

Using Game Design to Increase Engagement

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Introduction

The idea of using gaming concepts and game design strategies in non-gaming environments to increase engagement and motivation, as well as recognize individuals' accomplishments, has become popular in recent years (Harman, Koochang, & Paliszkiwicz, 2014). Known as gamification, an increasing number of scholars have encouraged the use of these concepts and design strategies in education (for example, see Chandler, 2013; Dickey, 2005; Glover, 2013; Goligoski, 2012). Research has shown that, if well designed, gamification does in fact provide the desired results (Hamari, Koivisto, & Sarsa, 2014). Based on this favorable research, some elements of gamification were added to the Imagine Language & Literacy program and were favorably received by end-users. Noting the success of these elements, we propose adding additional gamification elements. In this document we outline the need for increasing engagement, review our early gamification elements, detail the new gamification elements we hope to include in the program, and include the guiding principles we are currently using in our design work.

The Need to Increase Engagement

Imagine Learning has long used basic game-design strategies to engage students. While students are appropriately engaged at some grade levels, others are not engaging with the program. We believe we need to increase the use of game-design strategies in order to help engage these students.

Observations in Schools

Members of Imagine Learning's student engagement team have visited many schools over the years and have observed students using the Imagine Language & Literacy software and talked with students about their experience. Generally speaking, the software is fun and motivating for students. However, the older the student, the more likely the student is to encounter content that isn't as engaging or fun. For the most part, students in grades K-2 s get a lot of variety and games in their instruction. Any motivational issues in that group usually stem from technology (i.e., lengthy loading times, the product freezing, etc.), not from instruction. One exception is when students encounter the same activities again and again, which could possibly be a technical glitch, but is more likely the result of a flawed design or not enough content.

Third grade and above is when student engagement typically decreases. Following are a few examples to illustrate what we have seen in these upper grades. At one school we saw a sixth-grade boy who would mentally check out during the interstitial animations in our placement test, impatiently waiting for the activity to resume. In one afterschool program, a fourth-grade girl intentionally exited the program prematurely and lied to the teacher about being done when there were activities she didn't like. We have seen students content to stare at the "Ask for Help" screen which comes up after a period of inactivity and spend the rest of the session sitting there doing nothing, because they didn't like the activity they were on. We've seen students log out, then log back in using

their neighbor's credentials so they could play the activity their neighbor was on since they didn't care for their own. We've heard countless exclamations of boredom and frustration as students encounter activities they don't like.

A lot of this, we believe, is because the material for older students isn't as easily taught, practiced, and assessed via games. They are higher-order thinking skills and require a lot more long-passage reading. This, coupled with the fact that the students don't have much context for how they're doing overall, leads us to believe there is a lot we can do to augment engagement.

Research Team's Report

The research team at Imagine Learning (Warr, Porter, & Carter, 2015) has also focused their efforts on evaluating student engagement. After observing students and informally interviewing students and teachers, they provided several suggestions. The following are relevant to our work with engagement:

- “The program needs to adapt to student age and ability. For example, young students do not respond well to timed activities such as *Spellball*. Some teachers have told us that kindergarten students struggle with the pre-assessment. Additionally, older students appreciate more mature characters and game-like elements” (p. 2).
- Students are less engaged and more easily distracted by activities that require less interaction or no interaction for long periods of time. Activities with more interaction, such as *Go for the Gold*, are much more engaging for students. This interaction can take several forms such as high rates of academic response, fast-paced activities, and activities with game-like features.
- Students are frequently distracted during activities with little interaction, such as listening to books or recordings, or when listening to longer verbal instructions.
- Teachers have specifically requested more learning-based motivators, such as badges and levels that are tied to learning outcomes which allow students to see their progress.

Product Innovation Council

We held a product innovation council which was composed of teachers, paraprofessionals, principals, and district administrators, not all of whom are Imagine Learning customers. We received a great deal of feedback about engagement from this group which generally followed what the research team and engagement teams have observed. For instance, one teacher noted that Imagine Language & Literacy tends to be engaging for grades K–3, but the upper grades are not as engaged. Another person noted that her fourth-grade students don't want to use Imagine Language & Literacy because it's not engaging for them. She has observed students repeatedly clicking without processing the question in an effort to get through an activity as quickly as possible. She has also observed students doing this with the placement test. In fact, there were several concerns about whether or not students were being properly placed in the sequence by the placement test. If students are not being properly placed, as some of these teachers believed, it could be because students are not trying their best on the placement test. This could be the result of a lack of engagement. As one teacher noted, if the students aren't engaged, they are not going to use the program. It was concerns like these that led one teacher to ask if we could gamify Imagine Language & Literacy, suggesting that students want to be able to see what they've done and where they are in the system as a whole.

Gamification as a Solution

The idea of gamifying, or using game-based design strategies, certainly has merit. The popularity of video games and computer games (hereafter jointly referred to simply

Video games are known to be extremely engaging and it's common for users to spend their free time playing them.

as video games) has greatly increased over the last few decades. Video games are well-known for their ability to be extremely engaging, and it is quite common for users to regularly spend a great deal of their free time playing them. Utilizing the design aspects that make video games so engaging in other domains has become a popular idea in recent years.

While gamification has some exciting possibilities, it should not be considered a cure-all for engagement. If the object being gamified does not already have intrinsic value to the end-user, simply adding elements of gamification will not create lasting engagement. However, integrating gamification into something that is already intrinsically interesting can “deepen [users’] engagement and desire to participate” (Paharia, 2012, p. 17).

Imagine Learning is no stranger to the use of games and game design; the company has a long history of using both tools in the program. As much as a decade ago foundational skills were taught with fun interactive games like *Free the Aliens* and *Build a Monster*, as opposed to some of the dryer alternatives of that era. The program made good use of praise, strategically aiming to praise effort and not just ability. Activities such as *Monitor Your Progress* were designed to give students visibility into their learning. Achievement certificates were also awarded to students at certain milestones. The designers made attempts to require a student to interact with the program (even if it was just a mouse click to advance to the next section) at a certain frequency to maintain the student’s interest. Beautiful artwork was a priority, even though it took longer and was more costly, because it engaged the students. Expression elements were integrated such as customizing your own car or crafting your own song.

We believe that expanding and updating these efforts, together with adding game-design strategies to the program that live outside individual environments, could be used to increase motivation and engagement as the use of game dynamics could “successfully transform the interest of a learner into motivation, problem-solving, and critical thinking” (Chandler, 2013, p. 68). These strategies can reward students in numerous ways, and provide a context for what they are doing in Imagine Language & Literacy, including where they are in the overall instructional path. We can also provide students with more choice regarding what they will do in the program.

Early Game-Design Elements

To test our hypothesis, we chose a few game-design elements to add to Imagine Language & Literacy. While there are many elements of gamification that could have been employed, four main concepts were piloted in the program: showing progress within lessons, the use of experience points (XP), awarding Booster Bits, and providing an external reward experience (e.g., the monkey habitat in the Imagine Museum) that students can play after gaining a predetermined number of experience points. Booster Bits are used within this game to purchase items. All four of these gamification elements are interconnected, although they do not always appear together (e.g., some activities award Booster Bits but do not have progress dots and vice versa).

Progress Dots

Small, white circles, referred to as progress dots, were added to the bottom of seventeen learning activities. The number of dots in each lesson corresponds to the number of questions (or in some cases, sets of questions) the student will be asked during the activity. Besides showing a student how many questions are in an activity and how many questions they still have to answer before finishing an activity, progress dots also provide immediate feedback for each question and give an indication of how well a student is doing in the activity.

When a student answers a question correctly, the progress dot turns green, and the program advances to the next question. If the question is answered incorrectly, the dot turns red. Some activities allow students multiple attempts to get the answer right after a failed first attempt. In these activities, if the student gets the correct answer on the second try the dot turns yellow; otherwise, it remains red. Progress dots, XP, and Booster Bits are closely related as can be seen in table 1.

Table 1. Meaning and Relationship of Rewards

COLOR	STUDENT ACTION	BOOSTER BIT VALUE
	The student answers a question correctly on the first try.	20
	The student answers a question correctly on the second try, provided the activity allows more than one guess.	10
	The student answers incorrectly, including not getting the answer correct on the second try.	0

Experience Points

Experience points (XP) are earned based on correct and incorrect answers as reflected by the progress dots (the same award mechanic is used for activities with no progress dots). Twenty XP are given for each green dot and ten XP for every yellow dot. Red dots receive no XP. Experience points can only increase, unlike Booster Bits which can be spent and thus decrease in number.

Experience points are used to determine when a student is eligible to return to the Imagine Museum as well as what items are available to buy. Students were allowed to enter the museum every time they earned 250 XP. Every thousand XP earned resulted in a level up (these levels should not to be confused with levels used in units of instruction), which unlocks new items students can buy. The exact number of XP a student has is not explicitly made known to the students, although a progress bar that represents XP is shown while students are visiting the museum and when they are awarded Booster Bits at the end of activities. This progress bar shows how many more XP are needed to return to the museum and also indicates what level the students are on. This progress bar will appear in the new dashboard we hope to implement, and it will be visible by students throughout each activity.



Figure 1
Activity Progress Dots

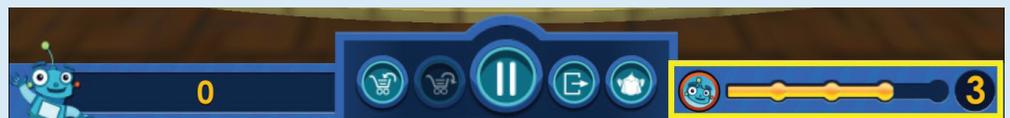


Figure 2. The Museum Dashboard

The dashboard above has the progress bar highlighted in yellow. Each circle on the bar indicates when the student has earned enough XP to go to the museum. The number on the far right of the bar indicates what level the student is on. When the bar is completely filled, students level up, thus unlocking new items they can buy for their museum exhibit.

Booster Bits

Booster Bits, which were piloted in forty activities, act as a type of currency and are awarded based on XP (e.g., the amount of XP gained per activity is equal to the number

of booster bits earned in the activity). Booster Bit coins originally came in three varieties—green, yellow, and red—with each color holding a different value, as can be seen in table 1 (our new design includes additional colors). Booster Bits were awarded at the end of an activity on a screen that showed both how many Booster Bits a student earned for the newly completed activity and how many Booster Bits the student had available to spend. For activities with progress dots, the progress dots are a reflection of the Booster Bits that will be awarded at the end of the activity.

Imagine Museum

Imagine Museum serves as an external reward experience. Every time a student earned 250 XP they were given the opportunity to go to the museum. Originally, the museum only housed the monkey habitat exhibit, but our new design has other exhibits students can choose to interact with. Regardless of the exhibit, students can use Booster Bits to buy items to customize their exhibit. They can also sell items back to the store. What items are available to purchase depends on what level they are on as each time a student levels up they unlock additional items to buy. In the monkey exhibit, they can also customize their monkey by changing the color of its fur, thus providing students with something they can do even if they have no Booster Bits. After ninety seconds, students are automatically returned to the learning activities.

Efficacy of Elements

Members of the engagement team and the research team have observed and informally surveyed students' reactions to these elements to gauge their effectiveness. We also received feedback from the product innovation council. Based on feedback from all of these groups, all of these elements appear to have performed well.

Progress Dots. Imagine Learning's research team reported that progress dots helped students "self-correct and maintain focus" while allowing teachers to "monitor students' performance and re-teach on the spot" (Warr, Porter, & Carter, 2015). Members of the engagement team have found that while younger students do not always grasp the fact that progress dots are an indication of how much further a student has to go in an activity, essentially all students recognize them as a form of immediate feedback, which they generally appreciate.

Booster Bits. Similar to progress dots, students really like receiving Booster Bits. The engagement team found that while some students did not understand how exactly Booster Bits were connected to getting into Imagine Museum, nor what each coin's actual value was (e.g., twenty bits, ten bits, etc.), students did like seeing how well they did, which they discerned by the color of the coin, and they liked receiving a reward for performing well. We have since redesigned the Booster Bit reward screen to try and make the connection between Booster Bits and the Museum clearer and to make the value of each coin more explicit.

Imagine Museum. The research team found that students are excited when they get to enter Imagine Museum, and they really like the monkey. Our own informal surveys have shown that Imagine Museum is one of the activities students most enjoy. The product innovation council also provided positive reviews. One teacher said students really like to build things in virtual worlds and the monkey habitat allows them to do that. The majority of the council felt ninety seconds was about the right amount of time to have students in the museum.

When designing game-based learning experiences, the learning content should be at the heart of the narrative.

Exploring Additional Game-Design Elements

Based on the success of the first game elements we added to the program, we wanted to add more. We investigated several additional game-design elements that could be added to Imagine Language & Literacy to increase engagement and motivation. Following are design elements that we plan to implement into the program.

Narrative

In many video games, gameplay takes place within a narrative context. This narrative often uses story lines and visual elements (Chandler, 2013) and is believed to be an important factor in motivating people to play video games (Chandler, 2013; Dickey 2005; Dickey, 2006; Waraich 2004). A fantasy narrative in particular is believed to be a highly effective way to engage and hold users' attention for extended periods of time (Waraich, 2004), most likely because fantasy narratives can foster intrinsic motivation (Dickey 2006). Narratives, even fantasy-based, need not be overly complex to achieve these goals, as Waraich (2004) notes that even a "simple narrative can be used to engage the learner" (p. 98). "Narrative can act as a useful structural mechanism to help guide students through a learning environment" (Waraich, 2004, p. 98).

Dickey (2006) argues that although narratives are often constructed to be linear, perhaps because narrative generally takes this form in books and movies, narrative can also be spatial in nature. By creating a visual world in which users can move about exploring and making choices, the narrative becomes capable of interacting with users, and the user becomes a co-creator of the story they are a part of, further increasing engagement and motivation.

When designing game-based learning experiences, the learning content should be at the heart of the narrative (Fisch, 2005) with "learning tasks coupled with the narrative" (Waraich, 2013, p. 98), so students can experiment with new content, skills, and ideas (Chandler, 2013). Such narratives also make it easier for students to remember and understand the learning content (Waraich, 2004).

Avatars

The use of an avatar—a digital character meant to represent the user—is a common design element in many video games. Schell (2008) suggests an avatar can take the form of a person the user wants to be, or it can be a more idealized version of the user (although idealized, it can be designed so as to not promote negative self-image). Schell states that the avatar can also be a blank slate, meaning it has less detail or is more cartoonish in nature, allowing the user to more easily project themselves into the avatar image, and thus be more engaged in the program. By starting with a generic, cartoonish avatar—a blank slate—the user can then adjust certain aspects, such as hair color and style, skin tone, clothing, and accessories, to create an avatar the user can more easily project themselves onto while also creating a more idealized image of themselves, such as giving themselves a hairstyle they always wanted. Chandler (2013) notes that providing the student with a customizable avatar allows students to express their own interests, style, and personality, creating more opportunities for the student to exercise choice and be a co-creator in the program.

Badges

Badges act as special awards to recognize accomplishments and achievements and, when awarded for reaching academic competencies, can actually increase intrinsic motivation (Cameron, Pierce, Banko, & Gear, 2005; Filsecker & Hickey, 2014). This is likely because badges can act as visual representations of intrinsic goals. These goals can include those educators would set for students (e.g., competencies and other achievements) as well as goals students might want to set for themselves. The

awarding of a badge signifies that a student has reached a goal (Randall, Harrison, & West, 2013), with a student's collection of badges acting as a pictorial display of what they have learned (Elliott, Clayton, & Iwata, 2014).

Like any goal, earning a badge should require effort. Badges should not be handed out like candy in an attempt to find an easy way to motivate students, as over time this can devalue the badges and the motivation to earn them (Glover, 2013; West & Randall, in-press). This is likely because issuing badges that require little to no effort changes the meaning of the badges. They cease to be a representation of an intrinsic goal and become instead an extrinsic motivator that could negatively affect students' intrinsic motivation to learn (Deci, Koestner, & Ryan, 2001).

One exception to this is when students first begin to use a program. Many students will test out of some competencies the first time they use a program, so those badges would be issued immediately, resulting in a student earning a lot of badges in the first session. As this is an established practice in badging, and happens only once at the start of a program, it should not be detrimental to the value of badges in general.

Levels and Leveling Up

Levels and leveling up are design strategies used to increase motivation by providing periodic rewards as the user increases in ability. These levels are different from, and should not be confused with, levels usually associated with games. Instead of working through a collection of content to complete a level, these levels are based on the accumulation of XP. Once a user acquires a predetermined amount of XP, they are rewarded by leveling up (Filsecker & Hickey 2014). When a user levels up, their level increases (e.g., going from level two to level three or progressing from white belt to yellow belt). This is usually accompanied by a celebration of some sort, such as a congratulatory message. Leveling up also generally provides some new power or ability, such as increased hit points or more options to choose from.

Leveling up can happen at any time and, because it is based on the accumulation of XP, will happen at different places in the program for different users. Besides acting as a reward, these levels provide a numerical representation of the user's status (Bjork & Holopainen, 2004) and can show how far a student has come, how far they have to go, and how they are doing overall, which itself can be a reward (Lewis, 2013; Simoes, Redondo, & Vilas, 2013).

Student Choice

Meaningful choice is a key principle in game design that can be very motivating. Meaningful choices are choices that have an impact on what happens next and make users feel like the things they do matter (Schell, 2008). These choices can include who the character is, where to go, what to do, and how to use items (Dickey, 2005).

Similarly, research has shown that giving students some power to direct their learning or choose what they are going to do can be very motivating (Chandler, 2003; Dickey, 2005; Ryan & Deci, 2000) and can also create hooks that increase engagement (Dickey, 2005). Students can still be given expectations from a teacher or from learning software, but providing students with some choice increases the likelihood that they will internalize those expectations and thus be intrinsically motivated, which will increase, or at least sustain, engagement in an activity (Toshalis & Nakkula, 2012). Students don't necessarily need a lot of choices, but they need just enough to feel like they have some say in what they are doing.

Choices can take many forms. One important type of choice is customization or allowing users to make style choices that reflect their interests and preferences, such

as to their avatar or the game environment. (Chandler, 2013). These choices can also be considered meaningful because they are reflected in the gameplay (Schell, 2008). Schell (2008) lists several types of choices that can be presented to a user in a game, including:

- Where should I go?
- How should I spend my resources?
- What should I practice and try to perfect?
- How should I dress my character?
- Should I try to get through the game quickly or carefully?
- Should I focus on offense or defense?
- What strategy should I use in this situation?
- Which power should I choose?
- Should I play it safe or take a big risk? (Schell, 2008, p. 179).

One caution about choice: you shouldn't offer meaningless choices, at least not at the expense of having meaningful choices. Meaningless choices have no real effect or have options that no one would want to choose (e.g., since no one would want to choose the alternative, there's really no choice at all). Meaningful choices include things as simple as the clothes an avatar will wear (Schell, 2008).

Merging New Game Elements and New Sequencer

In this section, we detail how our existing game-design elements and the proposed new game-design elements will work with the new sequencer.

Sequencer 3.0

The new sequence is comprised of twenty-nine units, with each unit having between two and six levels. Each unit and level is numbered. The level number is continuous throughout the units and does not restart with each unit (e.g., levels 1–6 are in unit one, levels 7–12 are in unit two, and so on). Learners must move through the units, and the levels within the units, in sequential order. Within each level, there is a menu from which students can choose what they would like to do. Students can do any of the things listed in any order they like, thus supporting the principle of student choice. There can be up to three types of options in a level menu (these options can also appear in sub-menus):

- **Sub-menu**—This allows students to pick a book, song, letter case, etc. from a number of options. Some sub-menus require students to pick only one thing to do and then they can return to a higher menu—such as the level menu—while other sub-menus require students to complete all of the activities contained therein before returning to a higher menu.
- **Individual activity**—For example, the student simply selects a regular activity.
- **Mini-sequence**—To the student, this looks just like an activity, but it is actually a couple of activities tied together. The student must complete all of the activities in the mini-sequence before they are allowed to go back to the level menu. Some sub-menus may have all three types of options.

Students receive a placement test at the beginning of each unit that determines what activities they need to complete. As a result, students may be required to do more activities than their peers. Similarly, depending on how well a student does within individual activities in a level or even a group, they may be able to skip some activities. A few activities within a level may be locked and unavailable until a student has

completed or tested out of another activity. Once students complete all of the levels in a unit they will do a posttest to see what they have learned.

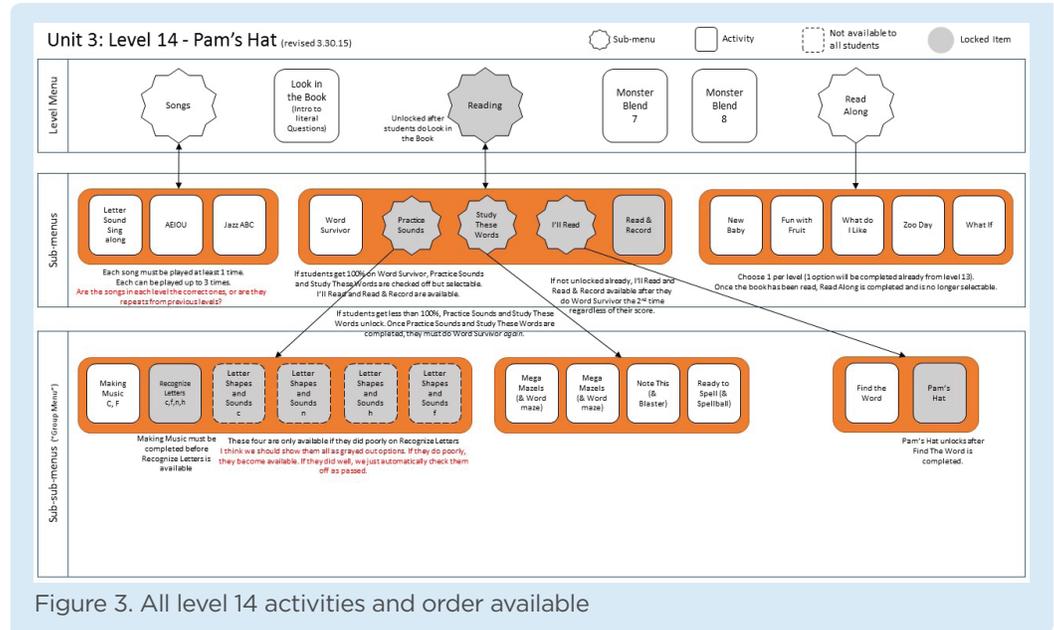


Figure 3. All level 14 activities and order available

Modular Game Design

Since there are twenty-nine units and over one hundred levels in the new sequence, using a modular approach to the overall game design will prevent us from having to create an unwieldy number of worlds and sub-worlds. Instead, we will create one 3D reusable world, Imagine Island, and thirteen 3D reusable sub-worlds, which represent different areas on the island (referred to as zones). This modular design will not only save an extensive amount of money and time, it will also provide us with the ability to adapt the game design to any changes made to the sequence.

In this design each unit in the sequence becomes a mission on the island with each level in a unit taking place in a different zone. Zones serve as the level menus in which students can choose to do an activity or open a 2D sub-menu to select from a number of activities. The activities are the same 2D activities currently in the program. The terminology of the sequence and that of the game are detailed in table 2.

Table 2. Terminology of the Game

SEQUENCER TERMINOLOGY	GAME TERMINOLOGY	DESCRIPTION
Unit	Mission	Full view of the island
Level	Zone	2.5D view of an island location
Level menu options	Elements (buildings)	Buildings within the locations
Sub-menus	Options	2D menus

Figure 4
Imagine Island Mock-Up

Each of the thirteen zones corresponds to a level, with only a certain number of zones being used in a single mission (e.g., a unit with four levels will require the student to visit four zones to complete the mission).



Figure 5
Waterfall City: Example of a Single Zone

Notice that icons, such as the music note and the book, represent different types of activities students can choose to do.



Figure 6
A 2D Sub-Menu

One activity has been passed off, while two other options remain locked. The two available options both represent additional sub-menus.



Units as Missions

For each unit, a student is assigned a mission. The missions could be numbered and/or given a name (e.g., 3: The Missing Mazel). The benefit of numbering missions is that students will be able to have some idea of where they are in the game as a whole. They will also be able to know how far along they are compared to their peers. These benefits are also the detriments, as some students might be discouraged to know that they are only on mission seven out of twenty-nine, or that they are only on mission seven while their friend is on mission thirteen. Each mission would have a goal, such as saving the badger or finding the missing mazel, which the name would match. This mission goal provides a narrative for the mission.

Levels as Zones (Areas of the Island)

The island is divided into thirteen areas or zones. For each mission, only two-to-six preselected zones are visited, but the student can choose the order they will visit them. However, regardless of what zone a student picks, they will receive the same instructional content. That is, level thirteen for student A might take place in the Lighthouse Zone, while student B might experience level thirteen in the Treasure Cove Zone, depending on which zone they choose to visit. Therefore, zones act as interchangeable skins for the levels, providing students with meaningful choices while also ensuring the sequence unfolds correctly. Since there are thirteen zones—far more than there are levels in any unit—we can mix and match which zones will be available in which mission. This provides numerous combinations so that each mission can be unique in terms of which locations you will visit.

Avatar

The new 3D zones will allow students to explore Imagine Island. To facilitate this exploration, students will be given an avatar. This avatar will be cartoonish in style and will be customizable, allowing students to change the skin tone, hair color and

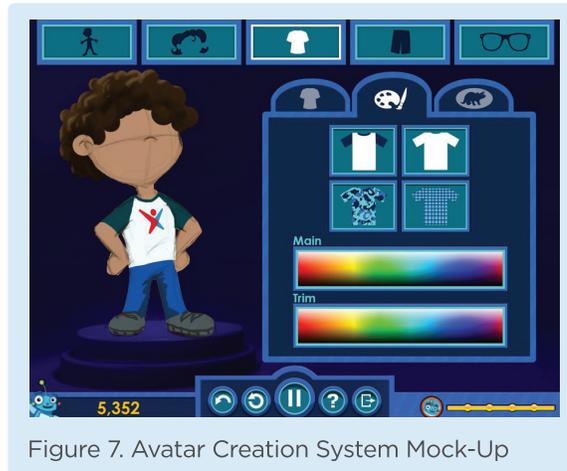


Figure 7. Avatar Creation System Mock-Up

style, eye color, clothing, and a number of other components. As students level up they will unlock additional items that they can purchase with Booster Bits to further customize their avatar. The style and customization options will allow students to more easily project themselves onto the avatar as well as provide more meaningful choices for the students to make.

Students will receive their avatar the first time they log into Imagine Language & Literacy.

Although they will be given a

limited time to customize their avatar when they first receive it, they will be provided with additional opportunities. Each time a student earns a visit to Imagine Museum, they can choose to customize their avatar instead of visiting one of the museum exhibits.

Narrative

We plan to use two types of narrative in the program. The first type is a single overall narrative that explains why students go on missions, periodically visit the museum, and receive literacy and language instruction. The second type is the mission narrative, meaning that each mission will have its own semi-standalone narrative that explains the goal for that mission, such as finding the missing mazel.

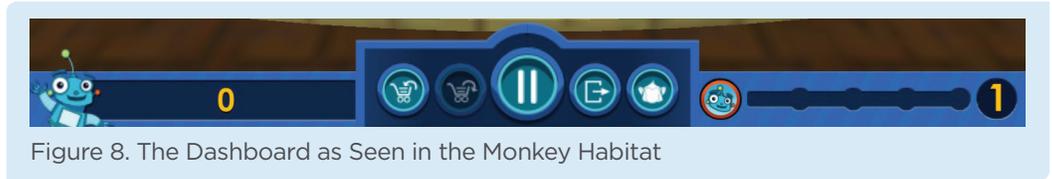
The overall narrative will be introduced to the student when they log into Imagine Language & Literacy for the first time. The narrative begins with the student visiting Imagine Museum with their class. As the student explores the museum, he or she discovers a secret area filled with unfinished exhibits. While exploring this area the museum's director, Dr. Cline, finds the student and invites him or her to help finish the exhibits by joining the Imagine Readers. The Imagine Readers (the characters in the program) are a group of kids who work with Dr. Cline. They help take care of Imagine Island as well as work on exhibits in the museum. The doctor explains that the student, as an Imagine Reader, will be sent on missions to Imagine Island to accomplish certain tasks and to collect Booster Bits that will allow him or her to add to the exhibits.

The mission narratives are, perhaps, the most difficult aspect to design. We want the missions to have a meaningful narrative; however, students will spend most of their time in individual activities that are thematically different from each other and Imagine Island in general. Creating a cohesive narrative that weaves all of these elements together will be extremely difficult, if even possible, in pre-K through second grade. There is a greater chance that we can reach this goal in grades 3–5 as those grades have far fewer activities, most of which are reading activities. The reading material in these activities could correspond to the mission theme, and perhaps even provide clues about how to accomplish the mission.

Dashboard

The dashboard will stretch across the bottom of the screen and will replace the current “pause,” “listen again,” and “let’s go” command buttons that currently appear on the right side of the screen. These command buttons will appear in the bottom middle

of the screen as a part of the dashboard. To the left of these buttons, the dashboard will contain the progress dots for the current activity, while on the right side of the dashboard there will be a progress bar that will display the XP gained from each activity, how long the student has until he or she gets to return to the museum, and



what “level” the student is on. Currently, this level does not correspond to the level within the sequence unit/level.

The command buttons are in the middle, and in this specific case include additional buttons specifically for the monkey habitat. On the left of the command buttons is the space where the progress dots would appear. In this case, the progress dots are not shown, but instead the number of Booster Bits are displayed.

Booster Bits

While Booster Bits have proven to be very successful, we saw small ways we could improve their use. For example, some activities that require students to read blocks of text took a long time to complete, but they awarded the student only a couple of Booster Bits. Other activities took relatively little time to complete and awarded many Booster Bits. To try to make the longer activities with fewer Booster Bits worth more to the student, we created two additional types of Booster Bit coins. The blue Booster Bit coin is awarded for getting all the questions in an activity correct. This is most likely to happen in activities with fewer questions, increasing how many Booster Bits a student is likely to earn in those activities. The purple coin is awarded randomly. We can adjust the chances of winning the purple coin, so activities that offer fewer questions have a higher chance

COLOR	STUDENT ACTION	BOOSTER BIT VALUE
	The student answers a question correctly on the first try.	20
	The student answers a question correctly on the second try, provided the activity allows more than one guess.	10
	The student answers incorrectly, including not getting the answer correct on the second try.	0
	The student answers all of the questions correctly (at the end of the activity one of the green Booster Bits turns blue).	30
	This coin is randomly awarded. The odds of winning one can change depending on the activity. Activities that students do not enjoy as much can be set to award a purple coin more often than activities students tend to enjoy more.	50

of giving students a purple coin compared to activities with more questions.

Table 3. Types of Booster Bit Coins

Badges

Another gamification element we plan to incorporate into the program is digital badges. We propose two types of badges: competency-based badges and achievement-based badges.

Competency-based badges. Educationally speaking, a badge awarded for meeting a competency is arguably the most important kind of badge. One simple way to identify competencies is to have a badge that corresponds to each sub-menu in Imagine Language & Literacy’s Activity Menu (or just for each sub-sub-menu). Students would earn the badge once they have successfully completed the assessment activity for that competency. Many of these competency-based badges could be aligned to the Common Core State Standards and other state standards. Teachers could have a special view of each student’s list of badges and would be able to quickly see which student has met which standards.

Achievement-based badges. Badges can be awarded for reaching predefined achievements that could take a number of forms. The question becomes, what kinds of achievements do we want to award badges for? Or, what goals do we want students to reach? Included in this might be behaviors we want to reinforce. The research team might have insights on this based on what skills and other things (e.g., time in program) we want to promote. Some possibilities include the following:

- Most time spent in program
- Most progress in a duration of time (week, month, session, etc.)
- Most books read in a duration of time
- Most words learned

The types of things we want to award achievement-based badges for will determine the rules for awarding those badges (and there could be multiple rules and systems). For example, a badge awarded for a specific competency would be awarded when that competency is met. Receiving the badge would have nothing to do with anyone else in the system, only the individual learner. However, a badge awarded for making a lot of progress in the system could be awarded under a number of different rules. It could be strictly based on how much progress the student has made compared to past performance (e.g., a kind of personal best—the student usually only gets through two activities per session, but this session made it through five), based on a set number of awards (e.g., the top ten students get the badge), or a percentage (e.g., the top ten percent of students).

While badges should require some significant amount of effort to earn them, they need not be overwhelmingly difficult to achieve. For example, there could be a badge for getting a perfect score on five activities in a row. This would certainly be a challenge, but not impossible. A badge requiring students to get a perfect score on twenty activities in a row would probably never be awarded to anyone. It requires a careful balance to make sure the badge is difficult enough that it is meaningful, but not overwhelmingly difficult. It should be noted that because we intend to display all the badges a person could earn, some badges listed will seem too difficult to some students simply because those badges are far ahead of their skill level. This, however, is not a bad thing so long as students at the skill level a badge is intended for do not find the badge too difficult to earn.

Guiding Design Principles

Based on the research above and the improvements the Imagine Language & Literacy program needs, we devised several guiding principles specific to helping us design game elements to add to the program.

Student Choice

One element of gamification we investigated was so critical that it became the first of our guiding principles: student choice. Student choice should be meaningful as previously mentioned, and it is particularly meaningful if the student can choose what to learn next (e.g., pick from among a few options). If needed, we can create the illusion of choice. We can allow students to choose between two or three different locations on the island to visit, or activities to complete, but we present the same instructional content no matter what they choose. So, the context (e.g., background, location, etc.) could change but the instructional content—the construct they are supposed to learn—would be the same. Students would likely be unaware of the difference, but they would see the context change as a direct result of their choice. Thus, the choice would feel meaningful while still providing content in the order required.

While student choice is most important when it comes to selecting what learning activities to do, it can and should be extended to other aspects of the program. Allowing students to customize their monkey in the jungle habitat is an example of student choice that increases students' autonomy but has nothing to do with the actual learning. Such choices can be provided throughout the program.

Visual Context of the Instructional Path

Closely tied to student choice is the principle of providing a visual context of the instructional path. Students cannot make informed decisions—the kind of decisions that increases student autonomy—without some understanding of what the consequences of their choice will be. Put another way, the menu presented to the student must have enough information so that they can make reasonably informed decisions. For example, if I choose this activity, I'm going to learn about X or do Y. Since the menus will be largely visual in nature and especially since students may not be able to read proficiently enough to use text-based menus, the images must convey the needed information. Consistent use of certain symbols, styles, etc. for types of activities or options will help provide this information.

The principle of visual context of the instructional path is true not just on the micro view (such as in a single sub-menu), but on a macro view as well (such as a mission overview and level menu). Allowing the student to see the “big picture,” or at least part of the bigger picture, will let students see where they have been, where they are going, and where they are in relation to the end. This can help them feel that they are making progress and help them see how their decisions and performance are affecting the game world.

Help Students Feel Successful

There are many ways to help a student feel successful. The use of progress dots and Booster Bits, along with other gamification aspects (e.g., badges, XP, etc.), can help achieve this.

Completion of levels, units, and other divisions within the instructional path can also help a student feel successful. However, for this to work the path to completion (including story narratives) needs to be short enough that students remember what they are doing, and the completion/reward needs to occur soon enough afterward that they haven't lost interest or given up on it.

Strive to Align: Matching Narrative to Existing Activities

While activities created in the future can be crafted to follow the Imagine Island narrative outlined in this document, the existing content must also be considered. Obviously, we don't want to simply discard what has already been done (although some activities could be phased out over time). This is especially true since there could be as many as a thousand datasets worth of legacy activities. A better alternative would be to create a story/narrative that explains or supports as many existing activities as we can.

The current narrative being considered consists of a student going to one particular part of the island and doing activities there. While this makes the most sense if you were designing a game from scratch, the many different backgrounds and locations of the activities will make it look like you are going to different places on the island instead of going to a single location on the island. As a result, the idea of going to a single place on an island to do multiple existing activities, which look like they take place in different locations, seems to destroy the illusion of where you are. However, it might be possible to add story elements that would explain this disconnect. Such attempts should be made to make the existing activities match the narrative as much as possible.

Driving Students Toward Activities

Allowing students to have a choice in what activities they will do creates the opportunity for students to spend an excessive amount of time doing something other than learning. This could take the form of not making a decision within a 2D menu (e.g., just staying on the menu screen instead of going into an activity) or running in circles in a 3D menu. Design strategies should be used to discourage wasted time and encourage students to quickly move into the next learning activity. The exception to this is during reward activities, such as visits to the Imagine Museum. However, even these exceptions should be designed so that they do not take too much time away from learning activities.

Future Work and Implementation Strategy

Our goal is to eventually move the program to a complete 3D world in which instruction and activities all take place in the 3D space. The implementation of the fully 3D world will take place in four phases.

Phase 1: This phase only includes 2D activities, which are chosen by the sequencer. This was the state of the program before the gamification strategy was conceived.

Phase 2: Merit-based, 3D rewards are interspersed in sequencer-based 2D activities. To complete this phase, the 3D museum exhibits must be completed, namely the following:

- Jungle habitat with monkey
- Roller coaster
- Avatar

Phase 3: This will have a 3D menu system. The 2D activities are wrapped in a 3D world. Students have options regarding what activities to do.

Phase 4: Instruction, practice, and assessment are all contextualized in the 3D world (e.g., no more 2D activities).

Conclusion

Research has shown that using game-design strategies can be very effective in helping to motivate and engage students in learning. Imagine Learning has long used some game-design strategies in the program, which have certainly captured the interest of younger students. We hope to continue to engage both younger students and students in older grades by using additional game-design strategies. Our early experiments with program-wide game elements, such as Booster Bits, have proven quite successful. We are currently working to include additional elements and strategies, such as narratives, badges, avatars, and more. We hope these additions will help engage students at all levels so that Imagine Language & Literacy can continue to engage and teach students for many more years to come.

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