



## **Students' and Teachers' Voices for Language Learning Materials Design in an English for Science and Mathematics Subject**

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### **ABSTRACT**

English is widely recognized as an international language for education communication, which has led to the development of several English for Academic Purposes (EAP) subjects for Thai students learning English as a Foreign Language (EFL), especially in specialized school programs. The primary objective of these EAP subjects is to prepare Thai students for academic success in an increasingly interconnected world. Therefore, appropriate learning materials are needed to enhance students' academic language proficiency and ability to engage in interdisciplinary studies. As part of a full research and development project, this preliminary study was conducted to investigate the voices of Thai secondary school students and teachers for theme-based learning materials design in an English for Science and Mathematics (ESM) subject. Focus group and individual interviews were used to explore the experiences and opinions of students and teachers in the Enrichment Program of Science, Mathematics, Technology, and Environment (SMTE). The study identified specific

	<p>academic English literacy needs, including reading strategies, planning for paragraph writing, sentence structure, knowledge of vocabulary and grammar, and learning materials preferences of the SMTE students. These empirical findings could offer valuable insights for materials developers and English language teachers engaged in designing learning materials for students with specific needs.</p> <p><b>Keywords:</b> Needs analysis, language learning materials, academic English literacy, English for Science and Mathematics</p>
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## Introduction

One of the primary objectives of designing learning materials in English for Academic Purposes (EAP) subjects for Thai English as a Foreign Language (EFL) students in science education is to relate curriculum requirements with the actual needs of students. To achieve this aim, the first and crucial step that English language teachers or materials developers should be concerned with is identifying learners' needs regarding language skills development and the features or characteristics of materials to promote students' language learning. As proposed by Tomlinson and Masuhara (2018), if we want to facilitate learners who have specific language learning purposes, materials that intend to provide students with additional specific language experiences or instructions based on their actual needs should be utilized.

In Thailand, since the Ministry of Education's announcement that Thai public secondary schools with specialized learning programs have the role and responsibility to set up, revise, and design their learning resources based on local requirements (Office of the Education Council [OBC], 2017), the lack of appropriate learning and teaching materials designed based on the needs of students in those specialized school programs has become apparent. This problem arises as well in the EAP subjects, particularly in an additional English subject as English for Science and Mathematics (ESM) for junior secondary school students in the Enrichment Program of Science, Mathematics, Technology, and Environment (SMTE) (Institute for the Promotion of Teaching Science and Technology [IPST], 2013a). This subject aims to improve students' academic English language literacy that support their interdisciplinary study. Based on the objective of the ESM subject, English is considered as "a language of knowledge" (Bjorkman, 2013, p. 6) for students in the SMTE program to gain access to global resources related to science and technology.

The role of the English language in an ESM subject conforms to the aim of educational management of the SMTE program, that is to help students accomplish science-related learning at the school level and to engage students in various science resources. Thus, the thematic learning materials that integrated science and mathematics and English language learning, is suggested to be employed in ESM classes. The significant characteristic of these materials types are features that effectively engage students with an opportunity to master language skills practice through other subject areas' content (Woodrow, 2018). Specific content, corresponding to science learning in addition to English language and language competency, is integrated for preparing learning objectives and content. To design theme-based learning materials for ESM learning and teaching activities, learner needs regarding academic English literacy development and learning materials should be examined.

However, although English language teachers in the SMTE program are authority figures in ESM materials design, there were uncertainties among these teachers about how to produce appropriate learning materials for ESM teaching. The information from the discussion with the local schoolteachers participating in the mentoring project for materials design training, organized by the first author's department, revealed that learner needs regarding academic English literacy development and learning materials were not adequately addressed in the process of creating ESM materials. Teachers tended to produce materials by simply selecting contents or tasks from commercial textbooks that they perceived suitable for their students, leading to the lack of appropriate specifications of students' needs.

Therefore, this preliminary study, as part of a full research and development project for the first author's dissertation on ESM learning materials development, aims to examine the needs of academic English literacy development in terms of the wants, necessities, and lacks, and learning materials preferences in an ESM subject from the perspectives or voices of SMTE students and English language teachers. To attain the purpose of this study, the specific research questions are specified as follows:

1. What are the needs of academic English literacy development of the SMTE students in terms of the wants, necessities, and lacks?

- 1.1 What are the wants and lacks from the perspectives of SMTE students?

- 1.2 What are the necessities and lacks from the perspectives of SMTE English language teachers?

2. What are the needs for learning materials in an ESM subject from the perspectives of the SMTE students and English language teachers?

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## Literature Review

### **Enrichment Program of Science, Mathematics, Technology, and Environment (SMTE)**

SMTE is the learning program provided by most Thai public secondary schools that implements the regulations and practices of the enrichment science classroom curriculum established under the supervision of the Office of the Basic Education Commission, the Office of the Higher Education Commission, the Office of the Higher Education Commission, the National Science and Technology Development Agency, and the Institute for the Promotion of Teaching Science and Technology. Since 2007, this curriculum has been implemented in 193 school programs at the lower-secondary level and in 195 school programs at the upper-secondary level (IPST, 2013b, 2013c).

The primary aim of SMTE educational management is to accomplish science-related learning at the school level and to engage students in various science learning resources to conform to the benchmark of education conducted as outlined in the curriculum. The English language serves as the medium of instruction and communication in this context, encouraging students' learning achievement in science as well as language proficiency development as successful international learners. According to the study of Arsingsamanan et al. (2019) regarding the management of Thai secondary schools' enrichment science classrooms, it revealed the need for additional compulsory English subjects that are different from general English subjects taught to students in a regular classroom, due to the media and learning resources used in the former program are in the English language thus the students need appropriate English literacy to access information and communicate with scholars in the academic fields.

According to the significant role of English language development for Thai secondary school students in SMTE, a discipline-specific language course as an ESM subject is included in the curriculum to develop students' academic English literacy (IPST, 2013c). The nature of this subject is associated with using English reading and writing skills in the academic profession. Molle (2015) suggests that English literacy maintains students' academic discipline and success since many school subjects' contents are prepared and updated through the English language. Thus, learning situation of the students in SMTE can prove that students' academic achievement is partially a consequence of their English language learning achievement, especially in the form of English literacy.

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## Literacy Development in EAP Courses for Science Students

From a traditional perspective, the term “literacy” in science education was simply defined as reading and writing ability (Foley, 2017). However, this definition has been extensively revised to reflect current literacy usage in educational settings (Fu & Matoush, 2015). For example, Kucer (2014) refers to academic literacy as “the ways in which language and thinking operate within such academic fields as the sciences, mathematics, and social sciences” (p. 5). It is also described as a set of practices that includes critical thinking, information searching and reading, and genre writing skills to communicate a specific message (McWilliams & Allan, 2014).

In developing English literacy skills for school students who study in a science major, EAP courses should include reading and writing topics and activities that supports their science learning needs (Charubusp & Chinwonno, 2014). More specifically, science students, especially in a science major with English as a medium of instruction, require proficient academic English literacy skills not just to read and write, but also to reflect on scientific information and to express what knowledge they have learned effectively.

In terms of reading for information, the students commonly need to read texts to comprehend the information and to understand the content in the subjects. Rivers and Temperley (1978) divide reading into seven types based on the purposes of reading activities: to get information; to respond to curiosity about a topic; to follow instructions; for pleasure; to keep in touch with friends; to know what happens in the world; and to find out when and where things are (as cited in Hedge, 2000, p. 195). According to River and Temperly’s acknowledgment, reading for information is the main reading purpose that represents students’ reading activities in academic contexts. Academic readers should carefully read a text to understand its meaning. Namely, students use this literacy skill to gain knowledge or extract data from a text that is useful to their subjects’ learning.

To enhance reading for information skill, Hedge (2000) proposed a model that helps students approach a variety of texts extensively following the top-down process of reading. This model is the SCROL procedure originally found by Grant (1993). This procedure includes five steps (i.e., survey the headings, connect, read the text, outline, and look back) for understanding, remembering, and locating new information that beginner readers should employ. In addition, skimming, scanning, and intensive reading are the reading for information strategies academic students should master.

In terms of writing for communication, writing is a complex process that involves several skills. Therefore, teachers’ teaching activities should integrate language knowledge teaching and language skills practicing to

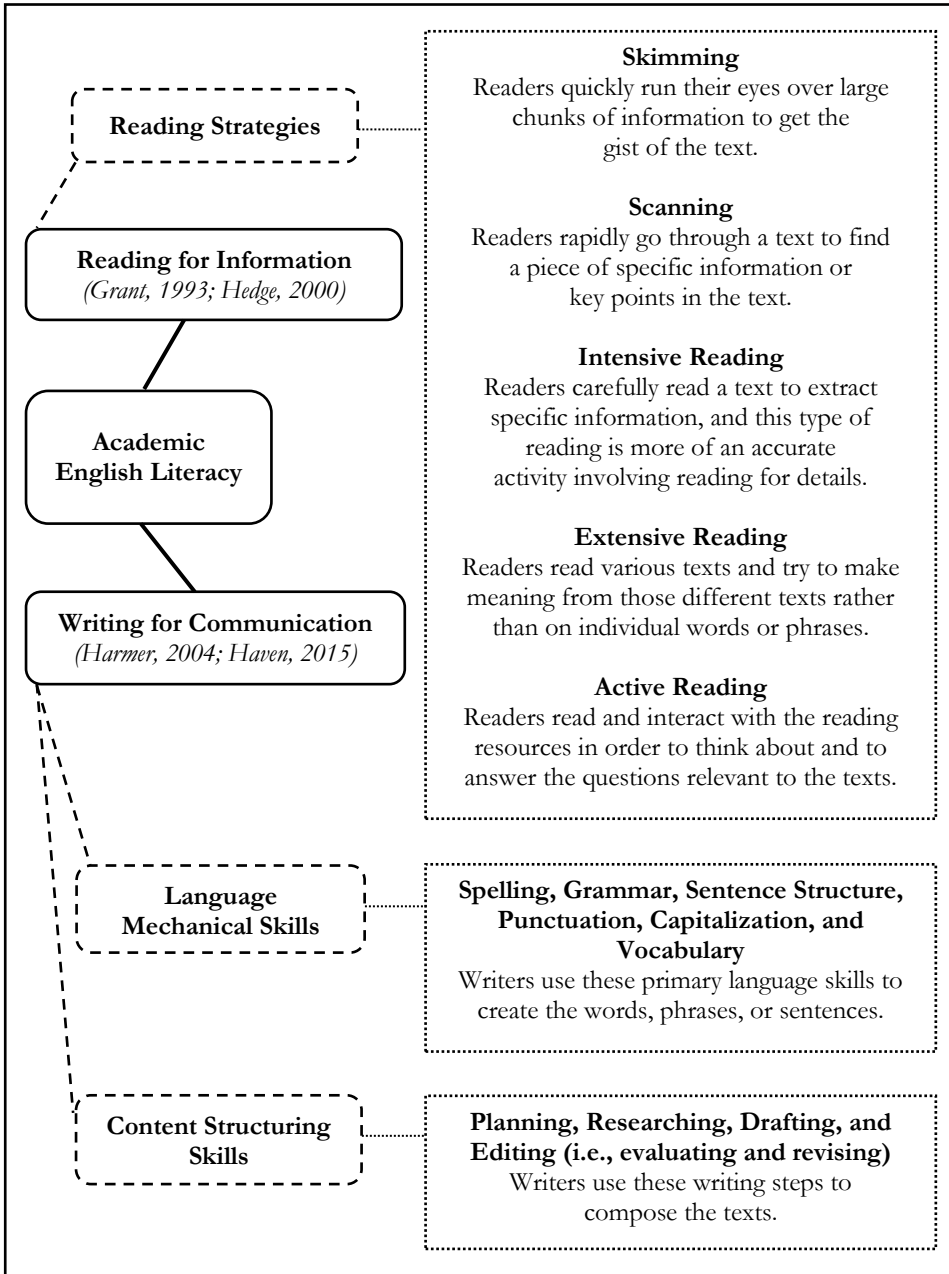
develop students' writing skills. Haven (2015) notes that writing skills can be divided into two distinct groups: mechanical skills and content-related skills. The mechanical skills include the competent use of spelling, grammar, sentence structure, punctuation, capitalization, and vocabulary that students should learn as their primary language skills. Concurrently, the content-related skills, including planning, researching, drafting, and editing (i.e., evaluating and revising) are also imperative in developing students' writing skills.

Rankin et al. (1993) noted that, in English writing, students' mechanical skills could affect their writing performance. For example, knowledge of vocabulary and spelling helps students see the patterns in the English language and understand how words are put together). Pennington and Rogerson-Revell (2019) also suggest that explicitly teaching of the orthographic or language patterns in spelling is useful for academic writing skill development.

In terms of content-related skills, Harmer (2004) suggests that planning helps students decide on what they are going to write, while researching for information is useful in preparing for writing. Also, drafting and editing help students in reading thoroughly to review and evaluate their first version of a written work and to revise it for more accuracy and appropriacy of language and content. Therefore, teachers should train students in these essential strategies for effectively guiding the composition process. In summary, according to the review of theories regarding reading for information and writing for communication skills, developing academic English literacy for students in science majors can be presented as shown in the following theoretical framework in Figure 1.

**Figure 1**

*Academic English Literacy for Students in Science Major*



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## Needs Analysis in Materials Design

In the field of materials development, conducting needs analysis is crucial in gathering language individual learners' needs, and it is usually performed in the beginning stage of the materials development process (Tomlinson, 1998). When theoretical suggested knowledge and skills can be used as a benchmark for materials design, it may not align with what learners really want or lack. The evidence to support this view is from Hutchinson and Waters's (1987) acknowledgment that even though learners' disciplined subjects can specify areas for improvement in their language knowledge or skills, it does not guarantee that the suggested knowledge and skills precisely align with what learners should learn or practice. Tomlinson (2011) also suggests that need analysis findings provide language learners' needs data from emic perspectives, so the study of learner needs should be conducted as the beginning step of the materials development process.

In language education, the term needs analysis first appeared in 1920s (Eshtehardi, 2017; Ruiz-Garrido & Fortanet Gomez, 2009), since then the definitions of needs have been identified by different language teaching scholars and educators. Among these, there are some definitions of need analysis that are still popularly used nowadays, such as the interpretation by Brown (1995) that can be defined concisely as:

The systematic collection and analysis of all subjective and objective information necessary to define and validate defensible curriculum purposes that satisfy the language learning requirements of students within the context of particular institutions that influence the learning and teaching situation.

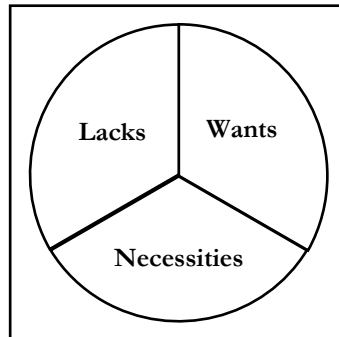
(as cited in Liu et al., 2011, p. 272)

Moreover, according to Hutchinson and Waters (1987), language learner needs can be grouped into two types: target needs and learning needs. The former can be defined as "what the learner needs to do in the target situation," while the latter can be referred to as "what the learner needs to do in order to learn" (p. 54). In other words, target needs are the language features or skills learners want to learn or practice, while the learning needs derived from the learning situations, learning activities, teaching approaches, or instructional materials that lead them the success according to their language learning objectives. Besides, Hutchinson and Waters (*ibid*) also suggest that teachers should investigate learners' needs from three different perspectives: necessities, lacks, and wants, as shown in Figure 2.



**Figure 2**

*Three Types of Needs*



The similar concept of needs is also explained in Nation and Macalister (2010), and it is applied in this present study as a framework for investigating the target learners' needs for academic English literacy, as illustrated in Figure 3.

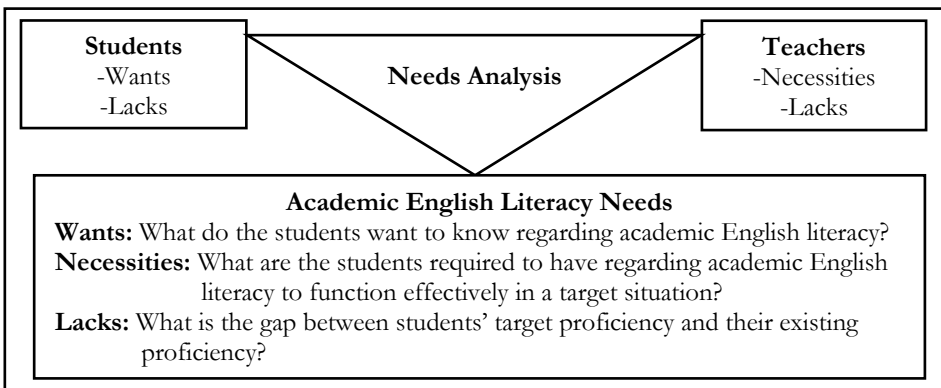
*Necessities* refers to the necessary academic language literacy: reading for information skills and writing for communication skills that students must know to effectively use it in their content areas learning.

*Lacks* is the gap between what students already know and what they do not know regarding reading for information skills and writing for communication skills. Lacks could hinder their process of learning in the content areas; therefore, they need to be fulfilled.

*Wants* include students' expectations or what they want to do and what they want to know regarding reading for information skills and writing for communication skills. The students' wants could motivate them to effectively use the language in their learning of the subject content.

**Figure 3**

*Needs Analysis of Academic English Literacy*



As illustrated in Figure 3, Hutchinson and Waters' (1987) suggest that the necessities are immediate needs that should be determined by teachers, while the lacks can be determined by both students and teachers and wants can be best revealed by learners themselves. Thus, academic English literacy needs in this study were collected from both students and teachers. The three types of needs, wants and lacks were determined by exploring the students' experiences and opinions regarding their academic English literacy development. Concurrently, necessities and lacks regarding students' academic English literacy development were explored through the teachers' perspectives.

In this preliminary study, the results of SMTE learners' needs towards academic English literacy development is necessary for further development of materials' main features, including unit objectives and practice tasks. The second purpose is to find out about the desired learning materials in the ESM subject or the characteristics of materials the SMTE students and teachers prefer to see and use. The data is useful as a reference to create the materials' designs. In conclusion, both students and teachers are important groups of stakeholders who can provide insightful information about language learning needs for further design and development of learning materials. In the next section, it describes how students' and teachers' voices were investigated in this research will be described in detail.

## **Method**

This qualitative study employs focus group interviews and individual interviews as methods for data collection. According to Creswell (2018), qualitative research is "an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem" (p. 3). As implied by Creswell, the primary data collected from one setting as a case of study can be utilized to uncover the meaning of an experience or phenomenon that emerges in this setting in detail. Bogdan and Biklen (2007) also suggest that the qualitative study of a specific group of people can provide the researcher with insightful data. Consequently, in this study, the setting of the SMTE program at a public secondary school in Thailand was selected, and the needs on academic English literacy development and the desired learning materials in an ESM subject from students' and teachers' perspectives were explored through two sets of needs analysis interviews questions.

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## Participants

In qualitative research, Creswell (2018) underscores the importance of purposefully selecting participants who can offer valuable insight based on their best understanding of the subject matter. Therefore, to identify learners' needs, a sample of ten seventh-grade students (aged 12-13 years old) in the SMTE program was chosen to represent the typical demographic of students in this program and provide insights from their direct learning experience in ESM classes. In the context of this study, ESM serves as an additional subject, offered in the first and second semesters known as ESM1 and ESM2. Additionally, during the needs analysis study, this group of students had already completed ESM1, and they were studying ESM2 with a teacher from the teacher participant group. The teacher participants are two Thai ESM teachers who participated in the mentoring project for materials design training organized by the first author's department. They were selected based on their extensive teaching experience in ESM classes in the SMTE program. Having direct experience as learners and teachers in ESM classes provides both groups of students and teachers unique and valuable perspective.

For the student participants, all of them are Thai EFL learners enrolled in the SMTE program at the target school. During their primary-level education, they attended public schools where all subjects, except English, were taught in Thai. Their English proficiency level was at the beginner level on average. None of them had prior experience with English as a medium of instruction (EMI) in the classroom. Thus, ESM1 and ESM2 classes mark their initial exposure to studying other subjects through EMI. Consequently, it is crucial to prepare learning materials specially designed and developed to accommodate their novice learning experience and language proficiency level.

## Instruments

To identify the needs for ESM learning materials, two sets of interview questions were developed. These questions were designed based on the two main established theoretical frameworks, including academic English literacy for students in science major (see Figure 1) and needs analysis of academic English literacy (see Figure 3). Subsequently, three experts in the field of ELT were invited to assess the validity of the interview questions. Their feedback suggested a few adjustments to the sequence of questions and the addition of questions aiming to relax the informants, especially the student participants, during the interviews. Consequently, based on expert recommendations, the researchers refined and tailored some questions to suit

the students' age. These two sets of interview questions were used as prompts to elicit comprehensive responses from the student and teacher informants.

The first set comprises semi-structured interview questions for focus group interviews with the students. These questions were designed to explore the students' views regarding their academic English literacy wants and lacks, and their desired learning materials in the ESM subject. The questions aim to prompt the students to discuss their needs based on personal experiences, opinions, or values, and to ensure that the researcher can elicit comprehensive answers from the student participants. More details of the focus group interview question items are presented below.

**Table 1**

*Needs Analysis Question Items for Students' Interviews*

<b>Theme1: Needs of academic English literacy from students' perspectives</b>	
Wants: What do the students want to know regarding academic English literacy?	
<u>Question item</u>	<u>Focus of question</u>
1	English learning experience
2-3	Preferred lessons or tasks
4-5	Reading skills that they want
6-7	Writing skills that they want
8	Grammar knowledge and practical skills that they want
Lacks: What is the gap between students' target proficiency and their existing proficiency?	
<u>Question item</u>	<u>Focus of question</u>
9-10-11-16	General English language knowledge and skills they lack
12-13	Reading skills that they lack
14-15	Writing skills that they lack
<b>Theme2: Needs of learning materials from students' perspectives</b>	
How do students picture learning materials in an ESM subject they expect to use?	
<u>Question item</u>	<u>Focus of question</u>
1	Learning materials that they want
2	Learning themes and tasks that they want
3	General focus on language forms or practices they prefer

The second instrument is a set of semi-structured interview questions designed for delving into teachers' views. According to Nunan (1992), qualitative data collection techniques such as individual interviews can help the researcher gain insight into the unique participants' experiences and opinions. Consequently, individual interviews were conducted to explore the teachers' views regarding learner needs of English literacy and learning materials in an ESM subject. Further details of the question items can be found in Table 2.

**Table 2**

*Needs Analysis Question Items for Teachers' Interviews*

<b>Theme1: Needs of academic English literacy from teachers' perspectives</b>	
Necessities: What are the students required to have regarding academic English literacy to function effectively in a target situation?	
<u>Question item</u>	<u>Focus of question</u>
1	Teaching experience
2-4	Necessary language knowledge and skills
5-6	Necessary reading skills
7-8	Necessary writing skills
9	Focus on language forms versus focus on practical skills
<b>Theme1: Needs of academic English literacy from teachers' perspectives</b>	
Lacks: What is the gap between students' target proficiency and their existing proficiency?	
<u>Question item</u>	<u>Focus of question</u>
9	General English language knowledge and skills students lack
10-11	Reading skills that students lack
12-13	Writing skills that students lack
<b>Theme2: Needs of learning materials from teachers' perspectives</b>	
How do English language teachers picture the expected learning materials in an ESM subject?	
<u>Question item</u>	<u>Focus of question</u>
1	Learning materials that students want
2	Learning themes and tasks that students want
3	General focus on language forms or practices students prefer

**Data Collection and Analysis Procedures**

For data collection, two student focus group interviews and two individual interviews with teachers were conducted at different items, with the same focus on the two main themes: academic English literacy development and desired learning materials in the ESM subject. Both interviews were conducted in a face-to-face format. Furthermore, to avoid confusion during the discussions, the informants' first language (i.e., Thai) was employed to facilitate their understanding of interview questions, thereby enabling them to relax and freely express their thoughts without encountering language barriers. During the focus group and the individual interviews, the researcher performed as a prompter, facilitating participants' understanding and expression of their views on the prepared questions. Regardless of their age, it was observed that the student participants actively shared their experiences and opinions during the focus group discussions, some answers even provide insightful perspectives that surpassed the researcher's expectations.

For data analysis, the data gathered from the focus group and individual interviews were inductively coded and categorized (Merriam & Tisdell, 2016). In summary, three analytical steps of category construction were conducted, including (1) data preparation and management, (2) coding and categorizing, and (3) reassessing various codes to organize and provide appropriate themes (Lichman, 2013; Savin-Baden & Major, 2013). Also, the inter-coding by three experts was employed to strengthen the reliability of the coding and categorizing process in this study. The intercoder agreement rate was 91%, while disagreements were discussed afterward.

Additionally, to enhance the internal validity of the findings, member checking process was employed by having the transcribed data shared with the informants for their feedback and confirmation whether the interpretation of findings correctly reflected their experiences and opinions. The findings found from the data analysis are reported and discussed in the subsequent sections.

## Findings

### Needs of Academic English Literacy from Students' Perspectives

#### *Wants*

The students' experiences and opinions regarding academic English literacy needs, collected from two focus group interviews were analyzed and categorized into five topics concerning their desires or "wants". Table 3 summarizes the interview findings based on each topic.

**Table 3**

*Academic English Literacy Needs in terms of Wants from Students' Views*

Topics	Students' views
Wants: What do the students want to know regarding academic English literacy?	
1. Students' English learning experiences	1.1) School system: Fundamental subjects and additional subjects 1.2) Self-learning: YouTube, English textbooks, and movies
2. Students' preferred lessons or tasks	2.1) Language skills: Reading and writing skills 2.2) Types of lessons or tasks: Reading to find key terms or specific information to answer the questions relating to the given texts, writing completed sentences, and translating the reading texts
3. Reading skills students want	3.1) Reading skill that allowed students to learn new words in sentences (i.e., intensive reading)

4. Writing skills students want	3.2) Reading skill that helped them to understand the whole picture of reading texts (i.e., extensive reading)
5. Grammar knowledge and the practical skills students want	4.1) Writing skill that helped them to construct compound and complex sentences (i.e., language mechanical skills) 4.2) Writing skills that supported their paragraph writing, such as how to plan the paragraph (i.e., content structuring skills) 5.1) Both language knowledge and communication skills were crucial and necessary for students in the science learning curriculum.

As shown in the table, under students’ English learning experiences, they highlight the importance of fundamental subjects within the school system and self-learning methods like YouTube, English textbooks, and movies. Their preferred lessons or tasks include learning language skills such as reading and writing, as well as specific activities that encourage reading for key terms, writing complete sentences, and translating texts. In terms of reading skills, students want to develop both intensive reading to learn new words in sentences and extensive reading for understanding the overall context. Regarding writing skills, they want to enhance their ability to construct compound and complex sentences, as well as to improve paragraph writing through effective planning. Additionally, students emphasize the importance of grammar knowledge and practical communication skills in the context of science learning curriculum.

### ***Lacks***

The data from two focus group interviews were analyzed and categorized into four topics concerning student language deficiencies or lacks. Table 4 summarizes the interview findings based on each topic.

**Table 4**

*Academic English Literacy Needs in terms of Lacks from Students’ Views*

<b>Topics</b>	<b>Students’ views</b>
	Lacks: What is the gap between students’ target proficiency and their existing proficiency?
1. Students’ English proficiency development	1.1) Study through school subjects 1.2) Self-study through various learning resources
2. General English knowledge and skills students lack	2.1) Reading skills. 2.2) Writing skills 2.3) Speaking skills

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3. Reading skills students lack	3.1) Reading comprehension that allowed students to find the gist of the given texts (i.e., skimming, scanning, and intensive reading) 3.2) Reading skill that helped students to understand the whole picture of the reading texts (i.e., extensive reading)
4. Writing skills students lack	4.1) Writing skill that allowed students to write longer English sentences (i.e., language mechanical skills in terms of sentence structures) 4.2) Writing skill that helped students to express their opinions toward what texts they have read or give more details for their readers as paragraph writing (i.e., content structuring skills)

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From the table, regarding general English knowledge and skills they lack, students struggle with reading, writing, and speaking skills. Specifically, students mentioned lack of reading comprehension skills, including the strategies of skimming, scanning, intensive reading, and extensive reading. One of the students mentioned:

In a science classroom, sometimes I cannot give the teacher a correct answer to her given question regarding the science story I have read. It seems like I do not understand that story or the overall picture of the story. Therefore, I have to improve my reading skills because I might have a problem with reading comprehension.

(Student #7)

Moreover, students reported challenges in writing longer English sentences due to deficiencies in language mechanical skills related to sentence structures. Additionally, they struggle with expressing and structuring their opinions and providing detailed information in paragraph writing. The following quoted answer supports this interview findings.

Writing long sentences in English is my problem because I do not have the proper vocabulary and grammar. Sometimes I cannot think of structure of sentence that I want to write in the correct order.

(Student #9)



**Needs of Academic English Literacy from Teachers' Perspectives**

***Necessities***

The teachers' experiences and opinions regarding academic English literacy needs of the SMTE students, collected from two individual interviews were analyzed and categorized into five topics concerning their suggestions on what are academic English literacy the SMTE students required to have or "necessities". Table 5 summarizes the interview findings based on each topic.

**Table 5**

*Academic English Literacy Needs in terms of Necessities from Teachers' Views*

Topics	Teachers' views
Necessities: What are the students required to have regarding academic English literacy to function effectively in a target situation?	
1. Teachers' teaching experiences	1.1) Fundamental English and additional English subjects for seventh-grade students in SMTE 1.2) Additional English subjects for eighth-grade students in SMTE
2. Necessary language knowledge and skills for students	2.1) Language knowledge: Vocabulary, sentence structures, and some grammar points such as tenses 2.2) Language skills: Reading and writing skills 2.3) Other skills: Translation
3. Necessary reading skills for students	3.1) Intensive reading 3.2) Vocabulary knowledge
4. Necessary writing skills for students	4.1) Language mechanical skills: vocabulary, grammar, and sentence structures
5. Focus on forms or focus on practical skills that are necessary for students	5.1) Practical skills in using the English language in students' core subjects learning in which they could apply their language knowledge and skills to complete their assignments from core subject teachers

Based on the interview findings in Table 5, the teachers share their expertise in teaching both fundamental and additional English subjects to SMTE students in grades seven and eight. They suggested that language knowledge, such as vocabulary and grammar, as well as language skills like reading, writing, and translation, are necessary for students to function effectively in academic situations. In terms of reading skills, students should focus on intensive reading and improving their vocabulary. Regarding writing skills, students need to master language mechanical skills, such as vocabulary, grammar, and sentence structures. Furthermore, it is also essential for

students to learn language forms and practical skills simultaneously that they can apply in their core subjects to complete assignments effectively.

### **Lacks**

The data from two individual teacher interviews were analyzed and categorized into three topics concerning SMTE students' language deficiencies or lacks. Table 6 summarizes the interview findings based on each topic.

**Table 6**

*Academic English Literacy Needs in terms of Lacks from Teachers' Views*

Topics	Teachers' views
	Lacks: What is the gap between students' target proficiency and their existing proficiency?
1. General English language knowledge and skills students lack	1.1) Language knowledge: Grammar and use of language knowledge in practice, sentence structures 1.2) Language skills: Reading, writing, and interpretation skills
2. Reading skills students lack	2.1) Intensive reading
3. Writing skills students lack	3.1) Language mechanical skills: vocabulary, grammar, and sentence writing

From the table, regarding general English knowledge and skills SMTE students lack, they seem to lack language knowledge and skills, particularly in grammar, practical use of language knowledge, sentence structures, reading, writing, and interpretation. Specifically, the teachers reported students' struggling with intensive reading, and mechanical sentence writing skills. The following is a sample extract from teacher interviews to support the above interview findings.

Although intensive reading is a fundamental reading skill that allows students to gain knowledge and information intensively from the resources, most students still lack this skill, and sometimes they do not want to practice.

(Teacher #1)

Another teacher provided the reason to support Teacher #1's answer:

Because of students' low proficiency in grammar and sentence structures, why sometimes students cannot understand English texts or stories they have read. Moreover, mechanical skills, such as grammar and sentence structures, are writing knowledge that they cannot use appropriately to support their disciplinary learning.

(Teacher #2)

## Needs of Learning Materials from Students' and Teachers' Perspectives

First, the students' views concerning the characteristics of expected learning materials they want to use, collected from two focus group interviews, were analyzed and categorized into three topics. Table 7 summarizes the interview findings based on each topic.

**Table 7**

### *Learning Materials Needs from Students' Views*

Topics	Students' views
How do students picture learning materials in an ESM subject they expect to use?	
1. Learning materials students want	1.1) Materials content: Various science stories, sentence writing practice focused on long and complex sentences and paragraph writing practice 1.2) Materials design: Texts with relevant pictures and learning units that included content and practice tasks
2. Learning themes and tasks students want	2.1) Themes: More learning themes from science subjects such as the solar system and the cycle of plants 2.2) Tasks: Authentic reading and writing practice tasks, such as writing reports or summaries, drawing, and summarizing reading content
3. General focus on forms or practice students prefer	3.1) Both grammar knowledge and communication skills should be the focus of learning materials in an ESM subject

From Table 7, students proposed materials content that provide different science stories, sentence writing, and paragraph writing practices. The design of materials should include whether texts with relevant pictures and learning units with content and practice tasks. The following is a sample extract from student interviews to support the above interview findings.

Long English sentences should be provided in the materials because, in a real situation, we have faced a lot of long English sentences in the science stories. Besides, learning materials that encourage us paragraph writing practice are also learning materials we want to use.

(Student #6)

In addition, learning themes from science subjects, and authentic reading and writing tasks with both grammar and communication skills practices should be presented in the materials. The following is a sample extract from student interviews to support the above interview findings.

I enjoy learning English through science themes, such as the solar system and the cycle of plants. At the same time, I prefer to practice my reading and writing skills with language tasks that allow me to use reading skills or language knowledge to complete science assignments, such as report writing and summary.

(Student #3)

Next, the teachers' views concerning the characteristics of expected learning materials that could be used in ESM learning and teaching, collected from two individual interviews, were analyzed and categorized into three topics. Table 8 summarizes the interview findings based on each topic.

**Table 8**

*Learning Materials Needs from Teachers' Views*

Topics	Teachers' views
How do English language teachers picture the expected learning materials in an ESM subject?	
1. Learning materials teachers want	1.1) Materials content: Comprehensible of content and vocabulary in the area of science and mathematics, practical tasks that allow to use of language knowledge in practice 1.2) Materials design: Colored illustrations
2. Learning themes and tasks teachers want	2.1) Themes: Learning themes in science and mathematics subject area 2.2) Tasks: Reading and writing skills practice tasks that integrate science and mathematics contents
3. General focus on forms or practice teachers prefer	3.1) Communication practice that encourages students to use language knowledge or language forms

Based on Table 8, desired learning materials from teachers' perspectives are those that provide students with comprehensible content and vocabulary in science and mathematics and practical tasks that allow them to use language knowledge in practice with colored illustrations. Thus, learning themes should be in science and math subject areas while integrated reading and writing tasks that allow students to use language knowledge or forms to complete tasks should be included.

## Discussion

The learners' needs analysis results play a crucial role in EAP materials design, particularly within an ESM subject. This claim suggests that, in the process of materials content and design creation, the needs regarding academic English literacy and learning materials from the perspectives of SMTE students and English language teachers can serve as the primary resources, distinguishing the developed materials as more effective than commercial textbooks. This specialized characteristic of EAP materials as proposed by Woodrow (2018), can only be achieved when they are prepared and created based on learners' academic needs. While some previous needs analysis studies (e.g., Ampa & Quraisy, 2018; Yasmin et al, 2016) utilized the needs data solely used it for the development of materials content, the present study propose to use needs data not only for content creation but also for the design process. The authors' perspective on the significant role of learners' needs is also underpinned by the primary factor of learner and teacher motivation. We believe that students and teachers tend to feel valued and engage more with the materials that are designed and developed based on their needs.

A number of language educators have agreed that learning materials that integrate learners' needs particularly their wants, with the standards of what they should learn, or their necessities are more motivational than those developed by general publishers (Ampa & Quraisy, 2018; Charunsri, 2019; Mazraehno & Mazdayasna, 2016; McGrath, 2016; Mubar, 2015; Prayoga et al., 2021; Tomlinson, 2011). Therefore, materials users, including both teachers and learners, should be given with opportunities and empowerment to express their needs regarding learning themes, tasks, or even learning and teaching procedures they should use (necessities) and want to use (wants). In the present study, both the content and design of the theme-based learning materials were designed and developed based on the target students' needs. In terms of wants, the SMTE students want to study both language knowledge and communication skills to complete the core subjects' assignments. Their wants correspond to English language teachers' viewpoints that SMTE students should learn how to apply their English

language knowledge and skills to work out those assignments. For this case, the want and necessities guide the researchers to design the practice tasks that benefit their core subject learning, particular reading and writing tasks that integrate what learners want to learn and use in their real life outside the language class, such as reading to find specific information, planning for expression their thought, and using more details for paragraph writing tasks. Comparing to most commercial textbooks that usually adhere to general ELT theories to determine what English language content should be included and how it should be taught; these materials specially designed and developed to meet learners' specific needs tend to be more meaningful and motivating for both SMTE students and English language teachers.

### **Conclusion and Implications**

This study serves as a needs analysis study that takes into account the necessary characteristics of appropriate learning materials to design ESM materials for SMTE students. The needs findings revealed students' desires, which reflected the lessons, reading, and writing skills they desired to study, as well as their general English knowledge, reading skills, and writing skills deficiencies. The need for academic English literacy from the perspectives of teachers revealed the necessary language knowledge and skills, as well as the language knowledge and skills that students lacked. Also, the need for learning materials content and design of the expected learning materials that students and teachers want to use in ESM subject learning and teaching. According to this insight information from students' and teachers' perspectives, the researchers can conclude that need findings are crucial for designing not only learning and teaching activities but also learning materials. Regarding the designing of learning materials based on learner needs, English language teachers or materials developers should understand the comprehensive process of need identification as it is the significant step of the whole process of learning materials development. In this study, it suggests what English language materials developers should do to examine learners' language learning needs. Moreover, to collect the needs data, it provides a suitable process to elicit participants' opinions and experiences towards the proposed topics. As can be observed in this study, the researcher chose to collect data through focus groups and individual interviews rather than a survey. The reason for this is that the researcher can expand on the interview questions during the interviews to get more information or urge informants to reveal additional thoughts or sentiments. Apart from using these questions to construct need analysis research, English language teachers can also utilize them to examine their students' actual needs and to retrieve rich and emic data for learning materials development.

For future research, it would be beneficial to investigate the needs of SMTE students across various grade levels and schools. As the context of this study is limited to SMTE students and English language teachers from a single grade level at a single public secondary school in Thailand, the findings may not be universally applicable to other settings within the enrichment science classroom curriculum. Therefore, conducting a needs analysis study among SMTE students and English language teachers in different grade levels and public secondary schools is essential to gather comprehensive data that can be generalized across wider contexts. Additionally, further steps of material development including material design, implementation, and evaluation, should be conducted to complete the process of language learning material development.

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