A genre-based approach to enhancing secondary students' English writing ability in science subjects

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Teaching tips

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Please visit our website to learn more about the project and download free teaching and learning materials: https://www.teachingscienceenglish.com

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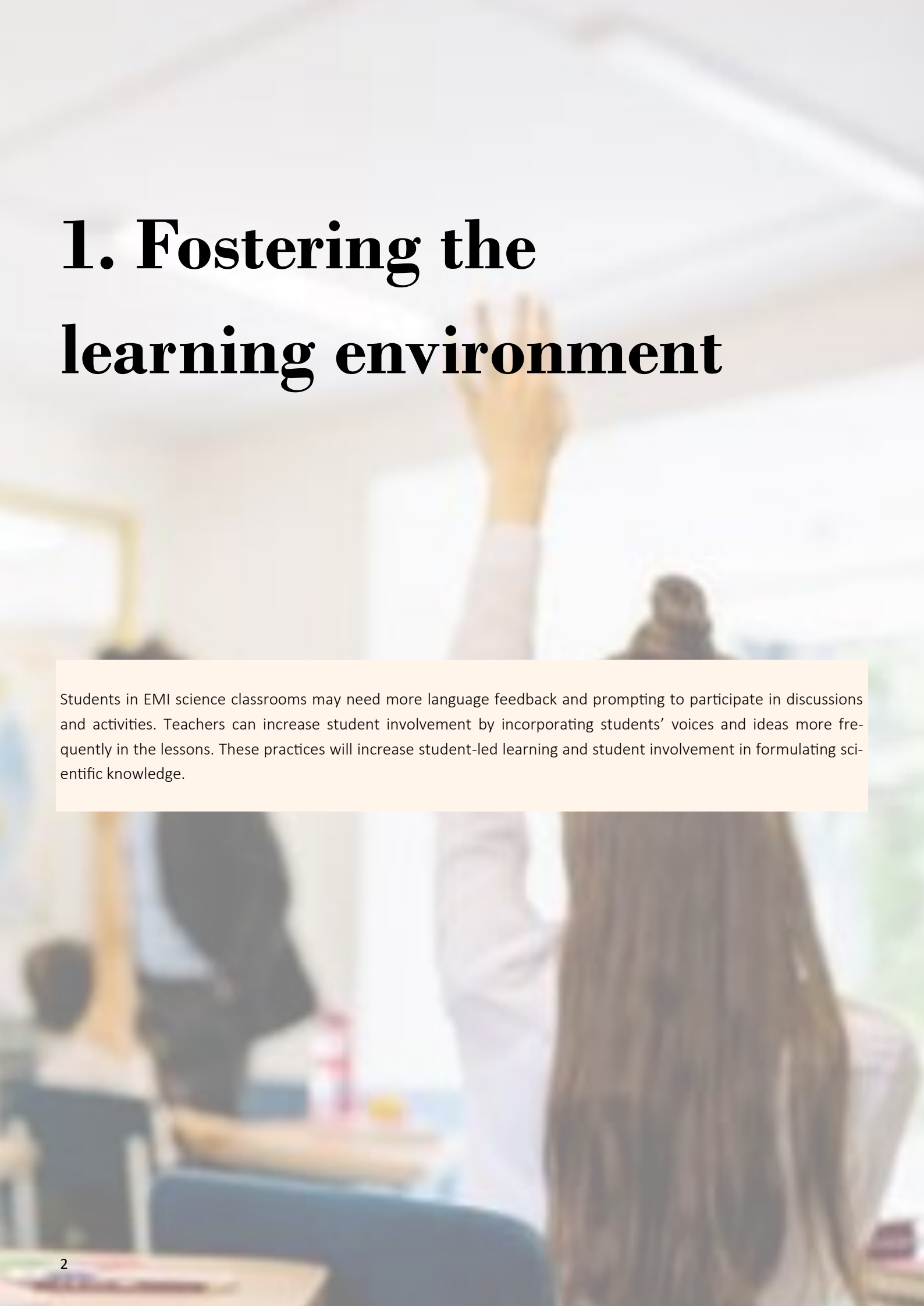
Teaching tips for implementing a genre-based approach to learning science

In coordination with the workshops and online resources, the project has compiled teaching tips for successful English language and scientific writing teaching using the genre-based learning approach. These tips were sourced from the workshop teaching materials, student outcomes, and teacher observations during the workshops.

The following tips for teaching scientific writing in English are organized into three categories: fostering the learning environment, integrating English learning in science classrooms, and overcoming English scientific report writing challenges. Educators may use a tip independently to bolster a specified teaching method or student learning outcome or use the tips cohesively to replicate a genre-based learning approach and the learning pathway observed in the workshops, fostering students' holistic learning development.

1. Fostering the learning environment



Students in EMI science classrooms may need more language feedback and prompting to participate in discussions and activities. Teachers can increase student involvement by incorporating students' voices and ideas more frequently in the lessons. These practices will increase student-led learning and student involvement in formulating scientific knowledge.

1.1. Consistency in lessons structure and time management

In EMI classrooms, students may struggle to follow lessons with complex scientific or high-density English language usage. However, consistently replicating lesson structure patterns, like time management, task prioritization, logical lesson flow, and instructions, will give students a predictable learning framework to maximize knowledge and skill progression.

Regularity in lesson structure provides a foundation for the process of learning and students' expected contributions, including task transitioning and recognizing salient information. A predictable framework for students to follow will improve language absorption and increase students' potential to listen, understand, and participate. Further, students with lower English abilities or English learning anxieties may benefit from a predictable class structure in which they can gauge opportunities to participate and expand their participation potential over time.

1.2. Scaffold the lesson framework with progressively more complex concepts

EMI science classrooms often incorporate challenging scientific topics and vocabulary, posing a significant challenge for EMI science students to interpret and articulate scientific ideas. Scaffolding the lesson framework will keep students engaged throughout the class and allow them to discuss abstract concepts. Teachers can prepare students for complicated subject matter by reviewing previous material, introducing new vocabulary, or group brainstorming—thereby progressively increasing the difficulty of the class material and preparing students for more in-depth knowledge development by learning to make causal links between scientific concepts or processes. The practice of scaffolding is also a low-demand method of boosting student involvement and casual conversation to stimulate focus and idea flow.

1.3. Ask questions to increase student involvement and guide lessons

Flexible question-asking is essential to developing a scaffolding technique incorporating student participation to engage more challenging concepts. Teachers can tailor questions or student interactions to mirror the subject matter's degree of complexity. In other words, the progression of the class and knowledge development mirrors the level of English required to participate. For example, reviewing or introducing material at the beginning of class may only require simple word or phrase responses; however, as the class progresses, students can produce more extended responses or use new vocabulary to expand on both language and scientific knowledge development. As a result, the teacher and students review the lexico-grammatical features required to participate in more in-depth subject matter, invoking simultaneous learning and practice and fluidity of question asking and answering.

Further, successful question-asking must be flexible, responsive, and supportive. If students cannot respond to a question, this may signal that new content was introduced too quickly, student attention is low, or there is incongruence between the teacher and students' language expectations. Flexibility in delivering questions is necessary to regain student attention and respond to students' needs, such as reintroducing essential vocabulary, modifying questions, or revisiting earlier concepts. In student-led knowledge generation, students may provide unexpected answers; however, flexible teaching methods help students more accurately convey their ideas in English, grasp new content, and make links between previously learned and new knowledge.

Additionally, flexible question-asking provides more opportunities for teacher feedback. Students respond to questions using their available knowledge of the topic and language skills to articulate this knowledge. Therefore, regardless of correctness, the teacher's responsivity to students' answers provides both topic and language feedback to support a progressive track for knowledge development. Flexible feedback will help guide students through complex topics, demonstrating the relationship between context and language.

1.4. Increase opportunities for student involvement at different English levels throughout class-time

Along with scaffolding and question-asking, student-led learning can be incorporated throughout the class by signifying language expectations and displaying content in different forms (e.g., written or verbal and lecture or question-asking). For instance, instead of teacher-led learning with long periods of lecturing—teachers can use questions to guide students to generate knowledge and build concepts. Similarly, teachers can indicate whether students' responses require single-word responses, phrases, or complex sentences. If students give single-word responses, teachers can reinforce student ideas by reiterating the student's response in a complete sentence. In doing so, the teacher demonstrates the usage of scientific vocabulary and continues the fluid production of knowledge through student responses. Teachers may also provide hints to help students recall pertinent vocabulary or aid students at lower levels, such as articulating the beginning syllables of a word (e.g., "universe" to "uni-"), describing words, or using simpler background concepts to describe more complex ideas.

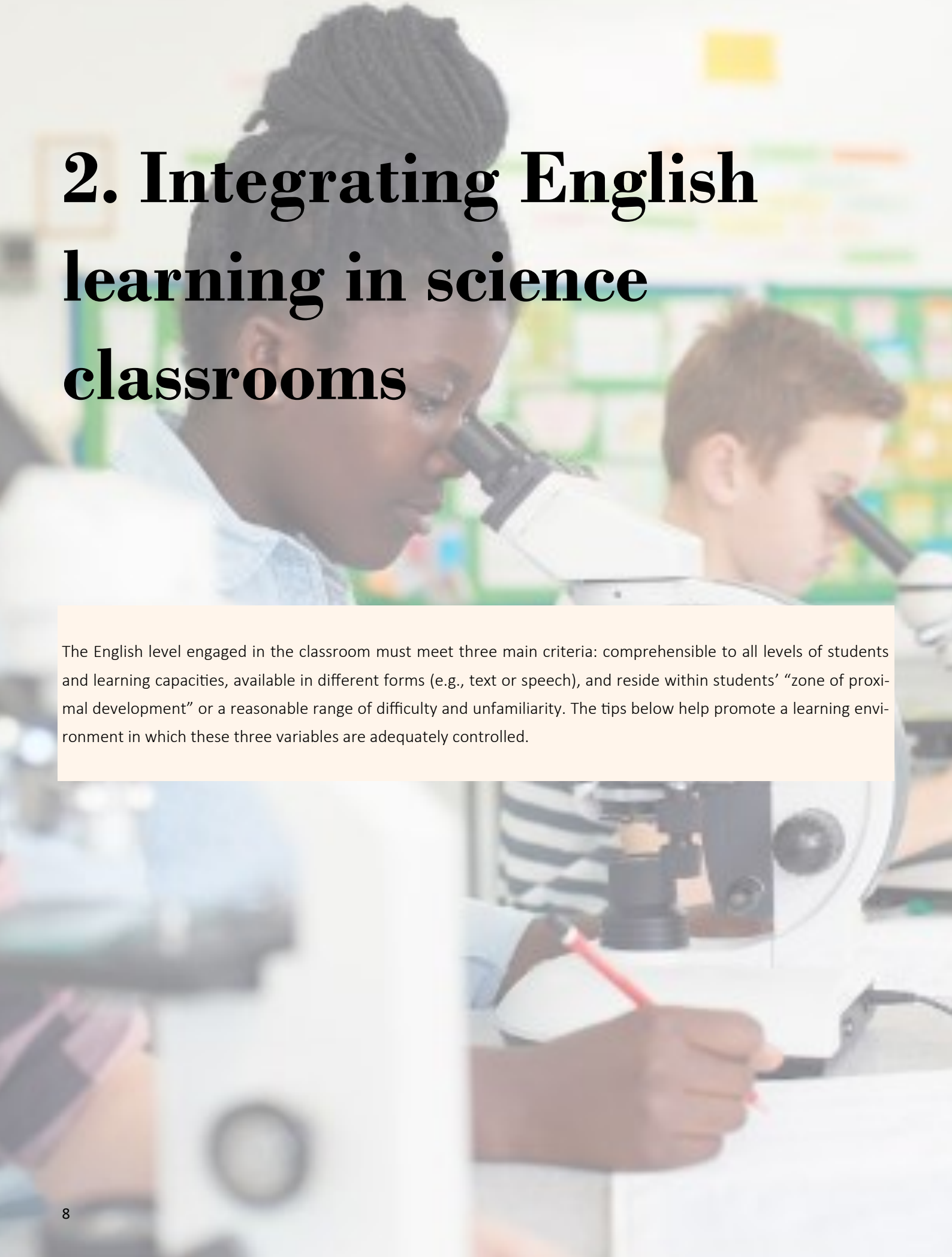
In order to involve more students, lesson content must be displayed in different forms so that students have more opportunities to access content or exercise individual strengths to adopt new knowledge effectively. Using different content formations such as voice or text and statements or question-asking makes information more accessible to students with varied English skill levels or responses to stimuli. Teachers can increase content variations by utilizing class space to combine text and visuals during discussions, revisiting older content while engaging in new content, and scaffolding activities so that highly verbal students initiate tasks while other students comfortably process their responses. Notably, content variation gives students more opportunities to locate the answer in English and accommodate different language skill levels and learning needs, equalizing student involvement and active role-taking. Because knowledge expression varies, students must practice engaging lesson content in numerous configurations, especially in EMI classrooms where students are expected to articulate knowledge in independent assignments.

One example is using Google Docs in the classroom to organize student ideas in text form during discussions or activities. Students will benefit from the coordination of text and speech and can observe immediate feedback when teachers make changes to the document. Technological aids help students "translate" knowledge into different forms and flexibly adapt their involvement.

1.5. Give cues for feedback and student involvement

In EMI classrooms, students may look for direct cues from the teachers to engage, understand new content, or know when to move on to new activities. Cues may be in the form of mannerisms, behaviours, class/concept outlines, or speech. Due to the absence of students' first language, EMI instruction supplemented by nonverbal cues may help give immediate feedback to students and guide fluid discussions without interruption. Nonverbal cues simultaneously "organize" ideas generated during lessons and lesson structure, aiding in progressive knowledge development throughout the class period and signifying task switching. Students may be especially attuned to teachers' facial expressions, tone of voice, and positioning (i.e., facing towards or away from students, distance from students). Conscientious nonverbal engagement with students naturally facilitates agreeableness and rapport and signifies classroom rules and boundaries to create a trusting learning environment. Therefore, more explicit organizational and positive feedback through cues will stimulate student understanding and responsivity.

2. Integrating English learning in science classrooms



The English level engaged in the classroom must meet three main criteria: comprehensible to all levels of students and learning capacities, available in different forms (e.g., text or speech), and reside within students' "zone of proximal development" or a reasonable range of difficulty and unfamiliarity. The tips below help promote a learning environment in which these three variables are adequately controlled.

2.1. Review and repetition

Reviewing and repeating concepts in English and English vocabulary or phrases are vital to stimulating students' knowledge retention. Implement quick review exercises at the beginning of classes, before discussion, and before introducing new concepts. When time is limited, review content through brief question-asking before combating complex ideas—this will help provoke student engagement through lectures and remind students of essential vocabulary for improved English listening or increase participation potential.

2.2. Clear expectations of student involvement

Clarifying the organization of the lesson and scaffolding progressive knowledge development will reinforce students' overall comprehension of the lesson and their involvement, reducing English speaking tension and stimulating student participation even amongst lower-level students.

Additionally, clarity of student expectations in their English involvement may be achieved by displaying key vocabulary, definitions, or grammatical structures within the classroom or text-inserts, as well as in giving detailed instructions before conducting an exercise, discussion, or giving students a group or independent task. Instructions must include expectations regarding content and language—preferably in a way that links the relevancy of content and language.

Like content, language expectations may also be scaffolded in the lesson framework. This technique occurs in two ways: through ongoing language development over a long-term period and during a single lesson. Therefore, teachers must be aware of students' English levels to address potential gaps in language abilities and gradually increase the depth of language use within the class period. Students may struggle to understand or articulate a scientific concept if its link to English lexico-grammatical features is unclear or appears irrelevant or arbitrary. Therefore, clarifying expectations of students' language usage in a specific exercise, providing instructions linking language use and content development, and scaffolding language in the coursework will provide students with a better English language foundation in which to complete work in the present time and articulate knowledge in the future.

2.3. Introduce new vocabulary or phrases prior to discussion

Regardless of students' English levels, introduce or review fundamental vocabulary and phrases to stimulate student attention and ensure equal understanding of the lessons. However, introducing new vocabulary and phrases may be tailored to the students' English levels. The English level engaged in the classroom may reflect the students' levels and abilities but also reinforces the relationship between language and context. Although students may revisit lower-level language concepts to reinforce the use of previously learned knowledge—the teacher may engage students using language that reflects the present material and is activated at a level slightly above students' own English levels. If proper scaffolding and review frameworks are in place, students may naturally engage in more challenging language components or become familiar with them and their usages over time. Described as the "zone of proximal development", this method of English language engagement recognizes the limitations of student knowledge acquisition and, in the context of English language learning or EMI classrooms, influences language development by integrating the peak of students' present English language development potential within class instruction. Therefore, conducting lessons within this zone ensures that students remain focused and on-task while also progressing their communication skills and contextually specific language knowledge in alignment with educational goals.

2.4. Give examples of English language usage in multiple contexts

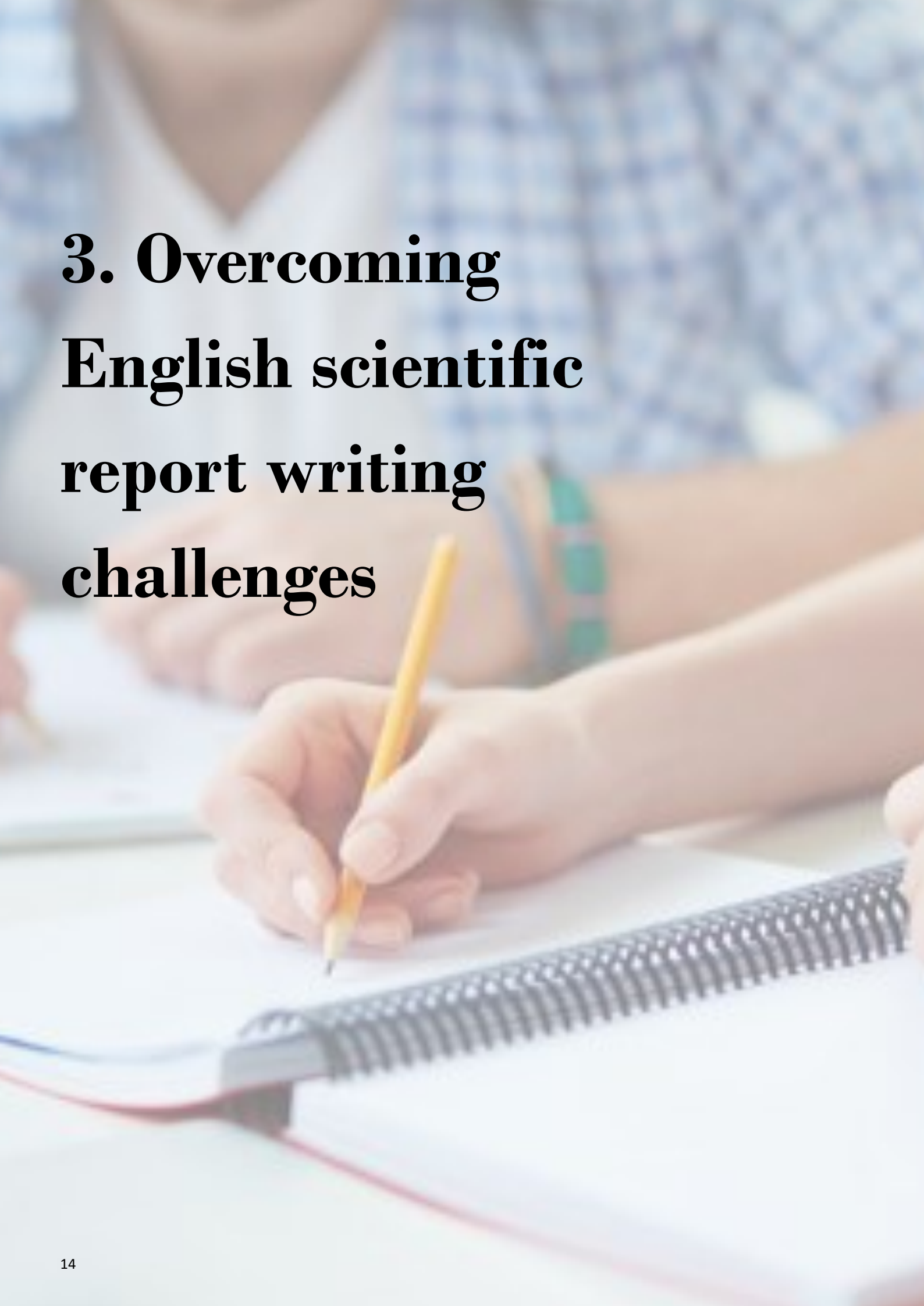
Provide students examples of English vocabulary or phrasing to demonstrate their usage. Do not disproportionately focus on English definitions; use examples in multiple contexts to describe the meaning and usage of the word or concept. Also, do not overwhelm students with multiple definitions of a word—instead, demonstrate its flexibility by making the context more accessible to students. In other words, using language in scientific contexts relative to the class material also demonstrates word functions in contexts more relatable to students, such as in their daily life. Using more relatable contexts may help students creatively engage with the word and utilize basic language structures or ideas already familiar to them. Therein, students develop clarity in the meaning and usage of the word and may increase the likelihood of retaining new vocabulary.

In coordination with this, regularly integrate exercises in which students use the English language in scientific and other contexts throughout the lesson and in different communicative forms. This approach will increase student engagement with language rules and vocabulary and comprehensively merge language, communication methods, and various contexts.

2.5. Use language that students can mirror

In a student-led learning environment, the teacher guides students' knowledge formation. As a result, students will acutely observe the teacher's use of language, and if teachers are adept at posturing language usage, students will mimic the teacher's language habits. The teacher is the pinnacle representative of what information (or language) is vital in the classroom, thus determining the content of students' overall knowledge. In EMI classrooms, the teacher is not only providing content but modelling it as well. Therefore, students are more likely to learn and use English words and phrases independently when teachers model the English language regularly and effectively.

In a science writing course, teachers may model three types of language: relevant vocabulary, writing features reflected in speech patterns, and English language-related scientific writing rubrics. Vocabulary repetition may be relevant to the specific content of the lesson. Writing features that can be flexibly integrated into spoken and written forms include phrases like "for example," "in conclusion," or "to suggest". Teachers can also reinforce writing rubrics and rules such as report structure and organization or citation writing by regularly using them throughout lectures. For instance, teachers can model report structure by introducing new topics using the same or similar structures or signposting language (e.g., first, second, last). Although students should constantly be challenged to use English to describe and explain scientific concepts or practice report writing skills—skills are not solely developed through exhaustive practice but also teachers' effective modelling as an example and reminder of the significance of a language-related concept.



3. Overcoming English scientific report writing challenges

In writing a scientific report, students are expected to develop report writing skillsets related to content, organization, and scientific investigation. However, students face challenges in developing these skills to write each section or create a coherent final report based on the four report assessment criteria: organization, content, language, and citations and referencing. The following tips assess challenges in meeting these criteria and practical teaching tips used throughout the report.

Report section	Skills
Introduction	• Introduce key topics and definitions • Provide relevant contextual and background information • Describe past research and gaps in order to demonstrate the significance of their scientific inquiry
Method	• Explain the research process including the sample, data collection methods, and type of data • Describe how the research was carried out, clearly define the hypotheses or research questions, and explain the procedures
Results	• Explain what they, the researchers, found • Present verbal or infographic findings • Use appropriate language descriptors and language rules to elaborate on the results
Discussion	• Contextualize the results and develop deeper meanings by answering the hypotheses or research questions • Comparing their results to past research • Understanding the significance or implications of their data

Organization

Problem	Teaching tips
Students are unable to visualize the connectedness of scientific processes between individual sections, reducing the reports' cohesiveness as a whole and the depth of scientific knowledge conveyed.	1. Use models like the IMRD model as a cohesive report outline. 2. Use scaffolding techniques to encourage students to use their present knowledge to build upon previously learned ideas—repeating the essential vocabulary and deepening their conceptual understanding while leading discussions on their own with the teacher's guidance. 3. Intertwine peer-reviewing, the use of logical sequencing outlines, and the examination of the organization of scientific texts to help students experience the construction of logical order between report sections and idea development within each section. These processes will also teach students to communicate learning strategies with one another and exchange advice on developing their writing skills. 4. Use activities to integrate organization, language, and content rules so that students understand the coherency of knowledge dissemination. These organizational activities may also coordinate with organization-specific language tools, such as signposting and other organizational language tools for students to use as markers throughout their report and transition to new ideas or concepts.

Content

Problem	Teaching tips
Students may not cite background information to support their claims, make assumptions, or forget to include critical information that adds legitimacy and depth to their investigation.	1. To overcome these issues, models intertwining writing and purpose, like the CaRS model, which helps students identify a niche research area through the investigation of current knowledge and research claims—use question sequences to make sure students understand the importance of their topic clearly while adding details to the written report. 2. Teachers may also demonstrate how the scientific method merges with the scientific report to increase congruency and content richness. 3. In developing students' knowledge base, teachers should avoid lecture-based teaching practices, instead giving students the language tools needed to discuss new concepts, enable students to answer more complex and developmental questions, and participate in group discussions. This student-led dynamic will validate students' current knowledge, giving them a platform to contribute ideas confidently. 4. Students may increase their scientific writing skills by learning how to display results using more descriptive texts and infographics. Skills such as this can be exercised in small group discussions or presentations that will give students more opportunities to work cooperatively with their classmates and simulate aspects of the scientific research process in coordination with scientific communication skills.

Language

Problem	Teaching tips
Students may use incorrect grammar or phrasing and make inappropriate or repetitive vocabulary choices	1. Integrating language learning with the scientific process and report writing is essential. For instance, teachers can demonstrate the correspondences between English lexico-grammatical features, content, and report sections. In other words, highlighting language tools or vocabulary specific to writing stages and content discussion will help students connect the rules of language and communication by orienting language and content strategically. 2. Teachers can inform students of scientific writing strategies, such as hedging, signposting, matching content and verb conjugation, and semi-technical or scientific vocabulary. 3. Teachers must also lead as an example by using language relevant to the lesson's content and not being afraid to make and correct their own mistakes. 4. This includes flexible language learning in which the English level corresponds to the activity at hand. For example, teachers may encourage an open flow of discussion despite English communication errors and make corrections or give immediate feedback directly related to the fundamental concepts or vocabulary used in the lesson—tailoring language corrections to students' immediate needs.

Citations and referencing

Problem	Teaching tips
Students may disregard references to corroborate their arguments or make errors in reporting citations	1. Teachers may integrate exercises that differentiate between trustworthy and untrustworthy sources to derive quality information that increases the depth of students' knowledge and scientific findings. 2. Analysing scientific texts' usages of references to develop content and make arguments will help students understand the shaping of arguments using references as a tool and relationship to other content and organisation-based models such as the IMRD and CaRS model. 3. Teachers may use exercises examining scientific texts as examples of citation use, and students can practice writing citations following a guide that they can quickly access. 4. Teachers can reinforce the necessitation of references and normalise their usage by regularly integrating citations within their teaching practices and demonstrations—referencing authors or studies while teaching new content.

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