

# **A Proposed Program Based on The Japanese Lesson Study Approach to Develop English Language Skills and Confidence in Teaching Mathematics among Prospective Teachers**

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Abstract:

The present study sought to investigate the effect of a proposed program based on the Japanese lesson study approach to develop language skills and confidence in teaching among student teachers of Basic Education-Mathematics in English at Damietta Faculty of Education. The study participants were assigned to one group (N=7) of male and female student teachers enrolled in the third and fourth years of the academic year 2022–2023. A four-language skill list constructed by the two researchers was used in order to assess the most needed skills among the student teachers. A pre-test of four language skills was administered to the group. Furthermore, a pre-application of the confidence scale was implemented. A program based on a Japanese lesson study approach for improving four-language skills and teaching confidence was implemented. Post-implementation assessments of both four-language skills and confidence in teaching were administered to the group. Results indicated the effectiveness of the proposed program in developing four-language skills and confidence in teaching among student teachers at the Faculty of Education Department of Basic Education Mathematics in English.

Key words: Japanese lesson study approach, English language skills, confidence in teaching, Prospective teachers.

## برنامج مقترح قائم على المدخل الياباني (بحث الدرس) لتنمية المهارات اللغوية والثقة في التدريس لدي معلمي المستقبل

### المستخلص:

هدف البحث إلى تنمية المهارات اللغوية والثقة في التدريس لدي الطلاب المعلمين بالفرقة الثالثة والرابعة أساسى رياضيات باللغة الإنجليزية بكلية التربية، وتكونت عينة البحث من (٧) طالب وطالبة من الطلاب المعلمين بالفرقة الثالثة والرابعة أساسى رياضيات باللغة الإنجليزية بكلية التربية جامعة دمياط، واشتملت أدوات ومواد البحث على استبانة بالمهارات اللغوية التى يجب تنميتها لدى الطلاب المعلمين بالفرقة الثالثة والرابعة أساسى رياضيات باللغة الإنجليزية، اختبار المهارات اللغوية، مقياس الثقة في التدريس، برنامج قائم على المدخل الياباني، قاموس مصطلحات رياضيات المرحلة الابتدائية، وتوصلت نتائج البحث إلى فاعلية برنامج مقترح قائم على المدخل الياباني (بحث الدرس) لتنمية المهارات اللغوية والثقة في التدريس لدي الطلاب المعلمين بالفرقة الثالثة والرابعة أساسى رياضيات باللغة الإنجليزية بكلية التربية، حيث اتضح وجود فروق دالة إحصائياً عند مستوى دلالة (٠.٠١) بين متوسطات رتب درجات طلاب مجموعة البحث فى التطبيقين القبلى والبعدى لاختبار المهارات اللغوية ككل وكل مهارة على حده لصالح التطبيق البعدى، كما اتضح وجود فرق دال إحصائياً عند مستوى دلالة (٠.٠١) بين متوسطى رتب درجات طلاب مجموعة البحث فى التطبيقين القبلى والبعدى لمقياس الثقة فى التدريس لصالح التطبيق البعدى.

**الكلمات المفتاحية:** المدخل الياباني، المهارات اللغوية، الثقة فى التدريس، معلمى المستقبل.

## 1. Introduction

The rapidly evolving world with scientific and cognitive advancements necessitates preparing students, especially future teachers, to adapt to these changes. This endeavor represents a bridge between traditional teaching methods and the demands of our evolving society, wherein scientific and cognitive progress is occurring at an unprecedented rate. Therefore, this requires identifying areas within the mathematics education system that require refinement and realignment with contemporary pedagogical methodologies. By doing so, a need to empower prospective mathematics educators with the competencies and tools essential to effectively transmit mathematical knowledge within an English language context.

In order to comprehend mathematical expressions, build reciprocal communication between the student and teacher, and describe what they understand and perceive, it is crucial for learner to utilize language correctly and effectively (Gürefe, 2018, p. 661). Hence, it is feasible to accomplish educational goals through interactions based on confidence. To foster a confident learning environment, teachers play a crucial role (Akman, 2020, p. 337).

Huang, et.al (2019) emphasize that a lesson study is a powerful teacher professional development approach, originating in Asia, has spread globally. As contemporary trends in teacher professional development place enormous value on teacher-driven initiatives, a wide range of opportunities are now attainable to help teachers on their journey to professionalism (Elkomy & Elkhail, 2022). In this context, Sakai, et.al (2021) in their exploratory study aimed to develop a global lesson study, which is known as an international collaborative lesson study using ICT to foster intercultural competence among teachers. The initial part of the program focused on mathematics education between Japanese and Singaporean elementary school teachers. The study found that lesson study enabled the creation of new lessons through cross-cultural discussions. Willems and Bossche (2019) extensively reviewed research on the effectiveness of lesson study for teachers' professional learning from January 2010 to April 2018. It utilized a rigorous selection process and identified five relevant studies meeting the inclusion criteria. The findings demonstrated the powerful of lesson study in professional development, leading to significant improvements in teachers' knowledge, skills, behavior, and beliefs. They select only high-effectiveness studies, although the sample size of relevant studies is currently limited. The study concludes by

suggesting the need for more large-scale and long-term research to explore the short and long-term effects of LS on teachers' and students' learning.

Richit and Tomkelski (2022) investigated how Brazilian math teachers gain from participating in lesson study, which is a reflective and collaborative activity. Teachers strengthen their comprehension of mathematics education through four editions of lesson study. Lesson research indicates promise in improving math learning in Brazil, enabling personal and professional development for participants, and improved teachers' subject instruction competency in mathematics and favourably affecting classroom practices to improve student education.

## **2. Review of Literature and Related Studies**

Willems and Bossche (2019) assert that Japan is widely recognized as the cradle of Lesson Study. Therefore, Appleton (2018) states that in general, lesson study, known as *Jugyō kenkyū*, was first utilized in the 1880s and has been widely practiced in Japan since the 1980s. In the Japanese education system, lesson study is typically integrated as part of a school-based training program called *konaikenshu* or in-school training.

Pjanić (2014) assumes that lesson study was first originated in Japan at the Tokyo Normal School in the 1870s, now known as the University of Tsukuba, and has been used to enhance lesson preparation, sequence, and topic selection. As international assessments in mathematics have consistently shown high performance of Japanese students and other Asia Pacific countries, leading to increased interest in their educational systems and practices. Japanese Lesson Study is derived from the Japanese word "*jugyo kenkyuu*". is especially renowned for its role in achieving above-average academic results for Japanese students. The term "lesson study" was formally coined by Makoto Yoshida in 1999 through his doctoral dissertation.

### **2.1. Importance of Japanese lesson study**

Globally, Richit and Tomkelski (2020) assume that research on teacher professional development focuses on lesson study, offering insights and specific aspects, enabling its adoption in diverse educational settings beyond Japan and promoting global growth. As for the importance related to teachers themselves, Appleton (2018) states that lesson study emphasizes gradual, sustained improvement through teacher expertise and local knowledge, enhancing students' learning experiences. Teachers can investigate their teaching methods on a small-

scale using lesson studies as a platform. For Pjanić (2014), lesson study is a regular practice and process requiring collaboration, observation, and reflective thinking on teaching. It led to emergence of new teaching approaches and curriculum development theories in Japan and beyond. The findings of Vermunt, et.al, (2019) emphasized the importance of lesson study for less experienced teachers who achieve highest gain in meaning-oriented learning. In this regard, Richit (2020) indicates that researchers receive important professional information regarding curriculum subjects and elements that affect their instruction, such as national guidelines and research findings, through this experience. Additionally, this experience helps them develop professionally as a whole. Lesson analysis, on the other hand, has had an impact on its own dynamics, revealing insufficient phases, difficult circumstances, or places that need improvement.

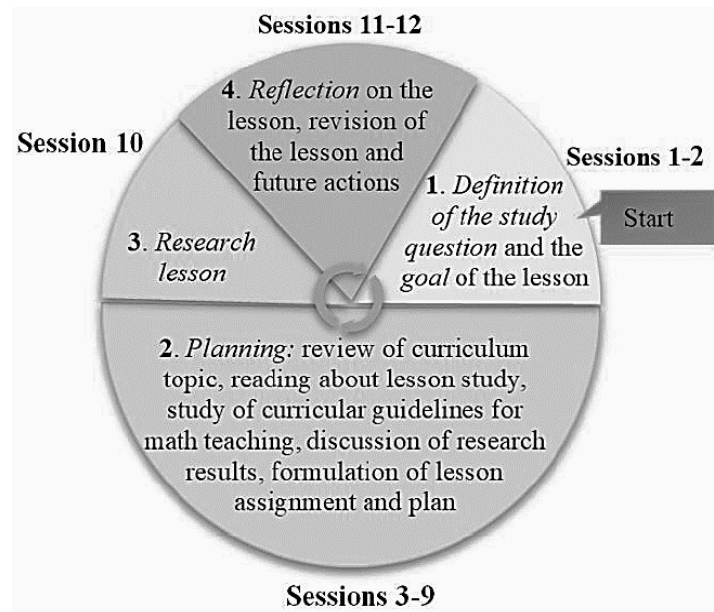
Additionally concerning confidence in teaching, Beswick, et al (2011) present data on the confidence of practicing primary teachers and pre-service teachers to teach various areas of the primary school mathematics curriculum. They examined differences in two teacher groups' levels of confidence at the beginning and completion of the project, as well as variations in the pre-service teachers' levels of confidence during the semester-course. Overall, from the beginning through the end of the semester, the pre-service teachers' confidence increased.

## **2.2. Phases of lesson study**

Vermunt, et al (2019) summarize the main phases of lesson study as follows: figuring out improvement goals; proposing hypotheses and goals; building collaborative research lessons; teaching and observing research lessons; post-research lesson discussions; and passing on knowledge gained. Moreover, Appleton (2018) assumes that in the United States, it is more common to revise and reteach the lesson, whereas in Japan, teachers typically discuss what the next lesson should be. He refers to the lesson study process involves the following steps, taking up to 20 or more hours for an entire cycle:

1. A small group of three to six teachers collaboratively plans a research lesson, setting goals, developing activities, and anticipating student responses.
2. One teacher teaches the planned research lesson while others in the group observe and collect data on student thinking, learning, and engagement.
3. The group meets to reflect on the observations from the research lesson.
4. The group makes revisions to the research lesson based on the reflections.

5. Another teacher from the group teaches the revised research lesson in their classroom while other members observe.
6. The group reflects on the observation of the revised research lesson and the overall lesson study process.

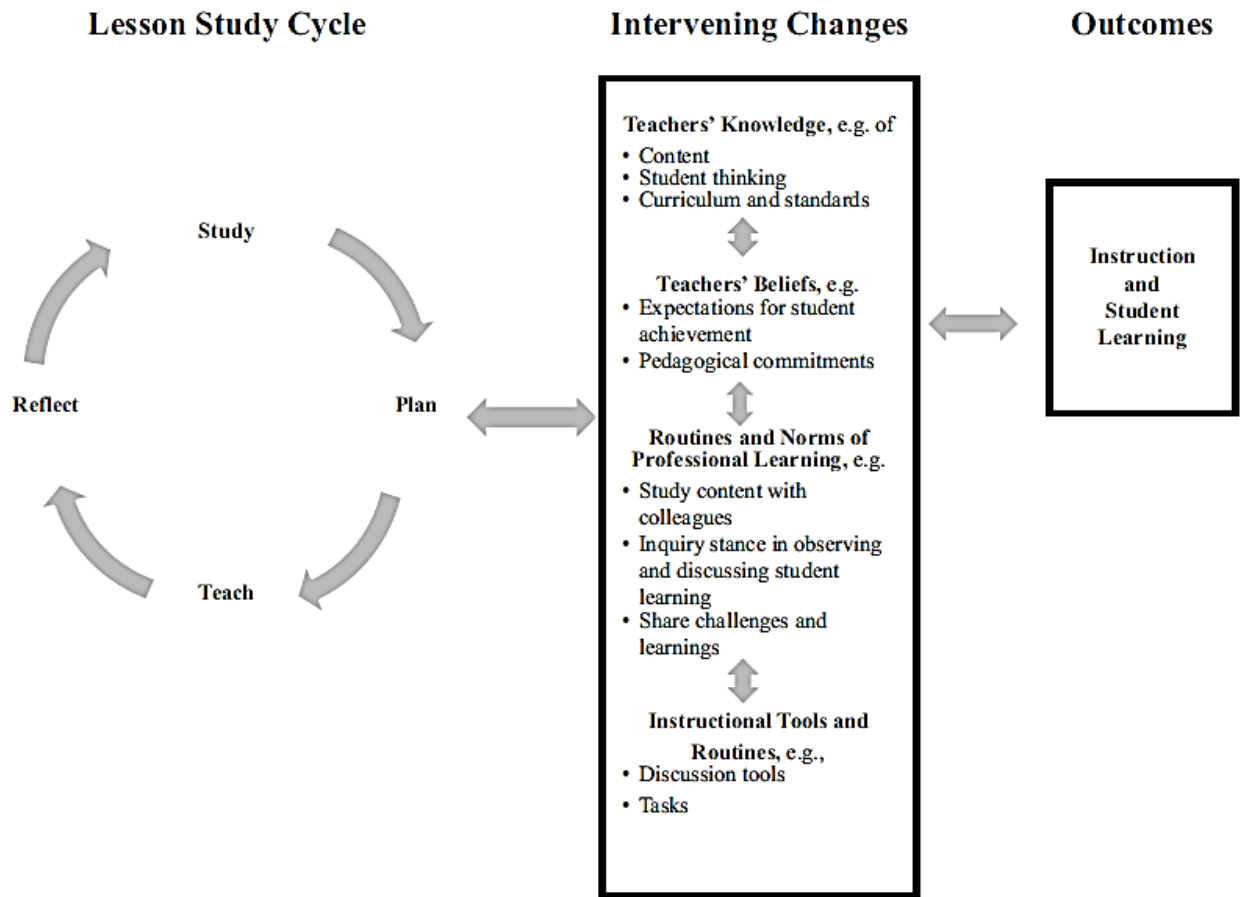


**Figure 1** . *Lesson Study Structure (Richit and Tomkelski, 2022)*

In figure 1. Richit and Tomkelski (2022) explain that the lesson study is a process organized into four moments:

1. Identifying the study question and objectives for a research lesson.
2. Collaborative lesson planning for a specific curriculum topic.
3. Conducting the research lesson with a chosen group of students, observed by colleagues.
4. Reflecting on the lesson's outcomes and student actions during a post-class debriefing session.

Li (2019) refers to the three basic forms of Chinese Lesson Study highlighting key features such as learning and receiving feedback from master teachers, and purposefully engaging in cycles of practice, discussion, revision, and reflection. These elements aim to deepen teachers' understanding of lessons and improve their teaching practices.



**Figure 2** .*Theoretical Model of Lesson Study Impact*

Richit (2020) highlights the four-stage model in lesson study. For her, it includes four stages: defining lesson goals, planning the lesson, teaching the research lesson, and discussing the lesson outcomes. She asserts that in some cases, the research lesson is reviewed, revised, and taught to another class, particularly in lesson study cycles promoted in the IPP (name of the institution/program). However, in continuing teacher education, the follow-up step is often performed by the teacher team involved in the lesson study, without coordination from the professor team.

Lewis, et.al (2019) propose that lesson study can impact instruction and student learning by inducing intermediate changes in teachers' knowledge and beliefs, professional norms and routines, and instructional materials. They describe four theoretical perspectives that help understand the impact of lesson study, focusing on knowledge, motivation, self-efficacy, and teachers' capacity to apply knowledge in the classroom.

### **2.3. Language skills and Japanese lesson study**

Chávez, et.al (2023) conducted a research in 2021-2022 to examine how lesson study enhances reading comprehension of tenth-grade students' reading comprehension at a public school in Loja. Their study found that implementing an intervention plan through lesson study helped the preservice teacher develop effective personalized lesson plans, including previewing, questioning, mapping, and summarizing, increased student engagement and their reading comprehension. This approach, combined with didactic materials and targeted vocabulary instruction, improved children's reading abilities and fostered an engaging learning environment.

When it comes to listening skill, Yustina, et.al (2020) conducted their study implementing a lesson study strategy to improve children's listening skills, concentrating on three indicators: listening intently, answering basic questions, and repeating words received. It used a pre-experimental, one-case study design with a sample of 20 children: Nine boys and eleven girls, from Paud At-Tauhid Palembang's class B1. Three sessions were held during the treatment, and data were gathered through observations and test scores. The t-test findings revealed a considerable improvement in students' listening abilities after using the lesson study technique, confirming that lesson study improves students' listening skills.

As for verbal and written communication skills, Najah, et.al (2019) conducted action research using lesson study to explore collaborative and continuous learning processes with a focus on collegiality. Their study aimed to enhance students' communication skills, both verbally and in writing, through problem-based learning (PBL) models. The results indicated a progressive improvement in students' oral communication skills across the lesson study cycles. They concluded that the lesson study, was effective in enhancing students' oral communication skills.

Concerning language skills improvement using lesson study in the Egyptian context, Khater and Aboelela (2022) conducted their research to utilize a remedial training program based on Content and Language Integrated Learning (CLIL) to develop math content components and English language competencies for future math teachers. The study involved 21 third-year students from Ain Shams University. Results showed CLIL-based training improved classroom language use, language competencies, and knowledge of mathematics material.



## 2.4. Confidence in teaching

Confidence can be defined as "a label for a confluence of feelings relating to beliefs about one's efficacy to act within a social setting, in this case the mathematics classroom" (Burton 2004, p. 360).

Additionally, Lau (2021, p.226) manipulates confidence in teaching situation emphasizing that teachers' beliefs and confidence both constitute teacher knowledge, but they are differentially related to different aspects of mathematical knowledge for teaching and, therefore, have unique influences on teaching practices.

Confidence in teaching relates greatly to professional development. Stearns (2015) investigated five student teachers' confidence in teaching guided by the situated learning perspective. Findings showed that student teachers' confidence changed throughout the student teaching practicum. From a "situated perspective," learning can be said to occur whenever individuals interact. He states that factors that influenced changes in confidence included the actual hands-on classroom teaching experiences of the student teacher, the mentor teachers' contributions, and student engagement as the student teacher developed rapport with the students, in his study, student teachers began the student teaching process with knowledge from their own K-12 classroom teachers and from their college teacher education courses. From this knowledge the student teacher participants had learned how to how to create lesson plans, manage discipline, and interact with students all without practice in actual classroom settings where they could exercise these strategies. Armed with their accumulated knowledge, the student teachers' goal in the beginning was to teach each lesson exactly as written, typically by the student teacher in advance of the lesson. Preparations for teaching often involved over-planning lessons, which the student teachers saw as ensuring success for the students. Successfully presenting the lesson as planned contributed to their confidence in teaching.

Lau (2021) in his study, focused on 24 pre-service mathematics teachers to investigate their beliefs and confidence in teaching before and after participating in an algebra pedagogy course. By using quantitative and qualitative analysis, the research found a notable boost in confidence. Moreover, the course assumed a crucial role in transforming the teachers' beliefs, shifting their emphasis from performance-oriented teaching to a more understanding-focused approach, ultimately leading to increased confidence in their ability to teach algebra. His

study underscores the significance of adopting a relativistic rather than a dualistic approach to mathematics teaching.

### **3. Rational of the study**

1. In-service teachers had no time because of their workload to develop the lesson study activities.
2. Lesson study is characterized as an in-service teacher training strategy with a core objective of steadily and methodically enhancing teaching methods. This improvement is achieved through collaborative efforts, where teachers work together to analyze and examine each other's teaching techniques (Pjanic, 2014).

### **4. Context of the problem**

- Checking the preservice notebooks by the researchers, they find out about certain problems concerning the preservice writing skill. They have many writing mistakes that hinder the reader from getting their main ideas. The writing might lack clarity, making it challenging to follow the thought process or the logic behind mathematical explanations. Mathematical Symbols Concerns: Non-native students may have trouble understanding and correctly using mathematical notation, which can result in mistakes in equations and mathematical expressions .

-Pilot study :

Researchers conducted a survey with 5 in- service math lecturers to highlight the complexities involved in understanding and using mathematical language, needs analysis students which may hinder, them comprehension and hence performance in mathematics. The survey consists of five questions :

- What are the key challenges you come across while conducting classroom teaching in your practicum experience?.
- Can you figure out the specific technical terms and mathematical terminology you need to learn to succeed as an EFL math teacher?.
- Can you specify any certain mathematical terms or concepts whose pronunciation is problematic for you in your practicum experience?.
- What specific mathematical issues do you encounter while presenting mathematical content in written form?.
- What specific challenges or factors make you hesitant or less confident while teaching?.

The results of the survey included the following:

(a) Meanings that depend on context. (b) More exact mathematical interpretations.(c) Words that are only used in mathematical situations. (d)Words that have numerous meanings (e).Technical definitions specific to a discipline .(f)

Synonyms of common words.(h) Difficulties with word translation. (i)spelling mistakes in item. (k) The propensity of both students and teachers to use informal terms rather than precise mathematical terms, for example, "diamond" instead of "rhombus".

-The researchers of the current study observed the following. The preservice students preferred to use Arabic as their primary language when communicating with their students, especially when posing questions, giving instructions, or explaining mathematical problems. However, they faced difficulties in pronouncing or writing key mathematical terms in English; “polygons, parallelograms, rectangles, parallel sides, and isosceles and equilateral triangles...”. They have varied worries about being misunderstood or failing to adequately when explaining the subject content. This pronunciation issues made them reluctant and hesitant to speak or write in English, leading them to rely on Arabic. This became problematic when some of their students were proficient in English due to their language education. To cope with the situation, the preservice students minimized their using of English language during classroom substituting English phrases and sentences with synonyms Arabic. These challenges significantly affected their confidence in teaching.

Although the beneficial effects of Japanese lesson study on math teacher improvement in their professional development, as prior research emphasized, its impact on their language skills does not addressed. Despite prior studies emphasizes that for achieving teachers personal growth, some current practices, such as lesson study, should be implemented to provide significant encouragement for teachers to assist them in their professional development (Elkomy and Elkhaial, 2022).

Lexical aspects and linguistic problems influence mathematics achievement, with students experiencing difficulties in both reading and mathematics. Specific support is critical for overcoming obstacles and improving performance, ultimately leading to better academic outcomes (Prediger, et.al, 2019). In the Egyptian context, Khater and Aboelela (2022) emphasizes that math and science teachers in Egypt need both subject expertise and foreign language skills, particularly in English, to effectively communicate scientific concepts. Egyptian mathematics teachers, in particular, face the challenge of teaching math content in English while ensuring clear communication. This dual responsibility can be demanding, requiring a balance between subject knowledge and language proficiency for successful classroom teaching. As a result, students in English Mathematics Departments may struggle with studying math in English, often relying on Arabic

for instruction and interaction, while incorporating English mathematical terms and symbols.

Prediger, et.al (2019). Numerous empirical investigations from a variety of disciplines have repeatedly demonstrated a connection between students' mathematical difficulty and difficulties with language. Language gaps affect monolingual persons who are adept in everyday language as well as multilingual learners. Effective mathematical communication needs the use of symbols, drawings, and mathematical language, which necessitates a high level of precision and abstractness which highlights mathematical academic language.

There is evidence that many primary teachers lack confidence in their capacity to teach topics on mathematics curriculum effectively (Beswick, et.al, 2006).

In the Egyptian context, Elkomy and Elkhaial (2022) in their study proved the effectiveness of the lesson study on kindergarten teachers' knowledge and perception of peer mentoring and communities of practice. They also concluded that learning science concepts and English vocabulary was developed due to teachers' participation in lesson study.

## **5. Research Problem**

The current study's problem may be attributed to the third and fourth year students' teachers at the Faculty of Education Department of Basic Education Mathematics in English, Damietta Faculty of Education, Damietta University insufficient language proficiency and teaching confidence. Thus, researchers attempt to give an answer to the following key question:

"What are the effectiveness of a proposed program based on the Japanese lesson study approach for developing Mathematics language skills and confidence in teaching for prospective teachers at the Faculty of Education, Department of Basic Education Mathematics in English, Damietta University?"

The above question is branched out into the following sub-questions:

1. What are the most essential language skills required for prospective teachers?
2. How far do prospective teachers master Mathematics in English language skills?
3. What are the features of the proposed program based on the Japanese lesson study approach?

4. To what extent is the proposed program based on the Japanese lesson study approach effective in developing prospective teachers Mathematics in English language skills?
5. To what extent is the proposed program based on the Japanese lesson study approach effective in developing prospective teachers' confidence in teaching?

## **6. Aims of the study**

The current study sought to:

1. Describing and analysis of Japanese lesson study approach, Mathematics in English language skills language skills and confidence in teaching
2. Describing prospective students' level concerning language skills and confidence in teaching.
3. Examining whether a proposed program based on the Japanese lesson study approach to develop English language skills and confidence in teaching among student teachers at the Faculty of Education, Department of Basic Education Mathematics in English.

## **7. Significance of the study**

The research was supposed to be significant for the following reasons:

1. Basic Education Mathematics in English prospective teachers can manipulate math problems and issues through implementing Japanese lesson study approach.
2. Basic Education Mathematics in English prospective teachers can improve their confidence in teaching via improving English language skills.
3. Providing teacher preparation program designers with a list of language skills that should be developed among basic Mathematics in English Department students, Faculty of Education.
4. Providing a suggested proposal for mathematics student teachers about integrating language skills in teaching mathematics and developing their performance in the light of the due skills through enhancing their strengths and addressing their weaknesses.
5. Providing language skills and a guiding program for teachers to be used in situations of mathematics lessons, and for the curriculum developers as well, to consider when developing mathematics curricula.
6. Preparing a generation of Faculty of Education graduates familiar with Japanese lesson study approach standards and can apply them in the field of work.

7. Providing mathematics teacher preparation programs specialists, at Faculties of Education, with Japanese lesson study approach to be included in curricula of mathematics and teaching methods. Additionally, training prospective teachers in using such Japanese lesson study approach and observe them.

## **8. Hypotheses of the study**

The current study investigates the following hypotheses:

1. "There are statistically significant differences at the level of ( $\leq 0.05$ ) between prospective teachers' group mean rank scores in the pre and post application of language skills test as a whole and in each subskill separately in favor of the post application.
2. The implementation of the proposed program based on the Japanese approach achieves a high degree of effectiveness in developing the language skills of the prospective students group at the level ( $\geq 1.2$ ), as measured by "Blake's Modified Gain Ratio", and at the level of ( $\geq 0.6$ ), as measured by the effectiveness "McGogian" ratio.
3. "There are statistically significant difference at the level of ( $\leq 0.05$ ) between prospective teachers' mean rank scores in the pre application of confidence in teaching scale and their scores in the post application, in the favor of the latter.
4. The implementation of the proposed program based on the Japanese approach achieves a high degree of effectiveness in developing confidence in teaching of the prospective teachers' group at the level ( $\geq 1.2$ ), as measured by "Blake's Modified Gain Ratio", and at the level of ( $\geq 0.6$ ), as measured by the effectiveness "McGogian" ratio.

## **9. Delimitations of the study**

The current study was confined to the following delimitations:

1. The experimentation was implemented in the second term of the academic year 2022–2023.
2. The study was limited to a sample of students and teachers of basic Mathematics in English at Damietta University's Faculty of Education, Zaid bin Haritha Language School in New Damietta. Participants were seven student teachers selected from third- and fourth-year students.
3. Mathematics in English handling four English language skills—listening, speaking, reading, and writing with three subskills for each are required for students and teachers of basic Mathematics in English.
4. A confidence in teaching scale.

## **10. Definitions of terms**

### **10.1. Japanese lesson study approach**

Pjanić (2014) define a lesson study in Japanese context as a collaborative process in which teachers discover techniques to encourage students' 'flexible' knowledge of Mathematics. Lesson study can be regarded as a three-step process: plan, do, and see. However, he refers to it in American and European context as a professional development process in which teachers methodically review their practice in order to become more effective. Richit and Tomkelski (2022) define lesson study as a process towards professional development of teachers reinforced by two main principles: collaboration and reflection.

### **10.2. English language skills in teaching mathematics**

Operationally, the researchers can define English language skills as the ability of a mathematics teacher to listen, speak, read, and write and generally communicate using adequate English language during mathematics subject content classes.

### **10.3 Confidence in teaching**

Confidence, in its academic elucidation, is construed as an attitudinal disposition originating from one's self-efficacy beliefs in their capacity to competently manage specific situations. It constitutes an integral facet of the learning process and is intrinsically intertwined with the development of one's identity. Furthermore, it is commonly perceived to be intricately associated with aptitude and is considered a pivotal determinant of performance, as posited ( Beswick et al. ,2011).

Operationally, confidence in teaching, within the context of this study, can be delineated as the prospective teachers' cognitive stance and conviction regarding their competence and proficiency in the successful delivery and facilitation of mathematical subject matter, utilizing the English language proficiently and effectively.

## **11.Design of the experiment**

The present study is a quasi-experimental design. It made use of the descriptive method in order to provide review literature and prior studies related to the Japanese lesson study approach, language skills and confidence in teaching, describing research tools, discussing and interpreting results, and preparing the

theoretical framework and previous studies. Additionally, The current study adopts a mixed design, combining quantitative and qualitative research methods, researchers collect and analyze both numerical data using statistical analysis of pre and post application for both the test and confidence in teaching scale (quantitative). Hence, non-numerical data or qualitative data was used such as observations, student teachers needs analysis, reports were implemented.

## **12. Pilot study**

It consisted of (9) male and female students from the professional diploma, Faculty of Education. The main aim was to construct the validity and reliability of the language skills test, and confidence in teaching scale.

## **13. Study group**

The study participants were assigned to one group (N= 7) prospective teachers or student teachers of third and fourth year enrolled in Department of Basic Education Mathematics in English Faculty of Education, Damietta University in the academic year 2022/2023.

## **14. Variables of the study**

### **The independent variable is:**

- The suggested program based on Japanese lesson study approach was the independent variable.

### **The dependent variable is:**

- English language skills in teaching Mathematics.
- Confidence in teaching.

## **15. Instruments of the study**

For collecting the necessary quantitative and qualitative data, the following instruments were implemented:

1. Pre-post test for English language skills in teaching Mathematics.
2. Confidence in teaching scale was administered to the participants of the study.

Concerning the mathematics English language skill list which is based on the student teacher needs analysis, it was submitted to some jurors to assess the



significance of each skill and its relevance to the student teachers at the Faculty of Education Department of Basic Education Mathematics in English. Based on their modifications, some changes were made. Each main skill had an equal relative weight compared to the rest of skills. The overall subskills were twelve as each main skill has three subskills measured according to four levels Needs improvement (1), developing (2), sufficient (3), and above average (4). Some necessary changes were done to relate to their specialists. As for reading skill, it was divided into three sub skills: reading for the main idea, reading for comparing and contrasting, reading for persuasion. Concerning writing subskills, they were as follows: Supporting with Evidence and Examples, conveying concise ideas and thoughts, and sentence structure. Regarding listening skill, it has three subskills: predicting content, listening for specific information, drawing conclusions. In relation to speaking subskills, they were as follows: Pronunciation, Vocabulary, grammar. As each main skill has three subskills, a rubric is used for outlining the required elements of the subskills. Additionally, they are crucial for reducing subjectivity. The grading system for criteria used in the rubric was divided as follows: Above average (4) which represented best performance, and sufficient (3) represented very good, developing (2) represented very good needs improvement (1) represented the worst performance.

### **15.1. Validity and reliability of Mathematics in English language skill list**

Based on the earlier mathematics English language skills list prepared by the researchers and validated by the jury, the researchers prepared the test. This test was used as a pre-post test. It covers the four skills with one hundred scores. Primarily, the aim of the test is to measure student teacher level of the above-mentioned subskills. Additionally, it was used to examine the effectiveness of the proposed program based on Japanese lesson study on developing some English language skills. For verifying its validity, the test its initial version was given to some jurors to assessing the test items in terms of clarity and their relevance and appropriateness to the study participants, representativeness of the items for each intended skill. Actually, their comments and modifications were considered. For the test reliability, it was administered to random group of nine students other than the participants of the experimental group.

## 15.2. Mathematics in English language skills test:

**Table 1.** *Pre-Post Language Skills Test Reliability Using Alpha Cronbach*

No.	Language skill	Reliability coefficient	intrinsic validity
1	Listening skill	0.95	0.97
2	Speaking skill	0.93	0.96
3	Reading skill	0.9	0.95
4	Writing skill	0.87	0.93

As the closer Cronbach's alpha coefficient is to one, the higher the reliability estimate of the test. Thus, as the table (1) indicates, reliability coefficient for listening skill is 0.95, while its intrinsic validity is 0.97. As for speaking skill reliability coefficient is 0.93, while its intrinsic validity 0.96. Concerning reading skill reliability coefficient, it is 0.9, whereas its intrinsic validity is 0.95. As for writing skill reliability coefficient is 0.87, while its intrinsic validity 0.93. Therefore, this value indicates a high level of internal consistency and proved the test prepared by the researcher was a reliable one.

## 15.3. Piloting the test

The test was piloted to conduct the test with proper timing, determine the difficulty of the item included in the test. Additionally, this is done to ensure that the test instructions were unambiguous and thorough. Results of the pilot study indicated that the overall test instructions were easily understood. Timing was estimated by calculating each time taken by every single student, add all the numbers together then dividing the total sum by the number of timing used. Thus, the overall time was 75 minutes. As for scoring the test, each skill has three subskills associated mainly with math field. As for listening skill, the overall scores for the questions are 11 marks, while the total scores for speaking skill is 16 marks. Regarding reading skill, the total scores for the questions are 12 marks. In relation to writing skill, the total score is 16 marks. So, the overall score of the test is 55 marks.

## **16. The program**

### **16.1. Purpose and the rationale of the program**

The purpose of the current program is to enhance the math prospective teachers at the Faculty of Education Department of Basic Education Mathematics in English language skills and hence reinforce their confidence in teaching based on real field observations and needs analysis of those students. For them, it provides access to a wide range of educational resources and academic content and acts as the principal instructional medium throughout the world. The more they become fluent in English, the more they are better and be able to communicate difficult mathematical concepts, which supports creative teaching techniques. Additionally, there is an abundance of math-related content available online in English, which helps understanding. Overall, learning English gives teachers and students more authority, which promotes academic and professional advancement.

### **16.2. Duration of the experiment**

The administration of the experiment started on the end of February 2023 and ended on the end of April. The program covered eleven sessions; two session a week. Each session was four hours long.

### **16.3. Resources and materials of the program**

The following resources were used in the program to boost the effectiveness of the proposed program; flash cards, Geogebra App, videos, photos, mind map application. As for the videos links they are as follows: <https://www.youtube.com/watch?v=HYSwQ1tZ5Aw>, <https://www.youtube.com/watch?v=1ia0LARVYT8>, [https://www.youtube.com/watch?v=w\\_jNzPdsT8o&list=PLqxm3idbpZc3F0JJ2uWF4LgWgjiwwszz](https://www.youtube.com/watch?v=w_jNzPdsT8o&list=PLqxm3idbpZc3F0JJ2uWF4LgWgjiwwszz), [https://www.youtube.com/watch?v=w\\_jNzPdsT8o&list=PLq-xm3idbpZc3F0JJ2uWF4LgWgjiwwszz&index=1](https://www.youtube.com/watch?v=w_jNzPdsT8o&list=PLq-xm3idbpZc3F0JJ2uWF4LgWgjiwwszz&index=1), <https://www.youtube.com/watch?v=rdjxm8LFhlg&list=PLq-xm3idbpZc3F0JJ2uWF4LgWgjiwwszz&index=4>, [https://www.youtube.com/watch?v=A5dJ4fd\\_zyg&list=PLq-xm3idbpZc3F0JJ2uWF4LgWgjiwwszz&index=5](https://www.youtube.com/watch?v=A5dJ4fd_zyg&list=PLq-xm3idbpZc3F0JJ2uWF4LgWgjiwwszz&index=5), <https://www.youtube.com/watch?v=ctS3J60ZW98>, <https://www.youtube.com/watch?v=IUTGFQpKaPU>, <https://www.youtube.com/watch?v=e4PTvXtz4GM>.

## **16.4. Procedures of the program**

### **Before lesson study (session 1-2)**

- The lesson study cycle initially began when the researchers observed the inadequate performance of the student teachers during their practicum. Teachers have trouble explaining and pronouncing various mathematical terms. Additionally, they find it challenging to come up with the students' questions. As a result, individuals give incorrect answers to questions while pretending to understand them. It leads teachers to hesitate when reading or responding to questions, which has a significant negative impact on their confidence in teaching.
- Actually, this problem led the researchers to ask the students teachers to write individually their needs from learning English language to explain the math subject content adequately. Besides, the researchers check the notebooks of the students teachers, which also shed the light on misunderstanding of lesson steps and procedures. The student teachers used improper language for planning their lessons. However, this point may be attributed to the fact that there are no teachers guide provided to this subject matter but only old experience from the supervisors and teachers at the school.
- Based on student teachers' reflection and needs analysis, they pose another challenge related to the subject matter, which is the geometric shapes and mathematical terminologies.
- A brief historical and theoretical definition, and steps of lesson study is given. A definition of the given math challenge is being discusses, organizing the role of each student in the study lesson for the target problems.

### **During lesson study (session 3-9)**

#### **In this stage the following procedures were done**

- Discussion and reflection on lesson study
- Reviewing lesson study main steps.
- Reviewing with the participants the target mathematics topics.
- Deciding the steps of improving each language skill separately.
- Determine the necessary materials and resources for manipulating language skills and geometric shapes and mathematical terminologies.
- Ensuring participants' understanding of their roles in lesson study.
- Determine the intended tasks, planning and organization of each step.

- Finalization of the exploratory tasks and stages.

### **After lesson study (session 10-12)**

#### **In this stage the following procedures were followed**

- After the middle stage of the lesson study, the lesson study group participants and the researchers engaged in the "debriefing" process to share their experiences during the research lesson delivery.
- Reflection of the participants action during the problem solve included in lesson study.
- Each participant received a sample of the lesson plan that was implemented, and the researchers discuss with the participants what was done in the classroom, ensuring that the if the presenter followed the intended lesson structure.
- Identify any challenges the students faced during the lesson, enabling them to make necessary changes and improvements to the teaching approach.
- Subsequently, the observing participants shared their views on the events of the lesson, which shed light on challenging issues and hence, they can address next time.
- Evaluation lesson study through reviewing its steps using each one reflection.
- Planning future action via concluding the cycle of the lesson study.

### **17. Procedures and treatment (the field study).**

The following is a description of the steps followed by the researchers in designing and implementing the current treatment.

Reviewing previous related studies, and research concerned with the following topics:

- Mathematics in English language skills in general and each skill separately in particular.
- Japanese lesson study history, characteristics, steps, different manipulation in different contexts, and limitations.
- Math subject content terms, relation to Japanese lesson study, and English language skills.
- Confidence in teaching generally and in relation to math in particular.

### **a. Before implementing the program**

- Surfing the YouTube channel for videos related to math terminology and lessons.
- Establishing the purpose and rationale of the program.
- Determining the resources of the content of the program sessions.
- Figuring out the duration of the administration.
- Designing tools prepared by the researchers (language skill test, and confidence in teaching scale).
- Presenting the aforementioned tools to a group of jurors for validation
- Identifying the language skills manipulation in each session of the program that.

### **b. During implementing the program:**

- Piloting the test and the scale on a sample of professional diploma students (N=9) for assuring validity and reliability of the tools.
- Conducting field visits Zaid bin Haritha Language School in New Damietta to determine the feasibility of the study.
- Pre-administering for the test and for the scale.
- Implementing the cycle of the Japanese lesson study.
- Recording reflection of the students on their peers and video tape their performance to discuss them in detail.

### **c. Post implementing the program**

- Reaching a conclusion concerning the students' performance and their steps for solving the proposed problem.
- Writing each session step.
- Writing a dictionary.
- Post-administering language for the test and for the scale.
- Analyzing results.
- Discussing the results and providing conclusions and recommendations.

## **18. Results and discussion**

The current study sought to examine the effectiveness of a proposed program based on the Japanese lesson study approach to develop English language skills and confidence in teaching mathematics among prospective teachers at the Faculty of Education (Department of Basic Education Mathematics in English).

### 18.1. Analysis of Findings:

Mathematics in English language skills test was administered to the study group and the students' scores were calculated. The average scores of the students, as well as the percentage of the mean and standard deviation, were calculated.

The following table (2) explains the means and standard deviations (SD), of the scores of the group (N =7), in the four language skills skills test and their total in the pretest.

Table (2) *.Level of Prospective Teachers in Mathematics in English Language Skills Test*

Skill	Number of the group participants	M	M %	SD	Level
Reading	7	3.29	%27.42	0.76	Weak
Writing	7	2.29	%14.3	1.89	Weak
Speaking	7	4.29	%26.81	0.76	Weak
Listening	7	2.71	%24.64	1.5	Weak
The whole skills	7	12.57	%22.85	4.31	Weak

From the above mentioned table, it is clear that the students level in mathematics in English concerning the four skills are weak. In so doing, the second question was answered “What is the level of the students-teachers of Basic Education Mathematics in English at the Faculty of Education concerning English language skills?”.

### 18.2. Confidence in teaching scale

A 25-item scale was designed by the present researchers using 6-point Likert design to measure the prospective teachers’ confidence in teaching math while using English language as a medium of instructions. Each item was scored on a response scale of 1 to 3, where student teachers were asked to select one of the following responses: Highly available 3, moderately available 2, slightly available 1 , and 0 = not available. The highest score is 75, the lowest score is 25.

### 18.3. Validity and reliability of confidence in teaching scale

For validating the scale, it was presented in its initial form to a group of jurors and experts in the field of EFL and curricula and mathematics teaching methods.

Their modifications and suggestions were considered. Thus, it was modified in its final form. A 9-piloting the language skills test and confidence in teaching to a sample of the third - fourth year students of the basic mathematics in English department in order to timing and statistically consistent them. Cronbach's alpha coefficient is used for calculating the reliability of the scale which is estimated 0.991, while its intrinsic validity is 0.995. Additionally, for assessing the stability of a scale the "re-application" method was used, applying the scale to the same group of 9 student teachers two weeks after the first application. The results of the percentage of agreement were calculated through the Cooper equation, and it showed a high level of stability, with an average stability score of 0.92%, indicating consistent and reliable outcomes over the two-week period.

#### **18.4. Quantitative analysis of the results**

To answer **the fourth question**, which To what extent is the proposed program based on the Japanese lesson study approach effective in developing student teachers of Basic Education Mathematics in English language skills?

The one and second hypotheses in the research have been formulated as follows:

Concerning the one hypothesis “There are statistically significant differences at the level of ( $\leq 0.05$ ) between students teachers’ group mean rank scores in the pre and post application of language skills test as a whole and in each subskill separately in favor of the post application.

As for the second hypothesis which states that “The implementation of the proposed program based on the Japanese approach achieves a high degree of effectiveness in developing the language skills of the preservice students group at the level ( $\geq 1.2$ ), as measured by “Blake's Modified Gain Ratio”, and at the level of ( $\geq 0.6$ ), as measured by the effectiveness "McGogian" ratio”.

For verifying the first hypothesis “There are statistically significant differences at the level of ( $\leq 0.05$ ) between prospective teachers’ group mean rank scores in the pre and post application of language skills test as a whole and in each subskill separately in favor of the post application, the researchers used the Wilcoxon signed-rank test for paired samples. They used it to test the significance of the difference between the mean ranks of students' scores in the pre-test and post-test applications of the language skills test, in favor of the post-test application, as shown in Table (3). Table 3 indicates the differences between the mean ranks of the pre-post applications of the language skills test as a whole and in each skill individually. Additionally, it indicates the effect size in the development of



mathematics English language skills of the study group as proved by gain ratio of “Blake’s ratio and "McGogian”

**Table 3.** *Differences Between the Mean Ranks of the Pre-Post Applications of the Language Skills and the Size Effect in Developing Mathematics Language Skills*

Pre-post Application Skill	Statement	No.	Mean rank	Sum of Rank	The pre-mean	The post mean	Value (Z)	Significance of level	Maximm value of the Scores	The effectiveness ratio of Mac - jujian	The modified gain ratio of Blake	The effect size (r)
Reading	Negative ranks	0	0	0	3.29	10.86	2.392	0.01	12	0.87	1.5	0.9
	positive ranks	7	4	28								
	tied ranks	0										
Writing	Negative ranks	0	0	0	2.29	14.86	2.41	0.01	16	0.92	1.7	0.91
	positive ranks	7	4	28								
	tied ranks	0										
Speaking	Negative ranks	0	0	0	4.29	15.29	2.401	0.01	16	0.94	1.6	0.91
	positive ranks	7	4	28								
	tied ranks	0										
Listening	Negative ranks	0	0	0	2.71	10.14	2.388	0.01	11	0.896	1.57	0.9
	positive ranks	7	4	28								
	tied ranks	0										
The whole Test	Negative ranks	0	0	0	12.57	51.14	2.371	0.01	55	0.91	1.6	0.896
	positive ranks	7	4	28								
	tied ranks	0										

Table (3) shows that the calculated value of (Z) for pre-test and post-test concerning the overall mathematics in English language skills is (2.371). The level of significance was (0.01). Additionally, the calculated values of (Z) for each subskill separately ranged from (2.388-2.41) at a significance level of (0.01). This

indicates that the effect of the program was significant on improving mathematics in English writing skill followed by speaking, reading, and finally listening skill. Consequently, there were statistically significant differences at the (0.01) level between the mean ranks of the prospective teachers' scores in the pre-test and post-test applications for the overall language skills and each sub-skill, in favor of the post-test application. Thus, the first hypothesis is accepted.

As the calculated value for the sub-skills of the language skills test and the total score of the test is less than (0.05), the value of (Z) for the mathematics in English language sub-skills test as a whole is significant at the (0.01) level. Furthermore, the mean ranks of the students' scores in the post-test application for the overall language skills and each sub-skills were statistically significant at the (0.01) level, in favor of the post-test application. Thus, the first hypothesis is accepted.

Therefore, the first hypothesis will be as follows: There are statistically significant differences at the level of (0.01) between prospective teachers' mean rank scores in the pre and post application of mathematics in English language skills test as a whole and in each subskill separately in favor of the post application.

As Table (3) shows the "Blake's Modified Gain Ratio" regarding the overall language skills test is (1.6). As the gain ratios for all mathematics in English language sub-skills ranged from (1.5 - 1.7), so they are greater than the criterion ratio set by "Blake's Modified Gain Ratio" to measure effectiveness which is (1.2), hence all of them are acceptable ratios.

Additionally, it is evident from Table (3) that the effectiveness ratio for "McGogian" concerning the overall mathematics in English language skills test is (0.91). As the gain ratios for all sub-skills ranged from (0.87-0.94), so they are greater than the criterion ratio set by "McGogian," which is (0.6). Moreover, the effect size "r" is (0.896). The effect size for all mathematics in English language sub-skills ranged from (0.9-0.91), and all of them are acceptable ratios.

Thus, the implementation of the proposed program based on the Japanese approach achieves a high degree of effectiveness in developing the language skills of the prospective teachers study group at the level (1.6), as measured by "Blake's Modified Gain Ratio", and at the level of ( 0.91), as measured by the effectiveness "McGogian" ratio. Therefore, the second hypothesis is accepted.

To answer **the fifth question**, which To what extent is the proposed program based on the Japanese lesson study approach effective in developing student teachers of basic Mathematics Department in English confidence in teaching?

The third and fourth hypotheses in the research have been formulated as follows:

Concerning the third hypothesis “There are statistically significant difference at the level of ( $\leq 0.05$ ) between students teachers’ mean rank scores in the pre application of confidence in teaching scale and their scores in the post application, in the favor of the latter.

As for the fourth hypothesis which states that “ The implementation of the proposed program based on the Japanese approach achieves a high degree of effectiveness in developing confidence in teaching of the students teachers’ group at the level ( $\geq 1.2$ ), as measured by “Blake's Modified Gain Ratio”, and at the level of ( $\geq 0.6$ ), as measured by the effectiveness "McGogian" ratio”.

For verifying the third hypothesis “There are statistically significant difference at the level of ( $\leq 0.05$ ) between students teachers’ mean rank scores in the pre application of confidence in teaching scale and their scores in the post application, in the favor of the latter, the researchers used the Wilcoxon signed-rank test for paired samples. They used it to test the significance of the difference between the mean ranks of students' scores in the pre-test and post-test applications of the teaching confidence scale, in favor of the post-test application, as shown in Table (4).

**Table 4.** *Difference Between the Mean Ranks of the Pre-Post Applications of the Confidence in Teaching scale and its Size Effect*

Application	Statement	No.	Mean Rank	Sum of Rank	The pre-mean	The post mean	Value (Z)	Significance level	Maximum value of the	The effectiveness ratio of Mac	The modified gain ratio of Blake	The effect size (r)
Confidence in Teaching Scale	The Pre- Post	0	0	0	11.43	68.43	2.4	0.01	75	0.897	1.66	0.91
	Negative ranks	7	4	28								
	positive ranks											
	Tied ranks	0										

Based on the results in Table (4), the calculated value of (Z) for pre-test and post-test of the confidence in teaching scale is (2.4) at a significance level of (0.01). This indicates that there is a statistically significant difference at the (0.01) level between the mean ranks of prospective students' scores in the pre-application and post- applications of the confidence in teaching scale, in favor of the post-application. Therefore, the third hypothesis is accepted. Hence, the third hypothesis will be as follows: "There are statistically significant difference at the level of (0.01) between students teachers' mean rank scores in the pre application of confidence in teaching scale and their scores in the post application, in the favor of the latter.

The results from Table (4) indicates that the "Blake's Modified Gain Ratio" in regard to the confidence in teaching scale is (1.66), which is an acceptable ratio as it is higher than the ratio specified by "Blake's Modified Gain Ratio" to measure effectiveness which is (1.2).

Furthermore, it is evident from Table (4) that the effectiveness ratio for "Mac McGogian" in relation to the teaching confidence scale as a whole was (0.897), and this is an acceptable ratio as well. This is because it is higher than the effectiveness

ratio specified by " McGogian," which is (0.6). Additionally, the effect size " r " is (0.91) which is also an acceptable ratio.

Hence, the proposed program based on the Japanese approach is effective in developing confidence in teaching among prospective teachers of the study group, with an effectiveness level of (1.66) as measured by the “Blake's Modified Gain Ratio” and an effectiveness level of (0.897) as measured by "McGogian" ratio. Therefore, the fifth hypothesis is accepted.

Briefly, The use of the proposed program based on the Japanese approach achieves a high level of effectiveness in developing confidence in teaching among prospective teachers of the study group, with an effectiveness level of (1.66) as measured by the “Blake's Modified Gain Ratio” and an effectiveness level of (0.897) as measured by " McGogian's" ratio.

## **19. Qualitative analysis of the results**

A qualitative analysis of study is based on prospective teachers' self-reflections, and peer observations about their experience regarding implementing the Japanese lesson study approach. Actually, this reflects their professional development concerning mathematics in English language skills and their confidence in teaching mathematics. Structured interviews were done for determining the effect of the program on them. The following questions were presented to them in the interviews:

1. Do you participate in collaborative planning with your colleagues? If yes, give reasons.
2. Do you participate with your colleague during the implementation of the lesson? If yes, give reasons.
3. What are the main difficulties that you face when teaching mathematics?

prospective teacher' responses have been coded as S1, S2, S3, S4, S5, S6, S7 to keep their information confidential.

**Table 5.** *Pre- Application Prospective Teachers Verbatim to Open Ended Questions*

<b>Questions</b>	<b>Responses</b>	<b>Frequency</b>
Do you participate in collaborative planning with your colleagues? why and why not?	S1, S2, S3 No, as they prefer to plan individually based on different opinions.  S4, S5, S6, S7 No, because they prefer to plan individually so that each student teacher does not bear the responsibility of preparing and relying on others.	3
Do you participate with your colleague during the implementation of the lesson? why and why not?	S1, S2, S3 No, because he/she was in a hurry during classes. So, I prefer to let him or her manage the classroom.  S4, S5, S6, S7 No, because some colleagues cannot control their classroom discipline or misconduct of their students.	4

It is clear prospective teachers declare their difficulty in decoding mathematical terms. Additionally, they have difficulty in pronouncing geometric shapes names. They lack using language appropriately when managing the classroom misconduct. They also determine their lack in planning lessons well; setting up objectives, using diverse teaching methods and strategies. Furthermore, some questions were asked such as: What are the main difficulties that you face when teaching mathematics? The prospective teachers determine that the problems they face were as follow:

- After implementing the proposed program, the same previous questions were presented to the study group participants. The respond of the prospective teachers was as follows: Mathematical terminology, especially the pronunciation of geometric shapes.
- Poor proficiency of English language instructions.

- Lack of verbal communication in English.
- Difficulty writing or reading steps to solve mathematical problems. Lack for required teaching skills; setting up lesson objectives.
- Lack of confidence in teaching.

**Table 6.** *Post- Application Prospective Teachers Verbatim to Open Ended Questions*

<b>Questions</b>	<b>Responses</b>	<b>Frequency</b>
Do you participate in collaborative planning with your colleagues? why?	S1, S2, S3 Yes, collaborative planning helps me, and my colleagues solve many occurred classroom problems, learn teaching strategies, setting up lesson objectives, timing classroom, using proper activities and procedures, selecting appropriate evaluation.  S4, S5, S6, S7: Yes, it helps in enriching pedagogical techniques such as Geogebra and mind mapping.	3
Do you participate with your colleague during the implementation of the lesson? why and why not ?	S1, S2, S3: yes Yes, this helps in finding out about our strengths and weaknesses and hence, improving teaching performance.  S4, S5, S6, S7: Yes, this help in reducing teaching anxiety, providing us with cooperation and suggestions for the problem solving especially teaching the lesson of geometric shapes.	4

Concerning their reflection about the main challenges that they faced when implementing the program, they were hesitant to teach as it was their first time to

know about Japanese lesson study. The observer of the prospective teachers informed that they assumed a distinguished lesson study. By the end, they were able to set up the learning objectives. Furthermore, this contributed to process and leading them to write the lesson study report that was published on WhatsApp later on. Regarding their insights about the entire process, they assert that they enjoyed the lesson study which motivate them in learning and teaching mathematics in English language. As a result, their confidence in teaching was improved giving them a proper opportunity to assess themselves through participating in lesson study team.

Generally speaking, prospective teachers assert that providing activities based on the Japanese lesson study approach activate their student's interests. In providing real-life problems examples, photos and videos, immediate and delayed feedback prospective teachers were able to process effectively using English language in teaching mathematics. Actually, this led to excitement, attention and motivation.

## **20. Discussion**

- The implementation of the proposed program based on the Japanese lesson study approach has shown a high level of effectiveness in developing mathematics in English language skills of the prospective teachers. This effectiveness was measured using "Blake's Modified Gain Ratio" and "McGogian" ratio, and the results indicate significant improvements in language skills among the student teacher group.
- Furthermore, the findings indicated that the proposed program had a positive impact on enhancing their confidence in teaching.
- Overall, the results of study suggest that the program based on the Japanese lesson study approach is effective in improving both language skills and teaching confidence among the prospective teachers. These outcomes further provide evidence of the program's success in achieving its intended objectives. This results are in line with the positive results on the use of lesson study for language skulls, such as reading comprehension as in (Chávez, et.al, 2023) study.
- There are studies that have been concerned with the development of language skills among student teacher, such as those of Gürefe (2018).
- Additionally, the current results indicated the effectiveness of the Japanese lesson study approach. This result is in accordance with studies that have been concerned with the development of confidence in teaching among student teacher such as those of Stearns (2015).



**Previous results can be interpreted as follows:**

- Provide activities based on the Japanese lesson study approach and activate the student's senses.
- Provide real-life problems, examples, photos and videos to develop language skills, which has increased their excitement, attention and motivation to learn.
- Providing immediate and repeated feedback, positive reinforcement during activities, and solving issues for students on language skills.
- Flexibility of the educational environment and enjoying the educational means and activities provided such as individual activities, group activities and educational games to develop language skills, confidence in teaching and suit the tasks and activities used in the lessons with the level of students.

**21. Recommendations:**

Based on the current results of the study, some recommendations are provided:

- Paying more attention to the Japanese lesson study approach in teaching mathematics, which contributes to improving the learning process, improving teaching practices, and fostering confidence in teaching.
- Training mathematics teachers pre and in-service on the Japanese lesson study approach.
- Focusing on developing mathematics in English language skills and confidence in teaching among prospective teachers at Mathematics Department.
- A follow-up assessment for evaluating the long-term impact of the program on prospective teachers' English language skills and teaching confidence is recommended.
- Creating supportive and encouraging learning environment for prospective teachers participating in the program.
- Encouraging prospective teachers to reflect on their teaching experiences regularly to facilitate a deeper understanding of their teaching practices.

## 22.Suggested research:

- Studying Japanese lesson study approach in a flipped learning for enhancing teaching proficiency and confidence in teaching among student teachers of other disciplines at the faculty of Education.
- A training program based on the Japanese lesson study approach to develop the teaching competencies of primary school mathematics teachers.
- Studying the effect of using the Japanese lesson study approach on other variables such as: attitude towards mathematics, verbal problem-solving skills, mathematical thinking skills, life skills, reducing mathematical anxiety of the student teacher.

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