5 Do EFL teachers transform their teaching with iPads? A TPACK-SAMR approach

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Abstract

Over the past decade, there has been an increasing interest in research on teacher knowledge about technology integration, namely Technological Pedagogical Content Knowledge (TPACK). However, few studies have investigated how teachers transform their teaching with technology. To fill this gap, the present study adopted the Substitution, Augmentation, Modification, and Redefinition (SAMR) model to investigate the degree to which four Taiwanese English as a Foreign Language (EFL) teachers enacted their TPACK in the context of teaching English with iPads, as well as identified contextual factors that might influence the levels of their TPACK enactments. Results suggested that, although some of the teachers' iPad-based teaching indicated their competency in transforming their teaching, their teaching was predominantly enhanced by the tablets as a substitute to deliver linguistic input to their students in conventional teacher-centred classrooms. In addition, students' access to iPads and a wireless network was considered essential. This technological problem might constrain the teachers from enacting TPACK towards the higher levels of the SAMR scale. This study contributes to the literature on TPACK by providing empirical evidence on investigating the levels of TPACK enactments using the SAMR model.

Keywords: technological pedagogical content knowledge, SAMR, contextual factors, iPads.

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1.   Introduction

1.1.   iPads in EFL classrooms

Mobile technology has increasingly been applied to student learning in the classroom around the world. Student learning can be enhanced via a variety of apps, such as dictionaries, reading, writing, graphic organisers, note-taking, multimedia production, and communication. Within this framework of Mobile Assisted Language Learning (MALL), mobile technology can contribute to language development of vocabulary (Lin & Yu, 2017), grammar (Khodabandeh, Alian, & Soleimani, 2017), reading (Lin, 2014), listening (Hsu, 2015), speaking (Sun et al., 2017), and writing (Eubanks, Yeh, & Tseng, 2018). By embracing MALL, teachers demonstrate that they are keen to integrate mobile technology into their teaching (Hsu, 2016; Young, 2016). However, they face technological and pedagogical challenges when applying it to teaching practices (Burston, 2014). To address the issue within the current context, the present study created a teacher community in which four Taiwanese EFL teachers shared their ideas and discussed their experiences with peers about enhancing English teaching with iPads. In fact, this intervention involves the enactments of their knowledge about integrating iPads into teaching, i.e. teacher knowledge specifically known as TPACK, which is critical to the adoption of MALL (Hsu, 2016).

1.2.   TPACK

TPACK was proposed by Mishra and Koehler (2006) to describe teacher knowledge in relation to integrating technology into teaching and learning. TPACK deals with how teachers develop their understanding of applying technology to the teaching of subject-matter content in an appropriate pedagogical manner. This process involves the interplay among the three bodies of core knowledge (i.e. technological knowledge, pedagogical knowledge, and content knowledge), as shown in Figure 1.

Investigating TPACK is a continuing concern within teacher education. Many researchers have been exploring how teachers enact and develop their TPACK

(e.g. Hao, 2016; Hsu, 2016; Koehler, Mishra, & Yahya, 2007; Niess, 2011). For example, Hutchison, Beschorner, and Schmidt-Crawford (2012) investigated the possibility of enhancing literacy instructions with iPads. Oriented towards the TPACK model, a fourth-grade teacher was guided to examine how she achieved curriculum objectives in iPad-based teaching with concerns about using iPads to teach what content, in what pedagogical ways, and with what apps to support student learning. Consequently, it was found that iPads not only contributed to student engagement but also facilitated students to learn in unique, creative ways. This study revealed how the teacher applied her TPACK to teaching literacy with iPads. However, this line of TPACK research failed to indicate whether technology helped teachers transform their teaching. Little was known about the degree to which teachers transformed their teaching using technology. To address this problem, Puentedura's (2006) SAMR model was adopted in the present study because this framework could help differentiate the levels of four Taiwanese EFL teachers' TPACK enactments in their iPad-based English teaching.

Figure 1.   TPACK model[2]
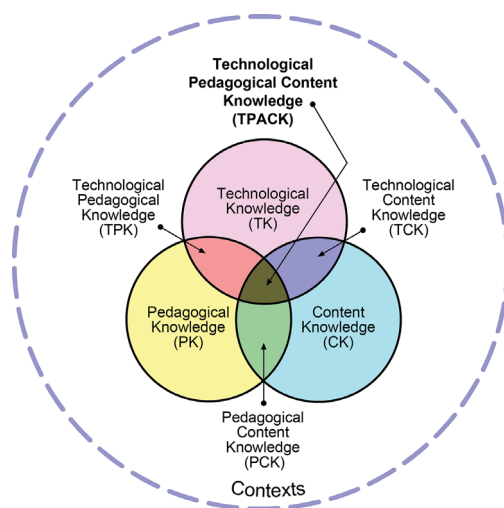
1.3.   The SAMR model

Developed by Puentedura (2006), the SAMR model is intended to describe the levels of technology integration into teaching and learning: *substitution*, *augmentation*, *modification*, and *redefinition*. As illustrated in Figure 2, *substitution* refers to technology as a substitute without functional change; *augmentation*, as a substitute with functional change; *modification*, as a tool for redesigning tasks; and *redefinition*, as a tool for creating new tasks. For example, an online version of printed reading texts is an example of substitution; dictionary search embedded in the online reading texts is an example of augmentation; multimedia software used to annotate the online reading texts is an example of modification; mind-mapping software used to display the visual aspects of the reading texts is an example of redefinition. It is assumed that teachers use technology more effectively at the levels of modification or redefinition, as opposed to the levels of substitution or augmentation.

However, problems with differentiating the SAMR scale occur. Hamilton, Rosenberg, and Akcaoglu (2016) noted that the SAMR model did not take into account the context in which technology integration occurs. For example, they indicated that a computer supported investigation in a science class may be considered a case of transformed learning, but in practice such design is not feasible to ten students working on a single computer in a poverty-stricken school. The inclusion of contexts into the applications of the SAMR model could prevent researchers and teachers from over-generalising their prescriptions of technology integration.

In addition, Hamilton et al. (2016) also commented that the SAMR model views technology integration as a simplified process in which learning products rather than learning processes are emphasised. In this sense, they exemplified the way an English teacher requires his/her students to make their research reports using online presentation tools. This end product of technology integration may be deemed higher on the SAMR scale. However, the process of collecting literature and analysing data may not be enhanced with technology. Product over process would prevent researchers and teachers from understanding a

whole picture of technology integration when they differentiate the SAMR scale.

Figure 2.   Puentedura's (2006) SAMR model[3]
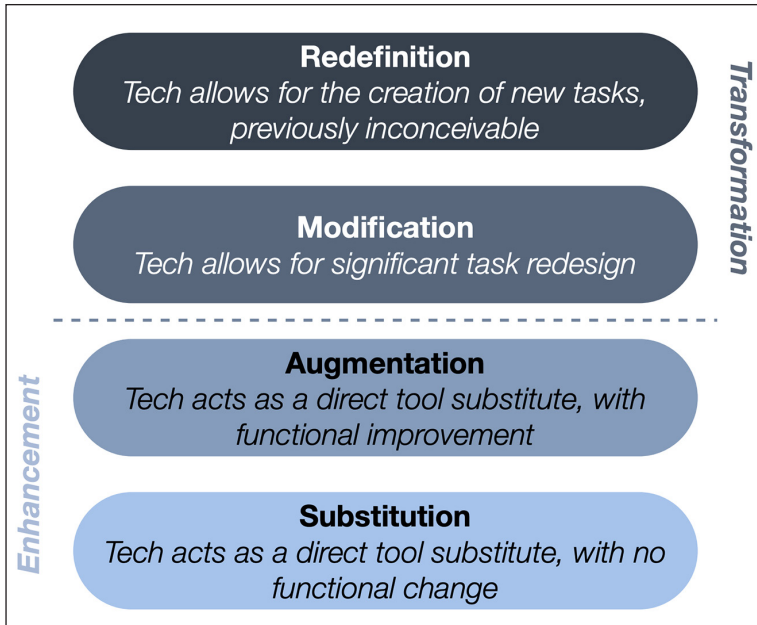
1.4.   Research questions

Although the SAMR model is popular among practitioners, few empirical studies based on this framework have been conducted. Thus, there is a need to provide empirical evidence to ascertain the differentiation of the SAMR scale, with an emphasis on the process and product of technology integration as well as on the inclusion of contexts. To fill this gap, the present study adopted the SAMR model to investigate the degree to which four Taiwanese EFL teachers enacted their TPACK in the context of teaching English with iPads over the course of one school year. In addition, this study also intended to identify contextual factors

3. http://www.hippasus.com/rrpweblog/archives/2014/08/27/SAMRInTheClassroom.pdf

that might influence the levels of their TPACK enactments. Based on the above research rationales and purposes, the present study is guided by the following two questions:

- To what extent did the four EFL teachers enact their TPACK in relation to iPad-based English teaching?

- What were the contextual factors, if any, that might influence the levels of their TPACK enactments?

2. Method

2.1. Participants

Four EFL teachers in Taiwan were invited to participate in this study. Their pseudonyms were Nancy, Luke, Bellini, and Christine. Nancy, aged 45, had served as an elementary school teacher for 24 years; Luke, 38, as a high school teacher for 12 years; Bellini, 45, as a high school teacher for 21 years; and Christine, 43, as a high school teacher for 19 years. While Nancy, Luke, and Bellini had integrated iPads into English teaching from one semester to one school year, Christine did not have any experience in using the tablet in classroom teaching. The four teachers came from different schools in Taiwan.

2.2. Research setting

This research project was situated in the teachers' classrooms. These were equipped with a desktop computer (or a laptop computer), an LCD projector, a screen, and a wireless network. In addition, an Apple TV was installed to enable them to project their iPads onto the screen. As such, the teachers did not have to glue themselves to fixed desktop computers; instead they could circulate among students with their iPads at hand. This mobility allowed the teachers not only to display teaching materials from either the tablets or the desktop computers, but also to make close observations and give immediate feedback to students.

2.3.   Research procedures

The whole research project spanned one school year. In order to help the participating teachers transform their teaching with iPads, the following procedures were operated:

- understanding the concepts of TPACK and SAMR: at the beginning of the research project, the teachers were introduced to the concepts of TPACK and SAMR. Particular emphasis was placed on how they examined their teaching using the two frameworks. More specifically, they were guided to analyse how subject-matter teaching was aligned with both iOS apps utilised and pedagogical methods employed. Afterwards, they moved on to explore and develop their understanding of how teaching could be transformed with mobile technology via the lens of the SAMR model;

- designing and implementing iPad-based instructions: with knowledge of TPACK and SAMR, the teachers learned to apply the two theoretical frameworks to teaching practices by creating iPad-based teaching materials and incorporating them into instructional activities and tasks. Such teaching ran for one school year; and

- sharing teaching through discussions: although the teachers possessed knowledge of TPACK and SAMR, it was not guaranteed that they had no difficulty in applying the theoretical concepts to teaching practices. To ensure this, they were encouraged to seek more inspirations in which bona fide examples associated with iPad-based teaching were demonstrated. For this reason, three Adobe Connect meetings were arranged respectively in the middle of the first semester, at the beginning of the second semester, and at the end of the second semester. While the professor (this author) illustrated anecdotes that depicted how the concepts of TPACK and SAMR were embodied in iPad-based English teaching, the teachers took turns and shared their experiences in applying iPads to their classroom teaching. Each of the three web-based conferencing meetings lasted for approximately two hours.

2.4.　Data collection

Data regarding the levels of the teachers' TPACK enactments associated with their iPad-based teaching were collected through video recordings. Towards the end of the first semester, one 50-minute iPad-based teaching conducted by each of the four teachers was video-recorded. This procedure was repeated at the end of the second semester. Eight video recordings were utilised to assess the degree to which the teachers enacted their TPACK. Afterwards, the researcher conducted a focus-group interview with the four teachers, in order to clarify any implicit messages hidden in the videos, such as *What made you teach this way?*, *What were the teaching objectives you wanted to achieve?*, and *Were there any reasons for integrating this app into the teaching of vocabulary?*. The whole interview was audio-recorded and transcribed verbatim for data analysis.

Data regarding contextual factors were collected through three web-based conferencing sessions and one focus-group interview, as described above. The teachers shared ideas through Adobe Connect on different impediments to integrating iPads into their teaching. Finally, the researcher clarified and confirmed the contextual problems, if any, with the teachers in the focus-group interview.

2.5.　Data analysis

To assess the degree of the teachers' TPACK enactments, the present study undertook quantitative content analysis: (1) determining video segments for analysis, (2) coding with an analysis framework, and (3) counting the occurrences of coding in particular categories (Riffe, Lacy, & Fico, 1998). First of all, teaching episodes involving the utilisation of apps were chosen since the app-enhanced teaching would indicate how the teachers applied their TPACK to iPad-based instructions. Then, the researcher coded the video segments using the SAMR model, with an emphasis on the process of how iPads were used in particular contexts. Each of the video segments was coded into a particular level of the SAMR model. Lastly, all of the codes in each level were counted. The counts indicated towards which SAMR level the teachers' iPad-based

teaching was oriented. In addition, to illustrate the ways the teachers enhanced/ transformed their teaching, the TPACK framework was utilised to describe how the teachers incorporated the apps into the teaching of particular language knowledge and skills in a specific pedagogical manner.

To identify contextual factors that impacted on the teachers' TPACK enactments, qualitative data analysis procedures were undertaken: (1) coding, (2) developing categories, (3) comparing data, and (4) determining themes (Silverman, 2000). Special attention was paid to any technical and pedagogical problems about the integration of iPads into English teaching.

3. Results and discussion

3.1. The levels of TPACK enactments

The coded teaching episodes intended to measure the extent to which the teachers enacted their TPACK associated with their iPad-based teaching. As can be seen in Table 1, 19 teaching episodes were categorised under the level of substitution; 16 teaching episodes under the level of augmentation; five teaching episodes under the level of modification; and none of the teaching episodes under the level of redefinition. It is apparent that, while the teachers utilised iPads mostly to enhance their teaching (the number of enhancement episodes: 19+16=35), they also demonstrated their competencies in transforming teaching with iPads (the number of transformation episodes: 5+0=5).

Table 1. The levels of the teachers' TPACK enactments

Teachers	Semesters	Substitution	Augmentation	Modification	Redefinition
Nancy	1st	2	1	1	0
	2nd	1	1	2	0
Luke	1st	2	4	0	0
	2nd	3	4	0	0
Bellini	1st	4	0	0	0
	2nd	4	0	2	0

Christine	1st	2	2	0	0
	2nd	1	4	0	0
Total		**19**	**16**	**5**	**0**

To illustrate how the levels of TPACK enactments were determined according to the SAMR model, the following are the descriptions of how the four teachers taught English using iPads at particular levels of the SAMR scale.

Luke used Popplet as a mind-mapping tool to help his students comprehend a reading article about animals' reactions towards earthquakes. With only one iPad device available to the teacher, Luke projected the process of creating a mind map together with students onto the screen in order to overcome the problem of students' lack of access to iPads. The teacher stated that Popplet-created mind maps were clearer and neater, compared to mind-map drawings on the blackboard. This instance of technology integration was rated the level of augmentation since the mind-mapping app substituted hand drawings with functional improvement.

Similarly, Christine used Popplet to visually present grammar: categorising prepositional phrases about travel transportations (e.g. by bus, by train, and by plane). She made the mind map viewable to students by projecting it onto the screen.This integration of Popplet into teaching grammar was an instance of augmentation.

In order to improve the restrictions imposed on textbook-based teaching, Nancy conducted a Bring Your Own Device (BYOD) project, in which students were encouraged to bring their iPads to class. Cooperating with an art teacher, Nancy guided students to produce iMovie videos that recorded their introductions to how they created pottery works. More specifically, the students produced their pots first, then shot photos of the pottery works with iPad cameras, filmed videos of interviews about their pottery creation with iPad cameras, and finally edited the material through iMovie. The case of recording students' pottery creations was deemed as an instance of modification in that iPads enabled the students to produce and annotate multimedia.

Inspired by Nancy's pottery creation project, Bellini organised an eco-traveller project, in which she and her students travelled to a tourist spot with their own iPads, with a purpose of shooting mini-films in which the students would introduce the attraction in English to future foreign visitors. The students worked in teams to collect information, take photos of sceneries, and film their narrations. Afterwards, they compiled materials and produced video clips through iMovie. In the end, they presented the outcomes of the mini-films. The use of iPads in this project was rated at the level of modification, like the way Nancy used iPads in her pottery creation project.

The levels of the four teachers' TPACK enactments were found mostly at the level of substitution and augmentation according to the SAMR model, albeit with a few teaching episodes reaching the level of modification. That is, iPads were predominantly utilised to enhance English teaching. A possible explanation for this result might be that iPads served as a substitute of transmitting linguistic knowledge to students in the context of conventional teacher-centred teaching. What is surprising is that using mind-mapping apps to present reading content and grammar in the present study was rated at the level of augmentation, contrary to Puentedura's (2006) redefinition example of using a mind map tool to visually represent structural aspects of texts. This discrepancy supports Hamilton et al.'s (2016) remark that the differentiation of SAMR should not ignore the process of technology integration. This finding has an important implication for teachers and teacher educators to understand the importance of technology integration processes in differentiating the levels of the SAMR scale.

3.2. Contextual factors

With regard to contextual factors that impacted on the teachers' TPACK enactments, three broad themes emerged from the analysis:

> **Access to mobile devices**
> "Due to the limited access to mobile devices, I once asked my students to bring their cell phones to the class for group activities and we did that. However, I just couldn't make this practice regular" (Luke).

"We just relied on the iPad owned by the teacher, with the majority of the students learning by watching. In order to increase the opportunity of learning with mobile devices among individual students, it is suggested that the Education Bureau accept iPad requests submitted by schools, in order for more students to benefit" (Christine).

Management of tablet computers
"Some students constantly chatted and romped. When they were free or when the teacher had not arrived, they were playing game apps" (Nancy).

"If the number of mobile devices increases in the classroom, many variables and unexpectations will occur. Sometimes managing these devices would make us feel frustrated, consume our time, and slow our curriculum progress" (Luke).

Access to wireless bandwidth
"The insufficiency of network bandwidth on campus made the teachers pay the cost of going online through the hotspots on their cell phones. How long would such enthusiasm continue?" (Bellini).

"iPads need to be connected to wireless network; unfortunately, the network connection on campus was not very stable" (Christine).

On the whole, these findings suggested that the teachers were concerned about technological access and support when they used iPads in classroom teaching. Their concern could be explained by the fact that the access to iPads and a wireless network was not sufficiently made available for the teachers and their students. It was very likely that this technological problem hindered the teachers' TPACK enactments towards the higher levels of the SAMR scale. Thus, students' access to mobile technology was critical in MALL. This finding was also reported by Aiyegbayo (2015) and Burston (2014, 2017). One of the issues that emerges from this finding is that policymakers can consider investing in building infrastructure of MALL, if MALL is to be implemented.

4.   Conclusion

The purpose of this study was to investigate the degree to which the teachers enacted their TPACK in the context of iPad-based English teaching as well as identify contextual factors that might influence the levels of their TPACK enactments. The results of this investigation show that although some of the teachers' iPad-based teaching indicated their competency in transforming their teaching, their practice was predominantly enhanced by tablets as a substitute to deliver linguistic input to their students in conventional teacher-centred classrooms. In addition, students' access to iPads and a wireless network was considered essential in iPad-based English teaching. This technological problem might constrain the teachers from enacting TPACK towards the higher levels of the SAMR model.

The present study contributes to the literature on TPACK by providing empirical evidence on investigating the extent to which EFL teachers enacted their TPACK via the lens of the SAMR model. However, the small sample size did not allow the findings to be generalisable to all English teachers, so a further study could develop a questionnaire instrument to assess how other English teachers apply their TPACK to MALL from the perspective of SAMR. Moreover, this study was limited by the lack of students' access to iPads, so future studies can be conducted, ensuring that students can have access to them.

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