Using English medium instruction in Moroccan secondary schools: Mathematics and science teachers' perceptions

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As a contribution to the ongoing studies on English as a medium of instruction (EMI) policy in non-native English-speaking countries, we explored the implementation of EMI in public upper secondary schools in the region of Rabat-Salé-Kénitra in Morocco as a case study. In particular, we examined EMI public upper secondary school teachers' perceived benefits of teaching maths and science through English. Semi-structured interviews were conducted with six EMI public upper secondary school maths and science teachers, who were the total number of the teachers recruited by the Moroccan Ministry of National Education in the whole region in the 2021-2022 academic year. The findings revealed that four teachers considered their EMI teaching experience to be beneficial. Using EMI improved their English language proficiency, made access to teaching resources easier, encouraged them to read more content in English and collaborate with English language teachers, enabled them to develop a bilingual teaching expertise in both English and French and diversify their language abilities. However, two EMI teachers considered using EMI as a burden. They cited difficulties with the additional lesson planning required. Additionally, lack of prior EMI teaching experience and training also made their EMI experience difficult. Suggestions for improvements included additional training and providing more compensation for teaching EMI courses, to account for the extra work and time required.

Introduction

The use of English as a medium of instruction (EMI) has gained momentum in education all over the world, especially over the past two decades (Gröblinger, 2017; Macaro et al., 2018). Many countries have adopted the EMI policy in their educational systems due to political, social, educational and economic motives (Doiz et al., 2012), including preparing youths for the job market which highly demands employees with a good English language proficiency (Nieto Moreno de Diezmas & Barrera, 2021). The use of EMI was initially witnessed in Europe as a result of the Bologna Process, which called for unifying the medium of instruction in European territories. Subsequently, the use of EMI became a common practice in numerous places worldwide, including Japan, South Korea (Bradford et al., 2022), China (Galloway et al., 2020), Qatar (Ahmadi, 2017), Sri Lanka (Jayathilake et al., 2021), Indonesia (Talaue, 2020), South Sudan and Nigeria (Dearden, 2014).

Concerning Morocco, the use of EMI in education is still in its infancy, especially in the public secondary education sector. The kingdom has incorporated the use of EMI in the public upper secondary school education since 2014, but it has been confined to a few piloting schools where scientific subjects, mainly maths and science, are taught through English in only three Moroccan regions: Tanger-Tetouan-Al Hoceima, Casablanca-Settat, and Rabat-Salé-Kénitra (The Ministry of National Education, Vocational Training, Higher Education and Scientific Research, 2014). On the other hand, French as a medium of

instruction is widely used in teaching maths and science in nearly all Moroccan public secondary schools, while Arabic has been maintained for the teaching of other non-scientific subjects (Ben Hammou & Kesbi, 2021).

The growth of EMI programs worldwide has raised the curiosity of researchers (Drljača Margić & Molino, 2022), and through a heavy reliance on surveys, they shifted their research interest towards the implementation of the EMI policy in education to develop a deeper understanding of some of its related issues (Curle & Derakhshan, 2021). These include the growth of EMI programs across the globe (Dearden, 2014; Sahan et al., 2021); EMI teachers' professional development (Borg, 2016; Costa & Coleman, 2012; Dearden et al., 2016; Drljača Margić & Vodopija-Krstanović, 2018; Farrell, 2020; Galloway et al., 2017; Uehara & Kojima, 2021); difficulties encountered in teaching disciplinary contents through English (Nieto Moreno de Diezmas & Barrera, 2021; Soe et al., 2020); attitudes towards future implementation of EMI (Banks, 2018; Ben Hammou & Kesbi, 2022; Soe et al., 2020; Zare-ee & Hejazi, 2017); and the impact of EMI on students' English language proficiency (Belhiah & Elhami, 2015; Lei & Hu, 2014; Tong et al., 2020; Zare-ee & Hejazi, 2017).

However, there is a lacuna of scholarly knowledge on how EMI functions in the Moroccan educational context (Ben Hammou & Kesbi, 2021). Few studies have been conducted in Morocco. These studies discussed either the use of EMI in the higher education context (e.g. Ben Hammou & Kesbi, 2022; Nadri & Haoucha, 2020) or science teachers' attitudes towards future implementation of EMI in Moroccan secondary schools (e.g. Ben Hammou & Kesbi, 2021, 2023). Nevertheless, studies which examine the perceptions of teachers who are involved in the EMI teaching profession in Moroccan public upper secondary schools remain lacking. Therefore, the current research aspires to add to the literature on the use of EMI in the Moroccan education, focusing on maths and science teachers' perceptions towards teaching their subjects through English in Moroccan public upper secondary schools.

Literature review

Although teaching disciplinary content through English is not without difficulties, it has benefits for EMI teachers (Chapple, 2015), among which staff mobility has been reported (Coleman, 2006; Drljača Margić & Vodopija-Krstanović, 2018; Raza et al., 2021). Due to the growth of EMI courses and programs in different parts of the world, there has been a tendency towards recruiting international staff. Hence, EMI teachers have more opportunities to move to different countries for teaching (Galloway & Ruegg, 2022; Jenkins, 2018). In fact, it is found that such international mobility has a positive impact on those teachers. For instance, Brandenburg (2014) showed that working abroad improved 93% to 96% of participants' social competence due to their interaction with people from different cultural backgrounds. Additionally, 81% of the academic staff admitted that the quality of their teaching was enhanced when they worked abroad because they learned and adopted new teaching approaches into EMI teaching contexts.

Another important benefit is that the EMI policy promotes collaboration among teachers. Due to linguistic difficulties that EMI teachers encounter in classes, they sometimes work collaboratively with English language teachers. Team teaching is beneficial for both parts: Content teachers tend to receive linguistic support from language teachers, while the latter improve their understanding of disciplinary contents and language use in non-linguistic disciplines (Dearden, 2018). Such team working is witnessed in Spain and Germany. For instance, Barrios et al. (2016) revealed that a university provided an innovative project in the form of workshops and seminars to develop EMI teachers' skills and competencies. This program entailed making collaborations with language specialists who provided teachers with feedback on classroom language use and assisted them with developing and editing teaching materials. Similarly, Wilkinson (2012) reported the engagement of English language staff in an EMI program in the German Maastricht University. They provided support for both EMI students and teachers. At the level of EMI students, they observed two to three tutorials every week for two years and provided feedback to students at the end of each session to ensure their preparedness for the international management track. At the level of EMI lecturers, they provided them privately with feedback after the session. Their feedback included making remarks on the teaching materials they used and whether they met students' linguistic competence and "ensure agreement on purpose, accomplishments, learning tasks, and classroom management" (p.5).

Using EMI also improves teachers' English language skills (Coleman, 2006; Drljača Margić & Vodopija-Krstanović, 2018). When they teach through English, they seek to accomplish certain academic tasks, which entail communicative activities, including gaining information through reading English teaching materials and listening to English speakers. In addition, they convey information through interacting with their students and provide written assignments like tests. All these forms of performances expose EMI teachers to the English language. Therefore, some degree of language development is expected to take place (Ibrahim, 2001). In fact, Jayathilake et al. (2021) confirmed these assumptions in their study through interviews with 10 EMI lecturers in Sri Lanka. The latter reported that their English language proficiency was enhanced over time. At the beginning of their teaching career, they encountered some linguistic difficulties, but they could overcome them by time as they started to get more familiar with the English subject-terminologies. Eventually, delivering lectures in English was easier for them than using L1 (Sinhala).

Within the same stream, Simbolon (2016) echoed similar findings in an Indonesian context. Through an interview with 21 EMI lecturers, the researcher found that teaching disciplinary contents, like mathematics, mechanics and quality management, through English improved EMI teachers' English language proficiency. Within the same geographical area, Floris (2014) revealed, through an in-depth interview with 13 Indonesian lecturers, that their English language proficiency was improved due to teaching disciplinary contents in English. Moving to another context, Borg (2016) found, through surveying 437 university teachers in Kurdistan Region of Iraq, that 97% of the participants agreed that teaching contents in English helped them to improve their language skills. In consonant with these findings, Werther et al. (2014) confirmed similar findings in a Danish context. They surveyed 1794 lecturers and interviewed 5 of them on

their experiences and challenges they encountered in EMI classes. These teachers stated that using EMI had a positive impact on the teachers' English language abilities.

In addition to that, using EMI facilitates teachers' scientific contributions (Coleman, 2006; Drljača Margić & Vodopija-Krstanović, 2018). English is considered the language of science as many works are published in English. For that reason, academics would be required to make their scientific contributions in English (Hanauer et al., 2019). EMI teachers are privileged in this regard due to their language proficiency that qualifies them for publishing contents in English (Aguilar & Rodríguez, 2012; Dearden & Macaro, 2016). They also have the chance to investigate issues in the domain of their profession itself, EMI, which is a trending research area that has increasingly attracted researchers' interest recently (Kling, 2022). Furthermore, what makes the situation more advantageous is that EMI has helped researchers to disseminate local knowledge to the world (Zare-ee & Hejazi, 2017). Some EMI teachers have been provided with better access to international events like visits to an English-speaking country or attending in-house training by English-speaking experts (Werther et al., 2014).

Furthermore, EMI teachers are sometimes incentivised by their institutions to take on their teaching classes. These inducements include providing increased salaries and calculating the workload of EMI classes higher than that of L1 as medium of instruction classes (Lei & Hu, 2014). For example, the Shanghai University calculates the workload of EMI courses three times that of Chinese as medium of instruction courses, and the University of Fudan provides a bonus of 2,000 to 8,000 RMB yuan for teaching EMI courses (Hu, 2007). Furthermore, there are institutions which provide financial rewards for teachers joining the EMI program for the first time (Brown, 2017). Other forms of inducement are valuing EMI teachers' efforts through integrating them in decision making, appreciating their contributions and supporting course development, including providing grants, reimbursements for buying teaching materials and funding for editing textbooks (Rose et al., 2020).

In some contexts, EMI teachers are privileged to teach in a motivating environment (Zhang & Pladevall-Ballester, 2023). It is found that students' motivation for English learning plays a crucial role in their engagement, satisfaction (Le & Nguyen, 2023) and success as they are committed, enthusiastic and persistent in achieving their goals (Khusainova et al., 2018; Polatova et al., 2020). In fact, some EMI students have decided to undertake their studies through English to learn the language (Iwaniec & Wang, 2023) which they in turn need to continue their studies abroad (Shimauchi, 2018) and secure a position in the job market (Sahan et al., 2021) which highly demands having not only good speaking skills but also written ones (Bryce et al., 2023). For that purpose, they have made efforts to improve their language proficiency. These efforts allowed students to study in an interactive environment where they have interacted with their classmates and teachers, asked and answered questions, followed the class and taken notes (Cicillini, 2021).

Method

Research question

Our investigation is a case study that seeks to explore EMI teachers' perceptions towards teaching maths and science through English in Moroccan public upper secondary schools in a Moroccan region called Rabat-Salé-Kénitra. It is qualitative as it utilised semi-structured interviews to get in-depth information from the teachers. These interviews were analysed inductively, seeking to answer the research question:

> What are EMI teachers' perceptions of teaching maths and science through English in Moroccan public upper secondary schools?

Participants

The interviewees who participated in the current study were all the maths and science teachers recruited by the Ministry of National Education to teach scientific subjects through English in Moroccan public upper secondary schools in the region of Rabat-Salé-Kénitra in the 2021-2022 academic year. The total number of teachers was six because there were only two public upper secondary schools with an EMI track in the whole region. Among the six, there were three teachers of mathematics, two teachers of life and earth sciences and one teacher of physics and chemistry. Additionally, their ages ranged between 28 and 61 years old and their teaching experiences as displayed in Table 1 ranged between 4 and 34 years.

Table 1: EMI maths and science teachers' demographics

Interview ID	Age	Teaching experience		EMI teaching subjects
		Total years	Through EMI	
1	35	10	1	Mathematics
2	61	34	8	Mathematics
3	36	12	6	Mathematics
4	48	29	6	Life and earth sciences
5	28	4	3	Physics and chemistry
6	35	12	4	Life and earth sciences

Procedures

Data were collected through face to face semi-structured interviews with six EMI maths and science teachers. The interviews were led by an open question asking the teachers to state whether there were any benefits in teaching scientific subjects through English in Moroccan public upper secondary schools (see Appendix). The interviews ranged between 20 and 30 minutes and took place in the two public upper secondary schools. Five interviews were conducted in Moroccan Arabic, while one was in English based on the interviewees' requests. Additionally, the interviews were recorded except for two which took the form of note taking due to the interviewees declining to be recorded. The interviews were transcribed and then translated into English. Following that, the

transcripts were examined and analysed inductively based on emergent themes using thematic analysis as a method.

Results

Guided by the research question, EMI maths and science teachers viewed that teaching maths and science through English in Moroccan public upper secondary schools had six main benefits:

1. EMI improved maths and science teachers' English language proficiency;
2. EMI made teachers' access to teaching resources easier;
3. EMI encouraged teachers for reading contents in English;
4. EMI allowed teachers to develop a bilingual teaching expertise in both English and French;
5. EMI promoted collaboration among teachers;
6. EMI allowed teachers to use their language abilities for other personal purposes.

EMI improved maths and science teachers' English language proficiency

The results revealed that teaching maths and science through English in Moroccan public upper secondary schools enhanced teachers' English language proficiency. Four teachers confirmed that their English language abilities were improved due to teaching contents through English. A teacher of life and earth sciences reported that the efforts she invested in preparing her EMI lessons allowed her to acquire more subject-related terminologies. Similarly, two other teachers of mathematics and life and earth sciences stated that using EMI provided them with an opportunity to practise English. In this regard, the latter admitted that her EMI teaching experience allowed her to learn some basics of English including pronouns and tenses, a practice that she did not master before she had EMI teaching classes. Additionally, the teachers revealed that interacting with EMI students who already had an advanced level in English helped them to practise English as well as learn from their students. For instance, they tended to translate Arabic or French words into English for their teacher when needed. The following is part of what is said:

> Teaching mathematics through English allows me to pay attention to the English grammar while speaking, which I did not master at the beginning. In the past, I used to feel confused when I had to choose between he or she, singular or plural, etc., but I master these things now. In addition, I sometimes learn from my students themselves who tend to correct my mistakes (Interviewee 3, mathematics teacher).

> Teaching through English has allowed me to develop my English language skills and practise the language through using it in the classroom as well as through interacting with students who already have a good level in English. Sometimes, I ask help from my students to translate French or Arabic words into English (Interviewee 6, life and earth sciences teacher).

EMI made teachers' access to teaching resources easier

Easy access to EMI teaching materials was reported to be one of the advantages of teaching scientific contents through English. A teacher of life and earth sciences stated that the materials for teaching the subject were more readily available on the Internet in English than in French. As a matter of fact, she had more choices among which she could select the appropriate ones for her EMI students.

> Teaching materials are more available online in English than in French. So, I have more choices for my students (Interviewee 4, life and earth sciences teacher).

EMI encouraged teachers for reading contents in English

Having EMI teaching classes encouraged teachers to read contents in English. A teacher of mathematics confirmed that teaching her subject through English motivated her to read more sources in English. For instance, she read British and American mathematics textbooks from which she took some definitions and exercises. Also, she felt motivated to read articles in English for her PhD thesis and prepare for the International English Language Testing System test.

> The EMI classes encouraged me to search for English sources and read about the subject [Mathematics] in English (Interviewee 3, mathematics teacher).

EMI allowed teachers to develop a bilingual teaching expertise in both English and French

Teaching maths and science through English enabled teachers to build a bilingual teaching expertise in both French and English. Maths and science teachers who taught EMI students also had French as a medium of instruction (FMI) teaching classes. Four teachers said that they taught their school subjects in French to some FMI groups of students in the same upper secondary school where they had EMI teaching classes. Two others taught only EMI students when the study was conducted, but they taught FMI students in the past. Therefore, these teachers could develop a bilingual teaching expertise in both languages as two teachers of mathematics reported.

> I developed a bilingual teaching career. I can now teach mathematics in French as well as in English (Interviewee 3, mathematics teacher).

> There is an added value. That is, I can teach in both languages: French and English (Interviewee 2, mathematics teacher).

EMI promoted collaborations among teachers

Using EMI promoted collaboration among maths and science teachers and English language teachers. An EMI teacher of mathematics revealed that the EMI program encouraged her to work with English language teachers from the same school. She tended to ask for help from English language teachers, especially at the beginning of her EMI

teaching career due to lack of experience. For example, she asked them to verify exam sheets and exercises before distributing them to students, because she did not want to have any mistakes in her work.

> I tend to ask English language teachers, especially at the beginning of my career, to check exams or exercises before distributing them to students to avoid any syntactic or grammatical mistakes (Interviewee 3, mathematics teacher).

EMI allowed teachers to use their language abilities for other personal purposes

Having EMI teaching classes enabled teachers to use their language abilities for some personal purposes. An EMI teacher of mathematics revealed that teaching mathematics through English increased her independence because of her improved linguistic skills. She started to rely on herself in tasks that required the use of the English language. These included writing her curriculum vitae (CV) in English, which she could not do on her own in the past. In this regard, she said that she did not know the French equivalent words in English for titles like PhD, MA and the scientific disciplines when she wanted to include them in her CV. Additionally, her improved English language level encouraged her to travel to Anglophone countries because she could use the language to communicate with foreigners.

> The use of EMI has allowed me to make some personal stuff in English on my own, like CVs, which I was not able to do in the past. Also, it has encouraged me to travel to English speaking countries because I like to travel a lot (Interviewee 3, mathematics teacher).

Conversely to the previously stated results, two teachers, one of physics and one of chemistry, reported their dissatisfaction with their EMI teaching experience. They considered teaching EMI students as tiresome rather than being beneficial. In this regard, the former argued that teaching physics and chemistry through English was no more than a burden. He justified his stance by saying that he was required to put in a lot of efforts in order to prepare his lessons in English. Similarly, the latter unravelled that he could not benefit from teaching mathematics through English because it was his first-year teaching through English and his level in English was low. However, he believed that he would have benefited from his EMI teaching experience if he received training on EMI Anglophone strategies. The following statements are their voices, respectively:

> It is extra work for me. It is more of a burden than anything else because I put a lot of efforts into getting prepared for the session (Interviewee 5, physics and chemistry teacher).

> For me, there are no benefits because it is just my first-year teaching EMI students. If there was training for teachers, I would have benefited (Interviewee 1, mathematics teacher).

Discussion

The current study explored EMI maths and science teachers' perceptions towards teaching scientific contents through English in Moroccan public upper secondary schools in the region of Rabat-Salé-Kénitra. The study revealed that using English to teach maths and science was beneficial for most of the teachers being interviewed. They stated that EMI improved their English language proficiency, which was, consequently, a result of the efforts they invested in preparing their lessons in English. In this regard, Borg (2016), Dearden (2018), Floris (2014), Simbolon (2016), and Werther et al. (2014) corroborated similar findings, confirming the positive impact of EMI on the teachers' English language skills. In the present study, interacting with EMI students who already had an advanced level in English was also a contributing factor to the improvement of the EMI teachers' language proficiency. Students tended to help their teachers in translating Arabic or French words into English when they were unable to find equivalent English words. In addition, they corrected their teachers' linguistic mistakes.

Within the same stream, three aspects of language improvement were identified. First, teaching maths and science through English enriched EMI teachers' linguistic background as they were able to acquire new maths and science related terms in English. Second, EMI enabled teachers to master some basic English grammar as an EMI teacher of mathematics confirmed. She argued that she started to use the English language appropriately, which she was not able to do prior to teaching EMI students. Third, EMI provided teachers with an opportunity to speak and practise English more with students. Such improvements might contribute to EMI maths and science teachers' teaching self-efficacy because it was found that the medium of instruction and the language of communication highly correlated with EMI teachers' teaching self-efficacy (Wang, 2021).

Furthermore, using EMI in teaching maths and science made access to teaching materials easier for teachers. Teaching materials were more readily available in English than in French, as reported by an EMI teacher of life and earth sciences. Therefore, the teacher had more choices to select appropriate sources to use in the EMI classroom. In this regard, Başıbek et al. (2014), Coleman (2006), Drljača Margić & Vodopija-Krstanović (2018) and Simbolon (2016) showed similar findings, revealing that teaching materials like textbooks and texts were more available in English than in students' L1 in non-English speaking countries like Indonesia and Turkey. However, the availability of these teaching materials may not matter when serious issues like the appropriateness of contents to the context occur. In fact, Brown (2018) and Garcia (2020) argued that using non-local teaching materials became problematic if they did not fit students' cultural background and linguistics competencies. EMI teachers are, therefore, required to adapt and adjust their teaching tools before using them in the EMI classroom (Simbolon, 2016).

Using EMI encouraged EMI maths and science teachers to read more content in English. This entailed reading British and American textbooks of mathematics to prepare EMI lessons, reading English sources for conducting scientific research and preparing for international tests like the International English Language Testing System test, as was the case for an EMI teacher of mathematics. Similarly, Macaro et al. (2019) found that EMI

teachers read more in English but for different purposes. These teachers relied on EMI in English to improve their teaching pedagogies and skills and develop a better understanding of some EMI related issues. In addition to that, they spent years learning the English language both in formal and informal contexts.

Moreover, teaching maths and science through English in Moroccan public upper secondary schools enabled EMI teachers to develop a bilingual teaching expertise in both English and French. In Morocco, maths and science are taught through French in nearly all schools, except for the EMI piloting schools. Some maths and science teachers who taught students through French also had EMI teaching classes. This allowed them to develop a bilingual teaching expertise. In this regard, Doiz and Lasagabaster (2018) argued that EMI teaching experience enabled teachers to shape a bilingual identity. Furthermore, Iyobe and Li (2017) confirmed that teaching through English supplemented by appropriate training effectively contributed not only to the teachers' EMI teaching practices but also to their Japanese medium of instruction (JMI) experience because of their adaptation of new approaches and techniques that they learned in EMI training sessions to the JMI context.

Additionally, using EMI promoted collaboration among Moroccan public upper secondary school teachers. Teaching scientific subjects through English raised certain linguistic difficulties for some maths and science teachers. Therefore, they were urged to seek help from English language teachers as asserted by an EMI teacher of mathematics. The roles of language teachers entailed verifying exam sheets and exercises before the EMI teacher distributed them to students, to avoid any mistakes. In this regard, Lasagabaster (2018) argued that collaborations between content teachers and language teachers enhanced students' learning outcomes because teachers complemented each other. In such contexts, the task of language teachers was to give feedback on linguistics issues when they occur in the lesson or on classroom language use and to assist with developing and editing teaching materials (Barrios et al., 2016). Language teachers could help alleviate feelings of isolation, especially when there was a lack of resources and guidelines for teaching disciplinary contents through English. Furthermore, team teaching enhanced EMI teachers' teaching skills because they could try new activities and approaches (Dearden, 2014).

However, collaborations between content and language teachers were sometimes difficult to establish. In Spain and Germany, such collaborations were organised by universities in the form of seminars and workshops (Barrios et al., 2016; Wilkinson, 2012). For instance, within an EMI program in Germany's Maastricht University, English language teachers were required to give feedback to students on linguistic aspects at the end of a course and to teachers privately afterwards on their teaching materials, on whether they met students' linguistic competencies and to "ensure agreement on purpose, accomplishments, learning tasks, and classroom management" (Wilkinson, 2012, p.5). However, Lasagabaster (2018) argued that despite the effectiveness of the team teaching, it was difficult to establish, as it required to get language teachers' consent and funding, especially when language teachers make classroom observations. In our study, team teaching was informal and language teachers helped content teachers voluntarily.

Along the same line, using EMI diversified teachers' language abilities. As confirmed earlier, being immersed in teaching maths and science through English improved some aspects of the EMI practitioners' linguistic competences. This allowed them to use their English for other purposes. For instance, an EMI teacher of mathematics revealed in this study that she was able to write CVs in English on her own, a task deemed impossible before initiating in teaching EMI students, due to her low English language proficiency. Additionally, she was encouraged to travel to Anglophone countries thanks to her good English language level. Similarly, Maíz-Arévalo and Orduna-Nocito (2021) corroborated correlating findings in their study. Through surveying 21 EMI university lecturers in Spain, 95% of the teachers were interested in traveling abroad. In addition, they expressed their need to develop intercultural competences for an effective higher education internationalisation.

Conversely to the previous findings, two EMI maths and science teachers in the current study had negative views towards their EMI teaching experiences. These two teachers stated that teaching scientific disciplines through English was a burden, due to three main reasons. First, using EMI was tiresome as it required them to put a lot of effort into lesson planning. In this regard, Coleman (2006) and Gürtler and Kronewald (2015) agreed that the preparation time was increased in EMI programs and there was an additional workload. Second, lack of EMI teaching experience made the situation more difficult for an EMI teacher of mathematics who participated in this study. Third, lack of training made the situation worse. In this matter, one of the EMI teachers argued that if teachers received training, they would be satisfied. This finding was also confirmed in a Turkish context in which EMI lecturers stressed the importance of providing EMI training courses (Ozer, 2020). In addition, these teachers would be more motivated if their institutions offered them some financial rewards. This might entail financial compensation with adjusted pay scales and regular promotions that more accurately represent the EMI teachers' efforts, contributions and greater time commitment (Chapple, 2015).

Conclusion and recommendations

This study explored Moroccan public upper secondary school teachers' perceptions towards teaching maths and science through English using semi-structured interviews. The findings revealed that most of the teachers viewed their EMI experience as a beneficial one. It helped them to enhance their English language skills, collaborate with English language teachers, access more teaching resources in English and build a bilingual teaching career in both French and English. It also motivated them to read content in English. Nevertheless, using EMI was not a promising experience for few EMI teachers, due to the increased workload and lack of training and EMI teaching experience.

Based on the findings of the current study, the researchers have three main recommendations for using EMI in Moroccan public upper secondary schools. It is preferable to provide training for all EMI teachers to improve their English language proficiency and sharpen their teaching skills. Also, EMI teachers would be more satisfied with their teaching experience if their workload decreased. For instance, teachers might be assigned to take on only EMI classes instead of having both EMI and FMI classes. This

would make them focus on preparing lessons and activities in one language. In addition, incentivising EMI teachers financially is a good strategy to motivate them to improve their language abilities and teaching skills.

In the light of this study, there are new research areas that would add to the EMI related literature, which the researchers did not consider. Although teaching disciplinary content has many benefits for EMI teachers, it is not without difficulties (Nieto Moreno de Diezmas & Barrera, 2021). Thus, future researchers may examine in more depth the difficulties that these teachers encounter in EMI classes. Noting that the current study revealed potential benefits for EMI teachers who were not native speakers of English, researchers can shed the light on the experiences of EMI native teachers in non-English speaking countries and examine whether they voice similar opinions. Additionally, exploring Moroccan students' benefits from studying scientific content through English is another interesting topic that deserves investigation.

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Appendix: Interview protocol with EMI maths and science teachers

Date:
The interview starts at:
The interview ends at:

Dear maths and science teachers, this interview is about the use of English as a medium of instruction (EMI). Its main objective is to explore your experiences with teaching maths and science through English in Moroccan public upper secondary schools. Please be informed that:

- The information will be used only for research purposes.
- You will remain anonymous and data will be de-identified.
- I will record this interview if you agree.

A: Personal information

May I have the following information before we start the interview:

1. How old are you?
2. Which school subject do you teach?
3. How many years have you been teaching?
4. How many years have you been teaching EMI students?

B: Interview questions

5. Does teaching your subject through English in the Moroccan public upper secondary school have any benefits for you?
6. If Yes, what are these benefits?
7. If No, what are the reasons behind that?

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