Evaluating the Learning Management and Assessment Abilities of Preservice Teachers in Mathematics Education Program

Yannapat Seehamongkon[1] & Sawitree Ranmeechai[1]

[1] Faculty of Education, Mahasarakham University Thailand

Correspondence: Yannapat Seehamongkon, Faculty of Education, Mahasarakham University, Thailand 44000.

Abstract

The objective of this research was to evaluate the learning management and learning assessment abilities of preservice teachers in the Mathematics field. Additionally, it aimed to provide guidelines for the development of these abilities. The study group consisted of 34 practicum teacher students, 34 mentor teachers, and 14 experts. Data collection tools included evaluation forms and interviews. Descriptive statistics, such as means and standard deviations, were employed for quantitative data analysis, while content analysis was utilized for qualitative data analysis. The research findings indicated that the preservice teachers possessed a high level of learning management ability, with an average self-assessment score of 4.02 and an average mentor assessment score of 3.98. However, their learning assessment ability is relatively lower, with an average self-assessment score of 3.96 and an average mentor assessment score of 3.50. Guidelines for development include promoting inspiration and adjusting mindsets about mathematics learning management. The study also recommended intensive practical training in both simulated situations and intensely real situations. In terms of learning assessment development, diversifying assessment methods for improvement and providing creative constructive feedback is suggested.

Keywords: learning management ability, learning assessment ability

1. Introduction

Educational management at the elementary level in mathematics at present takes a math course (Revised 2017) according to the Basic Education Core Curriculum, 2008, by the development of the Institute for the Promotion of Teaching Science and Technology (IPST), with the goals that the students wish to have upon completion of the curriculum as follows: 1) have knowledge and understanding of concepts, principles, theories in essential mathematics and can be applied. 2) have the ability to solve problems. Communicate and convey mathematical meaning, connect, reason, and have creativity. 3) Have a good attitude towards mathematics. Appreciate and recognize the importance of mathematics. Mathematics knowledge can be used as a learning tool at higher education levels. 4) Have the ability to choose suitable media, equipment, technology, and sources as tools for learning, communication, work, and problem-solving correctly and efficiently. from the above goals As a result, the curriculum has changed in various aspects as follows: 1) Change in content arrangement Mathematics learning course (Revised, 2017) according to the Basic Education Core Curriculum, 2008, organized into 3 subjects: number and algebra. measurements and geometry and statistics and probabilities. By separating mathematical skills and processes from the subject matter. Mathematics skills and processes still consist of the same five skills, namely problem-solving, mathematical communication, and interpretation, making connections, reasoning, and creative thinking. The assessment of competence in mathematical skills and processes is required along with content assessment. This can be seen from the changes in the indicators specified in the curriculum. and content changes at the elementary level, the content has been changed to be more international and coherent. This takes into account the appropriateness of mathematics content at different levels by considering curricula from many countries and mathematics content that is used as a framework for international assessments such as TIMSS, etc., so some contents have been added that are necessary. Flow some content to be appropriate. Cut some subjects that are repetitive with other subjects. and emphasizing the connection between mathematical content and problem solving in real life as mentioned in the Mathematics Curriculum Manual (Revised, 2017). According to the basic education core curriculum, 2008, an elementary level that the Institute for the Promotion of Teaching Science and Technology (IPST) has prepared for teachers to study guidelines for planning teaching

and learning by the predetermined.

Assessing the learning process in elementary-level mathematics is a noteworthy endeavor that furnishes educators with a more profound comprehension of their pupils' mathematical prowess, thereby enabling them to tailor their instructional schemes accordingly. This procedure permits pedagogues to pinpoint the obstacles, hindrances, and requisites of their pupils in mathematical subjects, authorizing them to devise suitable learning programs and remedial techniques (Harun & Helsa, 2013). Previously, evaluations in mathematics classrooms have focused on externally administered tests and objective measures of skill acquisition. Nevertheless, in light of new learning theories and curricula, there exists a necessity for innovative methodologies in assessment that align with social-constructivist frameworks and stress all-encompassing comprehension, problem-solving, and mathematical reasoning (Robiansyah et al., 2018). In conducting evaluations and implementing the results to inform instruction and make decisions regarding their students' mathematical progress, teachers hold a pivotal position (Khuzwayo & Khuzwayo, 2020). Baseline assessments have proven to be effective in identifying learners' skills and learning necessities. Hence, they ought to be regarded as a fundamental aspect of continuous professional development programs for mathematics instructors (Mitchell, 2010).

The Mathematics program in the Faculty of Education at Mahasarakham University offers its students exceptional opportunities and support to excel in their academic journey. These aspiring educators are granted scholarships specifically designed to nurture future teachers who can significantly contribute to local development at the primary level. The program's primary goal is to equip students with the necessary skills and knowledge to become proficient elementary school teachers, with a strong focus on effectively teaching mathematics. This entails mastering the principles of teaching mathematics and closely monitoring the implementation and evaluation of the mathematics curriculum in elementary schools to assess its impact on students' learning outcomes. The program aims to cultivate a new generation of passionate and competent teachers who not only impart mathematical knowledge but also instill a love for the subject in their students. Moreover, it proactively prepares its students for the ever-changing landscape of education, teaching adaptable pedagogical approaches to ensure graduates are ready to embrace future developments in teaching and learning methodologies. Overall, the Mathematics program's holistic approach empowers individuals to become exceptional educators who make a positive impact on their students, communities, and society. By investing in the education of these future teachers, Mahasarakham University contributes to the development of the region and fosters a brighter and more promising future for all.

From the above-mentioned importance. The researcher was therefore interested in evaluating the learning management ability and the ability to assess the mathematics learning curriculum learning at the elementary level of mathematics students. Faculty of Education, Mahasarakham University This will result in information that is useful for improving and developing teaching and learning management to be ready and produce the best results for students in the future.

2. Literature Review

This study aims to investigate the learning management assessment ability and learning assessment ability. The researcher conducted a thorough review of relevant literature to support this study.

2.1 Management of Learning in Mathematical Elementary School

In the contemporary epoch, a noteworthy metamorphosis has been perceived in the global terrain encompassing diverse arenas, including but not confined to the economic, scientific, and technological domains. Consequently, it holds immense significance to endow pupils with the indispensable competencies to navigate this dynamic milieu. Hence, pedagogues must demonstrate vigilance and readiness in administering the learning process to ensure that scholars accomplish knowledge in rudimentary subjects, learning proficiencies, and crucial skills pertinent to the 21st century, such as information technology skills, critical thinking, problem-solving abilities, communication skills, and life skills. Ergo, it is pivotal to modify the learning management methodologies to harmonize with the evolving social and technological context. In this regard, instructors ought to formulate student-centric learning regimens that facilitate learners to procure knowledge from practical scenarios and become knowledge producers themselves, with guidance from educators who stimulate interest and cultivate an ambiance of collaborative learning exchange (IPST, 2017).

The management of learning about mathematical process skills involves using teaching methodologies that are appropriate for cognitive skills and student characteristics (Sohilait & Lamasano, 2020). It is important to plan the teaching-learning process and use learning management as a strategy for effective learning (Wakit & Kusumodestoni, 2018). Deliberate practice plays a crucial role in the development of high-level performance in mathematics (Souza et al., 2020). This type of practice involves intentional efforts to improve skills and

competencies through thinking, problem-solving, and reflection (Baturina & Khasanova, 2020). Traditional drill-and-practice methods in mathematics education may lead to routine skills instead of adaptive and flexible number knowledge (Lehtinen et al., 2017). Therefore, it is necessary to design learning designs that promote understanding, provide a variety of strategies, and increase learning motivation. By using problem-based learning models and technology-based learning environments, students can engage in self-initiated deliberate practice to enhance their mathematical problem-solving abilities and process skills.

2.2 Learning Assessment in Mathematical Elementary School

The current approach to assessing mathematics learning involves measuring and evaluating real-life or simulated real-life performance while considering students' competencies beyond rote memorization. Diverse assessment methods are used, including problem-solving, research, data retrieval, knowledge application, critical thinking, and cognitive skill demonstration. The main objectives of these assessments are threefold: 1) to check learning efficiency and evaluate outcomes, aiming to enhance students' learning experiences based on content standards; 2) to diagnose students' mathematical knowledge and skills relevant to daily life and guide appropriate learning strategies using diagnostic results; 3) to collect data and create information for learning management, providing relevant feedback to students and stakeholders. This information supports educational planning, setting clear assessment objectives, and selecting effective tools for the practical application of desired outcomes. A clear definition of assessment objectives facilitates the selection of efficient methods and tools for practical and meaningful results.

2.3 Mathematics Learning Assessment Guidelines

The guidelines for assessing mathematics learning encompass four key aspects. Firstly, continuous assessment involves an ongoing process of questioning to reinforce students' understanding, foster their mathematical skills, and encourage critical thinking and discussions. Secondly, comprehensive assessment covers various aspects of knowledge, skills, and mathematical processes through practical activities that integrate knowledge from multiple subjects, promote diverse problem-solving methods, and relate to real-life situations. Thirdly, diverse and appropriate assessment methods should be utilized to collect data, including tests, questionnaires, observation, interviews, and portfolio assessments, ensuring alignment with assessment objectives. Lastly, the reflective learning process emphasizes providing valuable feedback to students for continuous improvement, while also enabling teachers to adjust their teaching methods and improve instructional effectiveness. Assessments are conducted before, during, and after learning, enabling teachers to understand students' foundational knowledge, monitor progress, and plan future strategies. Adhering to these guidelines facilitates a robust and effective assessment system that supports students' mathematical learning, development, and better learning outcomes.

Learning assessment in mathematical elementary school plays a crucial role in gathering valuable data about students' mathematical skills and identifying their specific learning needs (Harun & Helsa, 2013; Robiansyah et al., 2018; Khuzwayo & Khuzwayo, 2020; Goos, 2014). This process not only provides insights into students' academic progress but also serves as a foundation for designing appropriate and tailored learning programs to meet their requirements (Hendri et al., 2019). Recognizing that the traditional assessment approach, centered on recall and objective tests, is no longer fully aligned with our contemporary understanding of learning mathematics, educators are now encouraged to adopt a more dynamic and comprehensive approach. The new paradigm of assessment should be closely aligned with instructional strategies, fostering deeper understanding, problem-solving skills, and mathematical reasoning among students. In this context, teachers hold a pivotal role as they conduct assessments and utilize the data to inform their teaching practices, ensuring a more personalized and effective learning experience for their students. However, to optimize the benefits of modern assessment methodologies, further training is necessary to empower teachers with the knowledge and skills to effectively use assessment tools and technology. By implementing these effective assessment practices, teachers can create a conducive and engaging learning environment that propels students toward achieving their optimal potential in the realm of mathematics. This commitment to enhanced assessment practices promises to nurture young minds and pave the way for a bright future filled with mathematical proficiency and a genuine love for learning.

3. Method

This research employed a descriptive research methodology and utilized the following research methods: 1) The target groups consisted of two categories, namely 34 preservice teachers, 34 mentor teachers, and a group of 14 experts. The selection of participants in both groups was based on purposive sampling. 2) The data collection tools were categorized into two types: the Learning Management Ability Evaluation Form and the Learning Assessment Ability Form. The evaluation form is a Likert scale with 5 levels, consisting of 24 items. It was

validated by experts, resulting in a reliability coefficient of 0.84, for the entire evaluation form. Additionally, the interview form, which explored ways to develop learning management abilities and learning assessment abilities, followed a semi-structured approach and included 2 items.

4. Data Collection

Data collection Assessment of ability to manage learning and the ability to assess learning Data were collected from 34 preservice teachers, and 34 mentor teachers by using the evaluation form. Information section on development guidelines obtained from interviews with 14 experts.

5. Data Analysis

Quantitative data was obtained from the learning management competency evaluation form and the ability to assess learning. Descriptive statistics were used, namely mean and standard deviation.

Qualitative data is information about ways to develop the ability to manage learning and the ability to assess learning, using content analysis.

6. Result and Discussion

The findings in this study, It is an assessment of the ability to manage learning and the ability to assess the learning of preservice teachers in Mathematics Education Program, Mahasarakham University found the ability to manage the learning of preservice teachers at a high level, both self-assessment (Mean = 4.02) and mentor assessment (Mean = 3.98) However, their learning assessment ability is relatively lower, with an average self-assessment (Mean = 3.96) and an average mentor assessment (Mean = 3.50), as shown in Table 1.

Table 1. Assessment results of learning management abilities and assess learning

Assessment items	self-assessment		mentor assessment	
	Mean	S.D.	Mean	S.D.
Learning Management	4.02	0.53	3.98	0.47
Learning assessment	3.96	0.73	3.50	0.62

When looking at programs related to learning management that promotes most mathematical skills and processes, at a medium level, with an average self-assessment (Mean = 3.29) and an average mentor assessment (Mean = 3.13), including organizing learning activities that promote preservice teachers' ability to reason, organizing learning activities that encourage students to be able to solve mathematical problems, organizing learning activities that encourage students to have the ability to present and communicate mathematics, organizing learning activities that encourage students to have the ability to relate mathematical knowledge to everyday life and organizing learning activities that encourage students to be creative.

The preservice teachers' ability in learning management was at a medium or not high level. This is because the preservice teachers' professional experience training is concerned with teaching the basic education curriculum completely. Mathematics learning group 2017, which the school is a place to practice experience assigned to teach each person's room with a mentor to supervise and give advice in addition, there are other duties such as student activities, registration, academic work, document work, guidance, and supplies, causing students to learn and devote themselves to their assignments in addition to learning management. Plus the classroom is large. The number of students is 30–40, making it a learning arrangement that engages students or puts them into action. or organize learning groups quite limited. However, in assessing learning, preservice teachers should focus on the assessment to cover both knowledge, mathematical skills and processes, and desirable characteristics and are constantly being evaluated, using a variety of methods and tools, including providing quick feedback (IPST, 2017; Seehamongkon, 2022; Noinon, 2016; Yotha, 2021). Preservice teachers can proceed by asking students questions that give reasons. Even if each student's answer is different. Right, or wrong answers are not what make students develop reasoning. And the method used to solve the problem may be different, this is normal. Preservice teachers must join students in summarizing lessons to achieve correct understanding and avoid misunderstandings as shown in Table 2.

Table 2. Assessment results of the ability to manage to learn about mathematical skills and processes

Assessment items	self-assessment		mentor assessment	
	Mean	S.D.	Mean	S.D.
1. organize learning activities that promote the ability to give reason	3.18	0.52	2.99	0.63
2. organize learning activities that promote the ability to solve math problems	3.34	0.57	2.97	0.61
3. organize learning activities that promote the ability to connect mathematics to everyday life	3.42	0.67	3.50	0.94
4. organize learning activities that promote the ability to communicate	3.41	0.52	3.48	0.57
5. organize learning activities that promote creativity	3.13	0.32	2.73	0.79
Total	3.29	0.51	3.13	0.70

For guidelines about learning management in this research, the guidelines were summarized from interviews with 14 experts as follows.

1) Promote inspiration and adjust the concept (mindset) of mathematics learning management to focus on solving problems in daily life including in line with the rapidly changing world situation.

2) Promote the use of media and innovation in student-centered learning management such as active learning management, STEM learning management, cooperative learning management, problem-solving learning (PBL), etc.

3) simulation practice; It is the implementation of the learning management plan to be used in the classroom. by having classmates act as students Assessors and observers were involved and reflected from all groups. Including an assessment from the teacher as a whole and adding more

4) Practice in real school situations where students observe learning management and learning management experiments by students in real practice with mentors to supervise and give advice together with subject teachers intensively

5) For mathematical skills and processes may be implemented in conjunction with learning management in real school situations. Or can be organized as extra-curricular activities outside of class

The learning assessment section can be summarized as follows:

1) Encourage the emphasis on formative assessment to continuously improve and develop learners.

2) Emphasis on the assessment of both knowledge mathematical process skills and desirable characteristics.

3) Use a variety of methods such as testing, observation, inquiry, inspection of assignments, etc.

4) Encourage them to be used as feedback to improve and develop learners regularly and quickly.

7. Conclusion

In conclusion, this research aimed to assess the learning management ability and the ability to assess students' learning in mathematics at the elementary level. The study included 34 preservice teachers, 34 mentor teachers, and 14 experts as participants. Data collection tools, such as evaluation forms and interview forms, were utilized for quantitative and qualitative data analysis.

The results of the study showed that the ability to manage learning among preservice teachers was at a high level, with a mean self-assessment score of 4.02 and a mentor assessment score of 3.98. However, the ability to assess learning was at a lower level, with a mean self-assessment score of 3.96 and a mentor assessment score of 3.50.

The study recommended several development guidelines for learning management, including promoting inspiration and adjusting concepts about mathematics learning management to focus on solving real-life problems. It also suggested using student-centered learning management approaches, such as active learning, STEM learning, cooperative learning, and problem-based learning. Additionally, it proposed implementing learning management plans in both simulated and real school situations and involving students as assessors and observers.

Regarding learning assessment, the study emphasized the importance of formative assessment to continuously improve and develop learners. It suggested assessing both knowledge of mathematical process skills and desirable characteristics. Furthermore, the study advocated using various assessment methods, such as testing, observation, inquiry, and inspection of assignments, to provide regular and constructive feedback to learners.

Overall, the research findings highlighted the significance of effective learning management and assessment in promoting students' mathematical proficiency and problem-solving abilities. The guidelines and

jel.ccsenet.org
Journal of Education and Learning
Vol. 12, No. 6; 2023

recommendations provided in the study aimed to enhance the quality of teaching and learning mathematics at the elementary level, ultimately contributing to the development of competent and passionate teachers who positively impact their students, communities, and society as a whole.

8. Recommendation

The research recommendation is that. Firstly, focus on professional development programs for instructors to improve their learning management and assessment abilities. Secondly, adopt student-centric learning approaches to encourage practical learning, problem-solving, and critical thinking. Thirdly, implement guidelines for learning management, promoting inspiration, and adjusting concepts. Fourthly, emphasize formative assessment for continuous improvement of learners. Collaboration, feedback, and technology integration are also important. By following these recommendations, institutions can enhance mathematics education, nurture students' interest in the subject, and equip them with essential 21st-century skills. Continuous improvement and research are encouraged to adapt to the changing educational landscape and ensure favorable outcomes for students in the future.

Acknowledgments

References

Baturina, R. V., & Khasanova, G. B. (2020). Mathematical Training as a Means of Forming the General Scientific Competency of Economists. *Universal Journal of Educational Research*, *8*, 6116–6123. https://doi.org/10.13189/ujer.2020.082247

Goos, M. (2014). *Mathematics classroom assessment* (pp. 413–417). https://doi.org/10.1007/978-94-007-4978-8_104

Harun, M., & Helsa, Y. (2013). The Development of Mathematics Assessment model in elementary school. In Zulkardi (Ed.), *The First South East Asia Design*. Development Research (SEA-DR) International Conference, 22–23 April 2013, Palembang, Indonesia.

Hendri, S., Kenedi, A. K., Helsa, Y., & Anita, Y. (2019). *Elementary School Teacher Ability in Using Application Technology for Mathematics Learning Assessment in the 2013 Curriculum* (pp. 446–449).

Institute for the Promotion of Teaching Science and Technology (IPST). (2017). *A manual for the curriculum of learning subjects* (Mathematics revised ed., 2017). According to The Basic Education Core Curriculum 2008, Bangkok: Institute for the Promotion of Teaching Science and Technology. Ministry of Education.

Kemmis, S., & McTaggart, R. (1998). *The Action Research Planner* (3rd ed). Boston: Pearson Education.

Khuzwayo, M. E., & Khuzwayo. H. B. (2020). Baseline Assessment in the Elementary Mathematics Classroom: Should it be Optional or Mandatory for Teaching and Learning? *International Journal of Learning, Teaching and Educational Research*, *19*(8), 330–349. https://doi.org/10.26803/ijlter.19.8.18

Lehtinen, E., Hannula-Sormunen, M., McMullen, J., & Gruber, S. (2017). Cultivating mathematical skills: from drill-and-practice to deliberate practice. *Zdm*, *49*(4), 625–636. https://doi.org/10.1007/s11858-017-0856-6

Mahmud, M. N., Retnawati, H., Yusron, E., & Rachmayanti, E. (2021). Exploring the alternative assessment on mathematical instruction in an era of uncertainty. *Jurnal Prima Edukasia*, *9*(2), 261–271. https://doi.org/10.21831/jpe.v9i2.39212

Mejias, S., Muller, C., & Schiltz, C. (2019). Assessing Mathematical School Readiness. *Frontiers in Psychology*, *10*, 1173–1173. https://doi.org/10.3389/fpsyg.2019.01173

Ministry of Education. (2017). *Learning standards and indicators. Mathematics, Science and geography in the learning group Social Studies, Religion and Culture* (revised edition 2017). According to the Basic Education Core Curriculum 2008, Bangkok: Office of the Basic Education Commission (OBEC).

Mitchell, H. L. (2010). *Mathematics assessment and teaching in two elementary classrooms*. A Dissertation Doctor of Philosophy, The University of Georgia.

Noinon, P. (2016). *A Development of the 21st Century Learning Assessment Model for Sciences in Matayomsuksa 4*. Thesis, Doctor of Philosophy degree in Educational Research and Evaluation, Mahasarakham University,

Mahasarakham.

Papadakis, S., Kalogiannakis, M., & Zaranis, N. (2016a). Comparing tablets and PCs in teaching mathematics: An attempt to improve mathematics competence in early childhood education. *Preschool and Primary Education*, *4*(2), 241–253. https://doi.org/10.12681/ppej.8779

Papadakis, S., Kalogiannakis, M., & Zaranis, N. (2016b). Improving Mathematics Teaching in Kindergarten with Realistic Mathematical Education. *Early Childhood Education Journal*, *45*(3), 369–378. https://doi.org/10.1007/s10643-015-0768-4

Papadakis, S., Kalogiannakis, M., & Zaranis, N. (2018). The effectiveness of computer and tablet assisted intervention in early childhood students' understanding of numbers. An empirical study conducted in Greece. *Education and Information Technologies*, *23*(5), 1849–1871. https://doi.org/10.1007/s10639-018-9693-7

Papadakis, S., Kalogiannakis, M., & Zaranis, N. (2021). Teaching mathematics with mobile devices and the Realistic Mathematical Education (RME) approach in kindergarten. *Advance in Obile Learning Education Research*, *1*(1), 5–18. https://doi.org/10.25082/AMLER.2021.01.002

Popa, N. L., & Pauc, R. L. (2015). Dynamic Assessment, Potential Giftedness and Mathematics Achievement in Elementary School. *Acta Didactica Napocensia*, *8*(2), 23–32.

Robiansyah, S. T. U., Nanang, F., & Hidayat. (2018). Development Mathematic Assessment to Increase Mathematical Prerequisite Ability on The Student with Learning Disabilities in Inclusive Elementary School. *IOP Conference Series: Materials Science and Engineering*, *288*(1), 012129. https://doi.org/10.1088/1757-899X/288/1/012129

Seehamongkon, Y. (2022). *Learning Assessment and Evaluation*. Mahasarakham; Takasila Press.

Sohilait, E., & Lamasano, Y. (2020). Desain pembelajaran matematika dengan konteks permainan kuli bia pada materi faktor persekutuan terbesar dan kelipatan persekutuan terkecil. *Jurnal Karya Pendidikan Matematika*, *7*(2), 53–66. https://doi.org/10.26714/jkpm.7.2.2020.53-66

Souza, G. H. S., Coelho, J. A. P. M., Esteves, G. G. L., & Lima, N. C. (2020). *Learning Management: An Analytical Approach for Teaching Methodologies Associated with Cognitive Skills* (pp. 111–130). https://doi.org/10.4018/978-1-7998-2124-3.ch007

Sugimoto, A. T., & Rigelman, N. R. (2020). Developing Teacher Candidates' Formative Assessment Practices: Linking Mathematics Teaching to Assessing Student Thinking. In *Handbook of Research on Formative Assessment in Pre-K Through Elementary Classrooms* (pp. 254–280). https://doi.org/10.4018/978-1-7998-0323-2.ch013

Veldhuis, M. (2015). Improving classroom assessment in primary mathematics education. *FIsme Scientific Library* (Utrecht University), *90*, 1–188.

Wakit, A., & Kusumodestoni, R. H. (2018). Analysis of Mathematical Problem-Solving Skills and Student Process Skills in Problem-Based Learning. *Jurnal Ilmiah Pendidikan Matematika*, *1*(2), 130–135. https://doi.org/10.24176/anargya.v1i2.2683

Yotha, N. (2021). *The Development of Learning Management Assessment Based on STEM Education for High School Teachers*. Thesis, Doctor of Philosophy degree in Educational Research and Evaluation, Mahasarakham University, Mahasarakham.