Exploring the Relationship Between Teaching Efficacy and Formative Assessment Literacy Among BSEd Science Pre-service Teachers

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Abstract

Filipino students have continued to perform significantly below international standards, as shown in assessments like PISA. Among the many factors that may contribute to this trend, teachers' assessment literacy, particularly formative assessment literacy, should not be overlooked. Existing literature on assessment literacy remains largely general in scope, predominantly focused on in-service language teachers, and rarely examines formative assessment literacy in relation to other psychological constructs such as teaching efficacy. To address these gaps, this study investigated the relationship between teaching efficacy and formative assessment literacy among BSEd Science pre-service teachers, anchored in Bandura's self-efficacy theory. Employing a descriptive correlational design, the study involved 86 respondents who had completed their teaching internship in the school year 2025-2026. Data were gathered using adapted instruments, which are self-report questionnaires, measuring teaching efficacy and formative assessment literacy. Results revealed a very high level of teaching efficacy across instruction, motivation, and classroom management. Formative assessment literacy was likewise rated very high across the conceptual, practical, and socio-emotional dimensions. Spearman's correlation further revealed that teaching efficacy for instruction had a moderately significant relationship with the conceptual and practical dimensions and a weaker relationship with the socio-emotional dimension of formative assessment literacy. Similarly, teaching efficacy for motivation showed a moderately significant relationship with the conceptual, practical, and socio-emotional dimensions. Likewise, teaching efficacy for classroom management demonstrated a moderately significant relationship across all dimensions of formative assessment literacy. These findings support strengthening teacher education programs, fostering formative assessment literacy and teaching efficacy as pre-service teachers progress toward professional practice.

Keywords: Descriptive correlational design; formative assessment literacy; pre-service teachers; self-efficacy theory; teaching efficacy

Introduction

PISA results, both in 2018 and 2022, showed that students in the Philippines scored lower than the OECD average in Mathematics, Reading, and Science (Congressional Policy and Budget Research Department, 2024). These findings raise questions about potential issues with the quality of the country's educational system, particularly the effectiveness of teaching and assessment practices (Agawin & Alferez, 2024). There are many factors that contribute to this achievement trend, but teachers' assessment literacy is one thing that should not be overlooked (Rozilat et al., 2023).

In the educational process, assessment is an integral component that influences both teaching and learning (Levy-Feldman & Libman, 2022). Teachers are vital in this process (Sollesta & Despojo, 2025), and their role in regularly assessing students' performance and progress enables them to adjust their teaching according to the needs of their students (Rösken et al., 2024), leading to a more effective and efficient learning experience (Andrade & Heritage, 2018). Among the various forms of assessment, formative assessment acts as a powerful instrument to improve student achievement (Wu & Yu, 2025). Unlike summative assessment, which measures learning after instruction, formative assessment occurs during the learning process and provides timely feedback that guides both teachers and students (Nhan, 2024). Formative assessment literacy, therefore, is an interrelated set of knowledge, skills, and dispositions that a teacher can use to design and implement appropriate, context-based assessments with an aim to promote learning and improve teaching (Yan & Pastore, 2022).

Equally important is teaching efficacy which is defined as teachers' personal (i.e., self-perceived) belief about their abilities to successfully carry out tasks related to teaching (Bandura, 1997). According to Xie et al. (2022), the concept of teaching efficacy refers to teachers' personal beliefs about their capability that they could influence students' performance. Research has shown that educators who had high levels of self-efficacy were more willing to try out new teaching techniques, set more ambitious objectives, were more organized and planned, focused on finding solutions to problems, asked for help when needed, and modified their lesson plans when things got tough (Reyes, 2020 as cited Sangcad & Abarquez, 2024). Despite the well-documented importance of both teaching efficacy and formative assessment literacy as independent constructs, their relationship remains underexplored. Also, existing literature on assessment literacy remains largely general in scope, predominantly focused on in-service language teachers.

To address these gaps, this study investigated the relationship between teaching efficacy and formative assessment literacy among BSEd Science pre-service teachers. This research is particularly significant because

if the competencies that pre-service teachers must improve to achieve higher teaching efficacy and formative assessment literacy are identified, then teachers can be trained within these specific competencies. Overall, the findings from this study could help provide insights to teacher education institutions and education policymakers as they craft policies, programs, interventions, and trainings that would motivate all teachers to strengthen their teaching efficacy and enhance their formative assessment literacy.

1.1. Theoretical Framework

This study is anchored in self-efficacy theory, which originated from Albert Bandura's Social Cognitive Theory. Self-efficacy is defined as a person's belief in their ability to succeed in a specific situation or accomplish a specific task (Bandura, 1977). It specifically refers to the individual's evaluation of their capability to achieve a goal. In other words, it is a self-assessment of one's ability to handle a task (Yokoyama, 2019). In education, teachers' self-efficacy is crucial because it shapes how they view their teaching abilities (Kazanopoulos et al., 2022). For example, higher teaching self-efficacy among pre-service and in-service teachers indicates readiness to support, carry out, and commence positive change, persevere with difficulties, and be open to new ideas (Cerit, 2019; Charalambous & Philippou, 2010). These qualities help achieve specific teaching goals (MA & Cavanagh, 2018). In a study by Yan and Cheng (2015), self-efficacy was found to be the strongest predictor of teachers' intention to conduct formative assessment. Rozilat et al. (2023) noted that teachers with high self-efficacy in assessment are more likely to engage in effective assessment practices and to have a positive impact on student learning. These teachers are confident in their ability to design and implement assessments that are aligned with instructional goals, provide constructive feedback, and support students' progress. This theory relates to the current study, emphasizing pre-service teachers' beliefs in their own formative assessment capabilities.

1.2. Conceptual Framework

A recent systematic review indicates that research regarding formative assessment literacy is still emerging, highlighting a strong concentration of studies among language teachers (Lei & Lei, 2026). Also, a few studies have examined how formative assessment literacy relates to other psychological constructs, such as teaching efficacy. Given the limited availability of empirical studies on the relationship between these two variables and the need to explore teachers from different teaching environments, such as BSEd Science pre-service teachers, the primary goal of this study is to determine the extent of teaching efficacy and formative assessment literacy among BSEd Science pre-service teachers and to determine the relationship between them.

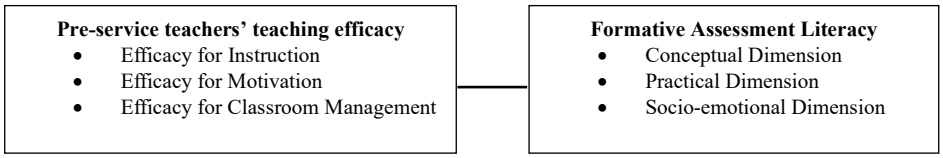

Fig. 1 Conceptual Framework of the Study

1.3. Statement of Problem

This study aimed to determine the relationship between teaching efficacy and formative assessment literacy among BSEd Science pre-service teachers in one of the universities in Tacloban City during the school year 2025-2026. Specifically, it sought answers to the following research questions:

1. What is the extent of BSEd Science pre-service teacher's teaching efficacy in terms of:
   1.1. instruction;
   1.2. motivation: and
   1.3. classroom management?

2. What is the extent of formative assessment literacy among BSEd Science pre-service teachers in terms of:
   2.1. conceptual dimension;
   2.2. practical dimension; and
   2.3. socio-emotional dimension?

3. Is there a significant relationship between teaching efficacy for instruction and formative assessment literacy among BSEd Science pre-service teachers in terms of:
   3.1. conceptual dimension;
   3.2. practical dimension; and
   3.3. socio-emotional dimension?

4. Is there a significant relationship between teaching efficacy for motivation and formative assessment literacy among BSEd Science pre-service teachers in terms of:
   4.1. conceptual dimension;
   4.2. practical dimension; and
   4.3. socio-emotional dimension?

5. Is there a significant relationship between teaching efficacy for classroom management and formative assessment literacy among BSEd Science pre-service teachers in terms of:
   5.1. conceptual dimension;
   5.2. practical dimension; and
   5.3. socio-emotional dimension?

1.4. Research Hypotheses

In reference to the research questions, the researcher formulated the following hypotheses:

1. There is no significant relationship between teaching efficacy for instruction and formative assessment literacy in terms of conceptual dimension, practical dimension, and socio-emotional dimension.
2. There is no significant relationship between teaching efficacy for motivation and formative assessment literacy in terms of conceptual dimension, practical dimension, and socio-emotional dimension.
3. There is no significant relationship between teaching efficacy for classroom management and formative assessment literacy in terms of conceptual dimension, practical dimension, and socio-emotional dimension.

2. Methodology

2.1. Research Design

This study utilized a descriptive-correlational design. This approach allowed the researcher to describe the extent or current levels of variables without altering any conditions, while also identifying whether a statistically significant correlation exists between them (Avila & Baguio, 2025). Hence, descriptive-correlational design is appropriate for this study since it focuses on the description of the phenomena and determines the relationship between the identified variables. In this study, the pre-service teachers' teaching efficacy in terms of efficacy for instruction, efficacy for motivation, and efficacy for classroom management was described using descriptive statistics. Similarly, formative assessment literacy among pre-service teachers, in terms of the conceptual, practical, and socio-emotional dimensions, was described using descriptive statistics. Lastly, this study also investigated the relationship between teaching efficacy in terms of efficacy for instruction, efficacy for motivation, and efficacy for classroom management and formative assessment literacy in terms of conceptual, practical, and socio-emotional dimensions among BSEd Science pre-service teachers.

2.2. Research Respondents

The respondents of this study were the BSEd Science pre-service teachers in one of the universities in Tacloban City. The population comprises of BSEd Science pre-service teachers who completed their teaching internship during the academic year 2025–2026. This population was chosen because they had already completed the required content coursework, finished all field study courses, and completed a semester of teaching internship in the cooperating school, providing meaningful results essential to the study's purpose. Total enumeration sampling is used when the total population of a target group is small and manageable, and when all members share a distinct and specific characteristic. In this study, the total population consists of 87 individuals who have all completed the same teaching preparation program at a state university. Given that the population is limited in size and bounded by the same inclusion criteria, total enumeration sampling was considered the most appropriate method for this study. This approach ensures that every member of the population is included in the data collection process, eliminating the need for random selection. By including all 87 respondents, the study is able to achieve a more comprehensive and accurate representation of the target group.

2.3. Research Instruments

This study utilized an adapted survey questionnaire. Part 1 of the research questionnaire asked for the respondent's basic information. Part II focused on pre-service teachers' teaching efficacy, while Part 3 concerns the formative assessment literacy. The teaching efficacy was adapted from Nie et al. (2012). This research instrument was designed to help the researcher gain a deeper understanding of the factors that create difficulties for pre-service teachers during their teaching internship This instrument consists of 12 items across three dimensions: Efficacy in Instruction (4 items), Efficacy in Motivation (4 items), and Efficacy in Classroom

Management (4 items). The instrument uses a 5-point Likert scale providing five possible responses ranging from 1 (none at all) to 5 (a great deal), i.e., (1 = none at all, 2 = very little, 3 = some degree, 4 = quite a bit, and 5 = a great deal). Below is the interpretation scale to describe and interpret the results of the pre-service teachers' teaching efficacy.

Table 1. Interpretation Scale for the Pre-service Teachers' Teaching Efficacy

Range	Descriptive Level	Interpretation
4.20 – 5.00	Very High	The teaching efficacy of pre-service teachers is always evident.
3.40 – 4.19	High	The teaching efficacy of pre-service teachers is oftentimes evident.
2.60 – 3.39	Moderate	The teaching efficacy of pre-service teachers is occasionally evident.
1.80 – 2. 59	Low	The teaching efficacy of pre-service teachers is seldom evident.
1.00 – 1.79	Very low	The teaching efficacy of pre-service teachers is never evident.

The formative assessment literacy was adapted from Yan and Pastore (2022). This instrument is a self-report instrument to comprehensively assess BSEd Science pre-service teachers across three dimensions: Conceptual dimension (7 items), Practical Dimension (8 items), and Socio-emotional Dimension (7 items). The respondents were required to rank the items using a 5-point Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, and 4 = agree, and 5= strongly agree. Below is the interpretation scale to describe and interpret the results of the pre-service teachers' formative assessment literacy.

Table 2. Interpretation Scale for the Pre-service Teachers' Formative Assessment Literacy

Range	Descriptive Level	Interpretation
4.20 – 5.00	Very High	The formative assessment literacy of pre-service teachers is comprehensive.
3.40 – 4.19	High	The formative assessment literacy of pre-service teachers is sufficient.
2.60 – 3.39	Medium	The formative assessment literacy of pre-service teachers is moderate.
1.80 – 2. 59	Low	The formative assessment literacy of pre-service teachers is limited.
1.00 – 1.79	Very low	The formative assessment literacy of pre-service teachers is insufficient.

Validation of these instruments was conducted using the rating scale adapted from Waltz and Bausell (1983) and interpreted according to Lynn's (1986) criteria. The content validators were three experts in the fields of language and science education. Based on the validation results, no items were removed, confirming the instruments' content validity. Furthermore, pilot testing for internal consistency was conducted, yielding Cronbach's Alpha coefficients of 0.873 and 0.969 for the teaching efficacy and formative assessment literacy instruments, respectively; hence, all items were included in the survey questionnaire.

2.4. Data Gathering Procedure

After obtaining the university president's approval to conduct the study, the researcher formally contacted each respondent to confirm their preferred method of providing consent. All respondents completed the survey via Google Forms, and a copy of their responses was emailed to the address they provided. In compliance with the Data Privacy Act of 2012, the information gathered from this research study was kept strictly private. To ensure anonymity, any identifying information was removed before analyzing the data. The researcher did not include any details that could identify individual respondents, ensuring that responses could not be linked to specific individuals. Moreover, confidentiality was maintained to the degree permitted by the technology used; however, participation in this online survey involved risks similar to those encountered in everyday internet usage.

Regarding the Data Protection Plan, all responses recorded via Google Forms were stored in a private, password-protected Google account and on a personal computer accessible only by the researcher. Most importantly, no third parties were granted access to the raw data files. Once the research was completed and the final paper was approved, all responses were stored in Google Forms and temporary files from the personal computer (e.g., downloaded CSV/Excel files) were permanently deleted from both the cloud and local storage to ensure no long-term records remained.

The researcher intends to disseminate the findings of this study through multiple channels to maximize its reach and impact within the educational community. Primary dissemination will be carried out through open-access journal publications and the submission of a copy to the university library, making the study freely accessible to researchers and students alike. The findings will also be presented at an international conference and shared on social media platforms such as Facebook, enabling broader engagement both within and outside academia. To ensure practical application, the researcher crafted explicit and actionable recommendations for teachers, school administrators, and teacher education institutions and will be open to invitations to present the findings directly to educational stakeholders. Finally, the researcher welcomes collaboration with other

researchers who wish to replicate or build upon the study, with the collective goal of bridging the gap between research and practice to drive meaningful improvements in educational policy and instruction.

2.5. Data Analysis

The study employed descriptive and inferential statistics to analyze the data gathered from the survey questionnaire. For the descriptive component, the mean and standard deviation were used to determine the extent of teaching efficacy and formative assessment literacy among BSEd Science. Before analysis, the data were checked for missing values and cleaned, during which one outlier was identified and removed to ensure the dataset's accuracy. Since the study uses a Likert scale for both teaching efficacy and formative assessment literacy, these two variables were measured on an ordinal scale. Moreover, a Kolmogorov-Smirnov test revealed that the data for both variables significantly deviated from a normal distribution (p<.001). Hence, Spearman's Rank-Order Correlation Coefficient (Spearman's rho) was employed as an inferential statistical tool to determine the relationship between teaching efficacy in terms of efficacy for instruction, efficacy for motivation, and efficacy for classroom management and formative assessment literacy in terms of conceptual, practical, and socio-emotional dimensions among BSEd Science pre-service teachers. All inferential statistics were measured at the 0.05 level of significance. Finally, the statistical software Jamovi was used to analyze and present the data from this study.

3. Results and Discussion

This chapter presents the results of the data analysis, organized according to the study's research questions and supported by statistical data. Tables were used to present the findings.

3.1. Extent of Teaching Efficacy among BSEd Science Pre-service Teachers

Table 3. Extent of Teaching Efficacy in terms of Efficacy for Instruction

	Indicators	Mean	SD	Descriptive Level
1.	How well can you respond to difficult question from your students?	4.31	0.559	Very High
2.	How well can you provide appropriate challenges for very capable students?	4.33	0.583	Very High
3.	How well can you implement alternative strategies in your classroom?	4.35	0.569	Very High
4.	How well can you provide an alternative explanation or example when students are confused?	4.47	0.588	Very High
	Overall	**4.36**	**0.483**	**Very High**

Note: Interpretation: 1.00 – 1.79: never evident; 1.80 – 2. 59: seldom evident 2.60 – 3.39: occasionally evident; 3.40 – 4.19: oftentimes evident; 4.20 – 5.00: always evident

Table 3 reflects the findings on the extent of teaching efficacy in terms of efficacy for instruction among BSEd Science pre-service teachers. It shows that the overall mean is 4.36, in a very high level. This result means that the pre-service teachers teaching efficacy in terms of efficacy for instruction was always evident.

All indicators were very high which means that pre-service teachers reported that it is always evident among them. Specifically, the BSEd Science pre-service teachers demonstrate particular strength in efficacy for instruction, as seen in their confidence in providing alternative explanations when students are confused (M= 4.47, SD= .588). This aligns with Ali et al. (2024), where they found that 75.5% of respondents affirmed that teachers who provide clear explanations contribute to students' comprehension and confidence. The high efficacy for instruction among BSEd Science pre-service teachers, particularly in offering alternative explanations (M=4.47, SD= .588), suggests that they perceived themselves as well-prepared to deliver the kind of instructional clarity that supports student learning.

Finally, the first three indicators such as responding to difficult questions (M= 4.31, SD= .559), providing appropriate challenges for capable students (M= 4.33, SD= .583), and implementing alternative classroom strategies (M= 4.35, SD= .569), also reflect very high result, though slightly lower than the fourth indicator. This slight variation may be attributed to the nature of these skills, which according to Bandura (1997), are refined through mastery experiences and prolonged pedagogical practice which are opportunities that pre-service teachers have yet to fully accumulate, as these are expected to develop further once they enter the professional teaching field.

Table 4. Extent of Teaching Efficacy in terms of Efficacy for Motivation

	Indicators	Mean	SD	Descriptive Level
5.	How well can you help your students value learning?	4.51	0.569	Very High
6.	How well can you motivate students who show low interest in schoolwork?	4.53	0.547	Very High
7.	How well can you improve the understanding of a student who is failing?	4.44	0.566	Very High
8.	How well can you get through to the most difficult students?	4.37	0.633	Very High
	OVERALL	**4.47**	**0.484**	**Very High**

Note: Interpretation: 1.00 – 1.79: never evident; 1.80 – 2. 59: seldom evident 2.60 – 3.39: occasionally evident; 3.40 – 4.19: oftentimes evident; 4.20 – 5.00: always evident

Table 4 reflects the findings on the extent of teaching efficacy in terms of efficacy for motivation among BSEd Science pre-service teachers. It shows that the overall mean is 4.47, in a very high level. This result means that the pre-service teachers teaching efficacy in terms of efficacy for motivation is always evident.

The BSEd Science pre-service teachers perceive themselves as very capable of motivating students who show low interest in school work (M=4.53, SD= .547), helping students value learning (M=4.51, SD= .569), and are able to improve the understanding of a student who is failing (M=4.44, SD= .566), emphasizing the BSEd Science pre-service teachers' efficacy in creating a safe, engaging, and positive learning environment. Indeed, pre-service teachers demonstrate motivational strategies for developing and maintaining student engagement in the classroom (Maba et al., 2025).

The indicator on getting through to the most difficult students yielded a slightly lower mean (M= 4.37, SD= .633) compared to the other motivational efficacy indicators, though still at a Very High level. This aligns with Lam et al. (2023), who noted that novice EFL teachers encounter more difficulties in dealing with students' low motivation, possibly because the very first teaching experience is easily recognized as a shocking experience (Caspersen & Raaen, 2014, as cited in Lam et al., 2023). Furthermore, pre-service teachers' self-efficacy remains malleable and the stress of the classroom is tremendous in the early years of their teaching career (Day et al., 2007, as cited in Lam et al., 2023)

Table 5. Extent of Teaching Efficacy in terms of Efficacy for Classroom Management

	Indicators	Mean	SD	Descriptive Level
9.	How well can you make your expectations clear about student behavior?	4.44	0.606	Very High
10.	How well can you get students to follow classroom rules?	4.49	0.589	Very High
11.	How well can you control disruptive behavior in the classroom?	4.43	0.642	Very High
12.	How well can you keep a few problematic students from ruining an entire lesson?	4.43	0.624	Very High
	OVERALL	**4.45**	**0.515**	**Very High**

Note: Interpretation: 1.00 – 1.79: never evident; 1.80 – 2. 59: seldom evident 2.60 – 3.39: occasionally evident; 3.40 – 4.19: oftentimes evident; 4.20 – 5.00: always evident

Table 5 reflects the findings on the extent of teaching efficacy in terms of efficacy for classroom management among BSEd Science pre-service teachers. It shows that the overall mean is 4.47, in a very high level. This result means that the pre-service teachers teaching efficacy in terms of efficacy for motivation is always evident.

Among the indicators, getting students to follow classroom rules obtained the highest mean score (M = 4.49, SD = 0.589), followed by making expectations clear about student behavior (M = 4.44, SD = 0.606). Controlling disruptive behavior and keeping problematic students from ruining a lesson both yielded the same mean score (M = 4.43, SD = 0.642 and 0.624, respectively). Overall, the findings affirm that the BSEd Science pre-service teachers perceive themselves as capable in managing students during class, particularly in establishing structure and behavioral expectations.

Table 6. Summary of the Extent of Teaching Efficacy among BSEd Science Pre-service Teachers

Domains	Mean	SD	Descriptive Level
Efficacy for Instruction	4.36	0.483	Very high
Efficacy for Motivation	4.47	0.484	Very high
Efficacy for Classroom Management	4.45	0.515	Very high
Overall Teaching Efficacy	**4.43**	**0.421**	**Very high**

Table 6 summarizes the overall extent of teaching efficacy among BSEd Science pre-service teachers across three domains. Overall, the pre-service teachers demonstrated a very high level of teaching efficacy (M = 4.43, SD = 0.421). Among the three domains, efficacy for motivation obtained the highest mean (M = 4.47, SD = .484), followed by efficacy for classroom management (M = 4.45, SD= .515), and efficacy for instruction (M = 4.36, SD= .483).

The overall high level of teaching efficacy may reflect the adequate and structured training provided by the College of Education through its coursework and practice teaching experiences. However, it is worth noting that these results are based on self-reported efficacy beliefs rather than observed classroom performance, and as such, future classroom observations may be conducted to validate these findings.

3.2. Extent of Formative Assessment Literacy among BSEd Science Pre-service Teachers

Table 7. Extent of Formative Assessment Literacy in terms of Conceptual Dimension

	Indicators	Mean	SD	Descriptive Level
1.	I have the ability to explain formative assessment.	4.45	0.524	Very High
2.	I understand that formative assessment can help identify students' learning needs.	4.56	0.523	Very High
3.	I believe that formative assessment tasks need to be aligned with learning objectives.	4.65	0.526	Very High
4.	I understand that formative assessment tasks should elicit evidence about students' learning.	4.58	0.519	Very High
5.	I know that the outcomes from the formative assessment are essential for teachers to help students' learning needs.	4.56	0.545	Very High
6.	I think students should be engaged in the formative assessment in order to promote learning.	4.60	0.515	Very High
7.	I know diverse methods that allow students to demonstrate their learning.	4.58	0.519	Very High
	OVERALL	**4.57**	**0.451**	**Very High**

Note: Interpretation: 1.00 – 1.79: insufficient; 1.80 – 2. 59: limited; 2.60 – 3.39: Moderate; 3.40 – 4.19: sufficient; 4.20 – 5.00: comprehensive

Table 7 presents an overall mean of 4.57 (SD= 0.451) with a descriptive level of very high which indicates that the extent of formative assessment literacy in terms of conceptual dimension among BSEd Science pre-service teachers was comprehensive. The highest mean score was recorded for believing that formative assessment tasks should be aligned with learning objectives (M = 4.65, SD = 0.526), followed by thinking that students should be engaged in formative assessment to promote learning (M = 4.60, SD = 0.515). The remaining indicators, including understanding the role of formative assessment in identifying learning needs, knowing its outcomes, and knowing diverse methods for demonstrating learning, all yielded mean scores ranging from 4.56 to 4.58, consistently reflecting a Very High level. These results indicate that pre-service teachers are well-grounded in the foundational concepts of formative assessment through their professional education courses which were further reinforced during their teaching internship. The results corroborate with the study of Gaikwad et al. (2023) where they posited that assessment literacy is demonstrated when teachers possess sufficient understanding of assessment, as well as the capacity to comprehend its shifting paradigm from teachers to learners and from traditional to alternative assessments.

Finally, the ability to explain formative assessment obtained the lowest mean score among the indicators (M = 4.45, SD = 0.524), though it still falls within the Very High range. This finding suggests that BSEd Science pre-service teachers are still very capable of explaining formative assessment, even if it is slightly lower compared to the other indicators. Overall, the findings reflect a well-grounded foundation in terms of the conceptual understanding of formative assessment principles among BSEd Science pre-service teachers.

Table 8. Extent of Formative Assessment Literacy in terms of Practical Dimension

	Indicators	Mean	SD	Descriptive Level
8.	I use a variety of assessment methods that allow students to demonstrate their learning.	4.50	0.548	Very High
9.	I teach students to engage in peer feedback processes.	4.50	0.569	Very High
10.	I help students to develop self-assessment skills.	4.45	0.587	Very High
11.	I engage students in using feedback information in subsequent tasks.	4.51	0.548	Very High
12.	Based on assessment results, I show students what they need to do in order to improve their learning.	4.57	0.498	Very High
13.	I train students to act on assessment feedback information to improve their learning.	4.45	0.567	Very High
14.	I clarify assessment purposes to students.	4.55	0.501	Very High

15.	I share assessment criteria with students.	4.58	0.519	Very High
	OVERALL	**4.51**	**0.444**	**Very High**

Note: Interpretation: 1.00 – 1.79: insufficient; 1.80 – 2. 59: limited; 2.60 – 3.39: Moderate; 3.40 – 4.19: sufficient; 4.20 – 5.00: comprehensive

Table 8 shows an overall mean score of 4.51 (SD= .444) which is very high, indicating that the extent of formative assessment literacy in terms of practical dimension among BSEd Science pre-service teachers was comprehensive. Among the indicators, "*I share assessment criteria with students*" has the highest mean score (M= 4.51, SD =.519). This result aligns with Wiliam and Thompson's (2008) framework as cited by Yan et al. (2022) which emphasizes about clarifying and sharing learning intentions and criteria for success, so students understand what is expected and how their progress will be judged. On the other hand, across all indicators, "*I help students to develop self-assessment skills"* (M = 4.45, SD = 0.587) and "*I train students to act on assessment feedback information to improve their learning"* (M = 4.45, SD = 0.567) were reported to have the lowest mean scores suggesting that while they report a very high level of efficacy for these practices, fostering self-assessment skills and training students to act on assessment feedback remains a relative area for further development compared to other assessed competencies.

Table 9. Extent of Formative Assessment Literacy in terms of Socio-emotional Dimension

	Indicators	Mean	SD	Descriptive Level
16.	I am aware of the need to create a common understanding of formative assessment among teachers and students.	4.57	0.543	Very High
17.	I attend to students' emotional responses to assessments.	4.57	0.498	Very High
18.	I recognize that students' values, beliefs, and attitudes impact how they experience the process of formative assessment.	4.59	0.517	Very High
19.	I am aware of the impact assessment feedback information might have on students' learning motivation.	4.53	0.547	Very High
20.	I am sensitive to the ethical aspects of formative assessment, such as fairness and student privacy.	4.58	0.542	Very High
21.	I am aware of my responsibilities to cater for students' well-being during the formative assessment process.	4.62	0.489	Very High
22.	I am conscious of the fact that students have the right to benefit from formative assessment practices.	4.60	0.492	Very High
	OVERALL	**4.58**	**0.433**	**Very High**

Note: Interpretation: 1.00 – 1.79: insufficient; 1.80 – 2. 59: limited; 2.60 – 3.39: Moderate; 3.40 – 4.19: sufficient; 4.20 – 5.00: comprehensive

Table 9 presents the extent of formative assessment literacy in terms of the socio-emotional dimension. All indicators were rated at a Very High descriptive level (M = 4.58, SD = 0.433 overall), indicating that teachers demonstrated a consistently strong socio-emotional awareness in the context of formative assessment. This finding implies that assessment-literate pre-service teachers do not only have very higher level of theoretical knowledge but also have very high literacy in the implementation of formative assessment in the socio-emotional aspects of the learning process. While this result reported very high level in socio-emotional dimension, the findings of Çibukçiu and Koliqi (2026) revealed that participating teachers in their study have a higher level of theoretical knowledge and practical skills for the formative assessment, with the remaining challenges mostly in the active inclusion of students and in sensitivity towards socio-emotional factors. Among the indicators, awareness of responsibilities to cater for students' well-being during the formative assessment process yielded the highest mean score (M = 4.62, SD = 0.489), closely followed by consciousness of students' right to benefit from formative assessment practices (M = 4.60, SD = 0.492). These two indicators reflect well-defined and concrete responsibilities, which may explain why BSEd Science pre-service teachers rated themselves most confidently in these areas.

Table 10. *Summary on the Extent of Formative Assessment Literacy among BSEd Science Pre-service Teachers*

Domains	Mean	SD	Descriptive Level
Conceptual Dimension	4.57	0.451	Very high
Practical Dimension	4.51	0.444	Very high
Socio-emotional dimension	4.58	0.433	Very high
Overall Formative Assessment Literacy	**4.56**	**0.407**	**Very high**

Table 10 shows a higher mean score in the socio-emotional dimension (M= 4.58; SD= .433), followed by the conceptual dimension (M= 4.57; SD= .451), with a slightly lower mean score for the practical dimension (M= 4.51; SD= .444). The findings partially align with international literature. While Xu and Brown (2016) indicate that teachers tend to score higher in the conceptual dimension and lower in practical and affective dimensions,

the present study found the socio-emotional dimension to be slightly higher than the conceptual dimension, though both scored closely. Consistent with the literature, however, the practical dimension yielded the lowest mean among the three. The overall very high level of formative assessment literacy across all dimensions suggests that their pre-service training is effectively equipping pre-service teachers with the necessary knowledge, dispositions, and skills for formative assessment. The practical dimension yielded the slightly lower mean (M = 4.51, SD = 0.444), particularly in areas in the areas of helping students develop self-assessment skills and training students to act on assessment feedback to improve their learning, suggesting that teacher preparation programs may consider further strengthening training in these specific areas.

3.3. Relationship between Teaching Efficacy and Formative Assessment Literacy Among BSEd Science Pre-service Teachers

Table 11. Relationship between teaching efficacy for instruction and each dimension of formative assessment literacy

Efficacy for Instruction					
Dimension	**Spearman's rho**	**df**	**p-value**	**Interpretation**	**Decision**
Conceptual	0.440***	84	<.001	Significant	Reject the Null
Practical	0.467***	84	<.001	Significant	Reject the Null
Socio-emotional	0.273*	84	0.011	Significant	Reject the Null

Note. * p < .05, ** p < .01, *** p < .001

Table 11 shows that all three dimensions of formative assessment literacy were significantly and positively associated with efficacy for instruction, with practical dimension demonstrated the strongest correlation with efficacy for instruction ($r_s(84) = 0.467$, $p < .001$). This finding suggests that practical competencies play a central role in shaping instructional efficacy. Similarly, the conceptual dimension showed a moderate positive relationship and significant correlation ($r_s(84) = 0.440$, $p<.001$), reflecting that a solid conceptual understanding is closely linked to instructional effectiveness. The near-equal strength of these two dimensions suggests that both knowledge and application are comparably important contributors to instructional efficacy, both reflecting a moderate positive relationship.

The socio-emotional dimension, while also statistically significant ($r_s(84) = 0.273$, $p=.011$), yielded a notably weaker correlation compared to the other two dimensions. This finding is consistent with Gebre et al. (2025), whose meta-analysis of 21 studies similarly revealed a weak positive relationship between teachers' socio-emotional competence and student engagement, suggesting that the weaker association observed in the present study reflects a broader empirical pattern. This may further be explained by the nature of socio-emotional competencies, which are inherently relational and experiential. Although the pre-service teachers were given the opportunity to apply formative assessment competencies during their internship, a semester of internship experience may not have been sufficient to fully translate socio-emotional literacy into consistent instructional practice.

Regarding the first hypothesis, we have to reject the null, indicating that there is a significant relationship between efficacy for instruction and each dimension of formative assessment literacy among BSEd Science pre-service teachers.

Table 12. Relationship between teaching efficacy for instruction and each dimension of formative assessment literacy

Efficacy for Motivation					
Dimension	**Spearman's rho**	**df**	**p-value**	**Interpretation**	**Decision**
Conceptual	0.405***	84	<.001	Significant	Reject the Null
Practical	0.550***	84	<.001	Significant	Reject the Null
Socio-emotional	0.482***	84	<.001	Significant	Reject the Null

Note. * p < .05, ** p < .01, *** p < .001

Table 12 revealed that efficacy for motivation was significantly and positively correlated with all three dimensions of formative assessment literacy. The strongest link was with the practical dimension ($r_s(84) =0.550$, $p<.001$), suggesting that efficacy for motivation most directly influences teachers' ability to apply formative assessment strategies. Among the three dimensions, the conceptual dimension showed the lowest correlation with efficacy for motivation ($r_s(84)=0.405$, $p<.001$), though still moderate and significant, suggesting that while motivational confidence relates to all dimensions of formative assessment literacy, its association with theoretical understanding is comparatively less pronounced than with the practical and socio-emotional dimensions; meanwhile, the relationship between efficacy for motivation and socio-emotional dimension ($r_s(84)=0.482$, $p<.001$) reflects that engaging students emotionally connects to assessment responsiveness.

These moderate positive correlations may reflect the practical reality of the challenges experienced by teachers in motivating and engaging students. As Narayanan et al. (2021) noted, self-efficacy is highly

situational and variable in nature, meaning that pre-service teachers' confidence in motivating students may fluctuate depending on their experiences, which in turn inconsistently drives the development of their formative assessment literacy. This highlights the room for growth among BSEd Science pre-service teachers in more consistently translating their motivational efficacy during the assessment process.

Regarding the second hypothesis, we have to reject the null, indicating that there is a significant relationship between efficacy for motivation and each dimension of formative assessment literacy among BSEd Science pre-service teachers.

Table 13. Relationship between teaching efficacy for classroom management and each dimension of formative assessment literacy

Efficacy for Classroom Management					
Dimension	**Spearman's rho**	**df**	**p-value**	**Interpretation**	**Decision**
Conceptual	0.441***	84	<.001	Significant	Reject the Null
Practical	0.534***	84	<.001	Significant	Reject the Null
Socio-emotional	0.509***	84	<.001	Significant	Reject the Null

Note. * p < .05, ** p < .01, *** p < .001

Table 13 shows a significant moderate positive relationship between teaching efficacy for classroom management and all three dimensions of formative assessment literacy. The highest correlation was found between the practical dimension and efficacy for classroom management ($r_s(84) = .534$, $p < .001$), suggesting that pre-service teachers who perceived greater confidence in managing the classroom also tended to perceive higher competence in implementing formative assessment strategies. This finding supports the view that classroom management and assessment literacy are closely intertwined aspects of instructional competence, as effective assessment practices promote active student participation, which is essential to effective classroom management (Diaz et al., 2023; Almutawa, 2025). This is followed by the socio-emotional dimension ($r_s(84) = .509$, $p<.001$), reflecting that efficacy for classroom management is also meaningfully associated with teachers' ability to engage students emotionally during the assessment process. The lowest correlation was observed with the conceptual dimension ($r_s(84) = .441$, $p<.001$), suggesting that theoretical understanding of formative assessment is comparatively less associated with efficacy for classroom management than its practical and socio-emotional applications. Regarding the third hypothesis, we have to reject the null, indicating that there is a significant relationship between efficacy for classroom management and each dimension of formative assessment literacy among BSEd Science pre-service teachers.

Across all three dimensions of teaching efficacy, the practical dimension of formative assessment literacy consistently demonstrated the strongest correlation, with efficacy for instruction ($r_s(84) = 0.467$, $p< .001$), efficacy for motivation ($r_s(84) = 0.550$, $p<.001$), and efficacy for classroom management ($r_s(84) = 0.534$, $p<.001$), suggesting that practical formative assessment competence has the most consistent and robust relationship with teaching efficacy overall. This pattern highlights that among the three dimensions of formative assessment literacy, the ability to implement formative assessment practices in actual classroom contexts is most closely tied to pre-service teachers' sense of teaching efficacy across instructional, motivational, and classroom management domains.

These results are consistent with Bandura's (1997) self-efficacy theory, which holds that individuals who believe strongly in their ability to perform specific tasks are more likely to engage in related competencies with greater depth and commitment, suggesting that BSEd Science pre-service teachers with a stronger sense of teaching efficacy are correspondingly more inclined to develop and embrace formative assessment literacy in its conceptual, practical, and socio-emotional dimensions.

4. Conclusions

The objective of this study is to determine the relationship between teaching efficacy in terms of efficacy for instruction, efficacy for motivation, and efficacy for classroom management and formative assessment literacy in terms of conceptual, practical, and socio-emotional dimension among BSEd Science pre-service teachers. It was hypothesized that there is no significant relationship between teaching efficacy in terms of efficacy for instruction, efficacy for motivation, and efficacy for classroom management and the dimensions of formative assessment literacy, namely the conceptual, practical, and socio-emotional dimensions. Results revealed that the BSEd Science pre-service teachers demonstrated a very high extent of teaching efficacy across all three dimensions, efficacy for instruction, motivation, and classroom management, indicating that they generally considered themselves highly capable in carrying out core teaching functions.

Regarding the extent of formative assessment literacy among BSEd Science pre-service teachers, the findings revealed a very high level across the conceptual, practical, and socio-emotional dimensions, indicating that their formative assessment literacy was comprehensive. Among the three dimensions, the socio-emotional dimension obtained the highest mean, followed closely by the conceptual dimension, while the practical dimension yielded

the lowest mean score, though all three remained within the very high range. The slightly lower mean in the practical dimension, particularly in competencies related to helping students develop self-assessment skills and training students to act on assessment feedback to improve their learning, suggests that these areas may require further reinforcement and targeted development.

The results of the Spearman rank correlation revealed that teaching efficacy for instruction has a significant relationship with all three dimensions of formative assessment literacy among BSEd Science pre-service teachers. The practical and conceptual dimensions both demonstrated a moderate positive correlation, with the practical dimension yielding the strongest association. The socio-emotional dimension, while also statistically significant, reflected only a weak positive correlation, suggesting that the relationship between instructional efficacy and the interpersonal and emotional aspects of formative assessment is comparatively less strong than that of the practical and conceptual dimensions.

Similarly, the results of the Spearman rank correlation revealed a significant relationship between teaching efficacy for motivation and all three dimensions of formative assessment literacy, with all correlations reflecting a moderate positive relationship. Among the three dimensions, the practical dimension yielded the strongest association while the conceptual dimension demonstrated the lowest, though both remained within the moderate positive range. This consistent pattern suggests that pre-service teachers who perceived themselves as more capable in motivating students also tended to demonstrate higher formative assessment literacy across all dimensions.

Results of the Spearman rank correlation revealed a significant relationship between teaching efficacy for classroom management and all three dimensions of formative assessment literacy, with all correlations reflecting a moderate positive relationship. Among the three dimensions, the practical dimension yielded the strongest association while the conceptual dimension demonstrated the lowest, though both remained within the moderate positive range. This consistent pattern suggests that pre-service teachers who perceived themselves as more capable in managing the classroom also tended to demonstrate higher formative assessment literacy across all dimensions. Furthermore, the study revealed that all three domains of teaching efficacy demonstrated significant moderate positive correlations with all three dimensions of formative assessment literacy. These findings suggest that BSEd Science pre-service teachers who held stronger beliefs in their teaching capabilities also tended to demonstrate higher formative assessment literacy, highlighting the significant association between teaching efficacy and formative assessment literacy in pre-service teacher education.

5. Recommendations

Results from the study revealed a moderate positive correlation between teaching efficacy and formative assessment literacy among BSEd Science pre-service teachers, wherein teaching efficacy for motivation and classroom management demonstrated moderately significant relationships across the conceptual, practical, and socio-emotional dimensions, while teaching efficacy for instruction showed moderately significant relationships with the conceptual and practical dimensions but a weaker correlation with the socio-emotional dimension of formative assessment literacy. This result supports the need to strengthen teacher preparation through pre-service training, offering targeted interventions both for teaching efficacy and formative assessment literacy. The teaching internship is a crucial period that contributes significant changes among pre-service teachers. To maximize this experience, the study encourages cooperating teachers to conduct structured weekly consultations with their pre-service teachers, not just after their teaching demonstration. This is to allow them to reflect on their strengths and areas for improvement. Schools and TEIs may also provide cooperating teachers with a simple feedback guide or protocol to ensure that mentoring conversations are focused, consistent, and geared toward professional growth rather than evaluation alone. This study encourages school administrators to organize at least one professional development session per school year that addresses targeted competencies in teaching efficacy and formative assessment literacy. These may be conducted through Learning Action Cells (LACs), peer teaching demonstrations, or school-based workshops facilitated by master teachers or assessment specialists, ensuring that session topics are aligned with the areas where teachers need the most improvement. Furthermore, the researcher encourages future researchers to expand the sample size by including pre-service teachers from multiple universities or across different degree programs to improve the generalizability of findings; and incorporate mixed-methods approaches, specifically classroom observations and semi-structured interviews, to capture more nuanced insights into how pre-service teachers demonstrate teaching efficacy and apply formative assessment in actual classroom settings.

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