STUDENT-GENERATED VIDEOS IN A MANAGEMENT INFORMATION SYSTEMS COURSE – FEASIBILITY, STUDENT ACCEPTANCE, AND GUIDELINES FOR TEACHERS

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ABSTRACT

As lessons were forced to switch to online or hybrid mode during COVID-19, educators need to apply tools to foster engagement inside and outside the classroom. Screencasting software enables teachers to evaluate students' learning outcomes in compensation for the lack of face-to-face interactions. This study investigated the use of student-generated videos to replace written reports in an information technology subject involving hands-on skills. The SGV can prevent plagiarism as it requires showing steps with verbal explanations. The multiple benefits of getting students to create their own content using video were supported by pedagogical theories such as multimedia learning theory (Mayer, 1997), VARK model (Fleming, 2001), and dual coding theory (Paivio & Clark, 2006). Furthermore, it can encourage students to practise their presentation skills and gain experience in video editing, which may also be helpful for their future careers. This research aimed to explore the feasibility of applying SGV in an information technology subject, and students' perception towards the assignment format, and provide some guidelines for teachers. This qualitative study involved 39 Hong Kong students. Their opinions were collected in a focus group after the subject had finished. We found that even though making SGV may require more time and effort, the students in the focus group agreed that SGV can better evaluate their understanding of subject knowledge. Based on the empirical findings, guidelines for teachers who want to use SGV in formative assessment were provided.

KEYWORDS

Computer Programming, Student Acceptance, Screencast, Student-Generated Videos, Teacher Guidelines

1. INTRODUCTION

Due to COVID-19, many lessons were conducted online, and many teachers were forced to adopt online teaching upon short notice, asynchronous communication is commonplace during remote instruction (Grieger & Leontyev, 2020). Many of them had no choice but to migrate their teaching face-to-face (f2f) strategies to a virtual environment. In reality, even when the format of examinations and tests must be changed so that students can do them at home, the content of many teaching activities and assessments remain the same as those for face-to-face classrooms. In either f2f or online mode of instruction, student assignments take up a significant part of the teaching and learning activities. In fact, the role of student assignments has become more important when students and teachers can only interact virtually. That is because in f2f teaching, teachers can get clues about students' understanding of the materials by looking at their facial expressions and observing their reactions during lessons. However, in most online teaching environments, the teacher cannot see and hear the responses of the students. The widespread use of technologies by students and teachers at home means that they can complete assignment tasks in ways that were not feasible before. In particular, student-generated video (SGV) is one of the emerging multimodal learning approach with students demonstrating their learning or perceived knowledge by submitting video assignments (Campbell et al., 2020). The following student-generated materials has been identified from literature:

Table 1. Terminology of student-generated materials mentioned in literature

Terminology	Citations
student-generated video	Balija (2020); Box et al. (2017); Doyle et al. (2020); Gelman & Tosone (2006); Grieger & Leontyev (2020); Omar et al. (2013); Pereira et al. (2014); Pirhonen and Rasi (2017)
student-created video	Benedict & Pence (2012); Campbell et al. (2019); Campbell et al. (2020); Cowie & Sakui (2020); Marley (2014)
student-authored video	Campbell & Cox (2018)
student-produced video	Hubbard et al. (2017)
learner-generated video	Orús et al. (2016)
learner-generated content	Lee & McLoughlin (2007); Snowball & McKenna (2017)

Video is an effective multimedia tool to promote student engagement in asynchronous learning settings. Apart from viewing instructional videos provided by the teacher, students could also share videos that contain useful information with the class (Bledsoe & Simmerok, 2013). SGVs have the potential to better ensure students' submission is their own work, and therefore, fairness in grading. Conventionally, teachers asked students to submit assignments in form of printed or electronic documents containing text and images. Ideally, after submitting assignments, students can get formative feedback to improve their work. Teachers who mark with pens preferred paper to electronic documents, yet the process of submitting and returning assignments inevitably required extra effort. Even with automated plagiarism detectors such as Turnitin™, it may not completely prevent internet-facilitated plagiarism. With online machine translation website such as Google Translate and DeepL, students can cheat the system through back-translation, such that both computer software and teachers can hardly identify (Jones & Sheridan, 2015). In an age where wide-range of digital content is easily available, students are tempted to borrow online materials without comprehension, which has become a universal problem. SGV may address this "Paste-without-understanding Syndrome", because the individualized process of show and tell involves attentive engagement. After all, true understanding is hard to guarantee, as in written reports, paraphrasing mostly reflects students' language ability. Computer programming requires hands-on demonstration instead of mere description, therefore, SGV can be an effective assessment format.

2. LITERATURE REVIEW

2.1 Benefits of using SGVs

The taxonomy of educational objectives proposed by Bloom (1956) was mentioned in SGV papers (Arruabarrena et al., 2019; Frenzel et al., 2013; Marley, 2014). The revised Bloom's taxonomy consist of six levels, namely remember, understand, apply, analyze, evaluate, and create (Krathwohl, 2002). Marley (2014) found that SGV not only reinforces lower levels of learning such as memory and comprehension, but also enables the highest level through producing original videos on new topics. Furthermore, the SAMR technology-enhanced learning framework by Puentedura (2010) examined the degree which technology create added value to a teaching approach. **S**ubstitution refers to technology acts as a direct tool substitute with no functional change. **A**ugmentation stands for substitute with functional improvement. **M**odification takes place when technology allows for significant task redesign. **R**edefinition involves the creation of new tasks which is previously inconceivable (Hamilton et al., 2016). This research involves redesigning traditional computer programming assignments which was previously inconceivable. It is because traditional computer programming assignments only submitted the programs and related output as text only. With digital technology available at every students' home, it is now possible to ask students to show the steps of their work at the computer, the process of using for official information on the Internet, and their own explanations of the steps that they were taking.

According to multimedia learning theory, multi-sensory learning design of SGV can generate better outcomes (Mayer, 1997). In dual coding theory, language (logogens) and a nonverbal stimulus processed differently by the brain; multimodal messages could enhance memory, comprehension, and deeper learning (Paivio & Clark, 2006). In the VARK model proposed by Fleming (2001), individuals receive information through sensory modalities and have preferences over the four perceptual modes of visual (V), aural (A), read/write (R), and kinesthetic (K). Traditional assessments rely on the single modes of read/write(R). On the other hand, SGVs covers the visual (V) and kinesthetic (K) modes. It may reduce the difficulty level of completing coursework for students who are less confident in written assignments.

2.2 Turn Students from Consumers into Prosumers of Videos

Millennials are characterized by digitally-oriented and fluent in multimedia, students nowadays are on the receiving end of live or recorded videos. Videos offer a faster, easier, and more digestible medium to convey a message to a large audience than written assignments (Thomas & Marks, 2014). There is limited evidence of learning-by-doing, which is based on the theory of constructivism for teaching and learning. Open digital content is widely accessible nowadays, students perceive low value in the rote learning of factual information, the true value of education is to empower students to become a "prosumers", who not only passively receive pre-packaged authoritative content, but also be able to engage in social processes of knowledge construction through guided learning materials, or even actively create their own content (Lee & McLoughlin, 2007).

Students can learn more if they create content. SGV creates situation of active learning, which is associated with the constructivist approach of learning by doing, which requires activities that challenge the learners to perform tasks to engage in their own learning (Bonwell & Eison, 1991). By involving behavioral, affective, and cognitive engagement, this approach could renew students' interest in a previously learned topic, inspire higher-level independent thinking, and motivate students to reflect on their personal learning experiences (Quinn & Chu, 2017; Winstone & Millward, 2012).

Some SGVs featuring students and other actors, or even in the form of mini-documentaries or role plays, could be effortful as it required a script, storyboard and post-production (Benedict & Pence, 2012; Frenzel et al., 2013; Gelman & Tosone, 2006; Marley, 2014; Ng & Nicholas, 2015; Pirhonen & Rasi, 2017). Negative feedbacks from students were mainly complaints about SGV assignments needed longer preparation time, in which they need to pick up skill unrelated to the subject (Omar et al., 2013). Video editing can be a time consuming and tedious process, for some students, it was even more challenging than the subject content itself (Campbell et al., 2020; Feijóo-García & Gardner-McCune, 2020; Quinn & Chu, 2017). Therefore, teachers may hesitate in asking students to submit videos as assignments, because they are uncertain if the students have the skills to create SGVs, and even if they can, it is uncertain whether students would perceive them positively. On the other hand, teachers cannot be sure if the schools' LMS can handle the submission of videos, and if they can view and mark the videos efficiently and effectively. Making videos with storylines contribute very little to technical disciplines such as computer programming. Screen capture could be a preferable option to remove such skill barrier, which may reduce the cognitive load required from students to produce SGVs (Rasi & Poikela, 2016).

2.3 Discipline-Specific Application of SGV

SGV can be applied in a wide range of subjects related empirical study, commonly found in the discipline of pure science, such as physics (Douglas et al., 2017), chemistry (e.g. Jordan et al., 2016), and biology (Pirhonen & Rasi, 2017). Multiple findings show that, by doing video lab reports, students were able to complete labs in less time and less dependent on the explanations from instructor and teaching assistant (Benedict & Pence, 2012; Box et al., 2017; Jordan et al., 2016). Campbell & Cox (2018) proposed the ICSDR model to guide the design of SGV assignments, the framework contains procedures of **I**dentify, **C**onceptualize/**C**onnect, **S**toryboard, **D**evelop, **R**eview/**R**eflect /**R**evise. The ICSDR method was applied by Campbell et al. (2020), in which video drafts were review and revise multiple times before the videos are finalized for publish, the experiment found improvement in students' self-efficacy in STEM content and cross-curricular technology skills.

In human-oriented subjects such as education, SGVs foster meaningful, assistive, and therapeutic discussions among student teachers. In healthcare subjects such as pharmacy (Frenzel et al., 2013), psychology (Gelman & Tosone, 2006), and social work (Quinn & Chu, 2017; Thomas & Marks, 2014). SGV usually incorporate the element of role play. Sharing of individual stories with a group of peers was found beneficial for alleviating pre-service teachers' emotional pressure (Ng & Nicholas, 2015). There were studies in Asian regions on SGV in English as a Second Language (ESL) courses in Japan (Cowie & Sakui, 2020) and Taiwan (Hung, 2016). Through producing speech video clips and oral feedback, students can improve their fluency and accuracy with frequent practices. Even when applied in non-language subject, Omar et al. (2013) experiment in Malaysia shows that SGV can improve students' communication and presentation skills in ESL context.

2.4 Research Gap

SGV is an emerging research topic, with most articles are published during the past 5 years, mainly examined the effectiveness of SGV to enhance the effectiveness of teaching at universities. Although SGV has the vast potential as an effective tool for enhancing learning effectiveness, there is a lack of sufficient research in this area. In particular, we found that most of the past research was mainly in the disciplines of science, the application of SGV in computer programming is under-researched, which Arruabarrena et al. (2019) from Spain is the only related publication in Q1 and Q2 journals.

It is obvious that the more video assignments are used, the more benefit they can bring to students. However, previous researchers did not always indicate the number of video assignments used. Only certain studies clearly stated the SGV being a one-off assignment (Balija, 2020; Campbell et al., 2019; Campbell et al., 2020; Frenzel et al., 2013; Omar et al., 2013; Orús et al., 2016; Pereira et al., 2014; Snowball & McKenna, 2017; Willmott, 2015). The use of one-off exercise limits the opportunity for the student to receive teacher feedback and reflect on their own work.

When using SGV as an assessment tool, teachers should create shared objectives with clear, achievable and valuable perspectives for students (Arruabarrena et al., 2019), instructions could be provided to students for reminding them about the purpose of SGVs (Thomas & Marks, 2014). At the initial stage, teachers may have to spend time to instruct students and motivate them to participate in the activity and supervising their progress. However, millenniums undergraduate students are "digital natives", in general, they familiarize with technology quicker than the older generations who are "digital migrants" (Ryan, 2013).

3.   RESEARCH QUESTIONS AND METHODOLOGY

3.1 Research Questions

The research questions for this study are listed below.

1. Is it feasible to use SGVs to teach an IT subject?
2. What are the student perceptions on SGVs?
3. What are the guidelines that can help teachers to use SGVs in their course?

3.2 Sample

The student in this research were studying in a university during their final year of study. They were taking a subject called Management Information System from September 2020 to November 2020. The class was planned as a face-to-face course, but it was forced to turn into hybrid lessons due to COVID-19 pandemic. There were 40 students at the beginning of the course, but 1 of them dropped out, so only 39 students finished the course. The duration of the course was 13 weeks. Students were required to submit two SGVs.

3.3 Methodology

Lessons were delivered in a hybrid format, meaning that students may choose to take the lesson in face-to-face mode on campus, or virtually using Microsoft Teams. All lessons were recorded as videos and available for students to review. There was an examination component which accounts for 30% of the subject grade.It was changed to an extra assignment, in which students had to provide written essays to answer some questions. There were 2 SGVs which accounted for 5% of the students' grades in the subject. The students were required to submit 2 SGVs in week 4 and week 11 on two programming tasks. Task 1 required students to submit a video of their programming using Visual C# in 2 minutes or less. Task 2 required students to submit a video of their programming using Python in 3 minutes or less.

Due to the exploratory nature of this study and small sample size, we use a qualitative approach. After students completed the course, and received their grades, they were invited to join a focus group discussion. They were informed that, their participation were voluntary and their responses will not affect their grades. The focus group was conducted in December 2020. Four students participated in the focus group discussion. The discussions were transcribed and sent to students for their confirmation.

4. FINDINGS AND DISCUSSIONS

4.1 Feasibility

We found that SGV as a form of assignment for programming tasks was technically feasible. For Task 1, the submission rate was 95%. Two of the 39 students did not submitted the assignment, and only 1 student missed the deadline by 42 minutes. One student submitted an image file only. For Task 2, the submission rate was 82%. All files submitted were videos. Seven of the 39 students submitted the assignment, and two student missed the deadline. Both students missed the deadline by about 4 hours. The submission rates and punctuality ratio were similar to the other assignments. Furthermore, less than half of the students used the screen capturing software demonstrated by the teacher. No students reported problems about creation or submission of the videos.

Table 2. Summary of Student Submissions of Video Assignments (m = minute, s = second)

SGV Topic	Video Length Limit	Submitted Video Lengths	File Size	% of Students who did not use Screen Capturing Software Provided by Teacher
Programming Task 1 – Visual C#	2 minutes	Longest: 3m56s Shortest: : 10s Average: 1m	Largest: 103 MB Smallest: 0.49 MB Total:541 MB	31%
Programming Task 2 - Python	3 minutes	Longest: 3m24s Shortest: : 16s Average: 1m10s	Largest: 105 MB Smallest: 0.41 MB Total:547 MB	13%

While these results show that using SGVs as assignments is technically feasible, there are some drawbacks as well. Moodle, which was the learning management system, and the students themselves, had no issues with the submission of videos. Many students even used screen capturing software that were not taught by the teacher. However, we found that some SGVs were low-resolution, silent, or too short. This shows that clear instructions must be given to students about the submission requirements. Also, it requires more effort from the teacher to grade the SGVs. These will be covered in the "Findings & Discussions" section below.

4.2 Student Perceptions

The transcriptions were read and re-read carefully by the investigator. It was found that the students had both positive and negative views about the use of SGVs to replace traditional written reports. The following are positive comments made by students:

1. *It is interesting and innovative.*
2. *It is better than writing a report on programming.*
3. *I must understand the program in order to explain it in the video.*
4. *I learnt a new skill of creating videos using screen capture software.*

The following is negative feedback from students:

1. *It is time consuming to retake the video when I said something wrong.*
2. *It is hard to find a quiet environment.*
3. *There are no good video examples to follow.*
4. *I need to put effort in picking up a new skill of video editing.*

All the students managed to complete the two videos. It showed that creating screen capture videos is not difficult for the students. However, the students in this study were all IT major students. That cannot be generalized to students from other disciplines. Furthermore, the need to learn the new skill of producing screen capture videos has both pros and cons. Overall, the students' acceptance was high, and because there were no problems reported and the anonymous course-end evaluation was at the same level as the previous class in which no SGVs was used.

4.3 Guidelines for Teachers

Based on the findings, the following are suggested guidelines for teachers who want to adopt SGVs as assignments in their lessons.

- Assignment Design:
  - The assignment should state clearly the purpose of video is to let them assessed in the most appropriate way. When students understand the purpose, they acceptance should be increased.
  - Students should demonstrate correcting common mistakes such as syntax errors.
  - Students should show the search for relevant information from official websites.
  - Students should show a list of the major steps. This will improve their organization skills.
  - Ask students to their program and program output side-by-side.
  - Set a time limit so that the SGVs received would not be too short or too long.
  - Set a limit on the submission file format and size.
  - Indicate clearly if the student should explain using their own voice.
- Student Support
  - Provide a sample video to show what an SGV submission should look like.
  - Give a checklist for students to review their recordings before submission.
- Feedback
  - Use rubric to show how SGVs will be marked.
  - State clearly if voice explanation is required.
  - State clearly if text explanation is required.
  - Produce sample videos that show good practices for students to follow.

5. CONCLUSIONS & SUGGESTIONS FOR FURTHER RESEARCH

We found that it is feasible to use SGVs to teach an IT subject. The students' perceptions on SGVs in this research were generally good as reflected in the focus group and post-course evaluations. There could be guidelines for teachers who want to adopt SGVs in their lessons. SGV can bridge the gap of students from

diversified background by addressing discipline-specific skills and content from understanding of theoretical concepts to practical application (Hubbard et al., 2017). With feasibility proven, teachers should consider using SGVs as one of the tools to enable blended learning.

We have the following suggestions for future research. Firstly, it is worthwhile to find out if the student performances correlate with their language grades. It would be unfair if a student's grade in a computer programming assessment is significantly affected by the student's language skills. Secondly, there should be study to investigate the use of peer review of SGVs. Vygotsky's, as in Jaramillo(1996), sociocultural theory stated that competent peers were learning facilitators. Besides, social interactions between peers elicit different perspectives about a problem (Jaramillo, 1996). However, the teacher must consider if students should show their names or speak during video. Also, the computer desktop of a student in his/her video may cause privacy concerns. Thirdly, as the marking of SGVs involves more effort than traditional assignments, it is suggested that artificial intelligence (AI) be used to "view" the SGVs to help spot problems and misconducts. Finally, although the technical feasibility is confirmed, the workload on the teacher and the gain in student performance needs to be further investigated.

There are certain limitations in this study. The dataset was relatively small, and the sample is limited to students who were IT majors. Students from other disciplines may encounter other difficulties in creating SGVs. Therefore, future studies should be repeated using larger sample size and involving students who are non-IT majors. Furthermore, the need to learn the new skill of producing screen capture videos has both pros and cons.

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