"They are English education graduates, but they teach science by using English": A Mismatch between Policy and Practice?

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Abstract

In response to the issue of mismatched teachers teaching in international-based curriculum schools, this exploratory case study investigated the implementation of English teachers' background teaching science by using English as a medium of instruction (EMI). Data were collected from six teachers who taught science through multiple interviews in one international-based curriculum school in Jambi city, Indonesia. The data presentations were done by making the data tabulation and grouping it into themes and sub-themes. The data tabulation is narrated in paragraph form to draw the content of the data tabulations. The findings revealed that mismatched teachers had problems to implement EMI in teaching science, such as lack of competencies in content knowledge, hard times to use English, and no training for curriculum changes. Despite the weakness, EMI creates international-minded and excels in English. Portraying these findings, recommendations are also discussed in this study.

Keywords
EMI, international-based curriculum, mismatched teachers

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Introduction

The issue and problems of mismatch teachers occur over time in the teaching and learning process. It has become a major concern in educational reform and policy around the globe (Ingersoll, 2003). Most research on mismatch teacher practice in schools is concerned with teachers are hired for teaching subjects beyond their specialization (Bayani & Guhao, 2017; Boco, & Abadiano, 2020; Harja et al., 2021; Ingersoll, 2003; Luft, Hanuscin, Hobbs, & Törner, 2020). Therefore, highly qualified teachers who teach according to the field of specialization will provide qualified student output. Accordingly, Darling-Hammond (2000) argues that teachers who have high qualifications according to their knowledge will positively impact student achievement in school. Similarly, Harley, Bertram and Mattson (1999) suggest that the most important factor in students' learning is a qualified teacher by their knowledge of specialization. This is in contrast with the policies in schools for some teachers to teach that are not in accordance with their field of knowledge. Western Australian State School Teacher's Union (2008) reported that mismatched teachers or teaching outside their specialization tend to stress teachers themselves. Thus, the phenomena might result from school management recruitment procedures to solve the shortages of teachers who could teach outside their area of specialization.

The mismatch of teachers who teach beyond their area of specialization happens in both some private and public schools, particularly in bilingual schools in Indonesia. Teachers who are graduated from English education are assigned to teach science using English. Looking back on language policy in school, Indonesia had implemented a bilingual education program for public schools in 2006 through an international standard school program. However, the bilingual program had been closed due to a controversial policy issue in 2012.

The Indonesian curriculum for bilingual programs, particularly English as a medium of instruction for teaching science and mathematics, remains offered in private schools. Meanwhile, some parts of the world in Asia, such as Thailand, Japan, Korea, and China, have been implementing a bilingual education program as their curriculum in public school as early as in primary level and continuing their program. Additionally, being bilingual give more advantages to children and increasingly becomes global demand. Crystal (2003) argued that almost two-thirds of children evolve in a bilingual background, 41 percent as bilingual in English and some other language. However, the enactment of English as a medium of instruction for teaching science and mathematics in some private bilingual schools in Indonesia might not meet the ideal policy requirements that teachers are not in line with their specialization. In other words, teachers who teach science and mathematics in private bilingual schools using English are mismatched.

This phenomenon is undeniable. It has become a common practice in educational policy. The widespread occurrence of mismatched teachers would have some impacts on quality education. Some research consistently reported a significant correlation between teacher competencies and students' achievement (Goldhaber & Anthony, 2003; Ringstaff & Sandholtz, 2002). Therefore, it is a considerable problem for mismatched teachers to prepare their teaching materials and design curriculum because it assumes that teachers are unfamiliar

with the content subject and had no experience during their study in university. Thus, it would affect teachers' performance and their students. This research aims to answer the following research questions: 1) How do teachers teach science using English as a medium of instruction in a bilingual school? 2) What competencies do the teachers have in teaching science using English? 3) What are the challenges faced by the teachers in teaching science using English?

Literature Review

English as medium of instruction (EMI) in Indonesia context

English as a medium of instruction (EMI) in Indonesia is the product implemented of the international standard school program. The concept of EMI enactment in the international standard school program was from 2006 to 2012 for teaching science and mathematics. Teachers were required to use English in classroom activities; however, the program ran only for six years, then the policy was discontinued due to controversial issues in the implementation. The adapting of the international standard curriculum using English as a medium of instruction for teaching science and mathematics continues for some private schools as their "brand" to promote their schools.

Since EMI is a "brand" to promote international curriculum perspectives for schools, many parents are interested in sending their kids to that particular school. According to Bishra and Bhatt (2021), parents send their children to EMI schools because of their global status. Similarly, Erling (2014) argued that EMI schools promote skills development for children. Therefore, the policymakers considered that EMI would offer and create an international academic standard in the classroom and give an opportunity to open for the global community (Dearden, 2015). According to Kym and Kym (2014), EMI offers international job seekers a highly competitive student output. Thus, implementing EMI in schools would give many beneficial students' growth, particularly their English proficiency (Chang, 2010; Wong, 2010; Wu, 2006).

Furthermore, in Indonesia, students who study in a school where English is as a medium of instruction show prestige and power in society. Most people assume that if students are able to speak English fluently, they belong to high status in the community, such as from high economic status families. The power of English as a medium of instruction in school symbolizes superiority in the community. According to Bourdieu (1977), language has symbolic power within society. Thus, EMI was implemented in some private or bilingual schools in Indonesia as a vehicle to promote their schools as "better" and "superior" status.

Mismatching teacher in teaching

The issue of teacher quality worldwide is becoming increasingly important to increase student output. Teacher quality is one of the major priorities in every country because it has been admitted as the primary factor to students learning (Hammond, 2000;

Hattie, 2009). As the center of education, universities prepare their graduates to fulfill the workforce's needs with the relevant and essential curriculum so that they are ready to cultivate the next generation based on their area of specialization. Therefore, through government programs, universities offer quality assurance to maintain their graduates become more knowledgeable, high standard, and competent in their area of specialization. Unfortunately, in some countries like Indonesia, the shortage of highly qualified teachers, particularly teaching science and mathematics using English where English is not commonly used, becomes a more challenging policy. Thus, a mismatch occurs to fulfill the demands of the scarcity of teachers in the particular school program. According to Luft, Hanuscin, Hobbs, and Tomer (2020), teachers who teach beyond their specialization are called mismatched teachers.

Furthermore, one of the implications of mismatch teachers might bring any discomfort and ineffective teaching strategies in classroom activities particularly teaching content, that teachers do not have adequate knowledge on it. Besides, mismatched teachers might have problems with insecurity and frustration when they deliver the contents knowledge. According to Hammond (2000), one of the most important factors in students' learning growth is a competent teacher in their area of specialization. This is similar to Shimon and Brawdy (2001) that mismatch teachers lead to poor performance when they assign to teach outside their area of specialization. Thus, Goe (2007) argued that teachers' quality is a passport to better predictor and outcome of students.

Methodology

Research design, site, and participants

This exploratory case study was conducted in one private primary bilingual school which implemented English as a medium of instruction in Jambi, Indonesia. I selected this school because it has implemented and adopted an international curriculum using the Singaporean curriculum as learning material for teaching science. Besides, in the school applied English zone environment, students and teachers are required to speak English when they are in the school building. I got permission from the principal to have access to the school to interview six teachers from different levels of grade sections. I recruited teachers of grade one to grade six who were assigned as homeroom. The six teachers were responsible for teaching science by using English. In this study, the participants consisted of five female and one male teacher. Finally, I asked them to fill up voluntarily the consents form for the interview. Thus, for ethical consideration, the teachers' name was a pseudonym, and they were coded as teacher A, teacher B, and so forth. The demographic profile of six participants shows in the following table below.

Table 1. *Demographic profiles of the participants*

Demographic profile of the participants	Female teacher grade one	Female teacher grade two	Female teacher grade three	Male teacher grade four	Female teacher grade five	Female teacher grade six
Age	29	30	27	27	31	30
Educational background	Bachelor degree with English major	Bachelor degree with English major	Bachelor degree with English major	Bachelor degree with English major	Bachelor degree with English major	Bachelor degree with English major
Teaching experience	3 years	3 years	4 years	3 years	5 years	5 years
Formal training attended for teaching science	None	None	None	None	None	None

Data collection and analysis

In terms of conducting a qualitative case study, major procedural steps in collecting the data adopted from Creswell (2007) are using multiple sources, such as interviews, observation, and documents artifact. Additionally, the main data in this research used a semi-structured interview. The interview is one of the most commonly used tools in conducting qualitative research. An interview is oral structural communication with one or more participants, either directly or indirectly, to discuss and get information about the phenomena. In this research, the researcher conducted one-on-one types of interviews to get deep information. A one-on-one interview is a popular approach in educational research to collect the data. The researcher asks questions to one participant and records the answers in the study at a time (Creswell, 2012).

The interview was conducted based on the willingness of the participants' time. The researcher gave an option to the participants to answer the interview question in *Bahasa Indonesia* or in English, but teachers chose *Bahasa Indonesia*. For the questions, firstly, the researcher gave a general question related to the participant then followed by sub-questions related to the teacher's professionalism and competencies related to the research topic. Second, the question related to teachers' points of view about teaching science by using English as the Medium of Instruction (EMI). Third, the questions related to what the teacher experienced and the challenges they faced in conducting English as the Medium of Instruction (EMI) when teaching science subjects.

All interviews recorded were transcribed one by one thoroughly by the researcher. The interviews were conducted in *Bahasa Indonesia*. The researcher translated it first before

presenting the result of the research. Concerning the case study approach, categorizing similarities and differences the data is the way to code them in the themes to recognize the result of the data. The researcher needs a few times to read transcripts and develop them into themes and sub-themes to answer the research question. The researcher interpreted the data to make it clear and get the information to answer these research questions. It is as linked as with Merriam (1998), who argues that data analysis is the process of making sense of the data collected.

The data in the form of sentences and narrative were the steps of data display. It means the data reduced were shown in the data display in patterns. It beneficially helps the researcher to understand the data gathered. The researcher describes the data in a good sequence of narrative texts to make it easier to understand the information from the data. The data presentations were done by making the data tabulation and grouping it into themes and sub-themes. The data tabulation is narrated in paragraph form to draw the content of the data tabulations. Then the researcher selected, identified, and focused on the data collected by signifying the research problem's formulation. Secondly, the researcher displayed the data in good sentences. Lastly, after displaying the data researcher took the conclusion from the data.

Trustworthiness

The researcher needs to make sure that the interpretation and findings of the qualitative data are accurate. In terms of the credibility of the research result, the researcher used member checking. Creswell (2012) states that to validate the qualitative data, the researcher needs to check the accuracy of their data by using member checking that refers to a process of asking one or more participants. Afterward, the researcher allows the participants to check their responses from their interview transcription after transcribing the interview result. In other words, the researcher allowed the participants to review what they had said, and if they wanted to correct what they said, I allowed doing so.

Findings and Discussion

The finding of the research was to examine the implementation policy of EMI in teaching science with English background in a bilingual primary school. The findings portray from a semi-structured interview that presents three emergent themes: 1) enactment of teachers of English background teaching science by using EMI; 2) teachers' competencies in teaching science using EMI; 3) the challenges of teachers using EMI in teaching science. The three findings are addressed the research questions. The emergent themes gave insight on policy enactment of teachers of English background teaching science using EMI.

The enactment of English as a medium of instruction

The first theme that emerged from the interview data was the enactment of English teachers teaching science by using English. The sub-themes of my findings emerged from

the analysis of interview data to describe the enactment of EMI, such as (1) the teachers' view of EMI in teaching science (2) international-minded and excel in English.

Table 2. *Sample data analysis*

Emergent themes	Data	Sources
Teachers teach science using English	English is fully implemented in the school environment; teachers and students are competent in English for daily communication. Since this school required English to teach science, I implemented English in class (teaching **science using English).** Then, the textbooks adapted from Singapore, so we have to use English in teaching science **(teach science using English).**	Semi-structured interview
Teachers' competencies teaching science using English	Actually, I have no formal professional competencies to teach science because my background is English, but since school is looking for teachers who can speak English fluently, so they recruit us to teach science in English. Later, they will train us to teach science using English once accepted **(competencies training)**. For informal professional training, we will attend KKG (science teachers' forum) to discuss the issue of teaching strategies, methodologies, curriculum as well as content knowledge of science subjects every month regularly within primary schools in the city, but it used *Bahasa Indonesia* **(competencies training).**	Semi-structured interview
Challenges of teaching science using English and teachers' cope with the challenges	The biggest challenge in teaching science using English is that I do not really understand complex concepts of science at a higher grade level because I am not a science education background **(challenge).** It took sometimes to understand the content then I need to discuss or learn with science teachers during our meeting in KKG **(challenge/cope).** Reading more science concepts in *Bahasa Indonesia* on the internet, then I translate it into English, so that's the way how I cope with the problems **(challenge/cope)**. Then, if I have a problem with science terminology/concepts during teaching, I use Bahasa Indonesia to explain the contents to avoid misunderstandings **(challenge/cope).**	Semi-structure interview

Teachers' views on English as a medium of instruction implementation

The first theme is the teachers' perspective on English as a medium of instruction for teaching science in bilingual primary schools shows different conceptions. The following response from the teachers shows in the scene on the implementation of English as a medium of instruction.

Teachers' scene 1: Teachers' perspectives on English as a medium instruction

"I think the use of English for everyday communication and studying in school is a very good policy initiative. English is implemented well in this school. Most teachers and students do not have any obstacles using English for daily communication." (Teacher A, in-depth interview, 24 February 2021, researcher translation)

"English is fully applied in school and classroom activities; I think we do not have any problems when we use English for daily communication. Perhaps, teachers and students have little percentage using *Bahasa Indonesia* when they are in school, but if I use English for teaching science, I will face some difficulties in delivering the lesson." (Teacher B, in-depth interview 24 February 2021, researcher translation)

"For me, English is really good for students' growth, particularly to prepare for their future studies. We implemented English for teaching subjects that requires using English, such as science, mathematics, and English. So far, I do not have problems with English for communication. Still, I have a problem when I need to explain the comprehensive concept of science." (Teacher C, in-depth interview 1 March 2021. researcher translation)

"English is used as the main language in the school; I think English is really broadening teachers' and students' knowledge because we use international curriculum and textbooks, so our perspectives about knowledge and English improve well. However, teaching science with English, especially me from an English background, will create problems such as misconceptions when I don't know the science concepts well." (Teacher D, in-depth interview, 1 March 2021. researcher translation)

"I implemented English in classroom activities, particularly teaching science using English, but sometimes, we shifted to Bahasa Indonesia when we got confused with the contents. With this condition, the effectiveness of learning declines when we cannot explain well using English. One more thing is important when we shift our language from time to time, making learning slower, then students become less focused and more complicated. However, I think for the implementation of English, it works so far." (Teacher E, in-depth interview 3 March 2021, researcher translation)

"Since the school has the vision to implement English, I think the school prepares students to become global community and English as lingua franca, so we use English for our communication and study. So far, we really use English in classroom interaction, but there are times I have to use *Bahasa Indonesia* when I explain a bit complex concept of science; otherwise, misconceptions really occur in our activities

since I am English, not a science education graduate." (Teacher F, in-depth interview 5 March 2021, researcher translation)

The data above indicated that the implementation of English as a medium of instruction in the school for daily communication and interaction is well between teachers and students. Furthermore, the emerging themes from the interview show that there are three mains concerned need to take into consideration. Firstly, it is important to note that there are obstacles when teaching science using English as a fairly complex concept that makes the teacher not fully use English. This is because the teachers have difficulties in explaining the concept well in English. The impact is that if the concept given is wrong, students will not get real information about the lesson and even mislead about the lesson. This is very important to consider for schools that teachers who are not in their field will have difficulty providing information in accordance with what teachers should provide in their field.

Secondly, English is indeed the main language in interacting and learning in the school, but the school should place the right people in the same field in the learning process. This will have an impact on the basic foundation of "students' knowledge, especially science. Furthermore, the most important issue is the quality of teachers in teaching the lessons that are not in accordance with their fields will affect the effectiveness of learning. Moreover, the use of language that shifts from time to time will make learning slower and even become more complicated in comprehending the concepts. As a result, if this condition continues, most probably that a poor teaching and ineffective delivery of the lesson leads to broadening the achievement gap for the students (Jerald & Ingersoll, 2002).

Thirdly, it might create a misconception during the delivery of the lesson. Since teachers are not in line with their field of specialization, teachers would make common misconceptions in the lessons. A teacher who masters the learning material is a person who is in line with his/her specialization. However, it is found that teachers who teach science using English are not really mastered the concept. As a matter of fact, teachers would give worse and inappropriate information regarding the lessons.

According to Harley, Bertram, and Mattson (1999), teachers' quality is one of the most important parts of learning. Teachers' quality is also influenced by teachers' knowledge base, such as preparation, planning, and decision-making of the learning (De Jong, Veal, & Van Driel, 2002). Furthermore, Shulman (1987) argues that teachers' knowledge is one of the important aspects in teaching and learning, including subject matter knowledge and pedagogical content knowledge. Similarly, Magnusson, Krajcik, and Borko (1999) claim that effective science learning is a teacher who fundamentally masters subject-specific knowledge and content-specific. Therefore, every teacher who teaches any specific subject needs to consider the specific knowledge. In other words, every teacher should teach based on their area of specialization so that teachers might deliver their subjects effectively. Thus, teachers who are not in line with their specialization would create limited knowledge-specific content during teaching and learning.

International-minded and excels in English

The second sub-theme in English as a medium of instruction implementation in teaching science is international-minded students and excel in English. The participants in this research respond that English as a medium of instruction is preparing students to be part of the global community. Here are the following data with regards to international-minded and excel in English.

Teacher's scene 2: International-minded and excel in English

> "For me, using English as a medium of instruction in school is a very good policy initiative because English is a lingua franca and is used globally. I think we are preparing students to become part of the global community, and for sure, they will excel in English." (Teacher A, in-depth interview, 24 February 2021, researcher translation)
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> "International-minded and excel in English is the vision of the school. I hope this curriculum might be followed by other schools such as government schools. I think there are positive benefits if students excel in English; for example, they become part of the international community, and even they can study overseas and good career for them." (Teacher C, in-depth interview 1 March 2021, researcher translation)
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> "I think the international mindset for students how to deal with the global community grows very well in this school. We are not only using English, but through the international curriculum, students learn a lot about global culture such as English. Most important is students excel in English." (Teacher E, in-depth interview 3 March 2021, researcher translation)
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> "As an English graduate who teaches science, I felt English as a medium of instruction is a good policy for our students. We prepare our students knowledgeable in terms of English." (Teacher F, in-depth interview 5 March 2021, researcher translation)

International-minded and excel in English is a strong vision in this school. Teachers strongly support the implementation of English as a medium of instruction. The data above revealed that teachers agreed and strongly supported the use of English as a medium of instruction in school. A growing global phenomenon, English has become a "brand' for schools to be recognized as better schools that implement English as a medium of instruction. This is supported by Dearden (2014) that the rapid expansion of English as a medium of instruction is moving toward a general trend in education. The internationalization of education is reported skyrocketing growth in most Asian countries. According to ISC Research (2021) claimed that there were around 10,282 international schools around the world. It means that

the rapid growth of English worldwide through international school supports children to be more knowledgeable of using English. Munoz (2006) suggests that international schools introduced students to speak in a natural setting. The more students are exposed to English in everyday life, the better their performance of using English because students achieve unlimited exposure in their school's environment.

Teachers' competencies teaching science using English

The second theme in this research is teachers' competencies in teaching science by using English. The sub-theme that emerged from the interview data were teacher has no professional training. Data from teachers' competencies teaching science using English shows that teachers still do not have formal training in teaching science. Teachers still struggle to teach science, although they can speak English well.

Teacher scene 3: Teachers' competencies teaching science using English

> "Actually, I am not confident enough to teach science, but because no science teacher can speak English, I applied for that position. Anyway, schools provided training for teaching science for those who are not in line with specialization. So far, we need more training to teach science because we need basic concepts such as pedagogical knowledge or content knowledge." (Teacher A, in-depth interview, 24 February 2021, researcher translation)

> "I think I am not as competent as a science teacher background. We need more training in preparation, planning, and content delivery, although we have KKG (science teachers' group). Sometimes, KKG does not really make us competent in teaching because I take extra time to understand the contents. You know, KKG is really good for science teachers who are already familiar with pedagogical content knowledge." (Teacher B, in-depth interview 24 February 2021, researcher translation)

> "Actually, when we are accepted as science teachers with an English background, we are already oriented to have training but the training only how to use the textbooks since the curriculum is from overseas. Common training is like curriculum, strategies, and methodologies of teaching but not really specific to the content. So, I lack professional competencies in teaching science." (Teacher C, in-depth interview 1 March 2021, researcher translation)

> "For me, our competencies really need to take into consideration. Otherwise, it will create problems during the teaching and learning process. The school and government need to collaborate to think about this mismatch. I think both parties must give us training for our competencies." (Teacher D, in-depth interview, 1 March 2021, researcher translation)

> **"**In terms of English, I am professional enough, but I struggle to understand the concepts of science. I need extra time to understand and try to read and read more, and even I have to read in *Bahasa Indonesia*, then I deliver in English when I am in class. So, that is the weakness of me, but this is a mismatch." (Teacher E, in-depth interview 3 March 2021, researcher translation)

> "I think schools and governments must provide related training for teachers. I think the government should control this mismatch to make a good policy on what to do for the competencies of mismatched teachers like us." (Teacher F, in-depth interview 5 March 2021, researcher translation)

Portraying from the interview data, it was found that mismatched teachers need more training on the issues of pedagogical contents knowledge. Effective teaching and learning are the responsibility of teachers; it can be said that teachers who are qualified and specialize in their area of specialization would make students more confident in studying. According to Harley and Mattson (1999), if teachers are specialized in their area of specialization, students will trust their teaching skills. Furthermore, Olson (2000) argues that the success of the students in learning is due to skilled and knowledgeable teachers. Therefore, qualified, skilled, and competent teachers based on their specialization lead to effective teaching.

The issue of teacher competence in teaching is fundamental. According to the Republic of Indonesia, Number 20 of 2003, teacher competence includes learning management, academic mastery, personality, and potential development. Whereas the Republic of Indonesia Law Number 14 of 2005 stated that teachers' competencies consist of four elements: personality competencies, pedagogical competencies, professional competencies, and social competencies. Siri et al. (2020) suggest that teachers who have competencies based on their specialization are better than those not in line with their area of specialization. According to Kumar and Parveen (2015), teachers' competencies significantly contribute to students' performance. This is similar vein with Zhang et al. (2018), teachers' competencies influence teachers' performance.

Schools and government could not neglect the mismatch of teachers; both parties should consider this phenomenon; otherwise, the problems on quality will remain unsolved. Mismatch teachers will create a tremendous problem in the teaching and learning process because of a lack of professional training and competencies with regard to content knowledge. Villaverde (2017) suggests that effective classroom teaching and learning processes happen when teachers possess broad knowledge based on their specialization.

The challenges for teaching science with English background

The third theme in the research found the challenges of implementing English as a medium of instruction in teaching science. The sub-theme from the interview data were unfamiliar content knowledge, hard times using English to teach science, and curriculum change.

Unfamiliar content knowledge is the first sub-theme in the challenges of teaching science with English background. As mentioned earlier, there is no specific professional training for teaching science with English background. The training carried out was only general training on how to use textbooks since the curriculum was adopted from overseas. The following data was gathered from the interviews.

Teachers' scene 4: Unfamiliar content knowledge

> "For me, it is difficult to teach science without knowing basic concepts, particularly the content. I think I have to prepare well to understand and comprehend the content; otherwise, learning is really stressful. Sometimes, I am less confident, monotonous and traditional teaching, and less creative." (Teacher B, in-depth interview 24 February 2021, researcher translation)
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> "I have to read more from the internet and do some research so that I can explain to my students, at least I minimize the stress from unfamiliar knowledge. So far, our meeting in KKG (teachers' science club) does not really help us because in teaching science using English because we use international curriculum." (Teacher C, in-depth interview 1 March 2021, researcher translation)
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> "Unfamiliar content knowledge is an enormous issue for us who do not know the content well. You know, I am from English background; I am stressed when I start teaching science, especially the curriculum and textbooks from overseas; although we have KKG (teachers' science group) every month, I think it does not help a lot for our professional competencies since we are English graduates." (Teacher D, in-depth interview, 1 March 2021, researcher translation)
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> "The mismatch is really stressful; I know it is hard to teach if it is not in line with my specialization, but I have to do it. Most of the time, I struggle to understand the content well. Using English is no problem, but teaching science using English is a big problem (Teacher F, in-depth interview 5 March 2021, researcher translation)

Most scholars agreed content knowledge is important for teaching. According to Magnusson, Krajcik, and Borko (1999), pedagogical content knowledge helps students to understand the subject matter well through teachers' understanding in organizing knowledge subject matter topics and problems. Likewise, Ball, Thames, & Phelps (2008) suggest that pedagogical content knowledge is important for teachers to understand and comprehend the concept that teachers need to teach to avoid misconception when delivering the content. Furthermore, in his study, Shulman (1987) suggests that the key to the profession of teaching is to know the content-specific technical knowledge. It means that teachers need to master their content knowledge to be said as professional in terms of pedagogical content knowledge.

Furthermore, unfamiliar content knowledge leads to stress to teachers, the traditional methods of teaching, and less creativity. Childs and McNicholl (2007) argue that unfamiliar content knowledge happens when teachers are teaching out of their specialization. It can lead to difficulty designing good teaching strategies, teachers feeling incompetent and inadequate, and lack of cognitive knowledge. This is important to consider for formulating good policy in school management because the quality of the output is an important issue in providing better education for students.

Hard times using English to teach science, the second sub-theme in teaching science with English background challenges is hard times using English to teach science. It is noted that teachers who teach science using English are from English, but they still have hard times using English because of the mismatch of the teachers in teaching. The following statement from the interview data describes as follows.

Teacher's scene 5: Hard times using English to teach science

> "I am really sorry to tell you that although I know English and am competent enough, I still have a hard time using my English. I think the situation happens because, personally, I lack knowledge about science. So, when I use my English, I have to be very careful and slow; otherwise, I will deliver misconceptions about the content. So, when I need to explain a complex concept, I'd rather use *Bahasa Indonesia*." **(**Teacher A, in-depth interview, 24 February 2021, researcher translation)

> "Honestly, not all the time do I use English when teaching science? I consider that I am mismatched, so I use *Bahasa Indonesia* when I need to explain something quite complex concept. It is really hard to use a foreign language when you are not sure what to explain to your students." (Teacher E, in-depth interview 3 March 2021, researcher translation)

> "Using English for daily communication is easy, but when I use English to explain the concept, it is really hard, particularly the complex terminology of science." (Teacher F, in-depth interview 5 March 2021, researcher translation).

The problem in teaching science using English is that teachers are not familiar with the content knowledge or scientific terminology. It is really hard for English background to comprehend the term because they are not used to it. According to Hudson (2009), some teachers are finding hard times to use English when they teach science using English. Furthermore, he argues that some teachers teach science using English more comfortably if they use their mother tongue because it is easier and more understandable. Similarly to Therefore, these are the reasons why teachers with English backgrounds have hard times using English when they teach science using English.

Curriculum changes, in terms of curriculum changes, there should be training for teachers' readiness in preparing the lesson. The training offered in school-related to curriculum that teachers have oriented only the use of textbooks include training on teachers' guide. The following scene on the responses of the participants is as follows.

Teacher's scene 6: Curriculum changes

> "There is no further orientation and training on how teachers prepare the curriculum changes in teaching science using English. The textbook and curriculum used is an international curriculum, I think I need to adjust myself using that curriculum; otherwise, I cannot teach." (Teacher B, in-depth interview 24 February 2021, researcher translation).
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> "We need a further orientation to use the international curriculum. The training is not only introducing the curriculum but also planning how to use techniques, strategies, and methodologies when we deliver the knowledge to the students. I think from the Indonesian perspectives and Singaporean curriculum, and they are different. So, curriculum changes a bit shocked us in preparing the lesson." (Teacher C, in-depth interview 1 March 2021, researcher translation)
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> "Curriculum changes lead to ineffective teaching, so I think schools need to consider how to introduce further training for effective teaching using English as a medium of instruction as well as content knowledge and how to design an effective curriculum for it." (Teacher D, in-depth interview, 1 March 2021, researcher translation).
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> "Poor preparation, such as planning the lesson, designing the materials, and implementing teaching methodologies in teaching, needs to be introduced in our curriculum training when we are assigned to teach science using English. This is really challenging when we teach subjects beyond our specialization because we need to do more research on aspects of teaching materials." (Teacher F, in-depth interview 5 March 2021, researcher translation).

The mismatched teachers are trying to manage their capacity in teaching new subjects that they have never learned before. An ineffective way of teaching might happen in the teaching and learning process. It is important to consider that teachers who are not in line with their specialization need more training on managing, designing, and implementing the lesson well. Ideally, effective learning happens due to effective curriculum implementation. Experienced teachers sometimes find difficulties when they face frequent changes in curricula. The changes lead to an undesirable situation, such as a lack of motivation to prepare their lesson.

Furthermore, effective curriculum implementation requires skilled and knowledgeable teachers who are exposed to training related-subjects. This is in line with Hall and Hord (2015) suggest that individual educators will grow confidently and understand new ways when they are on a regular basis of training. According to Octaviani (2019), teachers

need orientation and guidelines before they teach a subject using English as a medium of instruction. The guidelines are related to curriculum orientation for planning and implementing strategies and methodologies of teaching.

Furthermore, it is important to note that training is needed for curriculum orientation for new teachers, particularly in schools that use international textbooks and curriculum. Curriculum changes would affect teachers' performance that is not in line with their specialization and readiness. Due to unfamiliar subjects and disorientation of using textbooks and curriculum, it leads to a poor teaching process. Therefore, curriculum orientation training for curriculum changes helps teachers to identify their weaknesses and readiness to use the new curriculum for effective teaching.

Conclusion and Policy Recommendations

I have to recognize that this research has limitations in terms of generalizability and transferability. The study displays only six (6) participants from one primary bilingual school in Jambi, Indonesia. This is impossible to generalize the result of the study. Further research might be recommended to conduct with a large number of schools and participants to give more broadened perspectives of mismatched teachers who teach in bilingual schools. Despite the limitation, the research administers an understanding of policy recommendation as a stepping-stone for larger research on the same issues.

Portraying from the data displayed earlier, the study offered recommendations for policymakers such as government and school managements with regards to policy on teachers' recruitment in bilingual schools, particularly the shortage of teachers in teaching science using English. The recommendations include curriculum preparation for teachers to avoid mismatched teachers and supporting teachers' development programs.

Curriculum preparation for teachers to avoid mismatched teachers, the rapid growth of internationalization of schools through English as a medium of instruction school program across the globe creates curriculum preparation for teachers. Teachers need to equip with a more flexible, knowledgeable, and adaptive curriculum. A comprehensive program curriculum design for English teachers in universities needs to be conducted before teaching across the disciplines. The universities, particularly the English department program, should provide a specific curriculum subject such as teaching science for primary and secondary school. So, this is more specific than teaching English for specific purposes only. This curriculum will orient students to be more open-minded and ready for teaching across the discipline in an international-based curriculum particularly teaching science using English. This curriculum program is designed to minimize teachers from ineffective teaching, not knowing well content subject, and being less self-confident.

Supporting teachers' development program, there is a need to support teachers' competencies that are not science background but teaching science using English. The mismatched teachers are undeniable across the globe. However, there are many ways to support teachers in order to they are ready to teach. The government together with school management should have a teacher's development program framework through senior mentoring from science teachers to train teachers who are not in line with their specialization. The

development program trains teachers candidate in terms of basic concepts or knowledge that teachers will be assigned to teach science using English. The training program covers preparation, planning, implementation, including techniques, methodologies, approaches, and contents, and assessment. Thus, introducing an international curriculum to teachers who will teach science using English, especially the textbooks adopted from foreign countries, needs adjustment for teachers to maximize their capability to comprehend and understand the concept.

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