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Integrating Technological Pedagogical Content Knowledge into Video-Making Activities: Learning from Practice

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Introduction

In recent years, the inclusion of technology in the classroom is getting more extensive for the purpose of enhancing learning. The use of digital technologies for teaching offers benefits, such as promoting learners' autonomy (Fernandez, 2010; Hsieh & Hsieh, 2019), increasing students' motivation (Cooper & Brna, 2010), and facilitating collaborative learning (Calloway-Graham et al., 2016). However, these benefits require teachers to not only understand the technology itself, but also be aware of how to use it according to the learning objectives or instructional goals. Using technology without having clear instructional goals will only provide fun for the students. After the class, however, students may forget what they have learned with the technology. Koehler and Mishra (2006) emphasized that only introducing technology is not enough because teachers' knowledge of the content and pedagogy—teaching methods and practices—also play an important role.

Drawing from Shulman's (1986) idea of pedagogical content knowledge, Koehler and Mishra (2006) proposed the technological pedagogical content knowledge (TPACK) framework to embrace the integration of technology in teaching. They have argued that technology alone does not promote change, but it is the teacher's strategy which has a pivotal role in technology integration that can contribute to the improvement of the students' learning outcomes. TPACK covers three domains of knowledge, including content (subject matter to be taught), technology (digital media used for teaching), and pedagogy (strategies and method used for teaching) (Koehler & Mishra, 2005). After this idea was introduced, TPACK has been widely researched (Brinkley-Etzkorn, 2018; Nazari et al., 2019; Reyes Jr. et al., 2017; Tanak, 2020).

In the Indonesian context, TPACK has been studied by some researchers. Drajati et al. (2018) surveyed 100 Indonesian teachers about their TPACK literacy. They found that many of the respondents had applied technology in their classroom, but the TPACK term was relatively new for them. Nurhadi et al. (2018) showed from the results of their survey that most pre-service Indonesian vocational high school teachers had good skills in using technology, but more limited skills in teaching the materials effectively. Another study carried out by Koh et al. (2018) concluded that Indonesian teachers' understanding of TPACK could be developed through a multi-pronged approach. Most previous studies investigated teachers' perceptions, but rarely captured the TPACK implementation in the classroom. Therefore, little

is known about the detailed steps for implementing a TPACK-based lesson. In addition, TPACK research in higher education contexts is also limited (Reyes Jr. et al., 2017). The present study attempts to fill this gap. This study focuses on answering the research question on how a video-making activity promotes the development of pre-service teachers' TPACK and how the students respond to the task.

Method

The Study

This study employed a case study design. It enabled the researchers to capture the students' experiences during the implementation of VMA (Kusumaningputri & Widodo, 2018; Yin, 2003). This study was conducted in a state Islamic university located in South Kalimantan, Indonesia. Thirty-one university students (consisting of 7 males and 24 females) who enrolled in the Grammar III class were invited to be the participants in the study. Since they were majoring in English language teaching, they were expected not only to understand the use of grammar, but also how to teach it. The Grammar III class was the third in a series of four grammar courses offered in the English department. Topics learned in this class were the passive voice, gerunds, infinitives, noun clauses, and adjective clauses. Before attending this course, the participants had taken two grammar classes in the previous semesters. In addition, they also took a Teaching English as a Foreign Language (TEFL) course in the previous semester, so these students had knowledge about strategies and methods for teaching English.

Data Collection and Analysis

Observation was used to record the empirical data. One of the researchers was the lecturer of the Grammar III class, so she had access to observe all the activities in the classroom. The observation was carried out to capture the students' participation and interaction, and also to analyze the lesson. The observation was conducted for 10 weeks during the implementation of the VMA. The lecturer took notes on what happened in the classroom in her teaching journal.

Students' work artefacts (the video product) were also collected to observe what they have learned. The artefacts helped the researcher to identify the students' ability in utilizing the video editor, their understanding toward the subject matter, and their strategies to include instructional benefits. In addition, interviews were also employed to get detailed data of the students' responses toward the VMA. Prior to the data collection, all participants were asked to provide their consent. They were informed that all data in this research would be reported in a publication. They, however, understood that they would remain anonymous to keep their privacy. The researchers also had asked permission to collect and use their video products for analysis and as examples displayed in the report. All the data gathered from observations, students' work artefacts, and interviews were transcribed and analyzed qualitatively using content analysis techniques (Mayring, 2000).

Findings and Discussion

The findings are divided into two themes to answer the research questions in this study: the implementation of the VMA and the students' responses toward the task.

The Implementation of the VMA

Before further discussing the VMA implementation, it is better to define what VMA in the present research is. The VMA was adapted from Harmer's (2001) idea about grammar lectures. A grammar class is frequently associated with being a boring subject, which requires the students to listen to the teachers explain language rules. Harmer suggests that students in a more advanced grammar class can be requested to make a video lesson for teaching their classmates. This kind of activity can trigger students to be more creative in learning the grammar concept, so their engagement during the course can be maintained. Inspired by this idea, the VMA was modified by adding some activities to promote not only the students' knowledge about the video making, but also knowledge about the grammar topics and the way to present them appropriately.

The first step was establishing the students' content knowledge (CK). University students were expected to be more autonomous learners, so they were grouped (consisting of three or four students) to study a grammar topic assigned to them. In the first meeting, they were told about the VMA and the purposes and goals of the project. After that, they were required to make a summary of the topic. In addition, they needed to create a worksheet as a means to measure their students' (audience) understanding after the video presentation. In the second meeting, the students were scheduled to have a consultation with the lecturer. The purpose of the consultation was to make sure that the students had a good understanding of the grammar concept they were going to present. In the meeting, each group explained their summary and worksheet.

In creating the groups, the lecturer was concerned with making sure that everyone in the group was active. Borrowing Widodo's (2016) ideas for assigning students into a certain role, the lecturer asked one of the group members to be the leader. The leader had a responsibility to share every member's job description. The leader needed to report to the lecturer what was done by every student during the video creation. Based on the report, they shared their roles into these three categories: the planner (to summarize the materials), the video maker (to create the video), and the presenter (to lead the presentation). Although each member had their own responsibility, they were encouraged to work collaboratively.

The second step was video making. In this stage, the students were exposed to several examples of grammar lecture videos. The examples were mostly taken from YouTube. They were also told some principles for effective educational videos. According to Brame (2017), three elements to consider in developing educational video are: cognitive load, students' engagement, and active learning. Simply, cognitive load principles require the video designer to manage the intrinsic cognitive load in order to ease the information process. Intrinsic cognitive load refers to the efforts made by the learners to understand the complexity of the tasks or the concepts being introduced (Paas & Sweller, 2014). Thus, new and complex information should be split into chunks, so learners can easily understand the concepts. Using keywords, eliminating complex background, and structuring the video are some strategies for meeting this principle. Students' engagement can be maintained by making the video duration brief. Last, complementing the video with interactive questions is one technique to make the students experience active learning during the video presentation. Inserting some questions during the video presentation can give a testing effect, which will require the students to recall information from what they have watched. By giving questions, it will add the amount of interaction which eventually will help to build a conducive classroom atmosphere (Truong, 2021). In addition, these questions can serve as a self-assessment for students to measure their understanding of the presented grammar concept.

The interaction between technological, pedagogical, and content knowledge were emphasized in the video making step. Knowing how to edit the video was not enough because the presenters also need to consider that their content was well presented and engaging for the students (audiences). For this purpose, the lecturer acted as the facilitator who assured that the students' grammar video concept met the principles of effective educational video as mentioned above. She made a simple guide that the video

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should consist of at least three parts: explanation of the grammar concept, examples, and exercise. Figures 1, 2, and 3 are an example of the students' work.

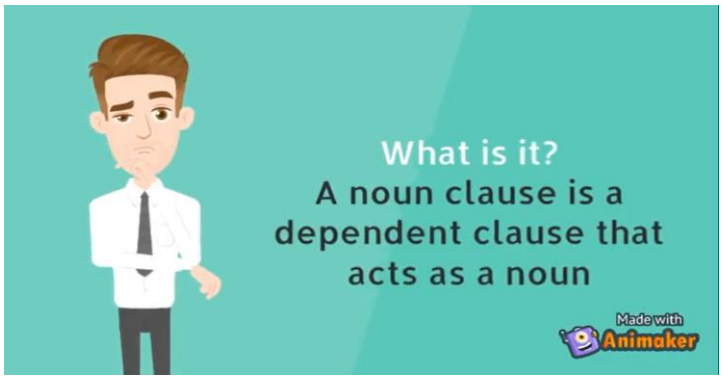

Figure 1. The explanation of the grammar concept.

Figure 2. Examples for the grammar topic explained.

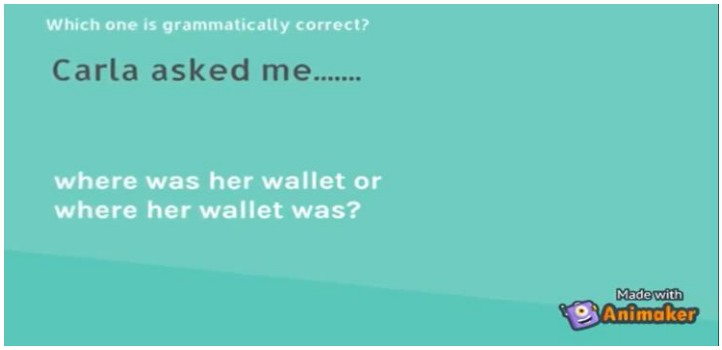

Figure 3. Exercise for the grammar topic explained.

This video making stage needed three weeks to complete. The first week was used to explore some examples of videos, to give a lecture, and to have a discussion on effective educational videos. The second week, the students experienced the video making process and the third week was for consultation as well as revision (if necessary). The duration of the video was limited to 10 minutes maximum and 5 minutes minimum. This brief duration was set to satisfy the engagement principle (Brame, 2017) and was intended to prevent the audiences from getting bored while watching a long grammar video.

After the video was made, the next step was the video presentation. This activity aimed to promote the students' pedagogical content knowledge about how to deliver the materials and assess their students'

comprehension. Each group spent 10 minutes displaying their videos followed by 20 minutes for the exercise. In the exercise, the audience participants completed the grammar worksheet. Next, the presenters invited their classmates to check their answers and hold a discussion. After the presentation, if the time allowed, the audience still had the chance to ask some questions to the presenter about the grammar topic. This activity was considered time consuming because it took five meetings for all groups to present their videos. Therefore, in future implementations of this VMA, it is recommended to take this step into the flipped classroom concept. The students can watch the video at home, so the class activities can be focused on helping them do tasks.

Last, after the presentation, each group received feedback from the lecturer and the students (audiences). The purpose of this activity was to improve the quality of their presentation performance and their videos. Each student had a simple rubric to assess the presenter's performance. This rubric was in the form of a Likert-scale which asked their agreement with four presentation elements: 1) whether the grammar topic explained was clear, 2) whether the video presentation was interesting, 3) whether the whole presentation helped them to learn the grammar, and 4) whether the exercise was given appropriately to assess their grammar comprehension. The scale was set from 1, which meant *strongly disagree*, up to 4, which meant *strongly agree*. They also could provide written comments in the rubric. After each student filled in the rubric, they gave it to the presenter. This activity was designed to keep every student in the audience actively involved in the lesson, not only the presenters. At the end of the lesson, the presenter also received some comments from the lecturer. The rubric for feedback is presented in Figure 4.

Presenter :
Topic :
Direction:
While watching the video presentation, please give rating. You can give a mark (X) on the column for the rating. This is the meaning of each score.
1 = strongly disagree
2 = disagree
3 = agree
4 = strongly agree

	Rating			
Statement	1	2	3	4
The presenter explained the grammar concept clearly				
The video presentation was interesting				
The video presentation helped you to understand the grammar concept				
The exercise provided by the presenters appropriately measured your grammar comprehension				

Do you have comments to improve their video presentation? Write down here.

Figure 4. Rubric for audience feedback.

Based on the lecturer's observation notes, not all activities ran well. There were also some problems during the implementation, including some audiences only enjoyed the video presentation, but not the follow-up activities. Some students were still passive in the after-presentation activity. Some of them were reluctant to ask questions. When this situation happened, it was the lecturer who raised questions regarding the topic explained. Although in the follow-up activity the students were asked to answer the grammar worksheet made by the presenters, the lecturer felt that asking questions was still necessary to

make sure that they understood the materials. In addition, she also recognized that not all groups followed her suggestions for the video revision. Consequently, some videos did not meet the expected criteria.

Apart from those facts, it can be noticed that the VMA activities in this classroom-based study reflected the integration of technological pedagogical and content knowledge (TPACK). The summary of how each activity promoted the TPACK elements is presented in Table 1.

TABLE 1
The VMA Activities and the TPACK Elements' Representation

Stage	The VMA activity	TPACK representation
1	Writing the summary of the materials and creating the worksheet	This activity established the students' content knowledge (CK). Their mastery toward topic assigned was a requirement in this stage before they could make the video.
2	Video making activity	This activity facilitated the students to better understand the pedagogical (PK) and technological knowledge (TK) integration in creating teaching media. They had to apply the principles of effective educational video as well as to learn the technology for editing the video.
3	Video Presentation	This activity introduced the students to the integration of TPACK in teaching. At this stage, the students should plan the steps for the video presentation; from engaging the students during the presentation until measuring their comprehension by giving exercises and the grammar worksheet.
4	Feedback session	This activity informed the students on the quality of their grammar lecture video (TK & CK), the presentation (TPACK), and the assessment (PK).

The Students' Responses and the Growth of Their TPACK

The students' responses were gained from the interview session. For this purpose, the researchers recruited six students who voluntarily gave their consent to be interviewed. The semi-structured interview asked some questions regarding the learners' experience and responses toward the VMA, such as what apps they used to make the video, what efforts they made to meet the lecturer's expectation for the video, and what benefits they got from this activity. To keep their privacy, all names mentioned in this research were pseudonyms.

Regarding the video editor, those six students mentioned various applications such as Filmora, KineMaster, VideoScribe, InShot, and Animaker. These answers reflected the participants' familiarity with video editing applications and had good digital literacy, so they could operate the applications. This result supports the findings in Drajati et al. (2018) that most Indonesian teachers, including the pre-service teachers, are able to use various digital media tool in their classroom. In excerpts from the interviews, Amara, Amir, and Amran relate their efforts to make the video.

> *I think a good video should* ***be interactive*** *and* ***support the students' learning****. I made the content of the video* ***simple*** *and* ***easy to understand****. To make the video interesting* ***I learned how to edit****. Before creating the video, I* ***discussed the materials with my group*** *and* ***read from credible sources****. We* ***needed to make the students active*** *and we* ***should not explain wrong grammar concept****.* (Amara, Interview data)

> *I used Filmora to edit the video. Before,* ***I had known how to edit a video****. A good video, for me,* ***should be brief*** *and* ***explain the materials simply*** *and* ***easy to understand****. Therefore, before making the video, I* ***attempted to simplify my explanation****, so the audience could understand it at ease*. (Amir, Interview data)

> *I think the* ***maximum duration of good video for teaching is 10 minutes****, **to keep the students' attention**. I **used music background to make the students feel relax** while watching. Our video should be **interesting so the students engaged during the lesson**. Besides, **it is important to learn the content before making the video***. (Amran, Interview data)

Analyzing their answers, we can recognize that the VMA was able to change the student beliefs in using technology for teaching. Amara and Amran's efforts to learn the grammar before making their video showcase their understanding that effective use of educational technology should be accompanied with a good understanding of the content (Koehler & Mishra, 2006). Their answers that a good video should be brief, simple, interesting, easy to understand, and should actively involve the students reveal their understanding toward the pedagogical content knowledge and reflect their knowledge of the principles for effective educational videos. Both types of knowledge should be possessed by a teacher so they would be able to create or select a video for instructional purposes.

Koehler and Mishra (2006) argued that the three components—content, pedagogy, and technology—should not be taught separately or it would be ineffective. Pre-service teachers should be exposed to experience the integration of TPACK to support them in integrating those three elements in their lessons. Moreover, students today are very familiar with technology, so knowing how to use it appropriately in the classroom will help the teachers keep the learners engaged. Supporting Reyes et al.'s (2017) recommendation, it is very important for university lecturers to introduce TPACK to pre-service teachers. In the future, the learning environment will be more technology-based, so we need to prepare them from now.

Conclusion and Implication

The VMA has four teaching steps: 1) establishing the students' content knowledge, 2) the video making stage, 3) video presentation, and 4) feedback. This study showcases findings that VMA enables pre-service teachers to enact the TPACK concept into their grammar materials presentation practice. The students become aware that a grammar lecture video should take some considerations from the content and pedagogical aspects to enhance the student learning outcomes. By implementing the VMA in a grammar class, pre-service teachers do not only learn the grammar topics, but also experiment with how to teach them through technology.

This classroom-based study provides practical implications for the teaching of grammar at the tertiary level. Teaching grammar using VMA offers some benefits. First, it pushes the students to be more autonomous in their learning. Second, the VMA can trigger their creativity as well as fostering a better comprehension toward the content because they need to teach it to their classmates. Lastly, the VMA can be a suitable alternative for university teachers to promote TPACK in their grammar course.

This study also highlights the importance of university teachers' role in introducing the TPACK concept to their students. TPACK should be introduced by treating the content knowledge, the pedagogical knowledge, and the technological knowledge in an integrated manner. Therefore, university teachers can look for strategies for teaching grammar which not only require them to read and listen, but also to explain and to teach. In addition, integrating technology into lessons can help students to be more technologically literate, which has become an important 21st century skill.

The findings in this study support some recommendations for teachers to integrate TPACK into their classroom projects. When assigning a project related to the use of technology, it is important to consider the students' knowledge about the strategies to use it, not only to know the technology itself. Pre-service teachers need to be exposed to the principles of effective educational use of videos. During the COVID-19 outbreak or for the purpose of distance learning, a project-based classroom using VMA can be an effective alternative because it offers flexibility in learning. The students will discover the knowledge themselves, since the role of the teacher here is more of a facilitator. What teachers need to do is to plan careful steps for them on what to learn and what to do.

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