EDUCATION BRIEF

Teaching About the Health Care Industry Through Gamification

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Objective. To describe and evaluate the impact of a competition on investment financial acumen, and its relationship with improved health care industry knowledge.

Methods. Students’ confidence on 19 specific areas was assessed by a survey before and after participation in the health care investment competition. Their performance was also compared to that of Standard & Poor’s 500 Index for Healthcare.

Results. Students’ self-perception on their knowledge of all 19 domains significantly increased after they participated in the health care investment competition. The average score to questions increased from 1.9 to 3.8. Thirty-eight percent of the students who participated in the competition outperformed Standard & Poor’s 500 Index for Healthcare in the duration of the competition.

Conclusion. Students at the University of Pittsburgh School of Pharmacy designed and implemented a novel way to teach students and faculty members about the business side of health care. The competition took the form of a competitive “mock stock market” style game and resulted in a marked increase in confidence in all observed areas. This increased confidence relates to the students’ increased knowledge in how the health care industry works from a business perspective.

Keywords: pharmacy education, investment, pharmacy business, gamification, industry

INTRODUCTION

In preparing pharmacy students to be health care professionals, the focus of training has long been on specific therapeutic techniques and the science behind the application of medications. While this reinforces the skills necessary to complete the basic tasks of a pharmacist, it ignores other important aspects of pharmacy as a practice. For this reason, the Accreditation Council for Pharmacy Education included non-therapeutic outcomes in the updated education standards. These outcomes mandate pharmacy schools to train students in leadership, management, and entrepreneurship, and can be related to the business side of the pharmaceutical industry. In this context, a method was developed to educate students about the current state of the pharmaceutical industry and the business of health care. This method was a fantasy investment league focused on health care investment.

The Biotechnology Investment Fantasy League was created with thorough consideration of the following principles: standard pharmacy education places a small emphasis on critical stakeholders in the health care industry whose needs must be addressed in the implementation of new therapies and practices; and that the information used by financial investors is used to address all players (stakeholders, customers, buyers, and end users) within an industry. When this understanding is translated to investments in health care, investment resources can be used to gain an understanding of all aspects of the health care industry.

The game-based delivery method was chosen because it overcomes the most important barrier in the implementation of a novel education topic, which is the lack of engagement. As described by Self-Directed Learning theory, adults are more engaged with learning if they can actively participate as an equal in an informal setting with a focus on problem solving. Grounding the learning in a competitive activity like a mock investment game organized by peers should allow greater engagement.

This fantasy investment league was created and administered by two students at the University of Pittsburgh School of Pharmacy and consisted of peers competing with each other in an informal environment outside the standard schedule of classes.

METHODS

All students and faculty members at the University of Pittsburgh School of Pharmacy were eligible to participate in the investment league. To participate in the competition, members created accounts on “Investopedia,” a platform where individuals can trade stocks that mirror...
the current market while possessing no monetary value. Each student was granted $50,000 to invest in this mock stock exchange. Investments were only allowed to be placed on health care companies, defined as a company where the majority income was generated through health care-oriented products or services. Successful enrollment was followed by a compulsory investment of at least half of the individual’s assets before a designated date, which ensured that the individual’s capital was actively influenced by the market. Students could buy, trade, or hold stocks in the companies of their choosing within the aforementioned health care company restriction. The competition was supplemented by weekly information sessions where the coordinating students would cover topics relevant to investing and the health care market in general. Topics discussed during the weekly meetings included: basics of the stock market, weekly industry updates, and how to evaluate a health care company. Educational resources were provided to all participating students. The winner of the competition was determined by the overall account value at the end of the designated term. Cash incentives were provided to the top 3 students. The prizes were $250, $100 and $50 for first, second, and third places, respectively.

Surveys were administered at the start and end of the investment game to evaluate the students’ knowledge and comfort with the financial investments and the health care market on a scale from one to five. The survey had 19 questions gauging the confidence of the participants in different areas of both investing and the health care field, including measures of the performance of a company, investing vocabulary, and financial knowledge. Participants were assigned anonymous identifiers, which were used to match responses on the pre- and post-surveys. These identifiers were handled by a third party to ensure that all participation in the survey remained anonymous to the survey administrators. The scores on pre- and post-surveys for each of the 19 questions, and for the mean of the 19 questions were compared using the Wilcoxon signed-rank test. To compare student performance with that of Standard & Poor’s (S&P) 500 Index for Healthcare in the same time period (September 16 to December 12, 2016), the percent return on investment (ROI) of each student and the proportion of students who outperformed this index were calculated. This study was approved by the University of Pittsburgh Institutional Review Board.

RESULTS

There were 54 students who enrolled in the competition, out of which 7 were excluded due to not placing investments by the required time. The mean ROI of the 47 remaining participants was -6.72% (SD 16.5); with the top performer achieving a return of 69.98% and the worst performer -57.7%. In the same time period, the S&P 500 Index for Healthcare decreased by 4.4%. Eighteen participants (38%) outperformed the S&P 500 Index for Healthcare.

Students’ responses on all 19 domains assessed by the survey significantly increased after participation in the competition (p values for each of the 19 comparisons <.05) (Table 1). The average score of the 19 questions included in the survey increased from 1.9 to 3.8 (p = .02) after the competition. A question that evaluated students’ knowledge on particular investment terminology, being the difference between growth stocks and value stocks, experienced the greatest improvement in score after the competition. It increased from 1.9 to 4.1 (p = .02). The improvement was lowest on the knowledge of vocabulary used to determine different types of investment markets (scores increased from 1.4 to 2.9), yet, it was statistically significant (p = .02). A particular strategy that was observed as a method of investing was the application of clinical knowledge gained from standard pharmacy education to the assessment of clinical trial outcomes. As the success of clinical trials has large implications on the stock valuation of a company, knowledge about current clinical trials provided positive insight on a student’s successful investment ability. Another outcome that was observed during participation in the investment league was an increase in student engagement in current events, and more specifically, the relationship between political events and the health care industry. This occurred as the outcome of the 2016/2017 election dramatically changed the investment atmosphere of the competition.

DISCUSSION

The Biotechnology Investment Fantasy League provided students and faculty members a new method to learn about the health care system and companies from a financial perspective. The provision of educational tools regarding investment can contribute to personalizing education, which is often limited by access to learning material. Both financial acumen and health care industry specific knowledge increased among participants. These insights can then be applied toward forming educated opinions regarding optimal careers in the health care industry.

This study had two limitations. First, market valuations are typically based on a long-term cycle, where the league participation is three months (one semester) in duration. This constraint may support large risky investments to make immediate stock rewards as opposed to long-term value investments. Second, the analyses were limited to a small study sample, and did not control for
potential confounders. In the future, it will be important to further analyze the improvement of students’ knowledge over a longer period of time, using a larger group of students, and controlling for potential confounders such as year of pharmacy school enrollment. Finally, it will also be interesting to assess how the improvement in students’ knowledge correlates with their performance in the investment league.

CONCLUSION
The success of the Biotechnology Investment Fantasy League in improving educational outcomes indicates the positive impact of this type of gamification. Continued implementation will further identify broad educational outcomes for participating students.

REFERENCES
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| I am confident in my ability to                                      | Pre-survey\(^b\) (N=47) | Post-survey\(^b\) (N=47) | \(p\) |
|---------------------------------------------------------------------|---------------------------|---------------------------|------|
| determine a company’s price/earnings ratio                         | 1 (1)                     | 3 (2)                     | .03  |
| determine a company’s earnings per share (EPS)                    | 1 (1)                     | 3 (2)                     | .01  |
| determine a company’s debt/equity ratio                           | 1 (0)                     | 3 (2)                     | .02  |
| determine whether a stock is a value or a growth stock             | 1 (1)                     | 4 (2)                     | .02  |
| determine whether a company is overvalued or undervalued           | 2 (1)                     | 4 (0)                     | .02  |
| explain what the S&P 500 is and how it relates to the general market | 1 (3)                     | 4 (3)                     | .02  |
| determine the success of a company vs. the entire industry        | 2 (1)                     | 4 (2)                     | .02  |
| determine the difference between revenue and net income            | 2 (2)                     | 5 (2)                     | .049 |
| explain FDA patent systems and how they affect companies           | 2 (1)                     | 4 (2)                     | .02  |
| research a pharmaceutical company’s pipeline                       | 2 (1)                     | 4 (2)                     | .02  |
| explain what an orphan drug is                                    | 3 (2)                     | 5 (1)                     | .02  |
| understand how a drug patent may be extended                       | 2 (2)                     | 4 (2)                     | .02  |
| identify the potential growth of a pharmaceutical company         | 1 (1)                     | 4 (1)                     | .02  |
| apply my knowledge to identify profitability of a product          | 2 (2)                     | 4 (2)                     | .02  |
| explain how to identify growth in a particular sector              | 1 (1)                     | 4 (1)                     | .02  |
| explain certain terms related to investing                         | 1 (0)                     | 3 (2)                     | .02  |
| explain how mergers/acquisitions/splits affects the consumer      | 1 (1)                     | 4 (3)                     | .02  |
| understand the technologies that are changing health care          | 2 (2)                     | 4 (2)                     | .02  |
| explain why companies chose to research certain drugs              | 2 (1)                     | 5 (1)                     | .02  |

\(^a\)All questions were in the form of Likert Scale evaluations. 1 = low confidence; 5 = high confidence
\(^b\)Results are expressed as median (interquartile range)