The Social and Ethical Effects of Gamifying Online Learning

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

60 million people. "The number of online learners is expected to grow to nearly 60 million people in the near future" (Peck, 2024) and what's concerning is that we know online learning is not effective for everyone. A comparative study in 2021 found that "all forms of engagement were worse in online courses" as opposed to face-to-face courses (Sekhon and Patil, 2021, p. 2137). Several studies claim that more engagement has been linked to more effective learning (Sekhon and Patil, 2021). With online learning on the rise, it is important that developers address the issue of lack of engagement and motivation to learn. One solution to this problem is to gamify the online learning platform. Gamification is "the usage of game mechanics, dynamics, aesthetics and game thinking in non-game systems" (Strmečki et al., 2021, para. 1). My STS topic will analyze which drives of the Octalysis framework (Chou, 2023) are most applicable to the gamification of online learning, interpret the results of an exploratory study I conducted to determine what engagement means in the context of online learning and if gamification truly does increase user engagement, and also provide a review of the ethical implications of gamifying online learning platforms.

Understanding How and Why Gamifying Online Learning Helps Increase Engagement

The gamification of online learning platforms helps increase user engagement and motivation. This behavior can be explained through the Octalysis framework. Entrepreneur, now CEO, Yu-kai Chou spent 17 years developing the Octalysis framework. It is a human focused gamification design framework that emphasizes "optimizing human motivation and engagement within a system" (Chou, 2023). This framework consists of eight core drives responsible for human motivation. The eight core drives are: 1) epic meaning and calling 2) development and accomplishment 3) empowerment of creativity and feedback 4) ownership and possession 5) social influence and relatedness or envy 6) scarcity and impatience 7) unpredictability and curiosity 8) loss and avoidance.

The three drives I consider most relevant to gamified online learning are development and accomplishment, ownership and possession, and empowerment of creativity and feedback, because they contain nine popular gamification elements in online learning systems. According to Strmečki et al., nine popular gamified design elements used in e-learning are points, badges, customization, leaderboards, levels, challenge, quest, feedback, and freedom to fail (Strmečki et al., 2015, para. 1). The development and accomplishment drive include five of the popular elements: **points, rewards, leaderboards, quest, and progress bars**. The ownership and possession drive includes one: **customization**. The empowerment of creativity and feedback drive includes two: **levels** and **feedback**. The **freedom to fail** element is not included under any of the eight drives, but I believe that it is a popular gamification element and should be included in the 'empowerment of creativity and feedback' drive.

It is important that gamification focuses on the user in order to elicit effective engagement. Khan Academy is a popular gamified online learning tool that many individuals have used or at the very least heard of. As of 2022, Khan Academy has 137 million users across

190 countries (EducationWeek, 2022). Khan Academy is an American non-profit educational organization with a goal of creating a set of free online tools that help educate students. Khan Academy provides short video lessons and maintains a website with practice exercises and personalized learning resources. This platform incorporates several gamification elements such as badges, points, avatar, and progress indicators (Morrison and Disalvo, 2014). However, despite adding gamification elements to the platform, several sources claim that Khan Academy does not utilize gamification to its full potential and has scope to improve user motivation. According to Briana Morrison and Betsy Disalvo, professors at the University of Virginia and Georgia Institute of Technology respectively, "Khan [Academy] is missing the notion of meaningful gamification, where the user is at the center" (Morrison and Disalvo, 2014, p. 7). They state that introducing external gamification elements without linking them to meaningful experiences could negatively affect the user. They claim that Khan Academy is more suitable for novice learners that are self motivated as the platform uses gamification to encourage short term engagement. Some approaches to improving gamification in Khan Academy that Morrison and Disalvo suggest are setting specific goals as opposed to general goals, indicating when effort is needed, focusing on process vs outcome, and providing comparisons with similar people.

In addition to focusing on user centric design, it is also important that gamification considers how different users are motivated. According to Joris Beerda, founding partner and CEO of 'The Octalysis Group', Khan Academy falls short in balancing extrinsic and intrinsic motivation (Beerda, n.d.). Extrinsic motivation is when individuals are motivated to do something because of the resulting outcome (Cloke, 2019). Possible outcomes could involve money, fame, or recognition. Some gamification elements that are commonly linked with extrinsic motivation are badges, points, and leaderboards. Users are motivated to complete tasks so that they can earn a reward or gain more points. Intrinsic motivation is motivation that comes from within (Cloke, 2019). Some examples are a sense of accomplishment, competence, and pleasure. Some gamification elements that are linked with intrinsic motivation are levels and progress bars. Users are engaged to continue learning because they feel a sense of accomplishment and enjoy the feeling of learning. However, there does not appear to be a direct link between a gamification element and the type of motivation it helps improve. For some learners, extrinsic motivators may fuel intrinsic motivation as users feel a sense of accomplishment. Other learners do not find extrinsic motivators motivating perhaps because they appear to be nothing more than just materialistic rewards. Therefore, I believe it is important for gamified online learning systems to include a variety of gamification elements and for developers to make deliberate choices about how each element could affect user motivation. Keeping this in mind, I designed a gamified web application using gamification elements that addressed both forms of motivation and revolved around user centric design. In the following section, I will be discussing the exploratory study I conducted, for which I developed the gamified web application.

Design and Results of an Exploratory Study

To find out how engagement changes when gamification is introduced in an online learning tool, I decided to conduct an exploratory study. Most of the studies and experiments I found were surveying individuals on just gamified tools rather than doing a side by side study of a tool with and without gamification. Therefore, I wanted to gather my own data to confirm the consensus that gamification increases student engagement. I decided to create two web applications (see figures below) intended to help individuals learn about the basics of the Python programming language (Chelimilla, 2024). The content and layout of the material is the same in both websites; but for one of the web applications, I have integrated 6 gamification elements while the other has none. Based on the findings and claims described in the previous section, I have carefully designed the gamified web application to include elements that are most applicable to online learning, making sure these elements, combined, achieve both extrinsic and intrinsic motivation. I have incorporated rewards, points, leaderboards, and progress bars to promote extrinsic motivation, and freedom to fail and feedback to focus on building intrinsic motivation. I built both web applications using Python, HTML, CSS, and Javascript to develop the application and Flask to host the application on a local server.

The purpose of this study was to see if users felt more engaged while interacting with the gamified web application, and through the analysis of the results, understand what engagement is in the context of online learning. I interviewed four undergraduate students at the University of Virginia, all of whom gave me verbal consent to be interviewed. Two participants interacted with the gamified version and the other two interacted with the non-gamified version of the web application. None of these individuals knew how to code, which was important in controlling for how engagement affects learning. When I discuss the results of the study, I will *loosely* quote the participants' responses to certain questions and refer to individuals as 'they' to better protect the anonymity of the participants. The results of the interviews should only be considered as a starting point for further research and will not provide solid conclusions.

The results of the exploratory study were quite interesting and lined up with the claim that gamification increases user engagement. When I asked the individuals interacting with the gamified web application how engaged they felt throughout, I got very strong and direct answers stating that they felt engaged. One of the individuals said they felt "pretty engaged as they focused on getting answers right". The other individual said they also felt "pretty engaged and felt like they wanted to keep answering questions". When I asked the same question to the individuals interacting with the non-gamified web application, both of them responded with comments about how they liked the user interface (UI) of the website, but did not mention the word 'engaged' in their response. Similar responses were elicited when I asked how they felt throughout the learning experience. One of the individuals interacting with the gamified web application said that they felt "pretty motivational". The other expressed how "there wasn't anything that made them want to stop learning" and "wanted to keep seeing how many questions they could answer". Notice that both responses are tied to motivation - the individuals conveyed how they felt motivated to keep interacting with the web application and learn the material.

When I asked the same question to the individuals interacting with the non-gamified web application, one of their responses was related to the UI and the other had no feelings towards the learning experience. This suggests two ideas, which will be discussed in the following two paragraphs: 1) engagement is related to motivation in that users feel motivated to learn when they are feeling engaged; and 2) UI plays an important role in engagement.

The results of the study suggest that specific gamification elements help increase motivation, thereby increasing engagement. I asked both individuals interacting with the gamified web application how they felt about the leaderboard and how seeing their position affected their motivation. One of the individuals said "it reminded them of Khan Academy and IXL[an online learning site for K-12] and kept them motivated to keep playing the *game*" and the other said that "knowing there's more people they're competing with, they want to go back and answer more questions to make their rank go up". An interesting observation to note is that one of the individuals referred to the website as a game. This suggests that they are viewing the tool as a fun form of play as opposed to a set of required tasks, thereby increasing their engagement. When asked how progress bars affected their motivation, both individuals said they "want to go back and re-answer questions to fill up the bars to 100%", which indicates that this element helped increase their motivation. When asked the same question about badges, there wasn't a strong response, implying that badges did not play as significant a role as the leaderboard and progress bars in motivating the user. In fact, one of the individuals said that the "badges did not really affect them". I infer that this may be because badges might be a motivating factor for long term learning. In the short 15 minute span of the interview, where none of the participants unlocked any of the nine badges, it might not have played a significant role compared to other gamification elements. But in the long term, as the user continues learning the material and unlocking more badges as they progress, it might be a more motivating factor. On the other hand, it may be that comparing oneself with others (leaderboard) is a more powerful motivator than long term accomplishment and achievements (badges). More research is needed to confirm which of these hypotheses, if any, are right.

UI plays an important role in engagement with online learning platforms and should be one of the first steps developers and designers should keep in mind when building a learning tool. One commonality in the responses of all four participants was that each made at least one comment on the UI of the web application. Three of the participants commented on how the chart layout for explaining the concepts organized the material in a simple and easy to digest format. One of the participants commented that they "liked the color scheme and it is pleasing for the eye unlike some websites". This suggests that the UI of a website is really important to creating a good user experience and providing the initial motivation to learn. Additionally, as mentioned previously, when I asked the individuals interacting with the non-gamified web application how they felt throughout the learning process or how engaged they felt, they answered by commenting about the UI. This again suggests that there is a direct link between engagement and UI. While solely having a good UI may not be enough to motivate and engage users in a learning tool, it is definitely something that could inhibit or discourage users from

initially using the tool or make the user experience of learning more difficult and unpleasant. This is something that the octalysis framework overlooks but is an integral part of designing an engaging online learning platform.

Based on the results of the exploratory study and the analysis of participants' responses, I argue that a user's engagement when interacting with online learning tools is best represented by the behaviors of a user interacting with the tool, is correlated with user motivation and state of mind, and stems from having an appealing user interface. This is a very broad definition of user engagement because it should be able to adapt based on the online learning platform. While it is important to examine how engagement is affected by the gamification of online learning, it is just as important to recognize any unintended consequences gamification may cause. As I was developing the web applications and conducting the study, I realized that there are several ethical implications that arise with gamifying online learning, which I discuss in the next section.

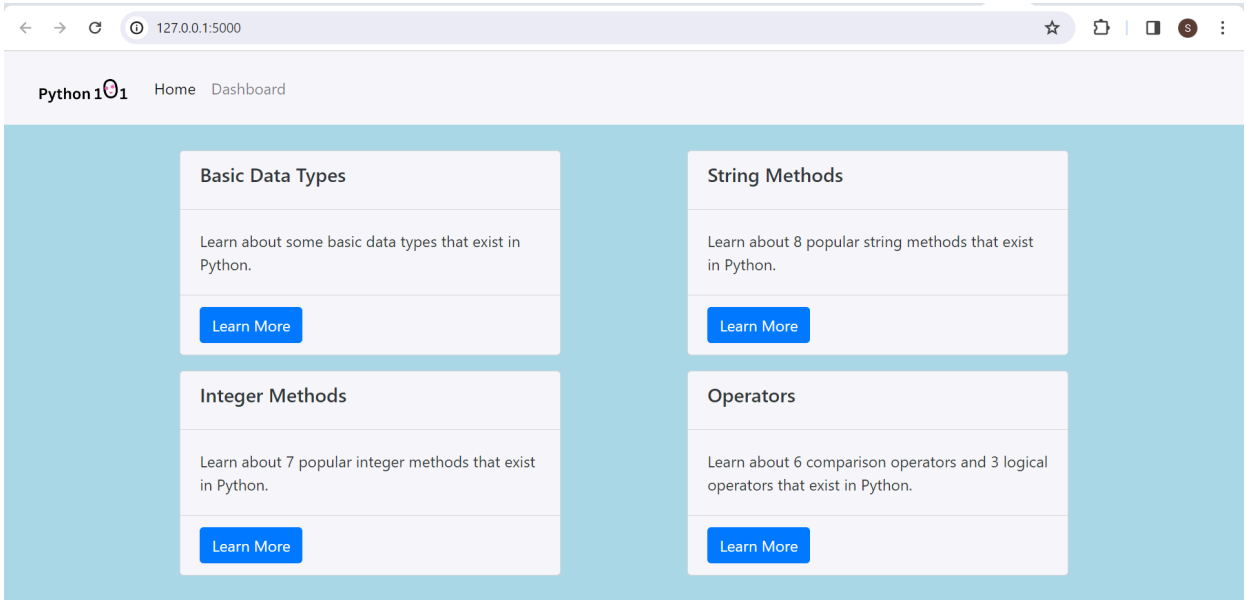

Figure 1. Home page for the gamified web application

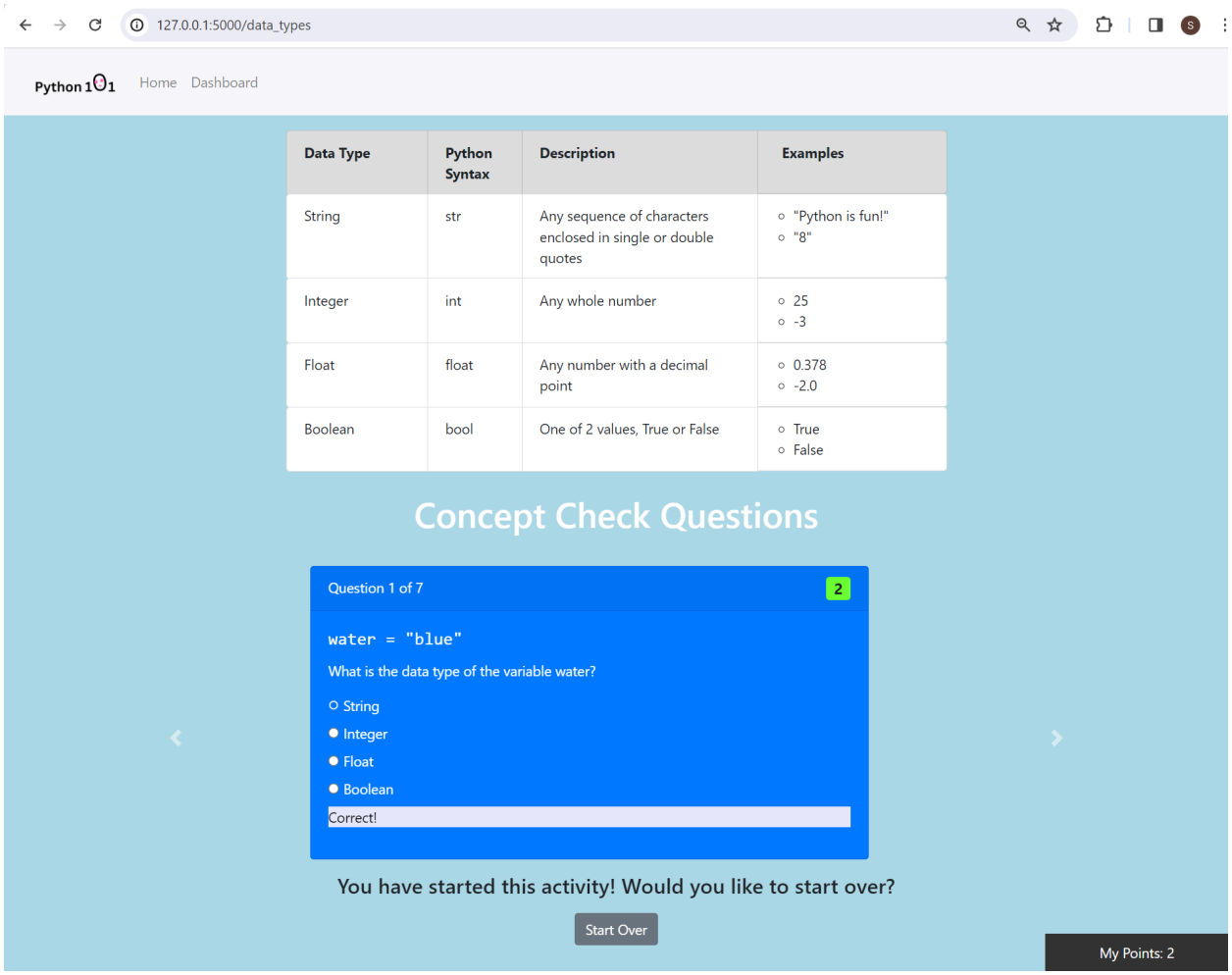

Figure 2. Data types page for the gamified web application

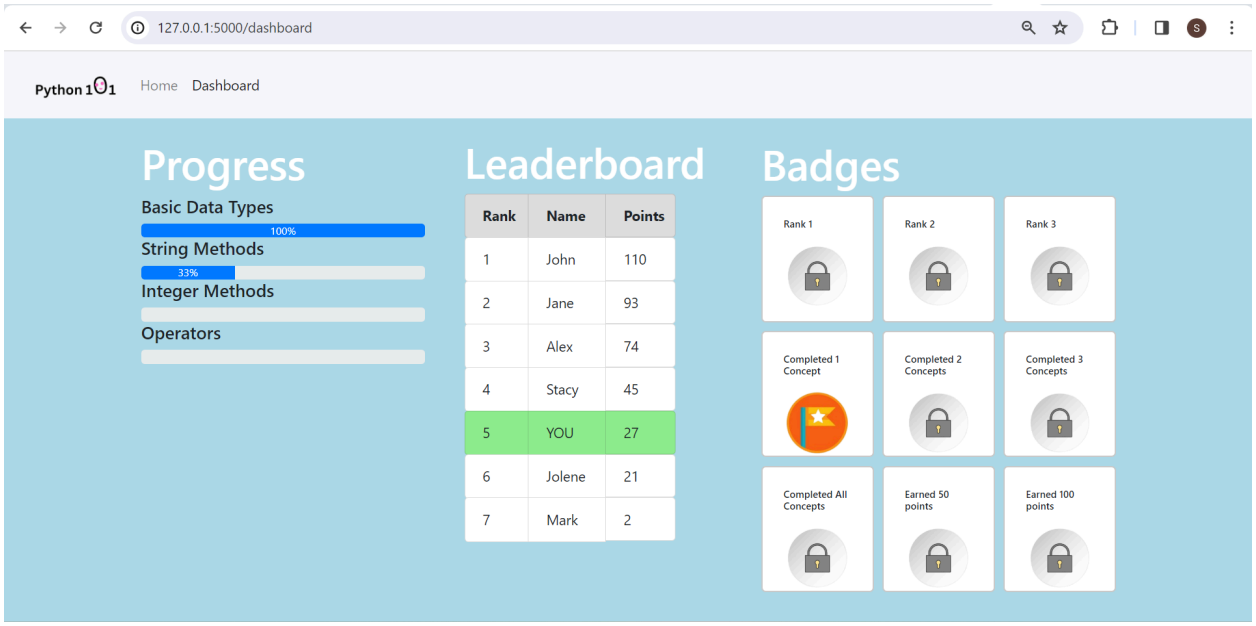

Figure 3. Dashboard page for the gamified web application

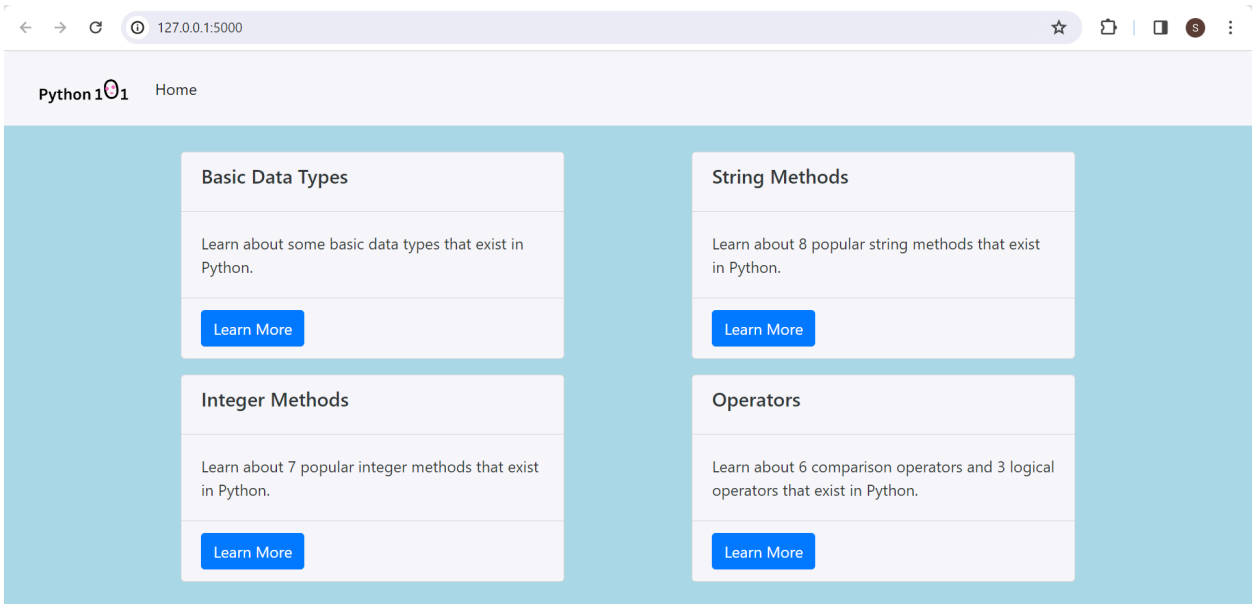

Figure 4. Home page for the non-gamified web application

Figure 5. Data types page for the non-gamified web application

Ethical Implications of Gamifying Online Learning

Engagement, in a broad sense, is not always correlated to increased learning. According to the Glossary of Educational Reform, engagement in learning is the "degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education" (Sabbott, 2016). Engagement is an important concept in learning because it is believed that learning improves when students are interested, motivated, and interacting with the material whereas learning decreases when students are bored or dispassionate (Sabbott, 2016). While there are several claims stating that gamifying online learning increases user engagement, and increased user engagement improves learning, I don't completely agree. I believe that engagement is specific to a learning source and that each scenario should be analyzed differently. For example, in the gamified web application that I built, one of the gamified elements, feedback, is incorporated through concept check questions. In this specific case, I would consider users engaged if they are actively answering these questions and re-attempting them to understand the material. However, a user could be randomly attempting questions in order to gain more points and advance in the leaderboard, which can be classified as addiction. While both behaviors may seem similar and might be considered as "a user being engaged", the latter will not help the individual learn.

Some may argue that the time spent completing an activity or the pattern of choosing answers will differ between the two scenarios (re-attempting questions vs randomly guessing), making it obvious if a user is truly engaged with a system. However, people come in with different knowledge and experiences and everyone has a different learning style so it is hard to compare the time two different users spend on the same activity. The same goes for comparing the pattern of choosing answers. An individual may be having a hard time understanding the

concept and is therefore attempting the question multiple times until the right answer is selected. This behavior, however, can look the same as a user who is trying to click on answers at random until the right answer is chosen. I think that time spent and pattern of choosing answers, along with other observations or knowledge, could be helpful identifiers, but alone does not allow for any conclusions. Therefore, I believe that there is no overall conclusion as to what extent engagement correlates with how much a student has learned, and needs to be analyzed differently for different learning sources.

While the intent for incorporating gamification elements into online learning is for increased engagement, it is important to differentiate between high engagement and addiction. Addiction is characterized by "players or learners with an uncontrolled drive to hunt for achievements" (Schulz et al., 2015, p. 29). Consequently, it becomes hard to draw the line between high engagement and addiction. While several sources claim that high engagement leads to improved learning, excessive engagement, or addiction, can actually distract users from the learning aspect of the platform and negatively impact their learning (Schulz et al., 2015). This is something that instructors, or whoever is administering the learning tool, needs to be aware of and learn to recognize and differentiate between these two behaviors.

Leaderboards are intended to help motivate users via social competition. According to the American Psychological Association, a social motive is "any motive acquired as a result of interaction with others. It may be universal (e.g., need for affiliation) or culture specific (e.g., need for achievement)" (Social Motive, n.d.). Social motivation enables us to achieve goals based on social needs. Gamification elements, like badges and leaderboards, play on the idea of social motivation to engage and motivate learners. Although, according to the Octalysis Framework, both leaderboards and badges fall under the 'development and accomplishment' drive, I believe there is a social factor at work here as well that the framework is overlooking.

While leaderboards may motivate some users through social comparison, they also have the potential to discourage others by skewing achievement measurements. The phenomenon of wanting to "do better" than others can be explained by the Social Comparison Theory in Psychology, a theory proposed by psychologist Leon Festinger, which suggests that "people value their own personal and social worth by assessing how they compare to others" (Cherry, 2022). Dr. Alicia Nortje, a Postdoctoral Research Fellow, states that while comparing oneself to others helps provide a benchmark of sorts, it also can be harmful and result in negative behaviors. She claims that this is because social comparisons can result in comparisons to unrealistic benchmarks, lowering self esteem (Nortje, 2023). Because each individual has a different learning style, a snapshot of progress at one certain point may not be the best benchmark. It also depends on the learning source and how the leaderboard measures achievement. For example, if more points are earned the faster a user answers a question, it doesn't make sense to compare learning achievement with the number of points each user has earned. Both users could have learned the same amount of content, but their learning styles could affect leaderboard placement. The extent a user is motivated, or demotivated for that matter, also depends on the learning style and mindset of the user. Not all individuals are driven by

competition. Those that are will likely be motivated to perform better, regardless of whether they are comparing themselves to a realistic benchmark, while those that are not, will be discouraged, even more so with an unrealistic benchmark.

Leaderboards often contain public data accessible to all users and it is vital to ensure it is protected. The specific implementation of the leaderboard and what information is displayed depends on the learning source. Some learning sources will include the name of the user or a distinguishable identifier whereas others will let the user choose what name to be displayed. Leaderboards are used to assess achievement so they often use some measure of points to quantify progress. Therefore, to ensure user privacy and compliance with FERPA regulations, it is important that this information is properly protected. Schulz et al. recognize this potential issue and express that not only must learning status and personal achievements be stored safely but should also be safeguarded against tampering or manipulation by others (Schulz et al., 2015). Another ethical question this raises is if users should provide some sort of consent to allow for their name and data to be publicly visible. The scope of this issue changes based on the purpose the leaderboard is being used for, the context of the learning source, and who has access to the information, but nonetheless, is an important topic of consideration.

Conclusion

Gamification of online learning, when carefully developed to focus on user centric design and avoid ethical concerns, can increase a user's engagement when interacting with an online learning platform. Gamifying online learning is important because millions of people are interacting with online learning platforms yet not everybody feels as motivated to learn. Gamification offers a solution to this problem, and this claim has been validated by several studies, including the simple exploratory study I conducted. The results of the study led me to propose a new working definition of user engagement in online learning - one that is more relevant to user behavior and motivation. I found that the user interface also plays an important role in engagement and it is interesting to note that this aspect is overlooked by the Octalysis framework. The results of the study, alongside additional research, led to some interesting follow up research questions: How does implicit vs explicit motivation affect a user's engagement? How does gamification of online learning correlate with effective design of the user interface? There is a lot more research that needs to be done in the field of gamification, especially the gamification of online learning. It is crucial to understand how to measure engagement for each platform and use that information to effectively and ethically design an online learning tool, as online learning is only projected to grow in the years to come.

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