2018

Leveraging Technology: Enhancing Study Time Through Competition

Ming Yang

Purdue University, yang521@purdue.edu

Lindsey Eble

Purdue University, leble@purdue.edu

Patricia Darbshire

Purdue University, darbishi@purdue.edu

Follow this and additional works at: <https://docs.lib.purdue.edu/pjsl>

Part of the [Other Pharmacy and Pharmaceutical Sciences Commons](#)

Recommended Citation

Yang, Ming; Eble, Lindsey; and Darbshire, Patricia (2018) "Leveraging Technology: Enhancing Study Time Through Competition," *Purdue Journal of Service-Learning and International Engagement*: Vol. 5 : Iss. 1 , Article 13.

DOI: 10.5703/1288284316833

Available at: <https://docs.lib.purdue.edu/pjsl/vol5/iss1/13>

This document has been made available through Purdue e-Pubs, a service of the Purdue University Libraries. Please contact epubs@purdue.edu for additional information.

This is an Open Access journal. This means that it uses a funding model that does not charge readers or their institutions for access. Readers may freely read, download, copy, distribute, print, search, or link to the full texts of articles. This journal is covered under the [CC BY-NC-ND license](#).

LEVERAGING TECHNOLOGY:

Enhancing Study Time Through Competition

Ming Yang, Lindsey Eble, and Patricia Darbshire, *College of Pharmacy*

STUDENT AUTHOR BIO SKETCHES

Ming (Max) Yang and **Lindsey Eble** are students in their final year of the Doctor of Pharmacy program in the Purdue University College of Pharmacy. Max is originally from Chesterfield, Missouri, and Lindsey is from Newburgh, Indiana. After graduation in May 2018, Max will complete residency training at Aurora St. Luke's Medical Center in Milwaukee, Wisconsin. Lindsey will complete residency training at Barnes-Jewish Hospital in St. Louis, Missouri. Both plan to work in a hospital or clinic setting providing patient care within an interdisciplinary healthcare team. They both worked under the guidance of Dr. Patricia Darbshire to develop a website called "Study in a Flash." This tool is intended to enhance pharmacy students' ability to communicate medication information to patients and caregivers.

BACKGROUND

Pharmacists are tasked with the responsibility of assessing many different aspects of a medication regimen for safety and effectiveness, including the appropriate dose, dosage form, indication for use, possible side effects, drug interactions, and important patient counseling points. They must effectively communicate this information and their recommendations to the patient or patient's representative, as well as other health care professionals and insurance providers. To wield such a knowledge base and become adept at these skills in high-pressure situations requires a high level of student engagement and full attention to learning (Wang & Degol, 2014). Colleges and schools of pharmacy employ active learning, a variety of technologies, and alternative teaching methods to engage students in learning (Stewart, Brown, Clavier, & Wyatt, 2011).

Creating a competitive environment is one proposed method of improving effort-based learning and attention. Additional evidence is needed to assess the power of competition and its effect on effort and memory in realistic applications (DiMenichi & Tricomi, 2015). A literature search for the use of competitive games to boost engagement and effort provides some evidence of effectiveness.

Gamification can be a powerful method of stimulating learning—allowing students to have fun and offering learners a means to safely explore knowledge deficits and strengths in a timely manner (Cain & Piascik, 2015; Janssen, Shaw, Goodyear, Kerfoot, & Bryce, 2015).

Throughout any pharmacy curriculum, lectures focus on medication facts, highlighting distinctive differences and similarities among medications. However, at Purdue University, first-year pharmacy students have a unique opportunity to apply this factual knowledge through actual patient encounters in the Purdue University Pharmacy (PUP), with assistance from upper-level peer mentors. In this hybrid course, students combine this real-life experience with a small group recitation that emphasizes practical skills and provides opportunities for simulations. This fast-track course helps pharmacy students develop into strong practitioners with the skills to advocate and communicate effectively with patients.

This paper describes a unique tool developed and piloted specifically for this course. It is a website called "Study in

Figure 1 (banner image, above). Pharmacy student using course knowledge to educate a patient about their medication in the Purdue University Pharmacy.

a Flash,” intended to enhance students’ ability to communicate medication information to patients and caregivers, thereby providing a valuable public health service. The specific objectives of this project were to (1) assess students’ baseline study habits in this course, (2) develop a competitive learning tool to enhance study time, and (3) obtain feedback on the utility of the website. By meeting these objectives, the researchers obtained preliminary data on the utility of this competitive study tool to motivate learning material for this course.

METHODOLOGY

The Purdue Investigational Review Board (IRB) granted expedited approval for this research project. This website was developed in conjunction with the Engineering Projects in Community Service (EPICS) program at Purdue (EPICS, n.d.). EPICS is a service-learning design program in which teams of students from differing disciplines partner with the local community to address human, community, and environmental needs. Project ideas are submitted by shareholders in the community (in this case, the instructor in the Purdue University Pharmacy course) with the intent that the project would impact human services, access and abilities, and education and outreach. Teams are assigned to projects based on the students’ discipline and skill set, with the goal of connecting students in a mutually beneficial way that positively impacts the community. The student researchers and authors of this paper were past students in the first-year pharmacy course and identified the need to create this novel study tool to help other students learn more effectively and retain the information through reinforcement and competition. The authors provided the medication content and vision for the project, as they collaborated with engineering and computer science students who contributed the technological knowledge to build and troubleshoot the website.

The final product was a website called “Study in a Flash,” which contained facts about the top 100 medications dispensed in a community pharmacy setting. This included brand and generic names, dosage forms, available product strengths, usual adult doses, indication for use, side effects, and counseling points. Students review the information in flash-card format, take quizzes over the material, and, most importantly, challenge their classmates to compete through a timed-quiz format to see who can obtain the highest score. The ten-question quizzes are randomly generated from a pool of questions similar to those that students might see on a weekly quiz in this class. Decoy answers (distractor choices) are

What is the brand name of metoprolol tartrate?	What is the dose of Diovan for hypertension?
Lopressor	1 (75 mg) tablet by mouth daily
Prinivil	1-2 (37.5/25 mg) tablet by mouth daily
Maxzide-25	1 (80, 160, 320 mg) tablet by mouth daily (MAX: 320 mg/day)
Toprol XL	1 (12.5, 25, 50 mg) capsule by mouth once or twice daily

Figure 2. Study in a Flash example questions.

selected by an algorithm that removes duplicate answers and ensures that all potential answer choices fit the category of the question. After an answer choice is selected by the user, the correct answer is highlighted in green to provide immediate feedback to students. As shown in Figure 1, when a question is randomly selected, all answer choices arise from the same category, eliminating blatantly obvious incorrect distractors.

After finishing a quiz, a challenge request is sent to another player. When challenged, the new player takes the same quiz and the top scorer wins the round. The tool incorporates an active-learning style, a timed challenge with need for rapid recall, and the competitive aspect of challenging one’s peers. These features offer an alternative study method to help students learn and retain information while having fun.

Pilot sessions were conducted following three recitation sessions of different students. Prior to each session, the voluntary participants were emailed an overview of the website’s purpose as well as step-by-step instructions on how to use the tool. During the pilot, the student researchers provided a visual demonstration on how to use the website. Participants created an account, played through multiple quizzes, and challenged their classmates to at least one head-to-head quiz.

After using the website, participants completed a questionnaire where they provided information on their current study habits in the course and gave feedback on their experience with the website through a series of multiple choice, free response, and Likert-like scaled statements. An abbreviated synopsis of the questionnaire is provided in Table 1. De-identified information was collected after each recitation section and the data was analyzed and thematically reviewed.

Table 1. Synopsis of questionnaire.

Quantify your experience in a COMMUNITY pharmacy and provide a description (if applicable).
How much time do you usually spend studying for the PHRM 822 quiz each week?
How often do you study for the weekly quiz?
I estimate that I will retain _% of the drug knowledge taught in this course.
How do you normally study for the weekly quiz?
Would you be more likely to use a study method that is competitive in design?

*Likert-like statements used this scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

RESULTS

Seventy-four first-professional-year students volunteered to participate in the pilot and completed the questionnaire after using the tool. Results were delineated into three basic categories, including baseline characteristics, current study habits, and feedback after using the website. Regarding baseline characteristics, almost half of the participants (47%, $n = 35$) had no or very limited experience in a community pharmacy setting beyond shadowing opportunities. This is typical of an incoming pharmacy class. Thus, many of the medication facts covered in the class and on the website were relatively new knowledge and concepts.

Table 2 shows baseline study habits for the student participants. About one-third (32%) of students said they only studied once during the week for each quiz, with the majority of students (53%) studying for 1 to 2.5 hours per week.

Table 3 describes current study techniques employed by students in the course. The most common study techniques in order of prevalence include repetitively writing information down, mentally reviewing and then self-quizzing, and using an online study tool such as Quizlet. With their current method of studying, 41% ($n = 30$) of students predicted that their overall retention rate of information would be 60% or less.

Table 4 describes student perceptions of the study tool after at least one challenge game. The majority of students (70%) felt the study tool was fun and engaging, 73% agreed the tool was easy to use, and 69% said they would use the website as a study tool if it was regularly available. Based on Likert-type question responses (Table 3) and free responses, participants liked the novel concept of this tool's competitive design, its ease of use, and the multiple-choice question format. The most commonly cited areas for improvement included the capability to include variation in question format (20%) and better visualization of the correct answer (19%). They noted some difficulty with sending and accepting challenges (16%). Overall, 36% of the students stated they would be more likely to use a study method that is competitive in design, but 45% said they were unsure.

Table 2. Baseline of study habits.

Frequency Studied Per Week		Time Studied Per Week (Hours)	
Once per day	32.4%	< 1 hour	13.5%
Twice per week	47.3%	> 1 and < 2.5	52.7%
Multiple times per week	16.2%	> 2.5 and < 4	25.6%
Other	4.1%	> 4	8.1%

Table 3. Current study techniques.

Method	N	Students (%)
Repetitively writing down information	43	58.1%
Mentally reviewing and self-quizzing	42	56.8%
Online study websites (e.g., Quizlet, StudyBlue)	33	44.6%
Paper flash cards	22	29.7%
Quizzing/reviewing with peers	17	23.0%
Other	4	5.4%

Note: Students could select more than one method.

Table 4. Likert-like question responses.

	No Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The study tool is fun/engaging.	1.4%	0%	8.1%	20.3%	41.9%	28.4%
The study tool is easy to use.	1.4%	0%	10.8%	14.9%	36.5%	36.5%
I would use this as a study aid.	1.4%	0%	9.5%	20.3%	41.9%	27.0%
I would play this with my peers competitively.	1.4%	13.5%	14.9%	43.2%	21.6%	5.4%

REFLECTION AND IMPACT

Our objectives of this pilot project were threefold. The first was to assess students' baseline study habits in this course to determine if a tool intended to increase study time and frequency was warranted. The second was to develop a tool that was competitive in nature, which current literature suggests that students would enjoy using. Finally, we needed feedback from students on the utility of the tool to make improvements. These three pieces of information would provide us the preliminary data on whether to consider implementing this tool in the course in future semesters.

At the time the pilot was conducted, this course was assigned only one credit hour, as it was deemed "experiential." Since then, the course has been recognized for its hybrid nature of didactic, simulated, and real experience content, and thus it was assigned two credit hours. First-year pharmacy students carry a large load of rigorous courses. Therefore, it made sense for us to determine how much time they spent studying for this one-credit-hour course and the relative merit of taking more of their time, no matter how valuable the content. Although not necessarily true, students often equate the importance of material to the number of credit hours assigned to the course. Based on our results, we noted that about one-third of students studied only one day per week and for less than 1.5 hours per week for the weekly quizzes. Anecdotal comments indicated that many students study right before the class quiz (cramming facts), which generally allowed them to pass the quiz, but likely diminished their ability to retain information on a long-term basis. Roediger and Bulter (2011) demonstrated that practice retrieving information often produces large gains in long-term retention relative to just studying, and feedback enhances the benefits of testing. In addition, retrieval practice promotes the acquisition of knowledge that can be flexibly retrieved and transferred to different contexts. They concluded that the power of retrieval practice has important application in education. Long-term retention of material is critical for pharmacy

students who must successfully complete a state board exam at the end of their curriculum and apply this knowledge daily throughout their careers. Based on our findings, we believe students should study the medication facts more frequently to assist in long-term retention of knowledge. We feel this tool could encourage students to study more often, based on results that most students found it fun and engaging.

The results of the pilot demonstrate that most students predict their retention rates of class material on a long-term basis to be 60% or less. The course instructor indicated that final exam results obtained over several semesters averaged between 80 and 90%. Knowing that retention of material without continuous application decreases over time, the students may have been correct in their assumptions, not knowing what was to come in the curriculum. In reality, true retention cannot be assessed because medication knowledge is repeated in a variety of courses from differing perspectives, which would confound any attempt to determine true retention of the medication facts learned in this course.

The baseline assessment showed that most students use multiple study techniques to prepare for quizzes, and a large percentage of the students were already investing time to create their own online study tools using websites such as Quizlet. Nearly 70% of students agreed they would be interested in using Study in a Flash to learn new material, thus demonstrating perceived value.

The use of competition to incentivize students is not a technique commonly employed in the pharmacy school curriculum, and only a quarter of students felt they would use this tool in a competitive manner with their friends to study. Interestingly, 43% of students were neutral on using the website competitively; these may be students who could find value in this learning style with increased exposure.

While this website was designed and piloted specifically for a first-year pharmacy course, the concept and

functionality could be applied to any material requiring memorization and quick recall. Even outside of the academic realm, anyone interested in learning new subject matter could utilize the different functionalities within the website, such as flash cards, quizzes, and friendly competition. One potential group that may benefit from this type of tool would be patients newly diagnosed with a disease state. Health care visits are short and leave little time to discuss medical conditions, educate patients, and reinforce knowledge. Medical jargon can be foreign and overwhelming. If patients and their families were provided access to a mobile website or application where they could actively learn about their disease state and medications by playing games with each other, the information may seem less daunting.

The potential applications of this pilot website are numerous, but not without limitations, as technical challenges exist. The quiz generator does not always generate four answer choices, and the correct answer is not always revealed before moving to the next question. Text may appear differently on the screen depending on the web browser used, and the process to challenge one another was described by some students as cumbersome. In addition, the website could be more visually appealing. Although the participants were voluntary and

the pilot was not conducted by the instructor, they knew the project was potentially associated with their course. Potential types of bias could include social desirability, extreme responding, and demand characteristics, among others. A larger study size would provide more robust information and feedback. If the tool is employed in the future, the researchers suggest correlating website use with student quiz grades to help demonstrate the efficacy of using this competition tool to engage learners.

While reflecting on our experiences throughout this project, we realized how much we learned. Working as part of an interprofessional team was invaluable. We learned how to utilize the different team member skill sets effectively and respect each other's knowledge. Communication between different disciplines was difficult at times, but it taught us how to more clearly express our ideas. The project took much longer than expected, teaching us patience, as things often did not often go as planned. This project gave us an opportunity to take ownership of an idea and see it to fruition despite setbacks. We were motivated by seeing the potential long-term value not only to the students, but also to the ultimate consumer of pharmacy services—the patients and their caregivers. We believe we may be able to help fill a need in our community. We realized we have a lot more to

Figure 3. Lindsey and Max working on the Study in a Flash website.

learn about the effectiveness of different study tools that engage students, and we want to continue investigating how best to motivate students and promote learning.

CONCLUSION

Based on the results of the pilot, we believe Study in a Flash could be a positive addition to the common set of study methods pharmacy students use on a daily basis. As students proceed through the curriculum, courses become more rigorous. Therefore, students have an inherent desire to find new ways to maximize time spent studying. While the competitive aspect may not be the most compelling part of this tool, the pilot helped demonstrate the importance of finding engaging ways to help students study material more frequently to increase retention of content. We believe there may be additional uses for this website, including other classes and topic areas, as well as using it to help provide patient education about disease states. The content can be customized to meet the needs of any individual and can provide a fun alternative to current study methods.

ACKNOWLEDGMENTS

To our project and writing mentor, Dr. Patricia Darbishire; the coders and developers for the website, Xiangyu Li, Tanuj Rungta, and Rayten Rex; and to our fellow pharmacy classmates for participating in the pilot.

REFERENCES

- Cain, J., & Piascik, P. (2015). Are serious games a good strategy for pharmacy education? *American Journal of Pharmaceutical Education*, 79(4), Article 47. <https://doi.org/10.5688/ajpe79447>
- DiMenichi, B. C., & Tricomi, E. (2015). The power of competition: Effects of social motivation on attention, sustained physical effort, and learning. *Frontiers in Psychology*, 6, Article 1282. <https://doi.org/10.3389/fpsyg.2015.01282>
- EPICS. (n.d.). Welcome to EPICS. Retrieved March 21, 2018, from <https://engineering.purdue.edu/EPICS>
- Janssen, A., Shaw, T., Goodyear, P., Kerfoot, B. P., & Bryce, D. (2015). A little healthy competition: using mixed methods to pilot a team-based digital game for boosting medical student engagement with anatomy and histology content. *BMC Medical Education*, 15, 173. <https://doi.org/10.1186/s12909-015-0455-6>
- Roediger, H. L., & Butler, A. C. (2011). The critical role of retrieval practice in long-term retention. *Trends in Cognitive Sciences*, 15(1), 20–27. <https://doi.org/10.1016/j.tics.2010.09.003>
- Stewart, D. W., Brown, S. D., Clavier, C. W., & Wyatt, J. (2011). Active-learning processes used in US pharmacy education. *American Journal of Pharmaceutical Education*, 75(4), Article 68.
- Wang, M.-T., & Degol, J. (2014). Staying engaged: Knowledge and research needs in student engagement. *Child Development Perspectives*, 8(3), 137–143. <https://doi.org/10.1111/cdep.1207>
-
- Yang, M., Eble, L., & Darbishire, P. (2018). Leveraging technology: Enhancing study time through competition. *Purdue Journal of Service-Learning and Engagement*, 5, 54–59. <https://doi.org/10.5703/1288284316803>