challenges), and sense of belonging (the need to have positive interactions with others) are met (see Figure 1).
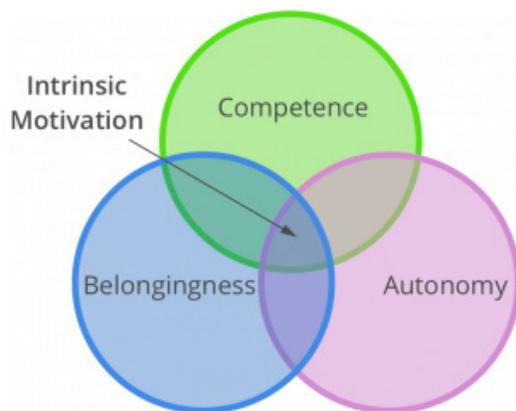
Figure 1. Three Key Components of Intrinsic Motivation
Image provided by the Center for Academic Innovation.

Ronit Ajlen is an Assistant Director at the University of Michigan's Center for Research on Learning and Teaching (CRLT). She earned her PhD in Psychology from U-M. Benjamin Plummer is a Learning Experience Designer for the University of Michigan Ross School of Business. He earned his PhD in Psychology and Education from U-M. Evan Straub is an Online Faculty Development Program Manager with the University of Michigan's Center for Academic Innovation. She earned her PhD from Ohio State University in Educational Psychology. Erping Zhu is an Associate Director at CRLT. She earned her PhD in Instructional Systems Technology from Indiana University-Bloomington.

Gameful pedagogy helps to meet these needs by giving students increased control over their own learning and enabling them to develop mastery. The use of this approach, particularly support of autonomy or assignment choice, has been linked to increased student engagement (Barata, Gama, Jorge, & Gonclaves, 2013; Boskic & Hu, 2015; Jang, Kim, & Reeve, 2016), greater motivation (Hew, Huang, Chu, & Chiu, 2016; Dikkers, Alkhawajah, & Hawks, 2015), increased feelings of control over learning (Aguilar, Holman, & Fishman, 2014), and even increased academic achievement or success (Marshik, Ashton, & Algina, 2017).

Gameful pedagogy incorporates design elements of games, such as choice and safe failure, to motivate students to engage with course content. As such, it requires instructors to fundamentally rethink their course design, especially their assignments and grading systems. Courses at the University of Michigan that take a gameful approach are defined by some amount of assignment choice, as well as an additive point system in which students build their grade up from zero. That is, their final grade is a sum of all of their assignment grades rather than an average of those grades. This framework allows students the freedom to fail because there is room to recover from setbacks by completing additional work. Students are encouraged to take learning risks and to step outside comfortable territory.

According to the Center for Academic Innovation, U-M instructors from a range of disciplines and across 48 programs have employed gameful pedagogy impacting over 10,000 learners as of summer term 2019. This *Occasional Paper* shares faculty perspectives on why they have chosen a gameful approach to their course(s), examples of how they have implemented it, and important considerations for those interested in doing the same.

Why take a gameful approach?

Based on conversations with U-M instructors, gameful pedagogy motivates student learning and engagement by promoting student autonomy, providing room for recovery that enables risk taking, building competency through authenticity, and cultivating a sense of belonging. Each of these elements is explained in detail below with explanations and examples from U-M instructors.

- **Promoting student autonomy through meaningful choices**

    Choice can take many forms, including choices about content, modality of assignments, and/or how an assignment grade is weighted in a student's final point total. Choice enables personalization of learning, balancing an instructor's course learning goals with

students' goals and interests, both when they enter the course and as they develop over the term. Providing students with choices also encourages them to develop skills in metacognition–reflecting on their learning and their progress–and self-regulation–planning and directing their learning approach to achieve their long-term goals for the course. These skills have been shown to lead to student success in school, improving students' ability to transfer their learning to new contexts or tasks and building awareness of their own strengths and weaknesses as learners (Bransford, Brown, & Cocking, 2000; Silver, 2013; Zimmerman & Schunk, 2001). For example, Professor Margherita Fontana in the School of Dentistry describes how choice helps students build awareness of their own strengths and challenges with the course content: *"They have control and autonomy over where they think they need more help and which additional things they might choose to engage in or not."* Similarly, Pamela Bogart, Lecturer IV in the English Language Institute, says *"students have reported that they're pleased with the resources they gain and how they're able to customize the experience to be relevant."* As one of the key components of intrinsic motivation (Deci & Ryan, 2000; Ryan & Deci, 2000), building student choice is a relatively simple first step in integrating gameful design principles and a concept that many instructors might already implement in their courses in some form.

- **Providing room for recovery to encourage risk-taking and exploration while maintaining rigor**

    Some teaching and grading practices may undermine students' willingness to take academic risks that are crucial for learning. For example, Arthur F. Thurnau Professor and Associate Professor of Movement Science Melissa Gross mentions that in some courses *"failure is non-recoverable. If they blow an exam for any reason, it's a permanent mark on their record...it really stresses students. It makes their whole life, their future, pivot on what happened at that one moment."* However, students are more likely to seek challenges and see failures as learning opportunities when there is room for recovery built in to the course. To help foster this growth mindset (Dweck, 2006), U-M instructors explain their use of gameful pedagogy and normalize failure as part of the learning process at the start of the term. Professor Fontana explains to students that *"[Gameful pedagogy] helps develop critical-thinking skills. It gives you opportunities to practice without being penalized. You can fail. It's fine to fail. It gives a little bit of a safe environment for the students."* Similarly, Professor of

Sociology Fabian Pfeffer begins his class in the first week by telling students,

I want you to fail, meaning I want you to try something because you're curious, and if it doesn't work out, that doesn't mean that you're going to go down in flames. It means that you turn around to the next thing. You learn something from it.

When introducing choices and encouraging risk-taking and learning from failure, concerns about academic standards often surface. However, instructors teaching gamefully at U-M have found that they are able to maintain and even raise their standards for academic excellence. It is possible to hold students to a higher standard when they have the autonomy to choose how they demonstrate their learning and opportunities for recovery after failing or underperforming on an assignment. As Professor Gross noted, *"I got to grade the way I want to grade–hard, but fair. I could give them real feedback. I could raise my standards for academic excellence, because they could have another chance at it."*

- **Building competence through authenticity**

Instructional methods such as incorporating real world tasks, or authentic learning, can help students apply knowledge and skills to real-life contexts and situations. A gameful approach lends itself well to helping students develop disciplinary skills, frameworks, and thinking or mindsets. For example, Walt Borland, Lecturer III in the School of Information, explains that

as an entrepreneur, [gameful pedagogy] was the best way for me to capture the entrepreneurial experience in the classroom. The great thing about gameful pedagogy is you start at the bottom and work your way up. It's how the world works. Trying to get students to embrace something that more accurately reflects reality is in their best interest and is frequently a real challenge because they've spent the better part of 18 years in school being taught top-down.

Similarly, Professor Fontana emphasizes the importance of students' ability to perform continuous self-assessment and master skills necessary for solving clinical cases. Fontana explains,

One of the things we wanted these graduate students to do is to be able to self-assess. As a clinician, you must be able to self-determine what you need, how you need it, and when. That's a very difficult skill to learn. I'm not assessing that skill, necessarily, but I am giving them the freedom to decide when they need

extra material to achieve the goal that they must achieve. [This provides] students the opportunity to engage in authentic tasks and learn how to think like someone in their field.

The kind of competence and skills students gain from these gameful courses serve them well in the long run. As Professor Gross comments, *"More and more I'm thinking about what can we do in my class, or any class actually, to help students develop skills that matter when they leave [U-M]."*

- **Cultivating belongingness to foster success for all students**

A student's sense of belonging (e.g., connection to a discipline and scholarly or professional communities) is a primary factor in student success in college and has been positively associated with academic persistence, achievement, satisfaction, and adjustment (Hausmann, Ye, Schofield, & Woods, 2009; Strayhorn, 2012). Furthermore, this sense of belonging has been demonstrated to lower performance gaps for underrepresented groups of students (Walton & Cohen, 2011). Creating an inclusive learning environment is critical to fostering a sense of belonging in a course and/ or discipline. Gameful pedagogy promotes inclusivity through transparency (e.g., clearly communicating about norms, expectations, and evaluation criteria) and the critical engagement of difference (e.g., acknowledging students' different identities, experiences, strengths, and needs; leveraging student diversity as an asset for learning). In order for students to make meaningful choices, it is important for them to have a clear understanding of the available choices, the course expectations, and the multiple paths to success. Thus, frequent feedback is critical in providing this clarity or transparency, which helps students to understand where they stand in a course much earlier in the semester and to seek help from their instructor if they fall behind. According to instructors who have used it, the gameful model achieves this goal. For example, Arthur F. Thurnau Professor and Professor of Political Science Mika LaVaque-Manty reflects, *"I'm pretty happy with this approach in general, because I think it opens up freedom to students who might not have thought of themselves as likely successful students."*

How do I take a gameful approach?

Though advance planning is recommended as a best practice for designing any course, a gameful approach *requires* careful planning to enable the transparency necessary to promote student autonomy (i.e., to aid students in their

decision making as they select their pathway through a course). As with any course design process, we recommend beginning with your course learning objectives. You may be creating learning objectives for a brand new course or perhaps reviewing and revising learning objectives for an existing course (see Figure 2). Following the articulation of learning objectives, we recommend determining the types of assessments you want to include for students to demonstrate competency and then creating activities for students to practice learning and perfecting their knowledge and skills. As you develop your course design, it is important to consider where within this course design you want to incorporate student choice.

Figure 2. Course Design Process
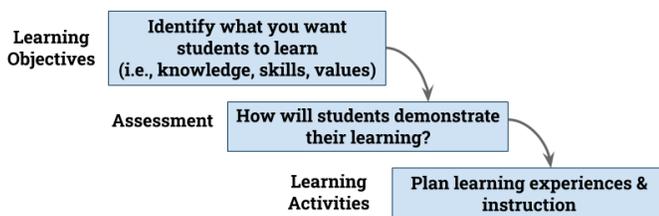
Adapted from Wiggins & McTighe (2005)

When determining how to incorporate elements of choice into a course, it is critical to strike a balance for both the students and the instructor. For students, too much choice can be overwhelming and debilitating, while too little can feel stifling or non-motivating. As Professor LaVaque-Manty observes, *"What is the optimal amount of freedom? Too much freedom and it becomes bewildering and boring, or both. Too little freedom and we're back to conventional structures."* Consider the knowledge and background of your students: when might it make sense to provide room for exploration, and when is more structure or instructor guidance needed? For instructors, the number of options available must still be manageable in terms of scheduling, grading, and providing timely feedback. Strategies for making student choice manageable include distributing options throughout the term to avoid being overburdened at the beginning or end of the term, using tools like rubrics to help increase efficiency of grading while still providing useful feedback, considering both the difficulty level and frequency of assignments, and scaffolding choice into assessments slowly (e.g., introducing a few choices in the first few weeks, and building additional spaces for autonomy as the term progresses).

Possibilities for implementing student choice

Instructors have a lot of flexibility in how they can implement student choice. Figure 3 offers a model to help instructors develop an approach that suits their course

and their students' needs. Some instructors opt to have all students complete the same core requirements for the course and then provide some elements of choice within those required assessments. Others structure their courses as a "cafeteria model," in which students select assessments à la carte from a variety of assessment categories. However, most instructors structure their course as a blend of these two approaches, or a "restricted cafeteria model," wherein there are set limitations for how many assignments or points may be completed or earned within each assessment category. In this model, some categories may be required for all students to complete (core requirements), whereas others may be optional (assessment selection). If we consider the analogy of ordering a meal, students may choose their entree, two sides, and a dessert (and an appetizer if they choose to have one), but they cannot load up on dessert and skip the entree.

Figure 3. Sample Model for Implementing Student Choice
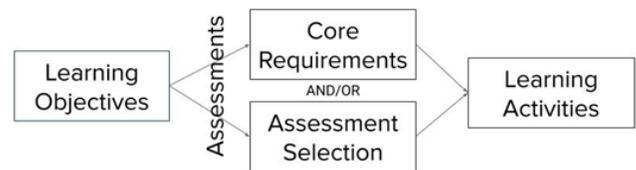
Thus, both core requirements and student-selected assessments can incorporate elements of choice. Options include the choice of

1. *Challenge level* - Students choose between different levels of challenge for assignments (e.g., exploration and understanding versus application, evaluation, or analysis), with increased challenge worth an increased number of points.
2. *Timing* - Students can choose when to complete assignments within a time window that the opportunity is available.
3. *Topic* - Students can select a topic for the assignment from a list of suggested possibilities provided by the instructor or propose a new topic or content area of interest.
4. *Modality* - Students determine the format of their assignment submission (e.g, paper, oral presentation, video, podcast).
5. *Resubmission* - Students can choose to resubmit an assignment to further develop or practice their knowledge and skills, leading to increased competence. For example, some instructors allow students to resubmit if their initial submission fell below the threshold determined for demonstrating competence, with limitations on how many resubmissions are permitted for a single assignment.

These elements of choice are not mutually exclusive, nor

is this an exhaustive list. Instructors may choose to provide students with multiple types of choices within a single course or even within a single assignment.

For example, in a U-M nutrition course, Professors Bridges, Hisamatsu, and Anderson (2018) take a "restricted cafeteria model" approach with core assignments that all students must complete (exams, clicker quizzes, and in-class assignments) and optional assignments (e.g., written report, in-class presentation) to allow students room for recovery if they do not earn all of the available points for the core assignments (see Table 1). This effectively lowers the stakes associated with the core assignments and encourages students to seek out additional learning or practice opportunities to demonstrate their increased competence in the course.

Another example is Honors 240. Following principles of gameful pedagogy, Professor LaVaque-Manty chooses to implement choice in assignments using a different version of a "restricted cafeteria model" that provides students with a set of core and selected learning activities and assignments closely connected to learning goals (e.g., surveys, reading quizzes, and practice assignments, such as short essays, interviews, and wikipedia analyses). Students must demonstrate competence and earn a defined number of learning goal badges[1] in order to pass the course, and then students can pursue their own interests, develop additional skills, and work their way up to the grade they are trying (or hoping) to achieve.

Building up from zero: Determining your point structure

The grading structure in a gameful course is typically different from that in a traditional course. In traditional courses, students tend to start with 100%, and their grade drops gradually during the semester, depending on their success on assignments. In a gameful course, on the other hand, students start with a zero and then work to earn points to achieve the learning goals of the course. By building up, all activities, regardless of the level of success, count toward achievement. This illustrates to students that all learning is progress and encourages them to take risks, to explore, and to demonstrate their competence (i.e., knowledge and skills) in multiple ways without the fear that failure leads to unrecoverable impact on their grade.

Often instructors are transitioning their existing course grading scheme to a gameful grading scheme. In a more traditional approach, the percentages of the various assessment categories sum to 100%, and all students are generally expected to complete the same assignments and exams. In contrast, a gameful course offers many more opportunities for students to earn points, usually with many more points available than what would be considered sufficient to demonstrate excellence or competence in the course. For this reason, gameful courses generally have total points available set to a higher order of magnitude (e.g., thousands, hundreds of thousands). In part, Professor LaVaque-Manty says,

> *the very large point totals are meant to help move students from thinking narrowly about any given set of points. They of course can do the math if they want to, but when we're talking about thousands of points, students' stress about missing a few hundred typically isn't as great.*

Furthermore, instructors can determine whether increased points reflect increased amount of work, increased quality of work, or both. For example, as Professor LaVaque-Manty notes,

> *Each of my assignments is graded on a rubric where the second highest point total is 'meets expectations' which, if consistently hit, earns the student an A. That allows us to grade each assignment very rigorously, signaling even to 'good' students that they could always improve.*

Thus, unlike in a traditional course in which the threshold for an A is typically set at around 90%, gameful courses tend to have much more flexibility with regard to the point value at which the threshold for an A is set.

To see an example of a gameful point structure from a real course, we can revisit the earlier U-M course taught by Professors Bridges, Hisamatsu, and Anderson. In this example, there are at least 1,555 total available points. The instructors set the threshold for an A at 1000 points, with every 50 points below that resulting in a drop in grade level. Thus, 1000 points = A, 950 points = A-, 900 points = B+, 850 points = B, etc. This means that students must earn at least 64% of the total available points in order to achieve an A in the course (see Table 1). The instructors based this percentage on prior grade distributions (the median student received 86% on these assignments in the prior year). Thus, the instructors expected the median students to reach 860 points from the required assignments. They would then need to earn an additional 140 points from optional assignments to achieve an A (Bridges et al., 2018). The instructors noted that in this gameful approach,

> *students who were getting A's were really demonstrating a lot of mastery, were doing more work and showing more competency than the students the previous year who were getting A's, just because they had a more diverse number of ways to show their expertise.*

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[1] Digital badges are typically used to recognize a particular achievement or skill development and can help incentivize behavior (Grant & Shawgo, 2013).

Returning to the example of Honors 240 taught by Professor LaVaque-Manty, see Table 2 for the overall point structure. In this course, the instructor sets the total possible points at 59,000, which is 11,500 points more than students need for an A, but the course is structured in a way that *"it is easy to advance fast, pass the course, and get a decent grade, but somewhat difficult to get an A."* Students must earn 81% of the total available points in order to receive an A in the course.

Table 1. *List of Core and Optional Assignments*

Assignments	Points	Number	Available
Core Assignments			
Exams	300	3	900
Clicker quizzes	3	19	50
In-class assignments	5	10	50
Optional assignments			
In-class presentation	50	1	50
Written report	75	1	75
Peer grading of in-class presentations	10	5	50
Discussions about in-class class presentations	1	20	20
Public contribution	25	3	75
Present a news item for discussion	10	6	60
Discuss news item	1	25	25
Review session questions	10	12	120
Participation in problem roulette	10	3	30
Social media	5-10	10	50
Design your own project	TBD	1	TBD

note. TBD = to be decided
The exact number of points for designing one's own project were to be decided by the instructor based on the project proposal.

Table 2: *Assignment Structure for Honors 240*

Assignment Type	Points Per Attempt	# of Attempts	Total Possible
Survey We'll conduct a survey at the beginning of the semester in order to get to know you better.	500	1	500
Readings There are readings (or other minimal homework) before each lecture. An online quiz, due before lecture, will encourage you to complete the readings.	300	24	7,200
Lectures Attending and participating in the lectures — where we will be doing a lot of stuff, not just listening passively — is important.	300	26	7,800
Discussions Your discussion sections are where you really learn. Attending them regularly is important.	800	25	20,000
Practice Assignments The weekly practice assignments are the backbone of the course. During weeks 2-12, you may complete one assignment per week. We expect most students to complete about five total. If you complete five, your lowest below-course-average score will be raised to the course average. The "Revision" assignment does not count in the five.	2,400	11	15,000 *Note that this is capped at well below the theoretical maximum.*
"Big Theme" Assignment The Big Theme assignment lets you develop a major project around a theme or a question you are interested in. You may do it collaboratively or you may do it on your own. We encourage you to use the practice assignments in your Big Theme Assignment.	9,000	1	9,000
Peer Review To encourage you to learn from your peers and to get practice in engaging others, you can earn points for peer reviewing one assignment for a fellow student.	1,200	1	1,200

Table 3 shows how students' final points in Honors 240 are converted to a letter grade at the end of the semester:

POINTS	LETTER GRADE
48,000	A
43,000	A-
40,000	B+
35,000	B
30,000	B-
24,000	C+
19,000	C
15,000	C-
12,000	D+
9,000	D

In addition to considering the order of magnitude of your point scale and the threshold for achieving an A in the course, other important considerations include

- Determining what the assessment categories are (i.e., what types of assessments you want to include)

- Determining which of these assessments are required core elements of the course that all students should complete in order to achieve the course learning objectives

- Deciding whether to include an A+ as a part of the grading structure. If an A+ is included, some instructors use the largest point differential between an A and A+ as a way to indicate that an A+ is truly going above and beyond in the course.

What advice do colleagues have about adopting gameful pedagogy?

Interviews with instructors teaching gamefully at U-M yielded the following suggested practices to those considering a gameful approach:

- **Ensure that you allot additional time for course planning and preparation in advance of the course.**

  We compared [the workload] to developing a new course for the first time, because with all these new assignments, we had to go back to what are we trying to achieve in this course. What are the end goals that we're trying to accomplish? Then we had to realign most of these new assignments. We also had to consider that not everybody is going to do all of these assignments, and so we also needed to consider what are the core things we really care that the students learn. What

are the optional competencies? How do we map those things together? (Olivia Anderson and Dave Bridges, Nutritional Sciences)

I think it's important to admit that it's probably more work, at least at first. Some of the specific ways in which it's more work: planning all the assignments before the semester begins so that the students can look at every single assignment in advance and plan if they want to. I think that that's important because, if you offer multiple paths and encourage initiative taking and planning, then the students have to be able to plan. (Mika LaVaque-Manty, Political Science)

- **Be prepared to provide students with regular feedback throughout the term, which likely means more frequent grading.**

  Because students were predicting, I needed to keep up with the grading in a fairly timely manner. I had a couple of checkpoints where I wanted certain assignments to be graded before the next round started up, so they could use the feedback they had gotten. (Melissa Gross, Movement Science)

  It's grading intensive. The GSIs are pretty busy. Yes, you're going to be busy, but on a more permanent basis as opposed to totally crazy midterms and then totally crazy towards the end of the semester. You're going to have this constant flow of really varied types of assignments. (Fabian Pfeffer, Sociology)

  Like most activities, if you really want to impact learning, you must give timely feedback, and if not, it doesn't make sense. I was a little bit concerned about how I was going to manage this, so I started small. (Margherita Fontana, Dentistry)

  Everything is pre-populated and created in terms of course content and interaction [before the start of the course]. That has freed up my time to provide that robust, individualized, customized feedback and connecting students to one another in our learning community. That has been a much better fit for the goals of the class. (Pamela Bogart, English Language Institute)

- **As with any innovative change to your teaching, expect to make adjustments to your course over time, as it may take multiple iterations to strike the right balance (e.g., proportion of student choice, point structure). Build in opportunities to gather student feedback to inform course improvements.**

  I always tinker a little bit because you learn this particular assignment didn't work, or this timing didn't

work, or this reading didn't work. That's no different from any other course. Once you get the gameful course planned, and then the second time you teach it, it will be much easier. You'll [just] need to fine tune. (Mika LaVaque-Manty, Political Science)

One of those feedback loops I use is course surveys. At the completion of every module, we do a survey, and the surveys are modeled somewhat after the teaching evaluations. Those periodic surveys—and I'm doing seven over the course of the term—give me some insight in terms of where the section's at, collectively. There are also open-ended questions that help me understand where certain individuals or certain students are individually. (Walt Borland, Information)

- **Orient students to your gameful course by familiarizing them with the reasoning for using a gameful approach and demonstrating how to navigate the course structure.**

   The primary challenge is orienting students (and re-orienting students) to how the course is built and how to navigate it, and to continue working on that human interaction piece so that the course is less about learning how to navigate the course and more about the learning going on in the class. Each semester is getting better and better at that, but that remains a challenging factor. (Pamela Bogart, English Language Institute)

   In the opening class I give them some exposure to the course structure and help them understand what we're going to accomplish...That first day is really intended to give them a better appreciation for what we're going to do over the coming term, for what gameful is like relative to the course approaches that they have seen historically, and some of the things that they're going to have to be comfortable with. (Walt Borland, Information)

   It requires a lot of explaining, partly because it's new to many students. They have gotten very good at playing the old game, and now I'm changing the game on them, so I need to explain the rules. I think that's very important. Not just the rules, but the reasons. This kind of pedagogy requires us to explain, "Here's what I'm trying to do and why." As we know, students, even if they read the syllabus, don't retain some of this information until they experience it. There's a lot of variance on the response. The most common pattern is that a lot of students are bewildered at first. (Mika LaVaque-Manty, Political Science)

   I do think that it takes a bit of clearly communicated motivation upfront. I wouldn't throw them into the water

saying, "Oh, by the way, go and check it out." I spend considerable time on telling them why I do it. How it's done. We revisit around midterm. (Fabian Pfeffer, Sociology)

- **Use rubrics to clearly define assignment learning objectives and expectations for students, and to save time when grading.**

   I build rubrics for all of the assignments. I spend a great deal of time with the instructional aides, who are given grading responsibilities, to understand those rubrics and be able to apply them uniformly. (Walt Borland, Information)

- **Communication with students is critical in a gameful course, so it is important to create frequent opportunities to check in with students.**

   Whether it's in person or not, I think the gameful approach where students can go in very different directions around similar goals and approaches needs an opportunity for check-in and reflection in order to enable students to determine how they're learning and what they are taking away. (Pamela Bogart, English Language Institute)

What resources are available for instructors to take a gameful approach?

The university provides numerous tools and resources to help instructors make the transition to gameful pedagogy. These tools include a learning management system designed to facilitate the implementation of gameful course design, consultations on grading system structure and course planning, as well as additional online resources.

Instructional consultants on campus are key resources for instructors who are seeking one-on-one assistance with planning a gameful course (e.g., Center for Research on Learning and Teaching, Center for Academic Innovation, college or departmental instructional support units). Consultants can help instructors think through the grading structure for a gameful course, share sample grade distributions that have been used successfully in other gameful courses, and help select the appropriate technology tool for a gameful course. CRLT also offers instructors midterm student feedback services (crlt.umich.edu/midterm-student-feedback) to gather feedback from students midway through the semester about their experience in a gameful course and to inform potential changes to improve teaching and student learning. Additionally, gamefulpedagogy.com offers a collection of helpful online resources, including sample course syllabi, stepwise instructions on getting started, and handouts and worksheets to help with course planning.

While tools can assist instructors in implementing a gameful course, they are not necessary in order to do so. Generally, the best tools will clearly show student progress, transparency with assessments across the term, and clear expectations for grade achievement. It is possible to track student assignment choices and accumulation of points using basic spreadsheet tools like Excel, or even within the U-M learning management system, Canvas. However, GradeCraft (see Figure 4) can better help students visualize potential pathways through the course and help instructors more easily track student choice and manage the additive point structure, especially for larger courses. GradeCraft can be enabled within Canvas, replacing the standard Canvas grade book and giving instructors choice about where students view and submit assignments.
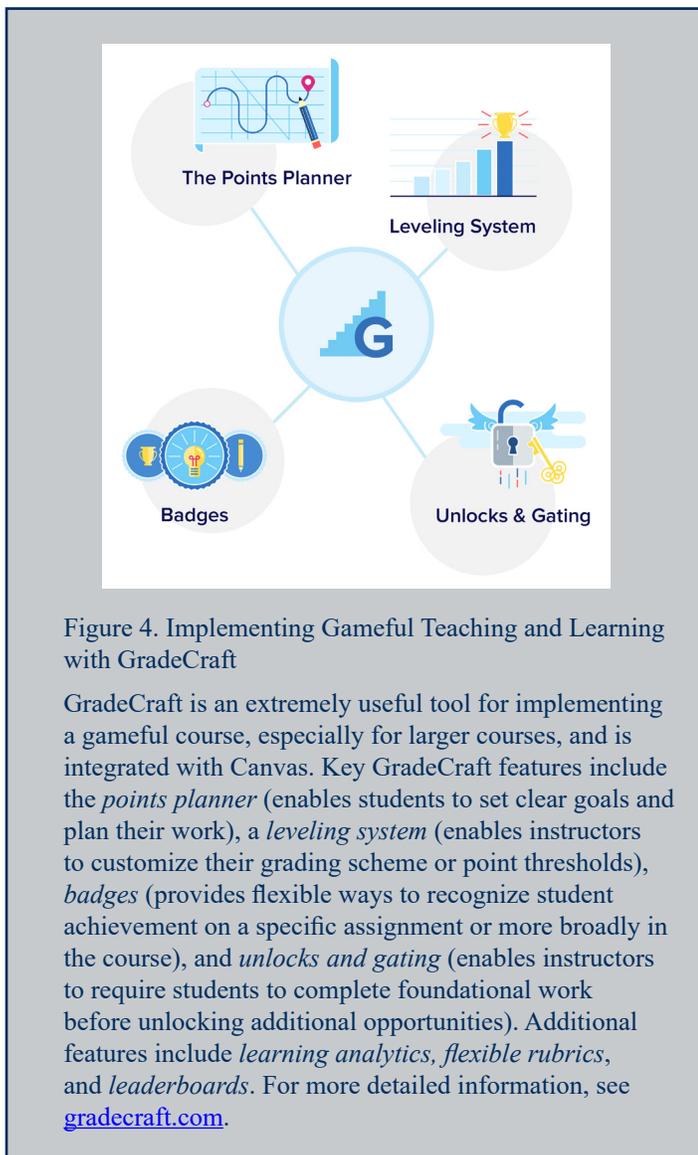
Figure 4. Implementing Gameful Teaching and Learning with GradeCraft

GradeCraft is an extremely useful tool for implementing a gameful course, especially for larger courses, and is integrated with Canvas. Key GradeCraft features include the *points planner* (enables students to set clear goals and plan their work), a *leveling system* (enables instructors to customize their grading scheme or point thresholds), *badges* (provides flexible ways to recognize student achievement on a specific assignment or more broadly in the course), and *unlocks and gating* (enables instructors to require students to complete foundational work before unlocking additional opportunities). Additional features include *learning analytics, flexible rubrics*, and *leaderboards*. For more detailed information, see gradecraft.com.

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