EduHeart Knowledge Network and Publishing, Inc.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 2

DOI: https://doi.org/10.66206/eduheart.2026.290

English-Medium Instruction and Its Effectiveness in Science Learning Among Primary 6 Students in Bangkok, Thailand

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ABSTRACT

This study examined the effectiveness of using English as the medium of instruction in teaching science to Primary 6 students in Bangkok, Thailand. Specifically, it investigated the relationship between the effectiveness of English instruction and teachers' profile variables, as well as the difference in perceptions of effectiveness between teachers and students. The null hypotheses were tested at a 0.05 level of significance. A quantitative descriptive-correlational research design was employed, utilizing convenience sampling to select respondents from selected schools in Bangkok. Data were gathered through a structured questionnaire administered via Google Forms. Statistical tools used for data analysis included frequency counts, percentages, means, Pearson Chi-Square, Pearson Correlation Coefficient, and Mann-Whitney U Test. Findings revealed that science instruction delivered in English was generally perceived as highly effective. Teachers' teaching experience showed a significant relationship with the effectiveness of English instruction, while other profile variables showed no significant association. Additionally, a significant difference was found between teachers' and students' perceptions, indicating a discrepancy in how instructional effectiveness is viewed. The results also highlighted demographic patterns, including gender imbalance and the prominence of Filipino teachers in science instruction. Based on these findings, the study recommends implementing targeted professional development programs focused on English-medium science instruction, particularly for early-career teachers. Schools are encouraged to establish mentoring systems, strengthen feedback mechanisms through student input, and develop inclusive instructional strategies that address differing perceptions between teachers and students. Furthermore, recruitment and retention initiatives may be enhanced to address gender disparities in the teaching workforce.

Keywords: *English Instruction in Science, Learning Science Using English, Primary 6 Students, Instructional Effectiveness*

INTRODUCTION

Education is vital to national development, with science education strengthening learners' critical thinking, problem-solving, and scientific literacy. Recently, many non-native English-speaking countries have adopted English as the medium of instruction (EMI) in science to improve both subject mastery and English proficiency, with the aim of preparing students for global opportunities. This study examines the effectiveness of English-medium science instruction among Primary 6 students in Bangkok, Thailand.

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Globally, EMI is widely promoted for its potential to improve access to scientific knowledge and international resources, while also enhancing communication skills. However, its effectiveness depends on factors such as teacher competence, students' language proficiency, and instructional support, and findings in primary education remain mixed.

In Thailand, science has traditionally been taught in Thai, but educational reforms and globalization have encouraged the use of English, especially in English programs and international schools. Bangkok provides a diverse and dynamic context for examining how EMI affects science learning outcomes at the primary level.

While EMI can improve exposure to scientific terminology and global perspectives, it may also create language barriers that affect comprehension, particularly for learners with limited English proficiency. Teachers likewise face challenges in balancing content and language instruction, highlighting the need to evaluate how EMI functions in real classroom settings.

This study is grounded in Content and Language Integrated Learning (CLIL) and Cognitive Academic Language Proficiency (CALP), which emphasize simultaneous development of language and content knowledge through appropriate instructional support.

Specifically, the study assesses the effectiveness of English instruction in science, examines its relationship with teachers' profile variables, and compares teacher and student perceptions. It also addresses a research gap in primary-level EMI studies in Thailand.

Findings are expected to inform teaching practices, policy development, and professional training programs aimed at improving English-medium science instruction and enhancing learning outcomes for Primary 6 students in Bangkok.

Statement of the Problem

This study determined the effectiveness of learning science using English instruction among Primary 6 students in Bangkok, Thailand. Specifically, it sought to answer the following questions:

1. What is the profile of science teachers?
2. What is the level of effectiveness of learning science using English instruction to Primary 6 students in Bangkok, Thailand, as perceived by teachers?
3. Is there a significant relationship between the level of effectiveness of learning science using English instruction and the profile variables of teachers?
4. Is there a significant difference in the level of effectiveness of learning science using English instruction as perceived by teachers and students?
5. What training plan can be proposed to enhance the learning of science using English instruction?

Scope and Delimitations

This study focused on determining the effectiveness of learning science using English instruction among Primary 6 students in Bangkok, Thailand. It examined teachers' profiles and assessed instructional effectiveness across key areas such as language proficiency, scientific vocabulary, subject understanding, participation, and related factors. The study was limited to selected schools in Bangkok and relied on self-reported questionnaire data from Primary 6

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students and science teachers. It was delimited to science instruction only and did not consider other factors such as teaching strategies or resources, thereby limiting the generalizability of the findings.

Review of Related Literatures

The use of English as a medium of instruction (EMI) in science education has gained global attention as a strategy to develop students' English proficiency and subject knowledge simultaneously. As noted by Coyle, Hood, and Marsh (2010), integrating language and content enables concurrent learning of science and English, although its success depends on language ability, pedagogy, and learning context.

Language proficiency is a key factor in EMI effectiveness. Cummins (2008) distinguishes between BICS and CALP, highlighting that students may communicate in English but still struggle with the academic language needed for science learning. Lee and Buxton (2013) further stress the need for both linguistic and cognitive development to support comprehension of complex scientific concepts.

Instructional strategies are also essential. Research shows that explicit vocabulary instruction, inquiry-based learning, and interactive activities improve both language and content understanding (Nation, 2001; Driver, Newton, & Osborne, 2000). Culturally responsive teaching further supports inclusivity by addressing learners' diverse backgrounds (Gay, 2002).

Teacher competence and ongoing professional development significantly influence EMI success. Teachers must combine language proficiency with effective pedagogy, and training programs help them manage language barriers and improve instruction (Wong & Song, 2006; Nguyen & Guo, 2020).

Student motivation, attitudes, and parental support also affect learning outcomes. Positive attitudes toward English enhance engagement (Gardner, 1985), while supportive home environments strengthen both language and academic development (Epstein, 2011).

Although EMI is widely implemented worldwide, challenges such as language barriers, cultural differences, and resource limitations remain. These can be addressed through teacher training, curriculum adaptation, and stakeholder engagement (Cummins, 2008; Byram, 1997).

Overall, EMI effectiveness is shaped by linguistic, pedagogical, cultural, and motivational factors. This study builds on existing literature by examining these dynamics in the context of Primary 6 science instruction in Bangkok, Thailand.

Theoretical Framework

This study is anchored on Lev Vygotsky's Socio-Cultural Theory (SCT), which emphasizes that learning occurs through social interaction within a cultural context. Central to SCT is the Zone of Proximal Development (ZPD), in which learners develop knowledge with guidance from more knowledgeable others (Vygotsky, 1978). In this study, teachers support students' understanding of science concepts through English instruction, promoting both content learning and language development.

Language is viewed as a tool for cognitive growth; thus, language proficiency, scientific vocabulary, and subject understanding are interrelated. An interactive and inclusive learning

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environment further enhances participation and collaboration, while students' attitudes toward English and its use beyond the classroom reflect its role in learning.

The framework is also supported by Byram's Intercultural Communicative Competence, which emphasizes cross-cultural understanding, and Guskey's Model of Professional Development, which guides teacher training. Together, these theories explain how language, social interaction, and teacher development influence the effectiveness of English-medium science instruction.

Conceptual Framework

The conceptual framework of this study presents the relationship between teachers' profile variables and the effectiveness of learning science instruction in English among Primary 6 students in Bangkok, Thailand, using an input–process–output model.

The input consists of teachers' profile variables, including sex, age, civil status, nationality, religion, income, years of teaching experience, educational attainment, and training attended, which may influence instructional effectiveness.

The process involves implementing English-medium science instruction across key dimensions, including language proficiency, vocabulary acquisition, subject understanding, student participation, inclusive learning, attitudes toward English, application beyond the classroom, parental involvement, and cross-cultural understanding, as well as analyzing relationships and perceptions between teachers and students.

The output is the overall effectiveness of English-medium science instruction, which serves as the basis for a proposed training plan to improve teaching practices. A feedback mechanism supports continuous improvement through professional development.

Overall, the framework explains how teacher characteristics and instructional processes jointly influence the effectiveness of English-medium science education.

METHODOLOGY

This study employed a quantitative descriptive-correlational research design to examine the effectiveness of learning science instruction in English among Primary 6 students in Bangkok, Thailand. It followed a systematic process of data collection, analysis, and interpretation to ensure the reliability and validity of the findings, guided by established research procedures and ethical standards.

Research Design

This study employed a quantitative descriptive-correlational research design to examine the effectiveness of learning science using English instruction among Primary 6 students in Bangkok, Thailand. This design was appropriate for describing current conditions and determining relationships between teachers' profile variables and perceived instructional effectiveness without manipulating variables.

Descriptive statistics were used to present teachers' profiles and the level of effectiveness across key areas such as language proficiency, vocabulary acquisition, subject understanding, and student engagement. Correlational and comparative analyses were applied

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to examine relationships between variables and differences in perceptions between teachers and students.

Guided by established research frameworks (Creswell & Creswell, 2017), this approach ensured systematic data collection and statistical analysis, providing objective insights into factors influencing the effectiveness of English-medium science instruction.

Research Steps

The study followed a systematic sequence, beginning with the identification of the research problem and a review of related literature. This was followed by the development and validation of the research instrument. Upon securing the necessary permissions, data were collected via an online survey. The collected data were then organized, coded, and analyzed using appropriate statistical tools. Subsequently, the findings were interpreted, resulting in conclusions and recommendations. These procedures ensured methodological rigor and coherence throughout the study (Creswell & Creswell, 2017).

Data Collection and Sample Selection

The study used convenience sampling to select 69 science teachers and 345 Primary 6 students from selected government and private schools in Bangkok, Thailand. This approach was appropriate given the accessibility of the participants involved in English-medium science instruction. Data were gathered using a structured questionnaire distributed via Google Forms, which facilitated efficient collection and retrieval of responses.

The instrument covered teachers' profile variables and the perceived effectiveness of English-medium science instruction across key areas, including language proficiency, vocabulary acquisition, subject understanding, participation, and learning environment. Prior to administration, the questionnaire was content-validated for clarity and relevance. Ethical procedures were strictly followed, including securing permission from school administrators, obtaining informed consent, and ensuring confidentiality, accuracy, and reliability of responses.

Data Analysis Methods

The study used descriptive and inferential statistical techniques to analyze the data. Frequency counts and percentages described the profile of science teachers, while mean scores and weighted means determined the level of effectiveness of English-medium science instruction across key dimensions, interpreted using a five-point scale from "Not Effective" to "Very Highly Effective" (Field, 2017).

For inferential analysis, the Pearson Chi-Square test and Pearson Correlation Coefficient were used to examine relationships between teachers' profile variables and instructional effectiveness, while the Mann-Whitney U Test assessed differences in perceptions between teachers and students. All tests were conducted at a 0.05 level of significance to ensure valid and reliable conclusions (Pallant, 2016).

Research Hypotheses and Validation

The study tested two null hypotheses at a 0.05 level of significance: (1) that there is no significant relationship between the effectiveness of learning science using English instruction

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and teachers' profile variables, and (2) that there is no significant difference in the perceived effectiveness of English instruction between teachers and students. Hypothesis testing was conducted using the Pearson Chi-Square test and Pearson Correlation Coefficient to examine relationships among variables, while the Mann-Whitney U Test determined differences in perceptions between groups. A p-value less than 0.05 led to rejection of the null hypothesis, while values greater than or equal to 0.05 resulted in acceptance, ensuring objective and standard statistical validation of results (Pallant, 2016).

Study Limitations and Ethical Considerations

This study was limited to science teachers and Primary 6 students in selected schools in Bangkok, Thailand, which may restrict the generalizability of the findings. The use of convenience sampling and self-reported questionnaires may also introduce response bias. Ethical standards were strictly observed, including securing permission from school authorities, obtaining informed consent, ensuring voluntary participation, and maintaining confidentiality of respondents. All data were used solely for research purposes in accordance with ethical guidelines (American Psychological Association, 2017).

RESULTS AND DISCUSSION

Profile of Science Teachers

The profile of science teachers reveals key demographic and professional characteristics that may influence the effectiveness of English-medium science instruction. In terms of sex, the majority of respondents were female (62.32%), while males comprised 37.68%. This reflects a common trend in the teaching profession where females predominate, which may influence classroom dynamics and instructional approaches (Smith & Tyler, 2010; Eren, 2017).

Regarding age, most teachers were between 25–34 years old (52.17%), followed by 35–44 years old (36.23%), indicating a relatively young teaching workforce. Younger teachers are often associated with innovative practices and adaptability, while more experienced teachers contribute instructional stability and expertise (Guarino et al., 2014; Parker et al., 2014).

In terms of civil status, most respondents were married (50.72%), followed by single teachers (46.38%), suggesting a balance of personal life experiences that may influence teaching perspectives and classroom management styles (Van Horn & Myburgh, 2016).

The majority of teachers were Filipino (92.75%), indicating a heavy reliance on foreign educators for English-medium instruction. This aligns with global trends in international and English programs, in which expatriate teachers are commonly employed for their language proficiency and pedagogical training (Lee & Lee, 2017; Knight, 2018).

Religiously, respondents showed diversity, with Roman Catholic (53.62%) and Adventist (28.99%) as the most represented groups. This diversity highlights the multicultural nature of the teaching workforce, which may contribute to varied perspectives in classroom interactions (Smith & O'Donoghue, 2019).

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Table 1: *Profile of Science Teachers*

Variables	Categories	Frequencies	Percentage
Sex	Male	26	37.68%
	Female	43	62.32%
Age	25 - 34 y/o	36	52.17%
	35 - 44 y/o	25	36.23%
	45 - 50 y/o	8	11.59%
Civil Status	Single	32	46.38%
	Married	35	50.72%
	Separated	2	2.90%
	Widowed	0	0.00%
Nationality	Filipino	64	92.75%
	Thai	2	2.90%
	Pakistani	2	2.90%
	Indian	1	1.45%
Religion	Roman Catholic	37	53.62%
	Born Again Christian	7	10.14%
	Adventist	20	28.99%
	Protestant	1	1.45%
	Buddhism	1	1.45%
	Hinduism	3	4.35%
Average Monthly Income	40,000 baht and below	28	40.58%
	40,0001 - 50,000 baht	41	59.42%
Number of Years in Service	Less than 5 years	15	21.74%
	6 to 10 years	29	42.03%
	11 to 15 years	18	26.09%
	16 to 20 years	5	7.25%
	21 to 25 years	2	2.90%
Highest Educational Attainment	Master's degree holder	6	8.70%
	With units in master's degree	35	50.72%
	Bachelor's degree holder	28	40.58%
Number of Relevant Seminars and Trainings	1 to 5	16	23.19%
	6 to 10	25	36.23%
	11 to 15	20	28.99%
	16 to 20	4	5.80%
	21 to 25	3	4.35%
	26 and more	1	1.45%

For average monthly income, most teachers earned between 40,001–50,000 baht (59.42%), while the rest earned 40,000 baht and below. Teacher compensation is strongly linked to job satisfaction and retention, making fair remuneration essential for instructional quality (Johnson & Lee, 2019).

In terms of teaching experience, most respondents had 6–10 years of service (42.03%), followed by 11–15 years (26.09%). This indicates a moderately experienced workforce, where

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balanced experience levels contribute to both instructional innovation and stability (Johnson et al., 2017).

Regarding educational attainment, most teachers had completed master's units (50.72%) or held bachelor's degrees (40.58%), suggesting a generally well-qualified teaching workforce. Higher educational attainment is associated with improved teaching effectiveness and student outcomes (Smith et al., 2018; Johnson & Brown, 2019).

Finally, in terms of professional development, most teachers attended 6–10 seminars or training sessions (36.23%), indicating moderate engagement in continuous learning. Regular participation in training is essential for improving instructional practices, especially in English-medium education contexts (Chen et al., 2017).

Overall, the profile of science teachers suggests a young, moderately experienced, highly qualified, and professionally diverse group of educators. These characteristics may significantly influence the effectiveness of learning science through English instruction in Primary 6 classrooms in Bangkok, Thailand.

Level of Effectiveness of Learning Science Using English Instruction to Primary 6 Students

Table 2: *Level of Effectiveness of Learning Science Using English Instruction to Primary 6 Students*

	Components	Mean	Descriptive Equivalent
A	Language Proficiency Attainment;	4.38	Highly Effective
B	Scientific Vocabulary Acquisition;	4.34	Highly Effective
C	Subject Matter Understanding;	4.30	Highly Effective
D	Active Participation in English-medium lessons;	4.40	Highly Effective
E	Inclusive Learning Environment;	4.33	Highly Effective
F	Integration of Language and Science Skills;	4.35	Highly Effective
G	Positive Attitude towards English-medium instruction;	4.47	Highly Effective
H	Application of English Outside the Classroom;	4.30	Highly Effective
I	Parental Involvement and Support; and	4.34	Highly Effective
J	Cross-Cultural Understanding	4.33	Highly Effective
Overall Weighted Mean		**4.35**	**Highly Effective**

4.51-5.0=Very Highly Effective (VHE) 3.51-4.50=Highly Effective (HE) 2.51-3.50 = Effective (E)
1.51-2.50 =Slightly Effective (SE) 1.0-1.50 = Not Effective (NE)

The level of effectiveness of learning science using English instruction to Primary 6 students in Bangkok, Thailand is high, as reflected in the overall weighted mean of 4.35.

Table 2 presents the summary of findings on the level of effectiveness of learning science using English instruction across ten key components, namely: language proficiency attainment, scientific vocabulary acquisition, subject matter understanding, active participation in English-medium lessons, inclusive learning environment, integration of language and science skills, positive attitude towards English-medium instruction, application of English outside the classroom, parental involvement and support, and cross-cultural understanding. The mean scores ranged from 4.30 to 4.47, all interpreted as "Highly Effective", indicating a consistently positive evaluation across all areas.

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The highest-rated component was Positive Attitude towards English-medium instruction (M = 4.47), suggesting strong learner acceptance and motivation toward English-based science learning. Other closely rated indicators such as active participation (M = 4.40) and language proficiency attainment (M = 4.38) further reflect strong engagement and perceived improvement in both language and content learning.

These consistently high ratings suggest that English instruction in science is effectively supporting both cognitive and linguistic development among learners. This aligns with studies indicating that English-medium instruction enhances subject understanding and language proficiency when appropriately supported in classroom practice (Cheng & Wang, 2005; Hellekjaer & Elklit, 2008). Similarly, research highlights that integrated language-content learning promotes active engagement and deeper comprehension in subject areas such as science (Jimenez, Jimenez, & Kirsch, 2013).

Overall, the findings emphasize that English instruction in science education is highly effective for Primary 6 learners in Bangkok, contributing to improved learning experiences across linguistic, cognitive, and socio-cultural dimensions.

Significant Relationship Between the Level of Effectiveness of Learning Science Using English Instruction to Primary 6 Students and the Profile Variables of Teachers

Table 3: *Significant Relationship Between the Level of Effectiveness of Learning Science Using English Instruction to Primary 6 Students and the Profile Variables of Teachers (Part A)*

Profile Variable	Pearson Chi-Square Statistics	Sig.	Df	Effect Size	Sig
Sex[a]	1.248	0.536	2	0.134	0.536
Civil Status[a]	4.07	0.397	4	0.172	0.397
Nationality[a]	2.289	0.891	6	0.129	0.891
Religion[a]	6.429	0.778	10	0.216	0.778
Average Monthly Income[b]	3.228	0.199	2	0.21	0.065
Number of Years in the Service[b]	**21.899**	**0.005***	**8**	**0.053**	**0.679**
Highest Educational Attainment[b]	6.27	0.18	4	0.213	0.18
Number of Relevant Seminars/Trainings[b]	16.242	0.093	10	0.186	0.126

**Significant at 0.05 alpha level.*
**Effect Sized Used: [a] Cramer's V; [b] Kendall's Tau-b*

Effect Size Interpretation	
less than or equal to 0.2	*Weakly Associated*
0.2 - 0.6	*Moderately Associated*
greater than 0.6	*Strongly Associated*

Table 3 presents the test of relationship between the level of effectiveness of learning science using English instruction and the profile variables of teachers, namely sex, civil status, nationality, religion, average monthly income, number of years in service, highest educational attainment, and number of relevant seminars/training attended.

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The results reveal that only the number of years in service is significantly related to the effectiveness of learning science using English instruction ($\chi^2 = 21.899$, $p = 0.005$), indicating a weak but significant association. This suggests that teachers' teaching experience may influence the effectiveness with which English is used in delivering science instruction to Primary 6 students.

In contrast, no significant relationships were found between the effectiveness of instruction and the following teacher profile variables: sex ($p = 0.536$), civil status ($p = 0.397$), nationality ($p = 0.891$), religion ($p = 0.778$), average monthly income ($p = 0.199$), highest educational attainment ($p = 0.180$), and number of relevant seminars/trainings attended ($p = 0.093$). These findings indicate that these demographic and professional characteristics do not significantly influence the perceived effectiveness of English instruction in science.

The significant role of teaching experience aligns with findings suggesting that more experienced teachers tend to demonstrate stronger classroom management and pedagogical adaptability, which may enhance instructional effectiveness (Smith et al., 2018). However, contrasting studies have also reported no significant link between experience and teaching effectiveness (Johnson, 2017), implying that contextual and instructional factors may play a larger role than demographics alone.

Overall, the findings suggest that while most teacher profile variables are not significantly related to instructional effectiveness, years of service remains an important factor. This highlights the value of experience in delivering English-medium science instruction, while also indicating the need to further explore other instructional and contextual variables that may better explain effectiveness outcomes.

Table 4: *Significant Relationship Between the Level of Effectiveness of Learning Science Using English Instruction to Primary 6 Students and the Profile Variables of Teachers (Part B)*

Profile Variable	Pearson Correlation Coefficient	Sig.
Age	-0.003	0.977

Table 4 shows that there is no significant relationship between teachers' age and the effectiveness of learning science using English instruction, as indicated by $r = -0.003$, $p = 0.977$. This suggests that age does not influence teachers' perceived effectiveness in delivering English-medium science instruction.

This finding is consistent with Lee and Smith (2019), who also found no significant link between age and instructional effectiveness, but contrasts with Johnson (2018), who reported a weak negative relationship.

Overall, the results imply that teacher age is not a determining factor in instructional effectiveness, and that other factors such as teaching strategies and professional development are more influential.

Significant Difference in the Level of Effectiveness of Learning Science Using English Instruction to Primary 6 Students as Perceived by the Teachers and Students

Table 5: *Significant Difference in the Level of Effectiveness of Learning Science Using English Instruction to Primary 6 Students as Perceived by the Teachers and Students*

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Mann-Whitney U Test

Variable	Mean	N	Test Statistic	Sig.	Decision
Student	4.05	345	**-4.951****	**0.000**	**Reject the Null Hypothesis**
Teacher	4.35	69			

***Difference is significant at the 0.01 level (2-tailed).*

Table 5 presents the comparison of perceptions between teachers and students on the effectiveness of learning science using English instruction in Bangkok, Thailand.

The results of the Mann-Whitney U test show a significant difference between the two groups (U = -4.951, p = 0.000). Teachers reported a higher mean score (M = 4.35) compared to students (M = 4.05), indicating that teachers perceive English instruction in science as more effective than students do. Since the p-value is less than 0.01, the null hypothesis is rejected.

This finding suggests a perceptual gap between teachers and students. Teachers may view instruction more positively due to their familiarity with teaching strategies and curriculum goals, while students may experience challenges related to language comprehension or content difficulty. Similar studies have also reported that teachers tend to rate instructional effectiveness higher than students (Smith et al., 2019).

Overall, the result highlights the importance of considering student feedback in evaluating instructional effectiveness and suggests the need for strategies that better align teaching practices with student learning experiences.

Proposed Action Plan

Title: Enhancing Science Learning through English Instruction: A Professional Development Program for Teachers in Bangkok, Thailand

Rationale

The effectiveness of learning science through English instruction depends on teachers' language proficiency, pedagogical skills, and ability to create an inclusive and engaging learning environment. In Bangkok, Thailand, where English is used as the medium of instruction in selected science classes, teachers face the challenge of integrating subject content with second-language teaching. Although English-medium instruction is generally perceived as highly effective, areas such as subject understanding, language use beyond the classroom, and student engagement still need improvement.

This action plan aims to strengthen teachers' competencies through continuous professional development that enhances both linguistic and instructional skills. By improving teacher capacity, it seeks to support students' scientific understanding, vocabulary development, and positive learning attitudes, ultimately leading to improved learning outcomes and a more effective bilingual science education system.

General Objective

To enhance teachers' effectiveness in delivering science instruction through English by

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improving their language proficiency, pedagogical skills, and classroom practices.

Specific Objectives

a) To improve teachers' English language proficiency for science instruction.
b) To strengthen teachers' ability to integrate scientific vocabulary in lessons.
c) To enhance strategies for improving students' understanding of science concepts in English.
d) To increase student participation in English-medium science lessons.
e) To promote inclusive and supportive English-learning environments.
f) To encourage positive attitudes toward English-medium instruction.
g) To support the use of English beyond the classroom setting.
h) To strengthen parental engagement in students' English science learning.
i) To develop teachers' cross-cultural teaching competence.

Activities

1. Language Proficiency Development Workshops

Focus on improving teachers' fluency and confidence in using English for science instruction.

Strategies:

- Communicative language practice sessions
- Role-playing science teaching scenarios
- Pronunciation and academic speaking drills
- Peer language mentoring

2. Scientific Vocabulary Enhancement Training

Strengthen teachers' ability to teach and integrate scientific terms effectively.

Strategies:

- Vocabulary mapping activities
- Subject-specific word banks
- Interactive vocabulary games
- Lesson integration exercises

3. Science Content and Pedagogy Training

Improve instructional approaches for teaching science concepts in English.

Strategies:

- Concept-based teaching workshops
- Lesson demonstration and modeling
- Collaborative lesson planning
- Use of visual and inquiry-based strategies

4. Student Engagement and Participation Seminar

Enhance strategies for active learning in English-medium classrooms.

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Strategies:

- Cooperative learning techniques
- Classroom interaction strategies
- Use of questioning techniques
- Simulation and inquiry activities

5. Inclusive Learning Environment Training

Promote equity and support for diverse learners in English science classrooms.

Strategies:

- Differentiated instruction training
- Classroom inclusivity practices
- Cultural sensitivity awareness sessions
- Peer support systems

6. Positive Attitude and Motivation Program

Strengthen students' and teachers' positive perception of English instruction.

Strategies:

- Motivational seminars
- Recognition of classroom success practices
- Reflective teaching sessions
- Goal-setting activities

7. English Application Beyond the Classroom Initiative

Encourage real-life use of English in science learning.

Strategies:

- Science fairs and exhibitions
- English science clubs
- Project-based learning activities
- Community-based science tasks

8. Parental Engagement Program

Strengthen collaboration between school and home.

Strategies:

- Parent orientation seminars
- Home learning support guides
- Regular progress communication
- Parent-student science activities

9. Cross-Cultural Competence Seminar

Develop teachers' intercultural teaching skills.

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Strategies:

- Cultural awareness workshops
- Multicultural classroom practices
- Guest speaker sessions
- Comparative science education discussions

Possible Budget (in Baht)

a) Training workshops and facilitators – 60,000
b) Teaching and learning materials – 40,000
c) Technology and resources – 30,000
d) Parent engagement activities – 20,000
e) Evaluation and assessment tools – 10,000

Point Persons

1. School Academic Coordinator – overall supervision
2. Science Department Head – implementation of training content
3. English Language Specialist – language integration support
4. School Administrator – budget and logistics management
5. Guidance Counselor – student-related support strategies

Materials Needed

- Training manuals and modules
- Science textbooks and curriculum guides
- Multimedia and ICT tools
- Worksheets and activity sheets
- Assessment and evaluation tools
- Visual aids and presentation materials

Timeline

a) Language Proficiency Training – 2 days (per semester)
b) Vocabulary Enhancement Training – 1 day (per semester)
c) Pedagogy Training – 2 days (twice a year)
d) Engagement Seminar – 1 day (per semester)
e) Inclusive Learning Training – 1 day (annually)
f) Motivation Program – ongoing
g) English Application Activities – quarterly
h) Parental Engagement – every 2 months
i) Cross-Cultural Seminar – 1 day (annually)

Proposed Action Plan Matrix

Table 6 shows the development of the proposed action plan on enhancing science learning through English instruction for primary 6 students in Bangkok, Thailand.

Table 6: *Training Plan for Enhancing Science Learning through English Instruction*

EduHeart Knowledge Network and Publishing, Inc.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 2

DOI: https://doi.org/10.66206/eduheart.2026.290

Major Activities	Strategies	Budget	Personnel in Charge	Timeline	Materials Needed
1. Language Proficiency Enhancement Workshop	• Language immersion activities • Role-playing exercises • Language practice sessions	50,000.00 baht	• Language instructors • Education specialists	2 days	• Language learning materials • Audiovisual aids
2. Scientific Vocabulary Integration Seminar	• Vocabulary-building exercises • Interactive games • Vocabulary journaling	30,000.00 baht	• Science educators • Language specialists	1 day	• Science textbooks • Vocabulary worksheets • Digital resources
3. Subject Matter Understanding Training	• Concept mapping activities • Case studies • Peer collaboration	40,000.00 baht	• Subject matter experts • Instructional coaches	2 days	• Science curriculum guides • Instructional materials • Visual aids
4. Active Participation Workshop	• Group discussions • Cooperative learning tasks • Interactive simulations	35,000.00 baht	• Classroom facilitators • Instructional designers	1 day	• Group discussion prompts • Learning games • Collaboration tools
5. Inclusive Learning Environment Seminar	• Diversity awareness training • Sensitivity workshops • Inclusive teaching strategies	45,000.00 baht	• Diversity trainers • Education consultants	1 day	• Inclusive teaching guides • Cultural sensitivity resources • Case studies
6. Positive Attitude Cultivation Program	• Motivational speeches • Team-building activities • Student recognition programs	25,000.00 baht	• Motivation speakers • School counselors	Ongoing throughout the academic year	• Inspirational posters • Student awards • Motivational videos

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
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Major Activities	Strategies	Budget	Personnel in Charge	Timeline	Materials Needed
7. Application of English Outside the Classroom Initiative	• Science fairs • English language clubs • Community outreach projects	60,000.00 baht	• Extracurricular coordinators • Community liaisons	Ongoing throughout the academic year	• Science fair materials • Club supplies • Community engagement resources
8. Parental Involvement and Support Workshops	• Parent-teacher conferences • Information sessions • Collaborative projects	20,000.00 baht	• Parental involvement coordinators • School administrators	2 days	• Informational handouts • Parent engagement guides • Communication tools
9. Cross-Cultural Understanding Symposium	• Cultural exchange activities • Multicultural showcases • Guest speaker presentations	55,000.00 baht	• Cultural ambassadors • Event planners	1 day	• Cultural displays • Multimedia presentations • International cuisines

By implementing this comprehensive training plan, teachers in Bangkok can enhance their capacity to deliver effective science instruction in English, thereby improving students' academic performance and language proficiency.

SUMMARY

This study examined the effectiveness of learning science using English instruction among primary 6 students in Bangkok, Thailand, as well as its relationship with teachers' profile variables and differences in perceptions between teachers and students. A quantitative descriptive-correlational design was used, and data were analyzed using descriptive and inferential statistics at a 0.05 level of significance.

The profile of science teachers showed that most were female, aged 25–34, and largely Filipino, with many having 6–15 years of teaching experience and engaged in professional development, including master's degree units. This indicates a relatively young, experienced, and predominantly foreign teaching workforce.

In terms of effectiveness, the overall result was high (M = 4.35), with all components such as language proficiency, vocabulary acquisition, subject understanding, active participation, inclusive learning environment, and parental involvement rated as highly effective. This suggests that English-medium science instruction is generally successful across multiple learning dimensions.

For the relationship between variables, only teachers' years of service showed a significant relationship with effectiveness, while all other profile variables were not significant.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 2
DOI: https://doi.org/10.66206/eduheart.2026.290

This highlight teaching experience as the only meaningful influencing factor among the variables tested.

Lastly, a significant difference was found between teachers' and students' perceptions, with teachers rating the effectiveness higher than students. This indicates a noticeable perception gap between instructors and learners regarding the effectiveness of English instruction in science education.

CONCLUSIONS

From the preceding findings, the following conclusions are drawn:

1. The profile of science teachers involved in English instruction for primary 6 students in Bangkok, Thailand shows a predominantly female and young workforce, mostly Filipino, with varied civil status, moderate income, ongoing professional development, and differing levels of training engagement.

2. The effectiveness of learning science using English instruction is high, indicating that teachers perceive English-medium instruction as generally successful across key learning components such as language proficiency, vocabulary acquisition, and subject understanding.

3. There is a significant relationship between teachers' years of service and the effectiveness of English-medium science instruction, suggesting that teaching experience plays an important role in instructional effectiveness.

4. A significant difference exists between teachers' and students' perceptions of effectiveness, with teachers rating it higher, highlighting the need to consider students' perspectives in improving instruction.

5. A training plan focused on enhancing science learning through English instruction for teachers in Bangkok, Thailand is necessary to further improve instructional effectiveness and address identified gaps.

RECOMMENDATIONS

Based on the findings and conclusions of the study, the following recommendations are hereby presented:

1. The administration may implement targeted recruitment and support strategies to address the gender imbalance among science teachers and strengthen workforce diversity through inclusive hiring and professional development opportunities.
2. The administration is encouraged to establish a structured mentoring program where more experienced teachers support less experienced ones in improving the effectiveness of English-medium science instruction through sharing of best practices and teaching strategies.

3. The administration may provide continuous professional development programs focused on enhancing teachers' pedagogical skills, English language integration, and classroom management to further improve instructional effectiveness.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 2

DOI: https://doi.org/10.66206/eduheart.2026.290

4. The administration may regularly gather students' feedback through surveys or consultations to better understand their learning experiences and address the perception gap between teachers and students, ensuring more responsive and student-centered instruction.

5. It is highly recommended to implement the proposed training plan on enhancing science learning through English instruction as a professional development program for teachers in Bangkok, Thailand.

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Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
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DOI: https://doi.org/10.66206/eduheart.2026.290

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