

# Influence of YouTube videos on the learning of tablet- and capsule-formulation by Malaysian pharmacy students: A pilot study

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## Abstract

**Background:** Pharmacy students at Monash, Malaysia, learn about the formulation of tablets and capsules through lectures (passive learning) and by making tablets in Pharmatopia (active learning). There is a gap between their active and passive learning as the students are not exposed to the real manufacturing process.

**Aims:** To study the influence of YouTube videos on student's learning about formulation and to fill the gap between active and passive learning through YouTube.

**Method:** Year-2 (n=27) and Year-3 students (n=45) were invited for this study. Lectures were delivered incorporating appropriate YouTube videos. Feedback from the students was collected using approved questionnaires.

**Results:** Students "Strongly agreed/Agreed" that the inclusion of YouTube enhanced the learning process. They also "Strongly disagreed/Disagreed" with the statements that opposed the use of YouTube ( $p < 0.05$ ). There were no significant differences in responses between Year-2 and Year-3 students.

**Conclusion:** Learning of capsule and tablet formulations could be enhanced through YouTube.

**Keywords:** YouTube, Learning Enhancement, Tablets, Capsules, Student Evaluation

## Introduction

Formulation of tablets and capsules are included in Year 2 of Monash B. Pharm curriculum under the drug-delivery stream. The context of this research is to study the influence of YouTube videos on the learning and understanding of pharmaceutical formulations such as tablets and capsules. The manufacturing of capsules and tablets is a complex process (Lachman *et al.*, 1991) and involves a variety of machinery. Students learn about formulation passively through lectures, and then complete a given task of manufacturing tablets with the desired properties in a virtual environment (Pharmatopia). Pharmatopia is a collection of web-based (<http://www.monash.edu/pharm/innovative-learning/technologies/pharmatopia>) interactive learning modules for pharmacy schools and industry. Active learning is achieved using Pharmatopia. Each student has to make a tablet of the desired property such as W% of friability, X amount of hardness, Y min of disintegration, and Z% of dissolution. Virtually, each ingredient (*e.g.* diluent, binder, disintegrating agent, and lubricant) is weighed, mixed, and compressed to develop tablets. Later, the tablets are (virtually) evaluated for friability, hardness,

disintegration, and dissolution. Students can change the percentages of these excipients in Pharmatopia and manufacture different batches of tablets until the desired properties are achieved.

Though Pharmatopia engages students in active learning, it lacks in mimicking the real manufacturing technology as well as machinery present in the industry and hence the students could not understand the process thoroughly. In addition, capsule manufacturing is yet to be added in Pharmatopia. There are some gaps to be filled between passive (lectures) and active (Pharmatopia) learning to enhance the learning process in tablet manufacturing. An industrial visit or a real demonstration would be a suitable alternative, but cost and availability are limitations; in Malaysia, hard capsule shell and soft capsule manufacturing industries are scanty. Inclusion of real videos showing these manufacturing processes could be an immediate and simple alternative to achieve the learning outcome. Though manufacturing aspects are presented in the lecture, information in the form of video is more interesting and easy to understand the facts, *e.g.* hearing the noise during tablet compression.

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Videos are considered as excellent media to enhance student learning (Lim *et al.*, 2006; Barabara & Russel, 2009; Youssef & Aspinall, 2010). Videos are expected to enhance students' understanding about the formulation process and machinery before they manufacture tablets in 'Pharmatopia'. Lectures followed by video and Pharmatopia could result in deeper and desired learning. Similarly, manufacturing of soft capsules and hard gelatine capsule shells are difficult processes, which need videos for better understanding. The benefit of videos in teaching pharmacy students is well documented in the practice and clinical perspective (Youssef & Aspinall, 2010; Butler *et al.*, 2013). No data are available in the literature regarding the influence of videos on learning about pharmaceutical formulations.

YouTube is an entertainment and social interaction website (Lance & Kitchin, 2007). With a search using a search engine such as Google<sup>®</sup>, one can easily find the desired video for learning. As the material is available for public broadcasting, there are no copyright issues, and it can be viewed, even using mobile/hand-held devices, as and when required. A tablet and capsule formulation search on YouTube (May 2014) resulted in 1430 and 661 videos, respectively. More options are available to select the most appropriate one to incorporate into the lecture. Instead of sending the whole video, a link of YouTube can be emailed or incorporated into the lecture, which makes the process simpler and easier. Students can view the videos as many times as possible. Recently, Chen (2013) indicated the possibility of applying YouTube to motivate self- and continuous learning. Panagiota & Christos (2010) evaluated the impact of video-based vs. traditional lectures on student learning and recommended the appropriate use of videos in teaching.

## Methods

Short YouTube videos (n=22) relevant to the learning outcome of tablets and capsules formulation are selected and incorporated in the lecture. The durations of these YouTube videos range from three to ten min. The videos were selected by the subject expert based on their content. Videos relevant to the learning outcome and lecture content were selected by a senior lecturer (one of the project investigators) who actually delivered the lectures to the students. Explanations were given at appropriate places while showing the video. A web-link was given to the student, and they were encouraged to watch the videos after the lecture (only applicable for Year-2 students). Videos show the following machinery and unit operation.

Tablet formulations: Cone blender, rapid mill granulator, Vibrio sifter, fluidised bed dryer, multi-station tablet compression machine, dissolution tester, disintegration tester, friability, weight/size variation, and hardness tester.

Capsule formulation: Extraction and quality control of gelatine such as bloom strength, iron content, and microbiological quality. Manufacturing of capsule shell from gelatine, capsule filling, and quality-control tests. Making soft capsules with different fill material.

A questionnaire as indicated in Table I was developed, and the approval was obtained from the Monash University Human Ethics Committee, Clayton, Australia, and the Campus Director, Monash, Malaysia, to collect feedback from the students. Two cohorts were invited to participate in the study. Group 1: Year-2 students currently learning formulation (n=27). About six lectures and 22 videos were delivered with appropriate explanations at a relevant part of the video. Group 2: Year-3 students (n=45) who have already completed the course. After a mini review of formulation (30 min), short YouTube videos were shown (n=10) with an explanation (30 min). The learning of tablet and capsule formulations is part of the course for Year-2 students and hence the maximum number (n=22) of videos was used during the lectures. Year-3 students had completed these topics when they were in Year 2. Only ten videos were chosen for Year-3 students as they participated for only one hour in this study. Year-3 students were used as the reference group and also to increase the number of participants. Students were invited by email to participate on a voluntary basis. Invitations were sent to 72 students (27 Year-2 and 45 Year-3) and all the students participated. As per the Ethics Committee directions, the following instructions were adapted to ensure a fair collection of the feedback:

- A. Email invitation carried a statement "the participation in this study is on a voluntary basis. Your decision to participate or not in the study will not affect your progress within the course/unit."
- B. The researchers involved in the pharmacy teaching were not allowed in the classroom when the feedback was collected.

After the completion of lectures along with the videos, approved questionnaires (Table I) were given to the students, and the feedback was collected. The participation of the student was anonymous; no personal data or identifying information was collected during the study. In the questionnaire, students were asked to rate 12 statements regarding the usage of YouTube videos using a five-point Likert scale (Strongly agree-Agree-Neutral-Disagree-Strongly disagree). The feedback received was statistically analysed to find the influence of YouTube on the learning of tablet and capsule formulation. Qualitative statistical tests were performed using the R-statistics to analyse students' responses based on the questionnaire. Significant statistical difference in the feedback between the study group (Year-2) and the reference group (Year-3) was analysed using the Chi-square test. The responses were regarded as significantly different when  $p < 0.05$ .

## Results

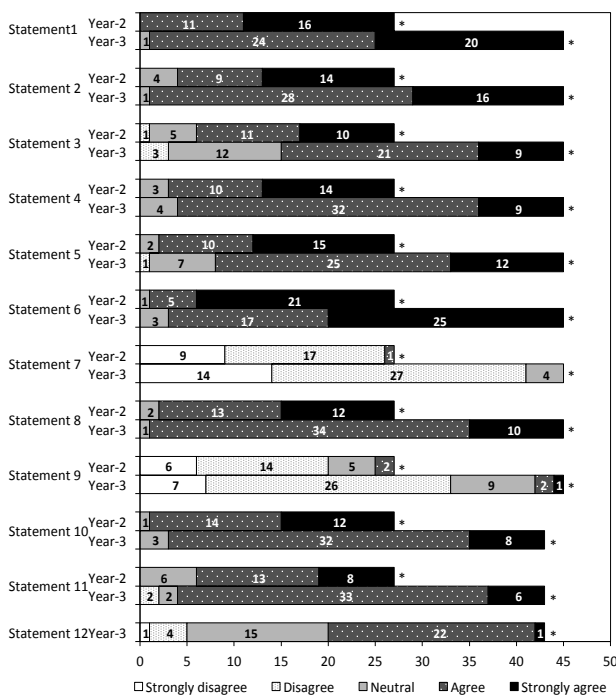
Year-2 and Year-3 (Figure 1) students significantly ( $p < 0.05$ ) responded as "Strongly Agree" or "Agree" to all statements (favorable statements for learning enhancement through video) except for statements 7 and 9. Students significantly ( $p < 0.05$ ) responded "Strongly disagree" or "Disagree" for statements 7 and 9

(statements against the use of videos in learning enhancement). There was no significant difference between the responses from Year-2 and Year-3 students (Figure 1).

**Table I: Questionnaire for student feedback**

Statement number	List of statements
1	The added videos are appropriate to the topic.
2	Videos enhanced my level of engagement with the lecture.
3	Videos stimulated further learning or reading.
4	Videos are essential in formulation lectures.
5	Videos assist us to learn better in less time.
6	The lecture should have both video and PowerPoints where the lecturer explains further.
7	The videos should not be used as they are not enhancing the learning process.
8	Overall, videos shown in the lectures enhanced my level of understanding.
9	Videos alone are not enough to understand the process.
10	Videos are useful to fill the gap between lecture (passive learning) and Pharmatopia (active learning).
11	Videos are helpful in remembering the facts.
12	If video was incorporated in the last year lecture, I might have achieved a better score in the final exam (only Year-3 student should answer this question).

**Figure 1: Responses of Year-2 and Year-3 students on each statement of the questionnaire. Responses in each year and responses between Year-2 and Year-3 were analysed by a Chi-square test. \* $p < 0.05$ .**



The present investigations focus on the influence of video on student’s learning about pharmaceutical formulations. We have observed student involvement, attention, and enjoyment during the lectures with the video session. Videos helped one to hear the noise generated during tablet compression and observe the dust formation in capsule filling along with dust control method in the manufacturing area. Soft gelatine capsule making is the most complicated process to understand through a lecture. However, videos made them comfortable, and the opportunity was provided by video to see various machinery.

Addition of videos enhanced the student’s exposure to the lecture topic and thus is useful in better achievement of learning outcomes. Students realised that the videos were helpful for their understanding; however, students thought that videos “alone” were not sufficient to understand a topic taught. Our findings also suggest that the videos selected for this study were appropriate for their understanding. Furthermore, Year-3 students might have understood better if they had the videos incorporated into their lecture. This investigation suggests that they understood some parts only after watching the video that they did not understand with the lectures alone. Our study showed that the videos were useful for enhancing students’ understanding of pharmaceutical formulations. Incorporation of videos into lectures needs to be skilfully tailored for individual topics. The videos with suitable contents and duration should be selected as well as shown at an appropriate part of the lecture along with an explanation.

The results of the present investigation were in accordance with the previous research conducted on the application of videos in teaching and learning (Azer *et al.*, 2012). Youssef and Aspinall (2010) have reported the enhancement of undergraduate pharmacy student’s learning in “Medicine Use Reviews” through video clips. Mitra *et al.* (2010) investigated the use of video in enabling deep learning in subjects such as English and Modern Foreign Languages, Geography/Archaeology, Media, and Cultural/Film studies. Research has suggested that video can be very useful for enhancing deep learning and for stimulating interest in topics. The feedback from students also suggested having a blended learning approach for deeper learning, which means inclusion of videos in the normal lecture along with active learning.

**Summary and Conclusion**

Tablet and capsule manufacturing are complex processes and involve machinery and critical formulation steps. Didactic lectures alone are not able to provide a complete understanding of the process. The analysis of student feedback about the incorporation of videos in teaching material indicated significant improvement in the learning process. Explanation of what is happening during the videos must be included for better understanding and deeper learning. Based on the results of our pilot study, we encourage lecturers to use appropriate videos in their teaching material where their inclusion will enhance learning and focus on a given topic.

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