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Exploring EFL Teachers' Development of TPACK in A Lesson Study: A Case Study

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Introduction

The pivotal role of teachers is to create possibilities for students to attain optimal learning outcomes. One of the possibilities is for teachers to conduct a lesson study (LS) that is a part of teachers' professional development (TPD) activities. LS is crucial to sharpen teachers' pedagogical content knowledge and skills (Tan-Chia et al., 2013). In LS, teachers work to plan and observe actual lessons in a collaborative way (Fernandez, 2002). Through LS' results, teachers can orchestrate their teaching and learning activities accordingly to reach ultimate learning goals.

LS has experienced an evolution in terms of its delivery which is traditional, blended, and online respectively. Before the massive development of modern technology aided in teaching and learning, LS was conducted using traditional delivery (Fernandez, 2002) with minimal use of modern technology tools. Teachers had to meet face-to-face to prepare, execute, and analyze the results of LS. The research focus of LS during this era was more on equipping teachers with pedagogical content knowledge (PCK) rather than technology (Arifani et al., 2020; Rock & Wilson, 2005; Tan-Chia et al., 2013).

As technology evolved, blended learning became popular primarily for its benefits towards the advancement in education. LS follows this shift and takes advantage of adopting blended learning (Soto et al., 2019). The delivery of LS no longer relies only upon on-the-spot classroom observations, as teachers can execute more advanced LS by combining traditional and modern tools. Technology such as video



conferencing tools and learning management systems made a hybrid type of LS delivery possible. Due to this shift, LS's focus evolved into technological pedagogical content knowledge (TPACK).

However, the COVID-19 pandemic has disruptively forced teachers to adjust their teaching and find a suitable pedagogical possibility (Yi & Jang, 2020). The teaching-learning activities and types of TPD, including LS, experienced an evolution. LS was conducted remotely for its practicality and efficiency. This condition was possible due to the development of technology and was a kind of novelty in LS. This episode of LS sees TPACK as a whole package that differs from the previous modes of LS. Technological pedagogical knowledge (TPK) was mandatory since the absence of this competence hinders teachers from joining LS and their main job as educators.

Many previous studies have used LS mainly for improving the quality of teaching-learning of a math lesson. Therefore, the use of LS in other areas is rare. LS in the area of English as a foreign language (EFL)/ English as a second language (ESL), for instance, is still scarce, despite its benefits. In addition, LS has focused on boosting teachers' PCK and has given insufficient attention to TPK. However, with the development of technology and the abrupt change that the world has experienced, TPK and PCK are necessary for teachers. Through LS, teachers learn TPACK, which has become mandatory for teachers.

The past research concerning TPACK have used instruments derived from the frameworks developed by Mishra and Koehler (2006). However, the framework is not explicitly designed for ESL/ EFL contexts and cannot clearly picture TPACK for that context. Therefore, the area of English language teaching is still minimal (Lander, 2015). Further, the previous study fails to examine the practice of TPACK in a real classroom to explore how educators use TPACK in action in a natural context (Tseng et al., 2022). After all, as stated by Yi and Jang (2020), LS is worth studying as this type of collaborative pedagogy is a feasible way that teachers can apply for improving the quality of teaching and professional development.

Literature Review

Previous Research on TPACK

The TPACK framework developed by Mishra and Koehler (2006) serves as a foundation for classroom technology integration. This framework has gained widespread acceptance since it captures the intertwining of the knowledge base (technology, pedagogy, and content knowledge). With this knowledge, teachers can create practical instructions with technology assisting learners in reaching their full potential in learning (Mishra & Koehler, 2006). Behind its prominence, previous studies on TPACK have explored a limited number of themes. Below are the four major themes that have emerged from the previous studies.

The first emerging theme falls under fostering TPACK for teachers. Based on the previous study, the notion of instilling TPACK begins in the classroom where future teachers pursue their careers in the university. The TPACK is given through some courses (Syamdianita & Cahyono, 2021) or is indirectly taught through the teaching practicum or training (Kuru Gönen, 2019).

The hindrances become the second theme of the previous study related to TPACK, and the studies of Fathi and Ebadi (2020) and Kuru Gönen (2019) are examples among many. Their studies found that the availability of technology tools, technical support, insufficient exposure to technology, and lack of information communication technology (ICT) competence during teaching become hindrances to technology adoption. In addition, they reveal that low internet bandwidth and connectivity, minimum opportunities to join TPD, and the development of the lecturers' ICT competencies are also factors that inhibit technology adoption.

In addition to the aforementioned, teachers' attitude towards TPACK has become the other central theme. Under this theme, researchers investigated teachers' self-efficacy toward technology integration for education (Park & Son, 2022). In addition, teachers' perceptions of TPACK also fall under this theme (Nazari et al., 2019; Raygan & Moradkhani, 2020). Nazari et al. (2019) studied teachers' perceptions of TPACK which revealed that experienced teachers scored low in technological knowledge (TK). However, the positive perception happened when it was accompanied by adequate school support since teachers will likely integrate

technology into their classrooms, as TPACK and attitude positively correlated with technology integration (Raygan & Moradkhani, 2020).

Based on previous studies, many researchers developed instruments to measure all the sub-components of TPACK. However, the instruments developed are, somehow, general aiming to capture general items. As a result, the instruments fail to capture better results of teachers' TPACK (Bostancıoğlu & Handley, 2018). Consequently, some researchers developed instruments to measure teachers' sub-components of TPACK for a specific topic (Baser et al., 2016; Bostancıoğlu & Handley, 2018). Baser et al. (2016), for instance, developed a survey that assesses preservice teachers' TPACK in EFL contexts. However, the instruments developed by Baser et al. (2016) tend to focus on a specific approach to language teaching. Due to this issue, Bostancıoğlu and Handley (2018) conducted a study aiming to propose a refined instrument to gauge teachers' TPACK for the specific area of English Language Teaching (ELT).

Based on previous studies, most of the TPACK framework used was developed by Mishra and Koehler (2006) and its' initial development was not for measuring TPACK in EFL pedagogy. Therefore, the framework was unable to capture TPACK comprehensively in EFL instruction because it did not provide specific pedagogical and content knowledge. In addition, many previous studies have never touched on lesson study as a method of investigating TPACK since TPACK investigation was conducted through courses or training. In other words, there was still a dearth of research about LS concerning TPACK and the other way around. The following research questions attempt to explore the impact of lesson study on EFL teachers' TPACK development:

1. How does a collective lesson plan (plan stage) impact EFL teachers' TPACK practice?
2. How do collective observation and reflection (do and see stages) impact EFL teachers' TPACK practice?

Method

Design

This research applied a case study approach to explore the impact of lesson study on EFL teachers' TPACK practices. A case study aims to analyze one or more individuals or cases in a natural setting (Yin, 2011). We wanted to focus on three Indonesian EFL teachers' experiences during LS activities and intended to draw on their collective lesson plans, observations, and reflections.

Research Context and Participants

This study involved (see Table 1) three Indonesian EFL in-service teachers aged 32-46 who regularly conducted lesson studies. To meet the ethical guidelines, we obtained consent from the participants and the Department where they worked. The participants were notified about the objectives and data collection procedures. All the data collected were treated confidentially. Participation in this research was voluntarily.

The study took place at a private university in East Java, Indonesia. The English education department of the aforementioned university had been awarded a three-year LS grant from the Indonesian Ministry of Education (Arifani et al., 2020) where the outcome of the LS was a research article. The implementation of LS has become a compulsory program aimed at enhancing EFL teachers' professional development and research performance for disseminating the lesson study.

TABLE 1
Participants' Biographical Information

| Name | Gender | Educational Background | Number of Years as A Teacher |
|-------|--------|------------------------|------------------------------|
| Beni | Male | Ph.D | 17 |
| Maria | Female | Ph.D. | 10 |
| Umi | Female | Ph.D | 6 |

Data Collection and Analysis

We collected primary data from participants' interview responses and their reflection journals. The interview protocols were derived from Bostancıoğlu and Handley (2018) and contained technological, pedagogical, and content knowledge. During item construction, we discussed the content of the questions. We consulted with two senior university teacher researchers majoring in collaborative teaching and computer assisted language learning (CALL) so as to create valid interview questions. Finally, four main interview questions were drafted: "How do you promote TPACK in collective lesson planning? How does it impact your TPACK practices? What dimension of TPACK did you emphasize in the lesson study? and how does collective lesson planning and reflection impact the implementation of TPACK in your teaching and lesson plan improvement?" The reflection journals were utilized to see possible changes in collective lesson planning, peers' observation, and feedback for their TPACK development. A word file containing reflexive questions was sent to participants' email.

During the data analysis phase, we applied a constant comparative method aimed to categorize the interview responses into codes (such as TPACK LS 1 refers to the impact of collective lesson plan on teachers' TPACK within the lesson plan cycle 1, TPACK OR 1 refers to the impact collective observation and collective reflection phase 1 on the EFL teachers' TPACK). Patterns and themes that emerged from the interviews and reflexive journals were analyzed and interpreted by two raters (Donnell & Harper, 2005). If there was a discrepancy between the two raters, we consulted a third rater.

Findings and Discussion

Research Question (1): How Does Collective Lesson Planning (Plan Stage) Impact EFL Teachers' TPACK Practice?

Examining the three EFL teachers' interview responses, all research participants in the lesson study team found all feedback during collective lesson plan design commonly constructive. Each teacher in the LS's team wrote his/her lesson plans' drafts before they shared them in the WhatsApp group (WAG). Afterward, each teacher scheduled synchronous online discussions using the Zoom platform to talk over their lesson plans. The discussion of the lesson planning (LP) is reflected in Beni's (pseudonym) interview scripts:

Maria and I took responsibility for each part of the lesson study cycle. She was responsible for preparing the WAG and Zoom meeting sessions (TK LP 1). After we sent our lesson plan to the WAG, I checked Maria's lesson plan, and she check mine. During this asynchronous session, we wrote our notes for further discussion in the Zoom meeting session (TPACK LP 1).

Maria and Beni allocated time to review and comment on the lesson plans from their LS team. They did this activity before they had discussion sessions in the Zoom meeting. They felt that this phase was a very productive process because they could learn a lot from each other. This finding corroborates Nami et al. (2016) who reported that collective lesson planning could enhance EFL teachers' understanding of TPACK and EFL pedagogy.

In the Zoom meeting, the participants were critical in providing constructive comments as they worked on the lesson plan together. They expected to receive feedback that could boost the lesson plans' quality, yet the reality was different. The participants mainly received affirmative comments from their LS team. Maria's statements best describe the situation:

Most of my colleagues gave me positive feedback that showed their agreement with my initial lesson plan design, but the most experienced teacher (Beni) usually gave me constructive feedback on course content and learning activities (PCK LP 2) so that I could revise my lesson plan. He often gave me brilliant ideas on how to further fix it. I still remembered when he asked me to add peer feedback activities and Grammarly check in my writing class and I add it into my lesson plan (TPACK LP 2).

The comment illustrates that participants generally found criticism more constructive. The content of the comment and suggestions touch not only technological tools like 'Grammarly, Zoom, and WAG applications but also content and pedagogical knowledge. They believed that the feedback allowed them to adjust their lesson planning accordingly and correct issues that were likely to occur. It also implies that EFL teachers in the lesson study team seemed to be very cautious in providing feedback, and tried to avoid negative critique. Perhaps, it is because of the four months working as a team in the lesson study which affects the connections among the participants. They had developed a strong sense of bonding and collegiality. They believed that giving negative feedback among them might harm their friendship and academic relationships. Regarding this finding, Rock and Wilson (2005) reported that less experienced teachers do not feel comfortable giving feedback to more experienced teachers.

Research Question (2): How Do Collective Observation and Reflection (Do and See Stages) Impact EFL Teachers' TPACK Practice?

Exploring EFL teachers' responses to the second question during TPACK observation and reflection (TPACK OR), we found that their perceptions of collective observation and feedback in the see phases greatly varied. Most of them valued the observation and reflection of their team for their TPACK involvement. Umi wrote, "I could learn about applications and websites for teaching writing and other skills (TK OR 1)." All EFL teachers in the LS team found this experience inspiring and constructive to learn and use other possible applications in EFL instruction which improved their technological content knowledge (TCK). Maria mentioned, "I had an opportunity to see how Grammarly works for checking learners' writing errors and I also learned how to prepare and schedule synchronous meetings using the Zoom application (TCK OR 2)." Beni also values observation and reflection times since they offer different examples of TPACK instructions. Beni's comments explain best:

It was great for me, as I learnt a lot for my technology-enhanced course in my writing class (TCK OR 1). I could detect any potential problematic learning areas and at the same time, I could learn from my team. It was perfect, indeed, as the use of the Grammarly in my class can ease and help to give detailed feedback on writing errors. The students could practice utilizing this tool to check their writing quality. My colleagues' suggestion to discuss the results of Grammarly check with peers were very helpful to assess students' writing progress (TPACK OR 1).

Previous studies found that reflection and observation activities under the traditional face-to-face lesson significantly promote pre-service teachers' pedagogical and content knowledge (Arifani et al., 2020). Similarly, other findings from similar lesson study activities indicate that collective observation during lesson study activities could improve EFL teachers' teaching practice (Nami et al., 2016; Tan-Chia et al., 2013). The above previous studies have acknowledged the benefits of observation and reflection phases towards the improvement of teachers' PCK and practices.

Meanwhile, under the technology-based lesson study, the findings have further indicated that observation and reflection could enhance EFL pre-service teachers' technological skills and subject matter. In the present study, implementing collective observation and reflection stages under a technology-based lesson study environment has impacted EFL learners' TPACK. It differs from the previous research, which examines separate units of TPACK. Discussing the results of collective observation, reflection, and identifying strengths and weaknesses helps EFL teachers improve their TPACK and teaching professionalism. This finding corroborates the frameworks of inquiry-based learning to teach, social negotiation, and reflection (Donnell & Harper, 2005). Having lesson study teams observe their peers' teaching and learning activities could enhance teachers' mastery of teaching with technology. At the same time, they could boost their pedagogical knowledge and subject matter (Soto et al., 2019).

During the second observation and reflection stages, the lesson study team also analyzed learning activities that worked and which did not work during peer observation. Then, after obtaining sufficient data regarding learners' learning activities, Beni reflected on his response as follows:

What was lacking in our lesson studies' reflections was addressing the weaknesses of the students' peer feedback in our writing class, as they only admired each other's works rather than providing constructive criticism. Therefore, my team suggests to use writing application during peer feedback session. Further, pausing the video is okay, but it should be conducted carefully to avoid distracting learners' concentration and focus. (TPACK OR 2).

In his comment on Maria's teaching activities, for instance, Beni found that the choice of technology used by Maria was not in line with the goal of the lesson she taught. According to Beni: "In Section 1, the video duration and its content was too long, and it did not closely match as its focus was on how to build a strong argument within the essay, but it did not elaborate the 'anatomy' of an essay writing. Likewise, Umi found a discrepancy. However, the issue was more on the video used and English students' level that is not in line: "The language in the video was a bit too fast and difficult for the students to follow, and I thought we could use the second video next time" (TPACK 2).

The possible reason is due to having too much focus on the technology and the pedagogy used in teaching, leaving out the content aspect. For successful technology insertions in the curriculum, there has to be a balance between content, pedagogy, and technology (Bostancıoğlu & Handley, 2018). Further, the above comment illustrates Beni's and Umi's concerns about giving negative feedback to their team or peer. Beni and Umi tended to use positive expressions before providing negative criticism to avoid tensions with peers. This attitude corroborates Nami et al. (2016) who disclosed that teachers tended to carefully select words offered for feedback to their teacher colleagues to maintain harmony within the groups during the period of lesson study (Nami et al., 2016). Polite sharing hinders teachers from more profound teaching and learning issues since this sharing covers only the surface issues (Nelson et al., 2010). Hence, teachers' learning and professional growth are hampered (Lee & Tan, 2020).

Conclusion

This study elaborated on the perception of EFL teachers towards the influence of lesson study (LS) practiced focusing on their TPACK development. The findings support the existing body of research in the area of lesson study, especially in the context of EFL teachers' TPACK education. The study has verified that LS as the type of inquiry learning does affect the development of teachers' TPACK. The influence happened during LS activities such as developing lesson plans, conducting observations and sharing feedback.

This study has several limitations. First, the study involved only three EFL teachers who voluntarily participated in the study. The small sample size involving only three research participants potentially indicates that the results may not be generalized to the larger population. Second, the study primarily relied on self-reported data, employing a single data collection procedure. Third, the EFL teachers were engaged in a

minimal period during lesson study implementation. Hence, additional research on lesson studies involving larger samples and multiple data collection procedures in different contexts may help to inform teachers' TPACK development better.

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