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Survey Research

Engaging the New Generation: A Study on Student Pharmacists' Views on the Effectiveness of Pre-Laboratory Video Tutorials in Pharmaceutical Compounding

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A B S T R A C T

In the rapidly evolving landscape of education, online learning systems have become a transformative force, aiming to provide accessible and inclusive education to individuals worldwide. The current generation of students has come of age in a technology-driven era, where digital influence plays a crucial role in shaping their learning journey. A comprehensive approach was taken to leverage the transformative potential of online learning systems and enhance the pharmaceutical laboratory course. During the APPE rotation, faculty and a PharmD student conducted a survey-based analysis to reduce face-to-face lecture time, improve flexibility, and alleviate stress for pharmacy students. Specifically, the College aimed to implement a flipped classroom model to improve learning outcomes and adopt the learning preferences of the new generation of students. Through survey questionnaires, we identified various kinds of learners and the impact of various learning methods on students' understanding and retention of pharmaceutical compounding skills. The findings revealed that a significant portion of the students identified themselves as kinesthetic learners (learning that involves physical activity, 58.5%) and visual learners (27.7%), while a smaller percentage (10.8%) believed that they learn best through reading and writing. Regarding the format of laboratory courses, the study revealed that a significant majority of students (64.6%) expressed a preference for watching pre-recorded laboratory video tutorials at home prior to attending face-to-face laboratory sessions. These findings provided valuable insights that can be used to enhance the design and delivery of tutorial videos, making them more accessible, inclusive, and aligned with the preferences of the new generation of students.

Keywords: Pre-laboratory video tutorials, Learning Pyramid, New Generation, Flipped Classroom, pharmaceutical compounding.

Introduction

Over the last two decades, compounding errors have led to severe consequences and fatalities in the United States.[1] These incidents are attributed to human error, lack of knowledge, poor skills, and retention in following proper procedures of the pharmaceutical compounding process.[2] The Learning Pyramid model suggests that students retain information better through active learning methods, providing a valuable framework for evaluating the impact of pre-laboratory video tutorials compared to traditional teaching methods.[3] The learning process in pharmaceutical

compounding requires a thorough understanding and retention of theoretical concepts and practical skills.[2,4] Laboratory experiences provide students with hands-on training opportunities to minimize risks and prevent the associated hazards in pharmaceutical compounding.

A comparative study published by the Universal Journal of Educational Research revealed that a video-based laboratory tutorial has higher student learning outcomes than conventional learning.[5] Another study conducted with 1089 general chemistry laboratory students indicated that using online pre-laboratory video tutorials has a substantial positive impact on student learning and the potential to alleviate the strain on institutional resources compared to face-to-face lectures.4 Similarly, another study suggested that students and instructors agree that pre-laboratory video tutorials help them better prepare for the laboratory sessions.[6] Furthermore, another study conducted in an orthodontic laboratory also demonstrated that instructional video tutorials are equally effective as live demonstrations in transferring skills and improving the learning experience for students.[7] Another study discovered that pharmacy students highly preferred and positively responded to the compounding videos available on their university website.[8] Another study, similar in nature, demonstrated that students prefer podcasts as an alternative or addition to conventional classroom lectures.[9]

Active participation in the learning process has been shown to enable deep thinking and long-term retention of knowledge.3 By incorporating pre-laboratory video tutorials based on the principles of the Learning Pyramid, students can be more engaged in the learning process, leading to improved comprehension and application of knowledge in laboratory settings. This integration of pre-laboratory videos as a flipped classroom model aligns with the evolving educational landscape, which requires adapting teaching methods to meet the needs and interests of the new generation of students.[10] Online and digital resources play a significant role in their learning journey. Traditional lecture-based approaches may not effectively engage these students, who thrive on interactive and visually stimulating content.[10,11] Therefore, we conducted a survey and reviewed research articles intending to implement a flipped classroom model in pharmaceutical compounding courses.

Methods

A Google survey was conducted among students enrolled at Appalachian College of Pharmacy (ACP) to collect and analyze the data; no identifying or personal data was collected from any participants. The survey aimed to explore and identify students' learning styles, preferred study methods, perceptions of pre-laboratory video tutorials, and the frequency of their utilization. The survey questionnaires consisted of multiple-choice questions and were distributed electronically to ensure widespread participation and convenience for the respondents. The target population for the survey included alumni who recently graduated and PharmD students who are currently enrolled at Appalachian College of Pharmacy (ACP). A total of six questionnaires were sent to address specific aspects of interest, including learning styles, study preferences, perceptions of pre-laboratory videos, and frequency with which students engaged with these videos.

Results and Discussion

A total of 65 responses were received and included in the data analysis. This provided a representative sample of the student population at ACP. The majority of respondents were P2 (second year) students, followed by the P3 (third year) students, and a small portion of respondents were alumni (recently graduated). A summary of the responses to the four main questions of the survey is represented in Figure 1.

In this study, 58.5% and 27.7% of respondents identified themselves as kinesthetic learners or visual learners, respectively. A smaller percentage (10.9%) indicated they learned from reading and writing (Figure 1, Q1). The total percentage of kinesthetic and visual learners (86.2%) suggests that students benefit from hands-on experiences, physical engagement, and visual aids, such as diagrams, charts, images, and videos. Regarding effective learning methods for understanding and

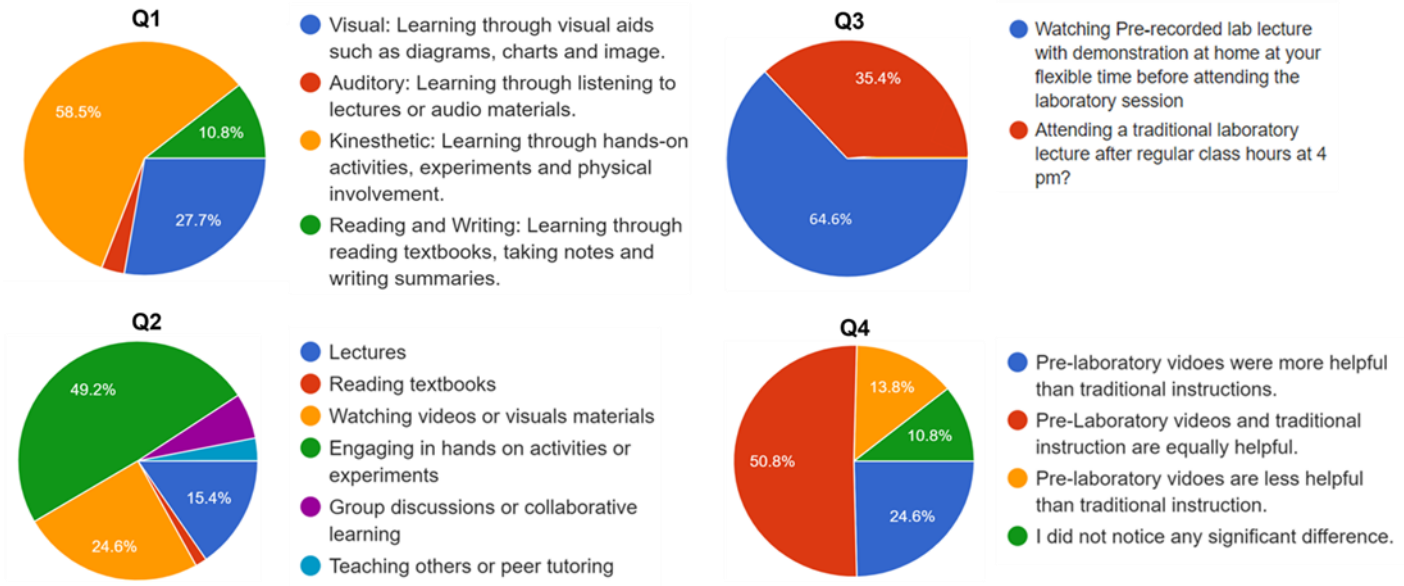

Fig. 1. A summary of the responses to the key questions in the survey

retaining information, 49.2% of respondents emphasized the importance of engaging in hands-on activities or experiments, and 24.6% of responses indicated the importance of watching videos (Figure 1, Q2). In contrast, only 15.4% of students found traditional lectures effective (Figure 1, Q2). This high percentage provides evidence that the new generation aligns with the previous studies that emphasized online and digital resources to improve learning and retention of pharmaceutical skills. This implies that this new generation of students prefers active learning approaches that involve practical application and visual aids rather than passive listening through conventional lectures.

When asked about the format of laboratory courses, the study noted that a significant majority of students (64.6%) opted to watch pre-recorded lab video tutorials at home before attending laboratory sessions, and only 35.4% of respondents preferred attending traditional laboratory lectures after regular class hours (Figure 1, Q3). This preference aligns with the concept of a flipped classroom model, where students are encouraged to acquire foundational knowledge independently before participating in interactive face-to-face sessions. In a flipped classroom, students are provided with pre-recorded lectures, videos, or other online resources to review before attending the laboratory sessions.[12] This allows students to acquire foundational knowledge, understand the theoretical concepts, and familiarize themselves with the procedures and techniques they will encounter during the hands-on activities. The strong inclination toward pre-laboratory video tutorials indicates that students value the flexibility and autonomy these resources offer. Most of the students who completed the survey mentioned that they watched these pre-laboratory videos before the laboratory session. In terms of enhancing understanding and retention of laboratory concepts, the survey suggests that only 13.8% felt the pre-laboratory video tutorials were not helpful. At the same time, a majority of students would be satisfied with pre-laboratory videos (Figure 1, Q4).

Conclusions

Students perceive these video tutorials as valuable resources that enhance their understanding and retention of laboratory concepts. The preference for pre-laboratory video tutorials and their flexibility suggest they can be a beneficial addition to traditional teaching methods. Incorporating pre-laboratory video tutorials as a partial flipped classroom model based on the principles of the Learning Pyramid model can potentially improve students' comprehension and application of

knowledge in laboratory settings. These study results also suggest that incorporating video tutorials in other pharmacy courses may improve learning outcomes and meet the needs of the new generation of students.

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Conflict of interest

The authors declare no Conflict of interest.

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