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Exploring Attitudes and Readiness for EMI among Moroccan Upper Secondary School Science Teachers and Students: Rehamna Directorate as a Case Study

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Abstract
This study explores Moroccan upper secondary school science teachers' and students' attitudes and readiness for adopting English as a Medium of Instruction (EMI). It aims to enhance understanding of the potential success and challenges of implementing this teaching approach in Moroccan science classes. Data was collected through two questionnaires targeting teachers' and students' attitudes, readiness, anticipated challenges, and their expectations and needs for adapting to EMI. The analysis revealed that while both groups acknowledge the critical role of English in advancing scientific research, concerns persist due to their Francophone educational background and limited English proficiency. Despite these challenges, respondents expressed positive attitudes toward EMI adoption, emphasizing that the transition should be gradual and supported by translanguaging practices and continuous training for both students and teachers. This study underscores the importance of introducing EMI in the early stages of students' education and implementing it gradually to ensure long-term success. To overcome linguistic barriers, it recommends dedicating more time to English language learning within the curriculum. These findings contribute to understanding how EMI can be effectively integrated into Morocco's educational system, aligning with global trends in science education and internationalization.

Keywords: CLIL, EMI, globalization, internationalization, lingua franca, translanguaging

1. Introduction

In the era of globalization, the status of English as a lingua franca plays a vital role in the global market by improving and facilitating business and academic partnerships worldwide (Tsou and Kao, 2017; Kirkpatrick, 2014). This fact forces the educational systems in the non-native English-

speaking countries around the globe to adopt English as a medium of instruction (EMI) in their educational programs, especially in science classes. In these non-native English-speaking countries, the EMI approach is implemented as a potential strategy for improving education quality and meeting the job market demands (R'boul et al., 2024).

Given the fact that most scientific research is written in English, which has also become the language of the international academic conferences, students have to be taught this language and receive basic scientific concepts in English in their early academic life. English is gaining ground in the Moroccan context as the educational policy makers and academics have started calling upon the generalization of English teaching on all school levels. Later, English would be used to teach the basics of scientific subjects at early school life stages.

This study aims at investigating the attitudes and readiness of Moroccan scientific high school teachers and their students for the use of English as a medium of instruction (EMI) in their science classes. In the Moroccan context, it should be noted that there was a shift in the language of scientific subjects in 2019; in the academic year 2019-2020, Morocco has actually shifted from Arabic medium instruction (AMI) to French medium instruction (FMI) in science classes (Belhiah, 2022, p.149). Yet, in the researcher's opinion, the shift to FMI in Morocco is supposed to be less challenging in comparison with EMI as the overwhelming majority of actors in the educational teaching leaning process (teachers and students) were more exposed to French than English. On the one hand, this is basically due to the status of the French language being taught early in the Moroccan primary school as the first foreign language of the nation. On the other hand, English was only introduced in the upper secondary education (K-10 to K-12), and was later on programmed for the 9th grade of middle secondary education (K-9), knowing that the Moroccan Ministry of Education scaled up the teaching of this language to include the first and second grades (K7 and K8) of middle secondary school in 2023 (Boussakou, 2023). Thus, the shift to EMI in Moroccan science classes might be a demanding task due to the lack of pre-training of both teachers and students in English, supposing that most of them studied scientific subjects either in Arabic or French.

Though numerous studies have investigated the implementation of EMI in non-native English-speaking countries, limited research has been conducted in the Moroccan context, especially at the high school level. Restricted attention has been paid to how science teachers and their students perceive and prepare for this transition from FMI to EMI. Particularly, there is a lack of a systematic investigation into the attitudes, readiness, and challenges encountered by these key actors. To address this gap, the present research aims at exploring and analyzing the perspectives of both Moroccan scientific high school teachers and their students, focusing on their attitudes, readiness, and challenges regarding the use of EMI in Moroccan high school science classes.

2. Literature Review

Teaching scientific subjects in English is a phenomenon that has started emerging around the world, especially in countries where English is not the first language. Hence, EMI has been internationally adopted in many non-Anglophone nations, such as China, Malaysia (Pun et al., 2022), the Netherlands, Korea, Japan, Germany, Sweden, France, Bahrain (Tsou & Kao, 2017), and Morocco (Belhiah, 2022). The rising popularity of EMI worldwide is due to many reasons, such globalization, internalization, and the status of English as a lingua franca. However, the implementation of this new teaching mode is challenging for non-native English-speaking EMI teachers and students. This is due to various factors, such as the duality of language proficiency and scientific content complexity as well as the curriculum genre and its specialized regulative and

instructional register features (Bernstein, 1996; Christie, 1997; Tsou & Kao, 2017; Veel, 1999; Schleppegrell, 2007).

2.1 Concept Definition

In the first section of the literature review, the focus is on defining the main concepts involved in the present study, mainly the terms English-Medium Instruction (EMI), Content and Language Integrated Learning (CLIL), and Translanguaging; then, the researcher sheds light on some empirical studies which were previously conducted on the same topic of the study overseas and in Morocco.

2.1.1 English-Medium Instruction (EMI)

Almost all scholars agree that EMI refers to a phenomenon of using English as a medium of instruction in countries where English is not the L1 (Fenton-Smith et al., 2017). In the same flow, (An & Macaro, 2022, p.1) believe that the concept of English-Medium Instruction (EMI) refers to the process of teaching academic disciplines such as mathematics, science and other social sciences through the medium of English, but only when English is neither the L1 of the majority of the learners or the population is being taught nor the L1 of the majority of teachers. Another definition that agrees on the aforementioned definitions of EMI states that "the use of English language to teach academic subjects in countries or jurisdictions where the first language (L1) of the majority of the population is not English" (Fenton-Smith et al, 2017, p.95).

2.1.2 Content and Language Integrated Learning (CLIL)

The concept of Content and Language Integrated Learning (CLIL) refers to "an educational approach where curricular content is taught through the medium of a foreign language, typically to students participating in some form of mainstream education at the primary, secondary or tertiary level" (Dalton-Puffer, 2011, p. 183; Lasagabaster, 2013, p.5)

A key difference between EMI and CLIL is that EMI is usually associated with higher education, whereas CLIL is usually interrelated with primary and secondary education. Additionally, unlike EMI, CLIL integrates language and content learning, giving equal focus to both (An & Macaro, 2022, p.1).

2.1.3 Translanguaging

The concept of translanguaging refers to the ability of multilingual speakers to move fluidly between two or more languages, strategically using their full linguistic repertoire in these languages to accomplish a task. For instance, in teaching, translanguaging allows both teachers and students to use more than one language in the classroom for the purpose of an effective communication (Canagarajah, 2011).

2.2 Empirical Studies

2.2.1 Reasons why EMI is Gaining Ground in the World

As discussed in (Tsou & Kao, 2017), the popularity of the shift to EMI in most of the educational systems around the world stems from many reasons. One of these reasons has to do with the status of the English language which has become a lingua franca to serve as a common language between people whose native languages are not the same. Another important reason behind this shift is the role that the English language plays in carrying out business transactions among the business community around the globe. Moreover, the growth in academic publications in English requires universities worldwide to double their efforts to gain a competitive advantage in today's globalized higher education sector. This trend reflects the prominence of the English language, alongside concepts like the internet, networking, globalization, and the global market,

which have come to define our era. Furthermore, the creation of a European Higher Education Area (EHEA), which aims to facilitate academic exchange and partnerships, also contributed to the status and growth of EMI programs in Europe (Kirkpatrick, 2014). In the researcher's opinion, this can also be another reason why EMI is gaining popularity in the world since the academic exchange and partnerships are not only restricted to the European institutions, but have also become widespread to concern all institutions around the world. Consequently, the English language, serving as the lingua franca for international academic conferences and business activities, plays a crucial role in facilitating exchange and cooperation among higher education institutions (Kirkpatrick, 2014). This dynamic necessitates the adoption of the EMI approach, which transforms regional campuses into global ones, fostering engagement between professors and learners from diverse linguistic and cultural backgrounds. Furthermore, intercultural dialogue contributes significantly to enhancing local students' language proficiency, intercultural understanding, global communication skills, and international mobility. Therefore, EMI is viewed as a key choice to enhance education quality, graduate employability, research publications, and global academic collaboration, all of which contribute to the global reputation and profile of institutions (Tsou and Kao, 2017). However, in many countries whose first language is not English, the adoption of the EMI approach is demanding for non-native English-speaking teachers, especially in science classes, for various reasons.

2.2.2 EMI as a Challenge for Non-native English-Speaking Teachers and Students

As Tsou & Kao (2017) declare, non-native English-speaking EMI teachers face significant challenges in achieving teaching and learning goals with their students. This is because the EMI approach not only requires them to have a high level of English proficiency to use the language fluently in teaching but also demands that they possess and apply additional skills through the medium of English. This stems from the nature and objectives of this new teaching approach, which goes beyond merely translating course materials and presentation slides from the students' native language to English. It requires involving the original language in the students' learning environment while also employing diverse and multilingual communicative strategies to effectively perform tasks and achieve the desired learning outcomes. In EMI classes, teachers are obliged to accomplish tasks such as comprehension insurance, input modification, and teaching-learning atmosphere creation in the benefit of learners. All of this should take into consideration the different language levels as well as the different cultural backgrounds of all learners (Dearden, 2015).

In support of the above, studies have confirmed that teaching a specific school subject in English is a specialized skill. While it is often assumed that instructors in EMI (English-Medium Instruction) programs who are fluent in English or have lived in an English-speaking country during their academic studies can teach other subjects in English, this may not always be the case (Tsou and Kao, 2017). This is due to the curriculum genre and its specialized regulative and instructional register features. On the one hand, EMI teachers need to master language to manage their classroom environment in order to achieve teaching-learning goals with their students (the regulative discourse). On the other hand, they need a high level of competency in the content and knowledge to be transitioned to students (the instructional discourse) (Bernstein, 1996; Christie, 1997; Tsou and Kao, 2017, p.57). Hence, when we are talking about an EMI teacher, we are not simply talking about language competency, but teacher's multiple skills and roles should be taken into account; an EMI teacher is a subject instructor, a classroom manager, and students' initiator into the teaching learning process (Tsou and Kao, 2017, p.57-58). This is true for all subjects, including those which do not depend on much language use, such as mathematics which has its own discourse and different grammatical structure that impose linguistic challenges to learners

(Veel, 1999; Schleppegrell, 2007). In science classrooms, according to Veel (1999), language has multiple functions; it is used to scientifically explain phenomena, conduct laboratory experiments, describe and discuss scientific facts, challenge an issue through exposition and discussion, and organize scientific information into taxonomies. It is also used to teach subjects' content through describing processes and procedures such as how something can be done in the laboratory, resolving or explaining class management issues such as giving instructions on certain homework, telling scientific stories related to concepts, technological issues, etc. (Scott et al., 2006).

In MENA (Middle East and North Africa) contexts, numerous studies disclose positive attitudes toward EMI with emerging challenges. In Saudi Arabia, studies like Aldawsari (2022) and Alharbi & Alghamdi's (2024) reveal generally positive attitudes and enthusiasm regarding EMI, especially among teachers. However, they also highlight varying levels of readiness among students and faculty due to challenges related to both language proficiency and pedagogy, calling for bridging programs and professional training. In the same vein, Al-Birbary (2023) declares that both EMI and EFL (English as a Foreign Language) teachers expressed their positive attitudes regarding teaching through the medium of English, but with high levels of pressure and anxiety about their students' engagement and evaluation. Thus, the researcher emphasizes the integration of professional development and ongoing training for teachers to improve their language confidence and proficiency, equip them with adequate strategies, and refine their classroom management. The study also proposed that strategies like providing institutional support, reinforcing teacher preparedness, and enhancing student motivation, would help reduce teaching-learning anxiety and better implement English as a medium of instruction.

In Tunisia, Abdeljaoued (2023) states that students largely expressed positive and enthusiastic perceptions toward EMI. They also declared certain challenges related to their teachers' low English proficiency, which rise their difficulty in understanding teaching content. This problem results in a widespread translanguaging technique by teachers trying to make their instructions more understandable. The study recommends more in-service professional training and institutional support for teachers to make the shift to EMI more productive. A recent study has been conducted in Algeria by Tobbi (2025) also declares teachers' positive attitudes toward EMI though they were worried about certain challenges related to duality of dealing with both language and content, limited institutional support, and low language proficiency. Thus, they resorted to numerous strategies to bridge language and content, such as informal peer collaboration, translanguaging, and scaffolding. The study proposes the need of incorporating culturally responsive policies that align with the Algerian context, institutional support, and teacher professional development.

2.2.3 Translanguaging and Code-switching to Bridge Language and Content in EMI Science Classes

Another challenge that may arise in EMI scientific classes is the technical terms. Each scientific subject has its own terminology with which students have to be acquainted. To overcome this challenge, as has been proven by studies conducted in Hong Kong, EMI teachers resort to codeswitching to bridge the linguistic gap among students whose English proficiency is low or modest. In EMI science classes, codeswitching serves as a technique to illustrate difficult or complex concepts and create positive rapport as well (Tsou and Kao, 2017, p.58). Moreover, in EMI science classes, students must be able to comprehend and work with complex epistemic constellations of meaning in a language other than their L1, in order to master scientific knowledge (Pun et al., 2022). This, in the researcher's opinion, makes it a demanding task for both EMI scientific teachers and their students. Thus, both of them resort to either translanguaging or code-switching to their first language (L1) to bridge the linguistic gap and overcome the communication barriers in their EMI science classes.

In a study conducted by Pun et al (2022) on EMI teachers and students' experience at a Hong Kong Secondary School, the majority of EMI teachers demonstrated a preference for using either Chinese or Cantonese to accommodate students with limited English communication skills and lessen the strain on language abilities. The same teachers declared that they allow and encourage their students to use translanguaging if they cannot express their ideas in English and since they just would like to check their students' understanding. In the same study, as the case for their EMI teachers, the majority of students acknowledged and valued the role of translanguaging in EMI classes, stating that it helps them interact with their teachers and their classmates in science-teaching activities. Additionally, both EMI teachers and their students believe that translanguaging is more likely to be used in science activities, where more priority is given to learning content over language (Pun et al., 2022, p. 11).

Of course, the use of the L1 can play a vital role in enabling science-teaching activities, especially in bridging the linguistic gap of both students and teachers, increasing the percentage of students' understanding of complex scientific terminology, and facilitating teachers-students' interactions in EMI science classes. However, the researcher is wondering whether the codeswitching and translanguaging strategies would be effective in achieving EMI objectives in science classes, taking into consideration that there might be distinctions between some specific scientific concepts in English and L1. For instance, In Fung and Yip's study (Fung and Yip, 2014), as also stated in (Pun et al, 2022., p.3), EMI students found it difficult to make distinctions between certain scientific subjects when they are used in their L1 (Chinese) as it does not make distinctions between these concepts in the way English does. For instance, the word "heat" in Chinese is used for both "heat" and "hot", while the meanings of these words are different in English (Pun et al., 2022, p.3).

It is argued that switching to L1 can be effective in EMI science classes and CLIL classes according to both Haroon's (2005) study in the Malaysian context and Gierlinger's (2015) study in the Austrian secondary schools. Both studies confirm the effectiveness of L1 in bridging language and content in EMI science classes or in CLIL classes when teachers are linguistically insecure to elaborate on a certain complex topic, check their students' comprehension, manage their classroom, and explain complex ideas and concepts (Haroon, 2005; Gierlinger, 2015, p.358; An & Macaro, 2022). On top of that, (Pun & Macaro, 2019) hold that the use of L1 in EMI science classes can indirectly support the L2 acquisition by reducing cognitive load and fostering a deeper understanding of content. Yet, both Gierlinger (2015) and Pun & Macaro (2019) also argue that the use of L1 should be balanced with the use of L2 to promote immersion and language development. They further highlight that an overreliance of L1 could limit students' exposure to and practice in L2, which draws our attention to the reasonable use of L1 which should be only used when it is urgently needed in order to maintain the L2 dominance in the class. Contrary to the above, as stated in (An & Macaro, 2022), Hellekjaer (2017) declares that there are no significant differences in understanding lectures delivered in the native language (L1) compared to those taught in English as a Medium of Instruction (EMI) across various humanities and science courses at universities in Norway and Germany. This suggests that using the native language (L1) does not necessarily ensure easier comprehension, particularly due to the specialized and technical nature of some concepts.

2.2.4 Overview of the Teaching Process in EMI Science Classrooms Overseas

What makes the teaching process through the medium of English debatable and problematic for some EMI science teachers is the language issues of their students. While some teachers of scientific subjects accept addressing the students' language issues alongside teaching them subjects' content, many other EMI science teachers refuse to deal with this duality (Pun et al., 2022). This owes to the lack of pre-service training, as confirmed by Dearden's international survey on EMI

implementation. Dearden (2015) found that very few EMI teachers received a pre-service training to teach subject content in English and address students' language-related difficulties. This gap in training underscores a critical barrier to effective EMI delivery, as teachers often struggle to simultaneously manage content and language integration without adequate preparation. Similarly, a study conducted by Othman & Saat (2009) on pre-service science teachers in Malaysia revealed numerous obstacles faced by EMI science teachers. These included difficulties in performing the dual task of integrating language and content, limited English communication skills, and a shortage of dual-purpose teaching materials tailored to meet both linguistic and subject-specific needs.

This issue of lack of training for EMI teachers is also discussed in other studies such as the study conducted by Yip et al (2003) on examining the instructional activities' quality in secondary schools' science classrooms in Hong Kong. The findings of the study demonstrated that EMI science teachers' limited English proficiency restricts their ability to explain complex and abstract scientific terms in English, as well as to pose more complex questions, such as higher-order and conceptual change questions. When EMI teachers are not proficient in the English language, they face challenges in making use of students' prior experiences and existing knowledge to engage them in a more constructive learning process. They also face barriers in using more complex questions rather than only using the simple recall ones to challenge the cognitive ability of their learners (Yip, 2004).

Both EMI teachers and students should be well-trained to improve their English language communication skills and proficiency. This is essential for fostering a more interactive, constructive, and productive teaching-learning process. A lack of language proficiency can negatively impact the learning of scientific subjects due to limited teacher-student interaction. This, in turn, can make the teaching-learning process one-sided, with the teacher acting more as an authoritarian instructor rather than a guide and facilitator who encourages a constructivist approach.

2.2.5 The Rising Popularity of English in Morocco

According to Belhiah (2020, p.39), in addition to factors such as globalization, internationalization of higher education, the internet, social media, tourism, science and technology, foreign policy will also pave the ground towards an accelerated growth of the English language in Morocco. For instance, French has been promoted as the first foreign language in Morocco for decades thanks to the Moroccan-French strong diplomatic ties. Likewise, the recent American recognition of the Moroccanness of the Sahara territories in December 2020 will certainly consolidate the status of English in the Morocco.

In addition to all of this, Errihani (2017) declares that there are seven agents which play an important role in the promotion and growth of the English language teaching and learning in Morocco. These agents are the Ministry of Education, the private Moroccan English language schools, the British Council, the American Language Centers, the Moroccan Association of English Teachers (MATE), the Regional English Language Office (RELO), and AMIDEAST. In my opinion, this promotion of ELT in Morocco is also proven by various factors, such as nowadays wide use of English by Moroccans either at school and public spaces or on Media tools, the number of regional, national, and international ELT workshops and conferences that are organized in Morocco each year, etc.

2.2.6 Moroccan Students' Attitudes towards English Learning

In a study conducted by Nifaoui (2021) on the attitudes of Moroccan secondary school students towards French and English, in which the researcher compares between the students' attitudes towards English and their attitudes towards French, the findings show that students expressed their great readiness and motivation to learn English rather than French. According to

the same study, it has been found that the students prefer learning English to French given that English has a great potential of improving their socio-economic status in the future as it can broaden their horizons due to the fact that English is widely used in the realm of telecommunication, business, and scientific research in a globalized world.

In the same sphere, Belhiah (2020, p. 46) states that Moroccan students have a preference for English rather than French or Arabic studies for various reasons. First, their attitudes and perceptions towards English are highly positive as they believe it facilitates their openness on the outside world and cultures. Second, they perceive English as linguistically far easier than French or Arabic counterparts. Third, they also regard English as a prestigious language as it is widely used around the globe, which can serve their interest in reaching out to people worldwide and discover the different cultures of countries whose English is the first or native language.

3. Research Methodology

3.1 Design of the Study

The type of the present study is exploratory since its objective is to investigate Moroccan high school science teachers' and students' attitudes towards English-medium instruction (EMI) in science classes through their perceptions, feedback and readiness for this new mode of instruction on the one hand. On the other hand, the researcher tries to examine the effect of the language of instruction on the classroom dynamics in science classes, reveal how the attitudes and readiness for the transition to EMI are convergent or divergent between the students and their teachers, explore the potential challenges that this transition might face, and investigate the potential pedagogical strategies that would facilitate the shift to this new mode of instruction.

3.1.1 Research Objectives

The main purpose of this study is concerned with exploring the attitudes and readiness of both Moroccan scientific high school teachers and their students towards the shift to EMI. To achieve this purpose, the study tries to:

1. Investigate the Moroccan scientific high school teachers' attitudes and readiness to shift to EMI in science classes
2. Explore the Moroccan scientific high school students' attitudes and readiness to study scientific subjects in English
3. Examine the convergence and divergence in the attitudes and readiness between the students and their teachers
4. Uncover the potential challenges and pedagogical strategies to facilitate the shift to EMI in science classes

3.1.2 Research Questions

Based on the previously stated objectives, the following research questions are addressed:

1. What are Moroccan high school science teachers' and students' attitudes towards EMI?
2. Are Moroccan high school science teachers and students ready for the shift to EMI?
3. To what extent is there convergence in the beliefs/reactions between the students and their teachers?
4. What are the potential challenges that might arise and hinder the implementation of EMI in Moroccan high school science classes?

5. What strategies and teaching pedagogies are suitable for an adequate and smooth transition to EMI in Moroccan high school science classes?

3.1.3 Research Hypotheses

Based on the previously stated objectives and questions, the following research hypotheses are drawn:

1. H1=Both Moroccan high school scientific teachers and students have positive attitudes towards EMI
2. H02=Both Moroccan high school scientific teachers and students are not ready to shift to EMI
3. H3=Moroccan high school scientific teachers' and students' attitudes and readiness to shift to EMI in science classes are convergent
4. H4=There are potential challenges that both Moroccan scientific high school students and teachers might face in shifting to EMI

3.1.4 Participants of the Study

The population targeted in this study is Moroccan scientific high school teachers and students. Fifty-four (54) scientific high school teachers and two hundred thirty-four (234) scientific high school students were taken as a sample of participants of this study. All the participants are Moroccans, and all of them provided their answers anonymously.

Table 1: Information about the Sample of Teachers

	Number	Gender		Age Range			School Subjects			Experience Range			
TEACHERS	54	F	M	25-35	35-45	45-60	Maths	Physics & Chemistry	Biology & Geology	Less than 5 years	5-10 years	10 -20 years	More than 20 years
		71,7%	28,3%	69,6%	15,2%	15,2%	43,4%	73,7%	18,9%	41,5%	26,4%	24,5%	7,5%

Table 2: Information about the Sample of Students

STUDENTS	Number	Gender		Age Range	School Level		
	234	Female	Male	15-19	K10	K11	K12
		72,6%	27,4%		10%	25%	65%

According to the two tables above, 54 Moroccan scientific high school teachers and 234 Moroccan scientific high school students were taken as participants of this study. Concerning the gender of the teachers' sample, 71,7 % of them were females and 28,3% were males. As for their age range, 69,6% of them were aged between 25 and 35 years old, 15,2% were aged between 35 and 45 years old, and 15,2% were aged between 45 and 60 years old. Regarding the scientific subjects are taught by this sample of teachers, 43,4% of them teach Mathematics, 73,7% teach Physics and Chemistry, and 18,9% teach Biology and Geology. With respect to their experience range, 41,5% of the teachers participated in this research have less than 5-year teaching experience, 26,4% of them have 5 to 10-year teaching experience, 24,5% have 10 to 20-year teaching experience, and 7,5% have more than 20-year teaching experience.

Concerning the students, 72,6% of them were females, and 27,4% were males. Their age ranged between 15 and 19 years old. As for their school level, 10% of the them were K10 students (common core students), 25% of them were in K11 level (1st Baccalaureate students), whereas the remaining 65% were in K12 level (2nd Baccalaureate students).

3.1.5 Data Collection Instrument

To collect reliable data for the present study, the researcher developed two questionnaires, one questionnaire for Moroccan high school science teachers and one for their students in Rehamna Directorate, Morocco. This was based on his readings in the review of literature on EMI in different contexts, including middle east and north African contexts (MENA). A small sample of teachers and students (n = 15) was used for piloting the questionnaires to guarantee content validity, clarity and cultural appropriateness. Both questionnaires featured similar sections slightly modified to reflect the participants' roles (teacher or student), with items investigating the participants' attitudes, level of readiness, and perceived challenges regarding EMI adoption in Moroccan high school science classes. The questionnaires used a five-point Likert scale (1=strongly disagree, 5=strongly agree) as well as open ended questions. Sample items included: "I would like to study science in English, but I need more training the English language and science terminology in English", "Adopting EMI in our science classes will enhance my career opportunities", "As a science teacher, I need adequate continuous training in English to successfully adopt EMI in my classes". To avoid misinterpretation, the questionnaires were distributed in Standard Arabic as it is the shared language among the participants.

3.1.6 *Data Collection and Analysis Procedures*

The researcher explained the purpose of his study to the respondents, informed them that they were taking part in a research project and that their participation was voluntary. He also reassured them that their answers, school affiliation and identity would remain confidential. Second, he kindly asked teachers to participate in his study by filling out their assigned questionnaire as well as convincing their students to do so. Actually, 54 teachers and 234 of their students from different high school levels in Rehamna Directorate were very responsive and cooperative in providing atomic data for this study.

Concerning data analysis procedure, responses were examined descriptively using frequencies and percentages to illustrate general trends among teachers and their students. Whereas the present exploratory study relied on descriptive statistics, prior studies on EMI, such as those conducted in the Middle East and North African countries, stressed the importance of incorporating inferential methods like chi-square and correlation tests to examine associations among attitudes, readiness, and proficiency (Aldawsari, 2022). Upcoming research in the Moroccan context would greatly benefit from the integration of such methods to enhance the generalizability of findings in the field of EMI research.

4. Results

4.1 Student Questionnaire

4.1.1 Students' English Proficiency based on Self-Assessment

According to the questionnaire that was distributed among students of different upper secondary school levels in Rehamna Directorate, it has been stated that they study the scientific subjects in French an occasional use of Arabic. Students self-assessment of English proficiency came as follows:

Table 3: Students' English Proficiency based on Self-Assessment

Students' English Proficiency	Very Low	Low	Intermediate	Good
	5%	25%	50 %	20 %

As it is clearly illustrated on the table above, 5% of the students participated in this study rated their English proficiency as very low, 25% as low, 50 % as intermediate, and 20 % as good. Thus, this students' self-assessment of their English proficiency reveals that they need continuous training in both English language and terminology of sciences in English.

4.1.2 Students' Attitudes towards EMI based on their Readiness and Ability

As for students' attitudes towards the use of EMI, the results came in favor of the use of English as a medium of instruction in science classes as 61% of the informants showed eagerness and positive attitudes towards EMI, reconsolidating their responses with a set of reasonable and sound arguments. On the other hand, 15.5% of the participants showed discouragement and negative attitudes towards EMI, justifying their responses with a set of relevant reasons, whereas 23.5% showed reluctance and undecidedness towards the adoption of EMI in science classes. In the same vein, 70% of the students declared their readiness and willingness to shift to the use of EMI, while 30% of their responses diverged between being unready and reluctant (6% and 24% respectively). As far as students' ability to study scientific subjects through the medium of English, 65% of the participants expressed that they are able to study scientific subjects in English on the condition that they simultaneously receive a continuous training in English scientific terminology, while 35% of them said the otherwise. Some of the students' responses concerning their attitudes and readiness to shift to EMI in their science classes came as follows:

Positive Attitudes:

- *"I would like to study scientific subjects in English due to its status as a lingua franca."*
- *"I prefer English as it is linguistically easier than French."*
- *"English is the language of science and scientific research, and it would add more value to us as science students."*
- *"I prefer English because it is a prestigious and worldwide language."*
- *"English is the language that the job market requires."*

Negative Attitudes:

- *"I would like to study science through EMI, but my low English level will certainly hinder my interaction in class, which would hurdle my scientific content learning."*
- *"I cannot study science through EMI because I did not study English since the early years of school."*
- *"I am used to studying in FMI"* (implying a fear of change).

4.1.3 Students' Perceived Potential Effect of EMI on Content Learning Dynamics

As for the students' perceptions of the potential effects of EMI on content learning dynamics, the responses were highly positive. 65% of the respondents stated that the shift to EMI in science classes would positively influence learning dynamics, while 35% expressed skepticism, asserting that this shift could hinder the teaching-learning process and result in content inaccessibility. Both groups supported their positions with solid justifications, as shown in the table below.

Table 4: Students' Potential Positive and Negative Effects of EMI in Science Classes

Positive Effects of EMI	Negative Effects of EMI
Access to a wide variety of reliable valid scientific resources and latest scientific research findings.	Content would be inaccessible for students who still struggle with vocabulary and basics of English.
Opening wider horizons before students in the international job market afterwards.	Students would be frustrated due to lack of interaction in class.
Openness to the world, benefitting from international expertise in different walks of life.	Science terminology in English would be a hurdle in the process of content digestion.

4.1.4 Continuous Training and Translanguaging as Initial Steps to Bridge Language and Content in EMI Science Classes

It is evident that students have become more inclined to EMI as they manifested awareness of the status of English as a worldwide language as well as a key to academic research. Nevertheless, students implied some fears and reluctance as far as EMI and English scientific terminology are concerned. Moreover, they expressed that this transition would not come without some side effects, such as limited classroom interaction and restricted content comprehension due to language barriers. They (90%) also asserted that they need a continuous quality training in the English language as well as English science terminology alongside a smooth transition to the use of EMI in science classes if content comprehension and classroom interaction are to remain intact.

According to students, a smooth transition to EMI would not take place without translanguaging technique and continuous training in the English language and English science terminology. The informants (95%) openly expressed that the use of translanguaging simplifies complex ideas and concepts, which bridges language and content making it more accessible. The students' responses concerning the effect of using translanguaging on bridging language and content in science classes are inspired from their experience with their science teachers shifting from French to Standard Arabic or Moroccan Arabic in the current mode of teaching scientific subjects through the medium of French (EMI). In brief, the transition to EMI in science classes should be accompanied with a number of pedagogical procedures (translanguaging, continuous training, teaching science terminology in English).

4.2 Teacher Questionnaire

4.2.1 Teachers' English Proficiency Based on Self-Assessment

Based on the questionnaire that was filled out by Moroccan high school science teachers in Rehamna Directorate, it has been outlined that they teach the scientific subjects in French with occasional use of Arabic. Teachers' self-assessment of English proficiency came as follows:

Table 5: Teachers' English Proficiency based on Self-Assessment

Teachers' English Proficiency	Very Low	Low	Intermediate	Good
	2%	32%	58,5 %	7,5%

As the table above shows, 2% of the teachers participated in this study rated their English proficiency as very low, 32% as low, 58,5 % as intermediate, and 7,5 % as good. The result of the English teachers' proficiency demonstrates that they need continuous training in both English language and terminology of sciences in English.

4.2.2 Teachers' Attitudes towards EMI based on their Readiness and Ability

Concerning teachers' attitudes towards the use of EMI, the results came as follows: 47,2% of the informants revealed that they hold positive attitudes towards EMI, justifying their responses with a number of solid arguments. 24,5% of the participants showed negative attitudes towards this new mode of teaching in science classes, providing responses that are based on relevant reasons, whereas 28.3% declared their undecidedness concerning their attitudes towards EMI. When it comes to teachers' readiness, 52,8% of them declared their readiness and willingness to shift to the use of this potential mode of teaching, 32,1% stated that they are somehow ready to teach through the medium of English, and 15.1% voiced their unreadiness. As for the teachers' ability to teach scientific subjects adopting EMI, 28.3% of them expressed their ability to teach their subjects using EMI if they are provided with a good quality training in parallel, while 71.7% said completely the opposite, attributing their inability to a number of variables, such as lack of prior training in English, low language proficiency, and their Francophone educational background. Below are some of the teachers' responses concerning their attitudes and readiness to shift to EMI in their science classes:

Positive Attitudes:

- *"The English language is universal"*
- *"It is the language of research as the majority of scientific research is written in English"*
- *"English is an international language as well as easier to learn compared to its French counterpart. Additionally, most of what we teach is a translation of English research"*
- *"Most of reliable and latest references are written in English"*
- *"Unlike French, English opens up wider horizons for graduates in different fields as it aligns with industrial, economic and scientific development"*

Negative Attitudes:

- *"Difficulty in classroom interaction due to low English language proficiency"*
- *"Students would be torn between understanding the language of instruction and the scientific content taught in that language"*
- *"Both students and teachers would struggle with the English language understanding and use due to lack of prior training in this language"*
- *"Lack of English proficiency among teachers would negatively impact the teaching-learning quality"*

4.2.3 Teachers' Perceived Potential Effect of EMI on Learning Dynamics

Moroccan high school science teachers declared that there are many perceived potential effects of EMI on learning dynamics. They affirmed that the shift from FMI to EMI would undoubtedly bring about significant changes and challenges due to language barriers and low language proficiency among actors in the teaching-learning process. First, 65% of teachers see that the content learning quality will be negatively affected, whereas 35% said the otherwise. Second, 76% of the participants pointed out that this shift would certainly decrease the classroom interaction and negatively affect the classroom dynamics in general, and 24 % stated the opposite. Third, teachers (74%) highlighted that their students would definitely be struggling with content learning and comprehension, given that they would face two simultaneous challenges, that of the language of instruction and that of the scientific content, while 26% declared that there would be no challenges.

Table 6: Teachers' Potential Positive and Negative Effects of EMI in Science Classes

Positive Effects of EMI	Negative Effects of EMI
Improving students' educational attainment quality thanks to availability and reliability of most scientific resources in English (if both students and teachers receive adequate continuous training in this language).	Content inaccessibility due to both students' and teachers' lack of English proficiency.
Increasing students' opportunities in the international job market.	Lack of classroom interaction.
Creating universal students, benefitting from different international expertise in different domains.	The challenging duality of understanding both EMI and the scientific content.

4.2.4 Continuous Training and Translanguaging as Initial Steps to Bridge Language and Content in EMI Science Classes

Teachers also demonstrated significant awareness of the status of English as a key to educational attainment and scientific research. Nevertheless, they approached the shift to EMI (English as a Medium of Instruction) with uncertainty and caution due to low English proficiency among both students and teachers. They also implicitly expressed concerns that classroom dynamics might be negatively affected.

To address these challenges, teachers emphasized that the transition to EMI must be gradual and smooth to help students adapt to this new mode of instruction. Additionally, 96.2% of teachers confirmed the need for continuous English training for both themselves and their students to ensure the effective implementation of EMI in Moroccan high school science classes. According to the teachers, this process should be complemented by the use of translanguaging techniques to clarify complex scientific concepts and bridge the gap between language and content. This approach would help preserve classroom dynamics.

5. Discussion

Numerous studies in the field of English as a Medium of Instruction (EMI) have highlighted the increasing prevalence of teaching scientific subjects through English in educational systems worldwide, particularly in non-English-speaking countries. The global spread of EMI can be attributed to the status of English as a lingua franca, the dominant language of scientific research, and the primary medium of communication in the international business sector. As Nifaoui (2021) emphasizes, these factors have established English as the preferred language among students, teachers, and researchers.

The findings of the present study demonstrate a convergence in the responses of Moroccan high school science students and teachers. Both groups generally hold positive attitudes toward English as a medium of instruction, while also expressing concerns about their proficiency levels. In addition, both participants view English as either linguistically more accessible or socially prestigious. They also widely regard English as the language of science, technology, and the economy, as well as a gateway to the global job market. Consequently, both students and teachers express support for the adoption of EMI in Moroccan science classes.

However, several uncertainties and challenges would accompany this transition. These concerns stem from limited familiarity with EMI as a new teaching mode, coupled with the

relatively low English proficiency of both students and teachers. Moreover, Moroccan teachers' academic backgrounds are predominantly francophone, and students are more accustomed to French, having been introduced to it early in their academic journeys. English, by contrast, was traditionally introduced at the 3rd grade of lower middle school until recently. Despite these challenges, both teachers and students recognize the potential benefits of EMI. Approximately 96,2% of respondents believe that English is essential for scientific research and accessing the global job market. They also acknowledge the opportunities that EMI could provide both nationally and internationally.

Both teachers and students expressed their readiness to adopt EMI in science classes, stressing that this transition should not be abrupt, but gradual and well-supported. They emphasized the need for educational measures to facilitate this shift, including continuous training in both general English proficiency and the specific scientific terminology used in English. Additionally, they highlighted the importance of employing translanguaging techniques to address language barriers, making scientific content more accessible and less challenging. Such techniques, they argued, would help maintain classroom dynamics, fostering interaction, engagement, collaboration, and a positive learning environment.

It is worth noting that the findings of this study align with those discussed in the literature review, such as Fung & Yip (2014), Dearden (2015), Tsou & Kao (2017), Belhiah (2020), Nifaoui (2021), Pun et al. (2022), Boussakou (2023), Aldawsari (2022), Abdeljaoued (2023), Al-Birbary (2023), Alharbi & Alghamdi (2024), and Tobbi (2025). For instance, the study findings are consistent with Alharbi and Alghamdi's (2024) study in Saudi Arabia, where high levels of support for EMI among STEM (Science, Technology, Engineering, and Mathematics) and students. However, the study also highlighted the persistence of challenges such as lack of training and limited language proficiency among the participants. Likewise, in the UAE, Al-Birbary (2023) declared that although EMI teachers expressed their willingness to adopt EMI, they were faced by students' limited readiness which resulted in increased levels of teaching anxiety.

Such parallels underscore common regional barriers, notably the lack of teacher pre-service and in-service training, student low English proficiency, and adherence of Francophone and Arabophone instructional traditions. Unlike the Gulf countries, Morocco has adopted French as a medium of instruction for long. This means that shifting towards EMI requires teachers and students to move from an already non-native medium of instruction (FMI) to another (EMI), introducing additional complexities not typically present in the UEA or Saudi Arabian contexts.

This study is not without limitations. In addition to its reliance on self-reported data, which may rise the possibility of bias, its scope is restricted to one directorate (Rehamna), which limits its generalizability and applicability to the broader Moroccan context. Moreover, the study findings are exploratory and descriptive, suggesting that future research should incorporate more advanced statistical analysis approach as well as direct classroom observations to confirm and strengthen these results.

When compared to other MENA (Middle East and North African) countries, numerous implications emerge for Morocco. For instance, Saudi Arabia and the UAE have heavily invested in teacher training programs, EMI-oriented curricula, as well as language centers (Aldawsari, 2022; Al-Birbary, 2023). In addition, research in Tunisia show that students expressed mixed feelings and attitudes toward adopting EMI as many of them struggle to understand the instruction and content when they shift from FMI to EMI, so they propose transitioning to this new mode gradually with support and adequate teacher training (Abdeljaoued, 2023). Thus, Morocco can benefit from these experiences through integrating English earlier in the curriculum to reduce linguistic shock at the

high school level, giving more priority to EMI teacher training, and incorporating translanguaging practices into classroom policy.

6. Conclusions and Recommendations

This study highlights the growing phenomenon of English Medium Instruction (EMI) in Morocco, focusing on its reception among science teachers and students in high schools. The findings reveal a strong inclination towards EMI, with both groups recognizing English as a global lingua franca and a primary language for science, business, and technology. They also view English as linguistically accessible and a gateway to reliable and up-to-date research. However, anticipated challenges emerged, including language barriers, limited English proficiency among teachers and students, and concerns about the impact of EMI on classroom dynamics and content accessibility. These challenges are particularly significant given Morocco's longstanding reliance on French Medium Instruction (FMI) and the deep-rooted francophone educational background of its stakeholders. To address these issues, participants expressed enthusiasm for continuous language training to enhance proficiency and ensure effective integration of language and scientific content. They also advocated for pedagogical strategies, such as translanguaging, to facilitate the comprehension of complex scientific concepts and maintain dynamic classroom interactions.

For the successful implementation of EMI in Morocco, the study recommends systemic educational reforms. These include introducing English as a foreign language from the primary education cycle and extending throughout secondary school, increasing its instructional time to provide students with greater exposure. This would help lessen linguistic challenges, especially for students. Additionally, prioritizing the training of science teachers and students to achieve advanced English proficiency by providing ongoing professional development programs for pre-service and in-service teachers equally. These training programs should integrate both English language development along with subject-specific pedagogy in EMI. Setting up specialized training modules and language centers within the educational system for a better and continuous professional development.

Besides, the adoption of translanguaging techniques during the initial stages of implementation is suggested to facilitate the transition to this new mode of instruction. These measures aim to bridge the language gap, enhance the retention of scientific knowledge, and support quality education within an EMI framework. Translanguaging and scaffolding resources should be embedded in the textbook to ensure comprehensive input and better knowledge retention. These techniques would help teacher bridge between Arabic, French, and English while content comprehension and student engagement remain intact.

Future research would be more beneficial if it covers different directorates in Morocco for better insights, applying mixed research methods such as classroom observations, surveys, interviews, and exploring the possible enduring impact of EMI on teacher identity, education equity, and student learning performance. Moreover, more comparative studies with other MENA and francophone countries should be conducted, so as to anticipate potential challenges and benefit from their experiences.

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