

## Science Lessons for Non-Science University Undergraduate Students: An Application of Visual-Only Video Teaching Strategy

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**Abstract:** Smart classroom techniques and social media applications have become communication, teaching and learning method in the recent decade. In the current study, the researcher introduced a pilot study to evaluate how visual-only videos increase learning motivation, knowledge acquisition and learning experience for non-science undergraduate students taking a science module at university classrooms. The researcher has coordinated with a university instructor providing visual-only videos with normal lessons to 102 undergraduate lower-level students in a business-oriented programme for a semester-long pilot study. After the completion, the researcher invited the instructor and 30 students to individual interviews for the feedback and opinions. The result indicated that both instructors and students advocated the application of this five-step weekly video posting procedure was a key to increase the motivation and interests of learning.

**Key words:** Science lessons, science teaching, video teaching, visual-only video, classrooms, motivation

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### INTRODUCTION

Information technology, smart-classrooms and visual-applicable lessons are amongst the famous teaching and learning strategies used in contemporary universities (Alelaiwai *et al.*, 2015). Textbook publications have incorporated various visual content, video materials and online learning platforms to attract students with different learning styles. In fact, studies indicated that the application of videos, YouTube videos and supplementary videos for the textbook publishing companies are examined (Chawinga, 2017). Most students, regardless of age and background, tend to read the news and learn about current events from social media platforms such as Facebook and Twitter. Social media serves as the strongest channel for both students at traditional entrant age and returning students at the university level to exchange and obtain new knowledge outside of the classroom environment (Aguilar *et al.*, 2018).

More than two-thirds of social media platform users tend to watch videos without the sound on. In addition, most current social media videos and information-oriented videos tend to deliver their messages with brief keywords and sentences. Therefore, most video users accept and understand the nature and application of visual-only videos on social media platforms (Patel, 2016). Considering this in educational videos based on visual-only videos, detailed explanations and descriptions may not be essential for current university students, particularly regarding traditional-age learners.

Currently, most of the universities and higher education institutions in Macau SAR recommend their undergraduate students to complete a series of general education modules including: Computer Technology, Mathematics, Foreign Languages, Liberal Arts and Sciences. Although, general education modules do not cover in-depth information about their subject matter, non-science undergraduate students express negative feedback regarding the level of difficulty of science and mathematics modules (Bowman and Akcaoglu, 2014). In the current study, the researcher introduced a pilot study to evaluate how visual-only videos increase learning motivation, knowledge acquisition and learning experience for non-science undergraduate students taking a science module at a university in Macau SAR.

### MATERIALS AND METHODS

**Background information and background of the students:** The study took place at one of the universities and higher education institutions in Macau SAR. At the university used in this study, students must complete at least six credits in modules in the field of science and technology as a graduation requirement. Most of the students tend to complete these modules during their first and the second years of study. As a result, students who are enrolled in a non-science degree programme are still required to complete these modules. The researcher coordinated with one of the science instructors to create

48, 4 min science visual-only videos for students enrolled in one of the piloted modules who were asked to join a private social media chat group at the beginning of the module to engage with each other and share their opinions of the videos. Each student was asked to watch no more than 5 videos per week. During the weekly lessons, the students were required to share/demonstrate their knowledge of the visual-only videos as a team, except in the exam weeks and the review weeks.

In addition to the videos, students also needed to attend normal lessons as the videos were only supplementary materials. It is worth noting that, although, the visual-only videos were supplementary materials, the researcher aimed to investigate how these visual-only videos can increase the student's learning motivation, knowledge acquisition and learning experience and more, specifically how these videos can increase student's scientific knowledge beyond the textbook level and outside of the classroom environment.

For this pilot study, 102 undergraduate lower-level students enrolled in a business-oriented programme were engaged. None of the students had a background or taken modules in science subjects during senior-high school or university. At the beginning of the module, all of the students agreed to watch the visual-only videos as supplementary materials.

#### The design and characteristics of the visual-only videos:

Unlike instructors with a background in art design, some instructors may not have training in video production. In this case, instructors may capture pictures from textbook materials, lab experiments, natural environments, city settings and the internet. Details of the video designs were as follows (Ramsay *et al.*, 2012).

Targeted picture related to the chapter subject; Instructors can capture pictures which are connected to the chapter and case studies for the particular weekly lesson. Targeted picture. Control the duration of the video; Video should be kept under 4 min. One key piece of knowledge per video; As non-science undergraduate students usually do not have a solid understanding and background in science modules, each video should focus on a single point of knowledge. Obvious title and target at the beginning; Display an obviously related picture or present a simple statement within the first 10 sec of the video. Employ the same text fonts and sizes for the whole series; Employ the same text styles as video users could be confused by differing fonts and sizes. Uniform and standardised styles are useful. Third bullet. Post videos at least 2 weeks ahead; As some students like to watch the videos ahead of the relevant lessons due to a lack of science background, instructors should post videos at

least two chapters ahead. Encourage the students to comment on the video on the social media chat group forum; Students were asked to comment on the forum. Other students and instructors could respond to the questions and opinions of the students for further discussion during the lesson. The video content should be adjusted to the level and engagement of the students; Within the progress of the module, instructors should be aware of the learning experience and motivation of the students. Instructors should create the later chapter's videos according to the progress of the students.

Five weekly steps were recommended. First, instructors should post the visual-only videos (no more than 5/week) on the social media chat group at least 2 weeks ahead of the relevant lesson. Second, students are required to watch the videos. Third, students are encouraged to comment on the videos on the chat group forum. Fourth, both instructors and students may respond to the comments posted by the students. Last, students are required to share and comment on the videos as a classwork discussion. The five-step video posting procedure is given in Fig. 1.

The feedback and opinions of the instructor and students formed the key data in this pilot study (Merriam, 2009). Therefore, after the completion of the semester, the researcher invited the instructor for an individual, face-to-face, one-on-one interview. The interview lasted 84 min in total. Besides getting the feedback and opinions of the instructor, the researcher also invited 30 students who had completed the module but had not received their final grade reports for an individual, face-to-face, one-on-one interview. It is worth noting that in order to avoid bias and conflict of interest, the instructor of the module should not be involved in the interview. The student interviews lasted about 20-36 min. After the

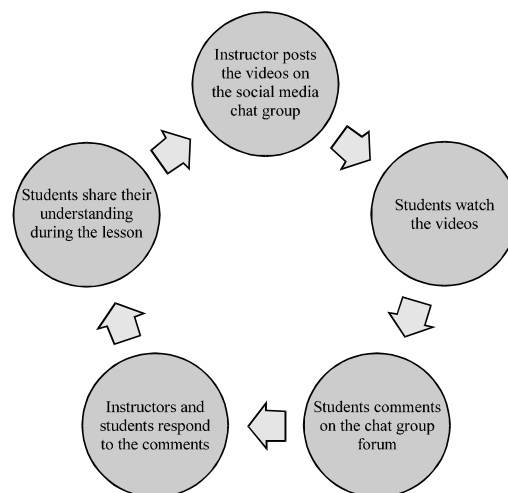


Fig. 1: Five-step weekly video posting procedure

interviews, the researcher narrowed the interview transcripts through first-level coding and second-level coding procedures to produce meaningful themes. As a result, 6 themes were categorised (Thomas, 2006).

## RESULTS AND DISCUSSION

After the semester-long pilot study of the science module for non-science undergraduate students with the visual-only videos on the social media chat group for viewing and discussion, both parties (instructor and students) expressed only positive feedback and opinions for this pilot study. The following section will outline the findings and results based on the instructor's and student's themes.

**The visual-only videos encourage daily learning:** First, as students without significant interest and motivation in science subjects, active discussions and sharing are uncommon. However, the concise and simple videos encourage students to learn a piece scientific knowledge with a short video which they can watch during their leisure time and then comment on or ask questions about on the forum. As the instructor said, "we encourage everyone to post questions and comments on the chat group, ..., it can be short."

**The posting of the video on a social media platform allows easier access:** Second, the instructor also indicated that students are able to access the videos without any further accounts or passwords: "the textbook has an online learning website but no students remember the user name and passwords, ..., the video posting on the social media platform allowed students to watch the video hourly" (instructor). In sum, the instructor strongly encouraged the application of the visual-only videos to be continued for the coming semesters as it could increase student's learning motivation and convenience of access.

**Allows us to watch the videos on mobile phones:** First, as non-science students, none of the students expressed interest in or motivation to learn the subject matter covered in science modules at the beginning of the module. As their motivation for learning science was low, several students indicated that they "will not search for and watch science facts, videos and news online" (Student #14). However, the visual-only video gave them an alternative way to seek science knowledge "for a short period of time" (Student #21). Several students further indicated that the visual-only videos usually show up on their social media chat group every morning, allowing them to learn about science as part of "my morning video" (Student #30).

### **Easy access from personal social media accounts:**

Second, more than 90% of the students indicated that they never accessed the textbook-provided online learning accounts as the access required more than five steps of activation. As one student said "[we] need to enter our email address, respond to the email, receive a random password, change the passport, go to the, ..., website [which involves typing a long and complicated URL address] and so on" (Student #3). However, once the students joined the social media chat group, they were able to use their personal accounts to watch the videos without further steps. As said by one student, "once I joined the chat group, I could watch the videos, no further passwords, etc." (Student #11).

**No pressures of learning and sharing:** Third, unlike quizzes and formal classroom discussions, the concise and casual feedback and opinions on the chat group forum allowed everyone to share and comment on the videos and each other's comments. One student said, "I do not need to write 50-100 words comments or respond to others, ..., if I like the video, I can just write several words" (Student #19). Furthermore, some others also believed the informal discussion chat group encourage them to make comments: "unlike the formal discussion board, I can write any comment without any pressure. I like this learning style" (Student #27).

### **The visual-only videos with single points of knowledge are clear to engage to lessons:**

Last, more than half of the students believed that visual-only videos were key in absorbing small pieces of knowledge. Several students indicated that videos with sound are usually in a language other than their native language: "most of the videos with sound are in English, I need to pay attention to listen to them" (Student #8). Some students also indicated that in the visual-only videos, the keywords and crucial knowledge were displayed textually. As said by one student 'what I should learn was written down why directed' (Student #5).

## CONCLUSION

First, the current pilot study was conducted with a small group of students in a business-oriented programme. Further research may be conducted with students in other faculties such as liberal arts, fine arts and vocational programmes which may result in different outcomes and feedback.

Second, the engagement of instructors could be another concern as not all instructors may be able to make the necessary time commitment for or have a

background in video production. If universities and training departments plan to expand this application to their students, teacher's professional development in video production and social media access should be introduced.

### IMPLEMENTATIONS

Third, the current pilot study dealt with science subject matter for non-science students. The design of the application could be changed for other subject matter with appropriate video designs (i.e., Foreign language learning for non-language-major students). However, in order to attract student's attention, appropriate pictures engaging students with the lesson knowledge, concise and simple keywords and a single key piece of knowledge per video are the key considerations when creating these videos.

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