

Effect of Language Hybridization on Teaching and Learning Science Subject through English Medium of Instruction

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ABSTRACT

The study investigates the impact of English Medium Instruction (EMI) and language hybridization on science education for intermediate students at educational institutions in Rahim Yar Khan, Pakistan. Pakistani educational institutions are adopting EMI for science instruction because English remains the dominant language in scientific communication throughout the world. The implementation of this educational transformation becomes difficult for multilingual classrooms because students use both English and Urdu to learn advanced scientific content. The study investigates how language hybridization affects students' comprehension and participation in science classes. The researchers used a mixed-methods study approach to gather data from 50 intermediate science students through a structured

questionnaire that included both closed- and open-ended questions. The researchers examined open-ended questions and teacher feedback through thematic analysis. The study demonstrates that EMI improves language skills but creates comprehension obstacles for most students. The study establishes that language hybridization functions as an effective teaching method in EMI classrooms which enables students to overcome linguistic obstacles while maintaining academic content. The study recommends using bilingual educational materials and teaching staff about translanguaging methods and developing language-inclusive educational frameworks which will match students' language proficiency.

Introduction

The worldwide growth of English Medium Instruction (EMI) shows how English has become the main language used in scientific research and technological development and international academic discussions. The intermediate level in Pakistan and other postcolonial and multilingual countries has adopted EMI as a standard practice which helps their educational systems meet global academic requirements while improving students' access to higher education and international employment opportunities (Suleman et al., 2024). The current educational changes have chosen science subjects as their main focus because these subjects essential for driving economic progress, technological advancements and developing scientific understanding. The use of EMI in multilingual environments creates major teaching challenges and linguistic issues despite its reputation as a method to access worldwide knowledge (Alanazi & Curle, 2025). Most students who begin intermediate-level EMI science classes in Pakistan demonstrate poor English proficiency. Their academic English skills lead to difficulties when they try to understand scientific theories which they need for their classroom work and for showing their understanding of the material. Non-native language learning requires students to navigate complex subject material which creates excessive mental demands that impede their ability to understand and take part in learning activities (Hayat et al., 2021). In response to the existing challenges teachers use language hybridization as a common teaching method which allows them to use English together with students who speak Urdu and other local languages during their

lessons. Students who need to understand academic material that EMI creates difficulty in accessing can use hybrid language to bridge the gaps between their language skills and academic requirements.

Language hybridization occurs through code-switching and code-mixing when teachers use these methods to explain technical terms, handle difficult concepts and manage classroom dialogue. The practices in question function as supportive techniques which help people understand information while decreasing student stress and encouraging their involvement (Ainee & Qamar, 2024). The system faces operational challenges because it needs to address multiple educational requirements. The authors maintain that students who depend excessively on their native tongue show two problems which include both scientific word identification problems and restricted academic English exposure fluleren who establish their own scientific communication style (Cohen, 2022). The existing studies show conflicting results about how effective language hybridization works in English-medium instruction environments. Research shows that students who use strategic code-switching techniques can connect their previous knowledge to new information which leads to better understanding of concepts and increased self-assurance (Younas et al., 2020) while other researchers warn that these techniques will interrupt students' full engagement with English and delay their academic language development (Alanazi & Curle, 2025). The educational period functions as a vital stage because it forms the base which guides students from secondary education into their future academic studies through which they will learn to use advanced scientific language.

The study investigates how students use blended language practices to understand scientific material while building academic confidence and teachers develop their teaching methods. It also investigates English medium instruction through actual classroom language usage to provide evidence for the current discussions about language policy and multilingual science teaching methods.

Background of Study

Due to the need for globalization, access to knowledge from around the world, and improved professional opportunities for graduates, English Medium Instruction (EMI) has gained popularity worldwide, especially in non-Anglophone nations. In

many places, like Pakistan, EMI is used to science courses at all levels of schooling, including intermediate.¹ Although content learning is frequently the main goal of EMI, it is also seen as a chance to enhance English language skills (Rose & Galloway, 2019; Rose et al., 2020; Yuksel et al., 2021). However, there are distinct difficulties in implementing EMI, notably in science, especially when it comes to students' language skills and how it affects their comprehension of the material. Since teachers and students frequently turn to using their first language (L1) or regional languages to close the linguistic gap and promote comprehension, this is where the idea of "language hybridization" becomes quite pertinent. Bilingual education approaches, which have progressed from traditional English Language Teaching (ELT) to an integrated approach where English is the medium for a variety of academic topics, form the theoretical foundation of EMI (Macaro, 2018). The linguistic demands on students are especially severe because EMI frequently stresses material delivery, in contrast to material and Language Integrated acquisition (CLIL), where language acquisition is a primary objective. This review will examine how linguistic hybridization, or the natural and pedagogical integration of L1, occurs in this complex setting, particularly in intermediate-level science courses.

The Situation of EMI in Intermediate-Level Science Subjects

For students from Urdu-medium or other local language backgrounds, the switch to EMI in science courses at the intermediate level can be quite difficult. According to numerous studies, students' and occasionally teachers' poor English language skills might make it difficult to explain and understand difficult scientific ideas. This language barrier can cause students to rely more on memorization, impede the growth of higher-order thinking abilities, and cause a gap between the new information. Since Pakistan's independence, there has been a continuous discussion about English as a teaching language. In many regions of the world, teaching content subjects in English have become more and more popular. The term English-medium instruction (EMI) will be used here, although it is also known as content-based learning, content and language integrated learning (CLIL), immersion education, theme-based language teaching, and bilingual education. EMI has been defined in a

number of ways, such as “the use of the English language to teach academic subjects (other than English itself) in countries or jurisdictions where the majority of the population does not speak English as their first language” (Macaro, 2018: 35). In many regions of the world, teaching content subjects in English has become more and more popular. The term English-medium instruction (EMI) will be used here, although it is also known as content-based learning, content and language integrated learning (CLIL), immersion education, theme-based language teaching, and bilingual education. EMI has been defined in a number of ways, such as “the use of the English language to teach academic subjects (other than English itself) in countries or jurisdictions where the majority of the population does not speak English as their first language” (Macaro, 2018) and “environments in which English is the primary language of instruction for content subjects, even though it is not the subject being taught, and is also a second or additional language for the majority of participants in the setting.”

Academic literacy challenges are a major problem that affects students’ subject learning outcomes when compared to programs that teach first languages (e.g. Aizawa et al., 2024; Bälter et al., 2024). Reading, writing, and spoken language are all elements of academic literacy, which is a multifaceted concept that may differ by subject area and requires acquaintance with genres used in the academy (Short & Fitzsimmons, 2007). The significance of disciplinary literacies has been highlighted in recent discussions of academic literacy, stressing its broader scope than language competency (Wingate, 2018). The understanding of “ownership” of academic English by EMI students and their expectations to acquire academic literacy in English as well as cultural and critical literacy has been addressed similarly. As theorized, academic literacy in the case of EMI describes the ability to understand and engage with demanding academic content utilizing critical thinking and effective communication. It allows learners to engage with the content and gain the competencies necessary for academic success in English-medium environments through providing them with the ability to critically assess and navigate their disciplinary coursework. Specifically, some research indicates that students’ learning experiences appear to differ based on their proficiency; students with higher

proficiency encounter difficulties when learning new academic subjects, while students with lower proficiency encounter significantly more burdensome challenges (e.g. Altay et al., 2022), such as limited engagement with the course material, difficulties participating in discussions, and difficulties comprehending and producing academic writing.

Studying the difficulties and tactics of EMI Language barriers

An increased workload for teaching and learning, the need for more time to prepare lectures, and more time for studying are just a few of the many issues that the reviewed research found in EMI from the viewpoints of both students and lecturers (He & Chiang, 2016; Hu et al., 2014; Kamasak et al., 2021). The research conducted by Kamaşak et al. (2021) examined Turkish students studying at an EMI university to determine their experience with linguistic difficulties and found that students at the university encountered greater difficulties in speaking and writing when compared to other language skills. The students' challenges with language skills showed variation based on their academic major, their first language background, and their prior experience with English medium instruction. Recent studies have specifically highlighted the difficulty local students and teachers have when they are unable to share L1s with overseas pupils. They found that the students attributed their language barriers to their Chinese teachers and found their teaching methods and styles problematic. Additionally, some studies suggested that teachers might not be completely cognizant of the language barriers that their pupils face or sufficiently prepared with EMI teaching methods (Abouzeid, 2021; Alhamami, 2021). For instance, Abouzeid (2021) investigated how four psychology professors perceived the difficulties their EMI students encountered when writing academically and how well their perceptions matched the difficulties the students faced. According to Abouzeid (2021), the professors identified three main issues with their Lebanese students' academic writing in English: "lexico-grammatical structure and accuracy, interference of another language, and a lack of specialized terminology." Although the first and third perceived problems were found to be aligned, the written output showed no signs of cross-linguistic interference.

Studies on the Professional Growth of EMI Instructors

The methods and efficacy of individual professional development programs (Chen & Peng, 2019; Lee & Lee, 2018), the effects of interdisciplinary collaboration on EMI instructors' professional development (Lu, 2020), and professional development from the perspectives of EMI instructors (Kim, Kweon, et al., 2021; Macaro et al., 2020; Macaro & Han, 2020) were all examined in the existing research. Macaro and Han (2020), for instance, looked at the opinions of Chinese university instructors regarding EMI's professional development, certification, and abilities. According to the survey, few schools adopted, much less put into practice, the teachers' generally good opinions toward EMI certification and professional development. The report also emphasized how crucial institutional and governmental participation is to the implementation of EMI professional development and certification. According to the aforementioned study by Macaro and Han (2020), professional development programs for EMI teachers should focus on at least four major categories of competencies: discipline-specific language and teaching skills, generic language and teaching skills, internationally transferable competencies, and national context competencies. Similarly, Yuan (2020) critically examined the social, pedagogical, and emotional obstacles experienced by university EMI instructors in China by drawing on his study and teaching experience as an EMI teacher educator. It was anticipated that the suggested framework would "develop and prepare EMI teachers cognitively, socially, and emotionally to meet university students' complex learning needs in different subjects" (Yuan, 2020). More research on the professional development of EMI instructors is clearly needed, particularly on the development of the necessary abilities for effective EM both before and during in-service training.

Language Hybridization: Definitions and Forms

In EMI, language hybridization is the dynamic and fluid employment of multiple languages (usually English and the learners' native tongue or first language) in the classroom to support instruction. This is not the same as rigid monolingual EMI, which exclusively allows English. In EMI classrooms, code-switching and translanguaging are the two most common types of language hybridization.

Code-switching (CS): Changing between two or more languages during a same

discussion or discourse is known as code-switching. According to research conducted in various circumstances, code-switching helps teachers and students in EMI science classes may alternate between their L1 and English for a variety of communicative and pedagogical purposes (IIARI, n.d.).

Clarify difficult material: When teaching difficult scientific ideas that pupils find difficult to understand in English, teachers frequently turn to L1 (Susilowaty & Rosa, 2024).

Promote comprehension and strengthen vocabulary: Deeper knowledge and memory of scientific terminology can be facilitated by translating and explaining concepts in L1 (Susilowaty & Rosa, 2024).

Establish rapport and lessen fear: By strategically using L1, a more encouraging and less scary learning environment can be created, which will encourage student engagement and lessen language anxiety (Susilowaty & Rosa, 2024).

Code-switching helps people understand better because it shows key concepts through L1 language and provides familiar examples. Recent studies provide compelling evidence for the educational advantages of translanguaging in intermediate-level science classes (Susilowaty & Rosa 2024). Translanguaging enables multilingual learners to understand and communicate subject-area content better. It enables learners to connect new scientific ideas presented in English with their prior L1 knowledge in a more profound way.

Language Hybridization as a Bridge to Content Learning

Translanguaging has become more popular as a method of teaching that stresses the integrated use of a multilingual person's whole language repertoire to communicate and create meaning. The process functions as a dynamic system which allows students to use their complete language skills for better comprehension and expression of complex concepts than they would achieve through code-switching. (Javaid et al., 2025; HRMars, 2025). Increased Comprehension and Engagement: Research indicates that the use of multimodal devices in translanguaging pedagogy enhances teaching and learning effectiveness by engaging students' visual, auditory, and kinesthetic senses, which in turn increases comprehension and engagement (Donley, 2022, as cited in HRMars, 2025). It makes learning more inclusive and

gives pupils a sense of belonging by enabling them to connect new ideas to their prior language knowledge (HRMars, 2025). The practice of switching between two or more languages during a single discourse or conversation is known as code-switching. For a variety of pedagogical and communicative purposes, teachers and students in EMI science classrooms may alternate between English and their first language. Studies conducted in various settings show that code-switching helps in many ways. When teaching difficult scientific concepts that students find difficult to understand in English, teachers frequently turn to L1 (Susilowaty & Rosa, 2024). Susilowaty and Rosa (2024) demonstrate that translating scientific terms into L1 and providing definitions of these terms will improve people's understanding of scientific vocabulary. The strategic use of L1 enables students to participate more actively in class while experiencing reduced language-related anxiety through the creation of a supportive classroom atmosphere (Susilowaty & Rosa, 2024).

Teachers' Inconsistent Use of Languages

One of the most serious practical challenges in language hybridization is language use inconsistencies on the part of teachers. Teachers develop their own language teaching methods because they lack official training and teaching protocols. The resulting teaching methods which instructors develop in classrooms lead to different educational outcomes between their classrooms and other instructional spaces. Students face learning challenges because teachers use different language standards which prevent them from understanding what is expected of them in their language development. One teacher allows students to explain using Urdu while another teacher requires students to use English which creates confusion about how students will learn different content. Research by Ali (2020) and Zaka et al. (2020) in Pakistani ESL class rooms, for example, illustrate how code-switching can enhance students' understanding of English content and promote positive teacher-student relationships. Gu et al. (2024) and Mbirimi-Hungwe (2023) demonstrate that translanguaging enables students to use all their language abilities which leads to deeper comprehension and enhanced critical thinking skills. The use of strategic language blending helps learners to develop vocabulary skills and fluency skills which extend beyond basic language comprehension. The ability to use all their

language skills helps intermediate learners build confidence which reduces their anxiety. This leads them to participate more actively in learning activities. The requirement exists to establish a supportive and inclusive learning environment. Students achieve advanced cognitive skills through their hybrid language use which extends beyond their basic language abilities. The writing process helps students develop clearer L2 essays because they use their native language to generate ideas and structure their thoughts about what they will write (Sahib et al., 2021; Yu & Zhang, 2023). The literature acknowledges existing challenges which researchers have identified. The study shows that learners who reach higher proficiency levels will depend too much on their native language which will limit their ability to learn the target language (Mekuria & Mohammed, 2025). Research shows that digital communication causes people to mix languages which results in vocabulary expansion but destroys their ability to use grammatical structures through "linguistic hybridity". The practice of translanguaging remains limited because institutional rules and teacher unpreparedness for it exist. Specific training programs and policy support exist to change this situation. The existing evidence shows that educators who handle language hybridization correctly create learning environments which support intermediate learners in their proficiency development process.

Challenges and Considerations in EMI Contexts (Intermediate Level)

Academic instruction faces a significant obstacle because teachers in intermediate EMI science classrooms lack sufficient English skills. Teachers who have restricted English abilities face challenges in delivering their content because their teaching methods fail to provide clear explanations and they spend less time with students. The successful implementation of language hybridization strategies depends heavily on teachers being adequately trained in bilingual and multilingual pedagogy.

Curriculum Design and Resources: The absence of educational materials which meet cultural requirements and deliver bilingual content required for EMI science programs creates learning barriers that prevent students from fully engaging in their academic work. The process of effective language hybridization requires curriculum developers to design bilingual materials which support both languages

and their first language implementation.

Assessment Bias: The assessments used in EMI programs test students' language abilities instead of measuring their scientific understanding which leads to incorrect assessment results. The assessment system needs to implement practices that recognize language hybridization as a valid form of assessment because it needs to evaluate all students.

Student Attitudes and Proficiency Thresholds: Translanguaging research shows positive results according to students' attitudes toward it, but their English proficiency levels influence their attitude. Some studies suggest that as students' proficiency increases, they may feel less need to rely on their L1 for support (Open Research Online, 2024). The relationship between proficiency and language hybridization use shows dynamic behavior between these two factors.

Aims of the Study

The research investigates how English Medium Instruction affects science education at the intermediate level. (1) How English Medium Instruction affects science teaching and learning practices. (2) How English Medium Instruction affects teaching methods and student learning results. (3) How language hybridization affects students' understanding and participation in science classes.

Research Methodology

Research Design

The study employs a mixed-methods study design, which combines both quantitative and qualitative research methods. The mixed-methods design enables researchers to collect quantitative data through structured questionnaires while they also gather detailed information from classroom observations and responses to open-ended questions (Ahmed et al., 2024). The survey (quantitative component) provides statistical data on language hybridization prevalence and perception, EMI practices usage frequency, and student understanding levels. The study collects qualitative data through open-ended questions and observations, which enable researchers to examine teachers' methods and classroom interactions and their real-life experiences of code-switching and code-mixing that explain the numerical data.

Population of the Study

The population under consideration for this study includes intermediate-level science students and science subject teachers from selected public and private institutions of Rahim Yar Khan, Pakistan. These institutions deliver their science education through English Medium Instruction which includes Biology and Chemistry and Physics courses, but most students and teachers use Urdu or provincial languages such as Saraiki and Punjabi as their primary language. Rahim Yar Khan presents an exemplary linguistic and educational environment for analyzing the effects of language hybridization in EMI classrooms.

Sample and Sampling Technique

Participants for this study were selected through purposive sampling because the researcher needed to study individuals who had direct involvement with science education in Rahim Yar Khan through EMI. The researcher needs to use purposive sampling because their study requires participants who possess specific knowledge and skills to conduct their research aims (Campbell et al., 2020). The schools are selected on the basis of the following criteria: offer science subjects on an intermediate level under an English Medium Instruction policy, the students predominantly communicate in Urdu or local languages at home and they possess a minimum of one year of teaching experience in science using EMI.

The study selected 50 intermediate-level students from the selected schools as its research sample. The selected sample size enables researchers to gather important quantitative results while observing participants and receiving feedback on their behavior. The research enables context-specific analysis through its limitation to one district which ensures researchers study the linguistic and educational characteristics of that particular area.

Data Collection

The research objectives required both quantitative and qualitative data collection from selected intermediate-level institutions which were located in Rahim Yar Khan. The study investigated language hybridization in EMI science classrooms through its mixed-methods approach which used both numerical data and classroom observations. The researcher created a structured questionnaire which they

developed using Google Forms to collect quantitative data. The questionnaire was designed to gather responses from intermediate-level science students who studied in public and private institutions which taught science subjects through EMI. The survey included closed-ended questions which participants had to answer. Used open-ended questions which followed student questionnaires to collect qualitative data through Google Forms. The questions were developed to identify students' personal opinions and their preferred methods of learning English Medium Instruction (EMI) and language hybridization during science classes at the intermediate level. The researchers used WhatsApp to distribute the questionnaire online because it enabled them to reach students from Rahim Yar Khan easily.

Data Analysis

This study used mixed methods to analyse information obtained from both numerical data and descriptive data. The researcher investigated three measurable student response patterns which were linked to classroom implementation of English Medium Instruction (EMI) language hybridization methods used in Rahim Yar Khan science classes. By using Google Forms questionnaire data to extract quantitative information which they transferred to Microsoft Excel for analysis with IBM SPSS Statistics (Version XX). The researchers used manual thematic analysis to examine the qualitative responses which students provided. It identified major themes which they organized into different categories after studying all the open-ended responses to determine how students used language and which languages they preferred in EMI classrooms. The major themes that emerged included:

- Preference for Mixed Language Instruction (English + Urdu)
- Difficulty in Understanding Scientific Vocabulary in English
- Textbook Language as a Barrier
- Language Anxiety and Its Effect on Participation

The study's research objectives found their most relevant explanation through these themes, which provided a deeper understanding of student perspectives. The qualitative analysis revealed intermediate students better understood science concepts through language hybridization which helped them engage with the material.

Results

English Medium Instruction (EMI) has become a widespread educational practice that teachers use to deliver science lessons in Pakistani intermediate classrooms because English functions as the global lingua franca for scientific and technological communication

Frequency of English Use in Classrooms

The first question examined how often science teachers use English during their teaching practice. Students received a five-point scale, which included "Always" and "Never" as its endpoints.

Table 4.1: *Frequency of English Use in Classrooms*

Response	Number of Students	Percentage
Always	10	20%
Often	14	28%
Sometimes	16	32%
Rarely	6	12%
Never	4	8%

Table 4.1 shows that only 20% of teachers follow EMI rules, but the majority of teachers use English at different times between "often" and "sometimes." A total of 60% of students fall into this category.

Student Understanding of Science in English

Respondents were asked to indicate their science concept comprehension results from English-based instruction, which served as the foundation for assessing EMI's effects on student understanding abilities.

Table 4.2: *Understanding of Science in English*

Response	Number of Students	Percentage
Strongly Agree	6	12%
Agree	18	36%
Neutral	12	24%
Disagree	10	20%
Strongly Disagree	4	8%

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Table 4.2 shows that the majority of students (48%) agreed or strongly agreed that English helped them understand science concepts better. The results showed that 28% of participants disagreed with the statement, while 24% of participants chose to remain neutral.

Language-Related Challenges in Science Learning

The third question examined whether students encountered difficulty in understanding science subjects due to the English language.

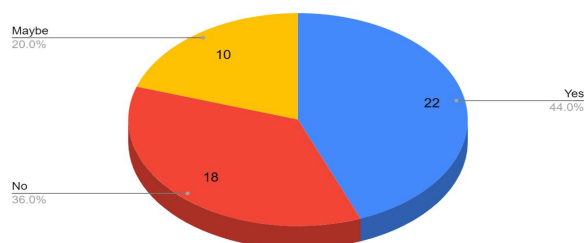


Figure 4.4: Language-Related Challenges in Science Learning

The study found that 44% of students reported English language problems, which prevented them from understanding science material because language functions as a barrier to their educational progress. The 20% who were unsure further suggest that the linguistic complexity of science content can obscure subject matter for those lacking strong English proficiency.

Perceived Improvement in English through EMI

Students were asked to evaluate whether studying science through English instruction improved their proficiency in the English language.

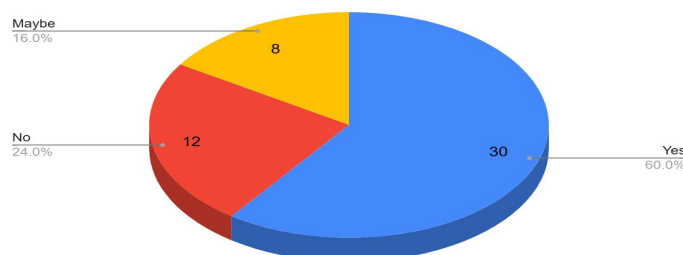


Figure 4.5: Perceived Improvement in English through EMI

The data in Figure 4.5 demonstrates that 60 percent of participants reported that the program helped them improve their English language proficiency.

Accessibility of Science Textbooks in English

The last question of this section required students to evaluate the difficulty level of their English science textbooks.

Table 4.3: *Accessibility of Science Textbooks in English*

Response	Number of Students	Percentage
Strongly Agree	5	10%
Agree	15	30%
Neutral	12	24%
Disagree	10	20%
Strongly Disagree	8	16%

Table 4.3 showed that respondents only understood English textbooks when 40% of them agreed or strongly agreed with that statement, while 36% expressed disagreement or strong disagreement and 24% responded with neutral answers..

Analysis of Language Hybridization in Science Education

To quantify student attitudes regarding the use of hybrid language in science classes, the following survey questions were examined. Instead of outlining them as discrete results, we amalgamated the responses into one overall summary table reflecting the key patterns.

Table 4.4: *Summary of Student Perceptions on Language Hybridization*

Survey Question	Most Common Response	%	Key Insight
Do your science teachers mix Urdu and English during instruction?	Often	2%	Hybrid instruction is widely practiced.
Does using both Urdu and English help you understand science better?	Yes	0%	Strong preference for hybrid instruction.

Which language mix helps you learn science more effectively? Both Urdu and English most effectively. 8%

Do you feel confident answering science questions in English? Yes 6% Many students lack academic confidence in English.

Should science be taught in both Urdu and English? Agree 0% Students support structured bilingual instruction.

A significant 70% concurred that the use of both English and Urdu in science classes enabled them to comprehend the subject better. Yet another crucial discovery is that a mere 36% of students were confident to respond to science questions in English. Lastly, agreement to teach science bilingually (40% agree; 28% strongly agree) indicates that the students are aware of the importance of inclusive teaching.

Thematic Analysis of Open-Ended Responses

To supplement the quantitative data and derive more profound insights into students' everyday experiences of English Medium Instruction (EMI) and language hybridization in science classes, two open-ended questions were also placed at the end of the student questionnaire. These comments were thematically analyzed, and multiple dominant themes were revealed.

Mixed Medium Preference (Urdu + English)

Most students displayed strong interest in studying science through English and Urdu language combined studies. One student explained, "*Combining both English and Urdu makes it simpler to comprehend science terms and principles. The English-only teaching method causes us to experience confusion, according to our statement. The teacher makes the material more understandable by using the Urdu language.*" The same information appeared in multiple responses. The theme links to the quantitative results which demonstrate that 68% of students preferred to study science through their chosen language combination of Urdu and English. The mixed language usage helped 70% of students to achieve a better understanding of scientific concepts, according to their statements.

English-Only Creates Comprehension Barriers

The primary lesson delivery in English leads to comprehension difficulties for some students, according to their own admissions. A student expressed that “I do not understand the entire lecture when the instructor delivers the material through English only. The lesson contained words which became difficult to understand because the teacher did not supply Urdu translations”. These responses indicate a high cognitive burden that EMI imposes on students, particularly if they are also attempting to decode both the meaning and the language at the same time. For most students at the intermediate level in Rahim Yar Khan, English is not the first language used at home or in everyday conversation. This theme is also evidenced by the quantitative findings, where 44% of the students indicated that they found science difficult to comprehend because it was in English.

Urdu-Only is Insufficient for Scientific Learning

Though a vast majority of students preferred a blended mode of instruction, some of the responses reflected an appreciation of the possible limitations of teaching science only in Urdu. One of the students said, *"If everything is done in Urdu, it becomes tough later when the paper or the book is in English. We need both languages."* This observation accounts for the fact that English continues to be the overriding language of science and communication in Pakistan and around the world. Learners recognized that despite Urdu being an aid in understanding in class, they must also know English scientific vocabulary in order to succeed academically, read school textbooks, and get into university.

Vocabulary and Textbook Difficulty

Numerous students complained about technical vocabulary, unknown words, and sentence patterns used in textbooks. Though some students were able to comprehend oral explanations by teachers, reading textbooks on their own in English was most commonly reported as difficult and demoralizing. A student commented, *"Science books have hard English; we cannot read meanings without assistance."* This remark implies that textbooks, which are the focus of self-study and exam preparation, are routinely not available to intermediate-level students, particularly when they are composed in advanced academic English.

Discussion

This study shows how English Medium Instruction (EMI) and language hybridization affect science education for intermediate students in Rahim Yar Khan. The research with 50 students used both quantitative and qualitative methods to show that EMI exists in classrooms though teachers implement it with less than complete fidelity. Teachers use adaptive teaching methods which combine English and Urdu to help students understand their lessons better. Teachers in Pakistan need to make teaching adjustments because their students have different language abilities, which results in an educational environment that supports adaptive learning. The most important finding shows how EMI influences both positive and negative outcomes for students. Students need academic English exposure through EMI to learn vocabulary better yet 44% of students found English to be a barrier for learning science concepts. EMI does not help students with low English skills because they need proper support to learn from it.

Language hybridization functioned as an effective teaching method within EMI classrooms. The students preferred a bilingual approach by a wide margin, where instruction employed both Urdu and English. The research showed that 70% of participants used this method because it enabled them to understand scientific concepts more effectively. The analysis of open-ended responses showed that students used Urdu explanations to improve their understanding but they needed English terminology to learn correct scientific terms. The evidence supports translanguaging theory which holds particular importance in multilingual settings like Pakistan. The students showed awareness that using only Urdu would create a dangerous situation for their academic work. Students acknowledge that English helps them understand better, but they need to use it for exams, academic reading to advance their studies. The students demand equal treatment of English, which they want together with all-academic learning that combines immediate comprehension with their future educational goals. Two main challenges stopped university students from attending their classes. Students displayed a deep fear of making language mistakes, which resulted in their refusal to participate in class despite their understanding of the subject matter. The psychological effects of EMI need

emotional learning environments that provide students with supportive spaces to learn.

The study results show that Rahim Yar Khan's intermediate-level science students need different teaching methods than complete EMI system. Hybrid teaching methods which use English for technical terms and Urdu for teaching purposes achieve better outcomes than single-language teaching methods. This study explains how students learn material through hybrid learning environments and English medium instruction methods which help them maintain focus and build academic confidence. The main areas which include educational policy development and student learning material that matches the language needs of their student population. The approach creates equal learning opportunities in science education while developing English proficiency, which supports academic success and professional development.

Conclusion

This research investigates the effects of English Medium Instruction and bilingual language teaching methods on science education at intermediate schools located in Rahim Yar Khan. A mixed-methods research design is used to collect data from 50 students who completed both structured questionnaires and open-ended question responses. The research shows that teachers use English Medium Instruction in their classrooms as a standard teaching method which they combine with Urdu to support student comprehension of mixed language elements that exist in their classrooms. The quantitative results demonstrate that many students who needed English language materials for their science studies encountered problems with understanding while bilingual teaching methods helped some students to learn better. Students improved their understanding and developed more interest when teachers used English together with Urdu to teach scientific vocabulary. Students exhibited better comprehension of scientific vocabulary when teachers delivered instruction through both English and Urdu languages. It also reconfirmed this, as the majority of the students showed a definite inclination towards a mixed-medium pedagogy, indicating increased clarity and lesser stress in learning science. The research findings show that language hybridization serves as an efficient teaching

method which teachers use in EMI classrooms that operate in linguistically diverse areas of Rahim Yar Khan. The combination of Urdu and English in EMI teaching helps students understand better while maintaining the original educational objectives of EMI.

Recommendations

The study results recommend that intermediate science classrooms should implement flexible language policies which permit both English and Urdu language use instead of enforcing English-only language requirements. The system of translanguaging, which includes code switching and code mixing should receive official recognition as an essential teaching tool in English medium instruction environments, according to Balam and Carroll 2024. The establishment of bilingual or simplified science materials requires implementation together with professional development programs which teach science instructors about effective English medium instruction methods. Creating classroom environments which support students together with specific language assistance programs, will decrease language obstacles and create equal opportunities for students to learn science.

Limitations of the Study

The study reached its definite conclusions, yet its findings contain specific limitations that require acknowledgement. The research only studied Rahim Yar Khan, which prevents its findings from being applicable to different areas of Pakistan. The study's results face limitations because the research involved only 50 students and a small number of teachers. The study depended on self-reported data, which introduces the possibility of subjective bias. The research findings depend mainly on student perceptions because the study lacked classroom observations and assessment-based academic data, which restricted the complete understanding of language practices in EMI science classrooms.

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