

Impact of professional development activities on teachers' formative assessment practices

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ABSTRACT

This study aims to explore the impact of professional development (PD) activities on the practice of formative assessment, mediated by outcome expectancy and self-efficacy. The study used a survey method to unveil compelling insights among 5,546 primary teachers within the context of Vietnam. The findings from partial least squares structural equation modeling (PLS-SEM) demonstrated a significant impact of PD on teachers' outcome expectancy regarding formative assessment and their self-efficacy in practicing it. The study emphasizes that PD significantly enhances the effectiveness of practice when interconnected with outcome expectancy and self-efficacy. When teachers anticipate positive outcomes and possess strong self-belief, PD notably improves their classroom formative assessment practices. These findings underscore the importance of tailoring PD initiatives to bolster teachers' outcome expectancy and self-efficacy. By emphasizing these aspects, PD can significantly elevate its positive influence on classroom practices, especially in formative assessment. This study provides crucial insights for educational policymakers and institutions aiming to maximize the impact of PD programs for primary educators in Vietnam.

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1. INTRODUCTION

Teachers' professional development (PD) received widespread interest in academia due to its proven significance in determining instructional quality [1]. It encompasses the learning process for educators, emphasizing how they acquire new knowledge and subsequently apply it to aid students in their learning journey [2]. PD can be implemented in various activities, such as meetings, workshops, training sessions, networking, and team training [3]. In the continuous education reform era, PD supports teachers in teaching and doing in a new way that they have never experienced before [4]. Therefore, in almost all countries, PD is popular for promoting teachers' teaching innovation. Sellen [5] conducted an international survey and revealed that teachers, on average, allocate approximately 10.5 days per year to participate in various PD activities. A good teacher's PD should bring teachers developments in their knowledge, skills, changes in

attitudes and beliefs, and the teachers' routine classroom practices [6]. In this paper, we would like to use quantitative data from teachers' self-assessments to study the impact of teachers' attending PD activities on their beliefs and classroom practices.

Self-efficacy and outcome expectancy are crucial factors in an individual's beliefs of his/her capabilities as essential determinants of successful outcomes [7]. In self-efficacy theory, the belief in one's capability to carry out a task, known as self-efficacy, is different from the belief in the likelihood of that task resulting in a particular outcome, which is called outcome expectancy [7]. Teachers with higher efficacy in their ability will ultimately shape their subsequent professional actions, including their approach to adopting new methods [8]. While the impact of self-efficacy and outcome expectancy on teachers' practice has been studied widely, their role in mediating the relationship between PD and teacher teachers' practice is still rare.

Formative assessment is a critical practice that teachers should apply in their classrooms to promote students' learning and achievement [9]–[11]. Vietnam is one country that provides many policies to enhance primary teachers by applying formative assessment activities such as feedback, limiting giving scores to students, and involving parents and students in formative assessment [12]. Following the 2018 new general curriculum, many teachers' PD activities related to formative assessment are offered to teachers' participants. However, the effectiveness of PD is still a question. Therefore, in this study, we used formative assessment activities in Vietnamese primary schools as an object to study the impact of PD activities on teachers' classroom formative assessment practices with two mediators: self-efficacy and outcome expectancy.

2. THEORETICAL FRAMEWORK

In this paper, we elucidated the relationships among teachers' PD, self-efficacy, outcome expectancy, and practices, grounded in the principles of the self-efficacy theory [13]. This theory, proposed by Bandura [7], is rooted in his broader social cognitive theory, which emphasizes the roles of cognitive, behavioral, and environmental factors in human functioning. Self-efficacy theory underscores the significance of personal factors, such as self-efficacy beliefs and outcome expectancy, while acknowledging the profound impact of environmental and behavioral factors on outcomes [14]. Researchers widely apply this theory when designing interventions, setting goals, and providing support to individuals seeking to enhance their capabilities and achieve success in various aspects.

2.1. Teachers' self-efficacy and outcome expectancy

Self-efficacy theory, a component of Bandura's social cognitive theory, underscores the significance of an individual's perception of their own abilities in influencing successful outcomes [7]. Within this framework, teachers' self-efficacy and outcome expectancy are pivotal factors in shaping behavior. Gibson and Dembo also presented the teacher efficacy scale, which comprises two subscales that align with Bandura's concepts of self-efficacy and outcome expectancy [15].

Bandura [7] defined self-efficacy as the belief in one's ability to effectively organize and execute actions necessary to achieve specific goals. Self-efficacy gained recognition for its significant impact on students' and teachers' behavior. Educators who hold strong confidence in their success will set elevated objectives for themselves and their students. So, they exert more effort to reach these goals and persevere through challenges compared to those who lack certainty in their success. Teachers with higher efficacy tend to be more ready to apply new teaching approaches, particularly those that are challenging [16].

Bandura [7] defined outcome expectancy beliefs as "a person's estimate that a given behavior will lead to certain outcomes" (p. 193). While self-efficacy pertains to individuals' confidence in their ability to perform a task, outcome expectations focus on the anticipated consequences of engaging in that behavior. Educators who possess strong confidence in their abilities (high self-efficacy) but hold low expectations regarding teaching outcomes might be inclined to avoid teaching this subject [17].

2.2. Formative assessment professional development activities and practices in the Vietnam educational context

Various frameworks were proposed before to identify formative assessment activities. One of the most frequently cited definitions characterizes them as endeavors to collect information about students' learning processes to inform decision-making about subsequent actions and adapt teaching and learning strategies to cater to the specific needs of students [18]. Veugen [10] proposed a formative assessment process in the classroom that encompasses five key activities: i) clarifying expectations in learning goals and success criteria; ii) eliciting student responses to gather information about the learning process; iii) analyzing and interpreting these responses; iv) communicating with students about the responses; and v) adjusting teaching and learning through follow-up actions. Each step in the cycle can be facilitated by a set of corresponding activities.

In the context of educational reform in Vietnam from 2013 to the present, the assessment of primary students has undergone significant changes, notably a shift towards strengthening formative assessment rather than solely focusing on summative assessment for grading purposes. Teachers are now required to conduct more frequent and diverse assessment activities to enhance learning outcomes. These changes were implemented through the adoption of new primary student assessment policy documents. For instance, the assessment guidelines before 2014 primarily emphasized evaluating learning based on established knowledge and skills standards. Then, post-2014, the focus shifted towards assessment for learning and assessment as learning, thereby enhancing the role of formative assessment in primary classrooms. Presently, direct observation and providing verbal feedback to students are regarded as crucial and continuous activities. These assessment policies have highlighted the positive impacts of assessment activities on students, providing them with opportunities to experience and develop their competencies and qualities.

Simultaneously, educational reform requires PD activities for teachers to encourage and support them in adapting and conducting formative assessments in their classrooms. It's widely recorded that attending PD every year was a requirement in the teaching construct of many schools [1]. In the Vietnam context, primary school teachers are able to participate in annual professional training activities (organized by schools, educational departments, and the Ministry of Education), attend colleagues' seminars, attend expert seminars, monthly professional group activities, participate in teacher communities, and self-study on online learning platforms. In this study, these activities are used to present PD activities.

2.3. Teachers' self-efficacy and outcome expectancy impact their formative assessment practices

In the social cognitive theory, self-efficacy beliefs are essential personal factors within the triadic reciprocal causation, alongside behavioral and environmental determinants [7]. Many researchers have worked to prove a profound connection between teacher self-efficacy and their actions in teaching and directly influence the effectiveness and outcomes of their teaching [19], [20]. Teachers with high self-efficacy increase persistence in working with new instructional practices [21]. Conversely, study by Emmers *et al.* [22] pointed out the nonsignificant relationship between teachers' self-efficacy and their teaching behavior. Similarly, the relationship is quite different among contexts related to formative assessment. Myyry *et al.* [23] conducted a qualitative study on university lectures and found that lectures' self-efficacy experiences were related to four assessment types, including formative assessment. Like Hong Kong education, Yan *et al.* [24] also proved that teacher self-efficacy significantly impacts immediate formative assessment practice. In contrast, in the US secondary school context, the Gotch *et al.* [25] study showed that self-efficacy levels were not consistently linked to the effective execution of formative assessment in the classroom. Thus, the first hypotheses of the study: Teachers' self-efficacy in conducting formative assessment significantly impacts their formative assessment practice (H1).

Besides self-efficacy, outcome expectancy is one crucial prediction of teachers' practice. Stern *et al.* [26] studied teachers' intention to teach science and showed that teachers with high self-efficacy but low outcome expectancy might avoid teaching science. Despite believing in their teaching capabilities, these teachers might doubt their students' capacity, even when effective teaching methods are available. A lack of belief in the value of formative assessment can limit teachers' implementation of it to an effective extent [11], [27]. Therefore, the hypotheses is presented as Teachers' outcome expectancy in formative assessment significantly impacts their formative assessment practice (H2).

2.4. Professional development activities impact teachers' self-efficacy, outcome expectancy, their formative assessment practice

Participating in PD activities can significantly influence teachers' beliefs and how they practice [6]. PD activities support teachers in increasing their knowledge and skills and then enhance their confidence [6]. Ross and Bruce [28] explored how PD impacted grade 6 mathematics teachers' self-efficacy beliefs in some aspects of teaching. The results showed that PD only influenced teachers' confidence in managing student behaviors. Therefore, PD has various impacts on teachers' beliefs in their ability to perform different tasks.

The connection between PD and outcome expectancy can be understood through the idea that outcome expectancy beliefs are influenced by personal experiences and the observation of role models [29]. Coppola [30] used the theory of cognitive and social learning to conduct experiments to study the impact of mastery experiences on teacher self-efficacy and outcome expectancy. The results showed that PD significantly impacts many types of self-efficacy but has no correlation with outcome expectancy. Hence, the hypotheses can be formulated as: Formative assessment PD attendance significantly impacts teachers' self-efficacy in conducting formative assessment (H3) and formative assessment PD attendance significantly impacts teachers' outcome expectancy in formative assessment (H4).

The impact of PD on teachers' practice can be explained by the third level of Kirkpatrick's [31] course evaluation model. This model explained that after attending a course or training activity, participants

could apply course content to their actual work [6], [31]. Vescio *et al.* [32] conducted a review and pointed out that all 11 studies reviewed showed a positive relationship between teacher's participation in a training community and practices. Thus, the fifth hypothesis: Formative assessment PD attendance significantly impacts teachers' formative assessment practice (H5).

3. METHOD

3.1. Measurement tools

The questionnaire comprised 28 items derived from earlier research and Vietnamese formative assessment policy at primary schools, organized into four categories: PD activities (four items), self-efficacy in formative assessment (eight items), outcome expectancy in formative assessment (eight items) and formative assessment practices (nine items). We used a 5-point Likert scale, with 1 representing strong disagreement and 5 indicating strong agreement. The description of each construct is presented in Table 1. The questionnaire was sent to two educational assessment experts and one expert from MOET to assess content validity. One item from formative assessment practices was removed (2/3 experts). The revised version was then sent to a pilot test with 300 teachers. The pilot results were confirmed with internal reliability by Cronbach's alpha and structure validity by exploring exploratory factor analysis. None of the items were eliminated. The final version of the questionnaire was used in this study.

Table 1. Constructs of questionnaire

	Definition	Examples
PD activities	A set of learning activities for teachers to support them in conducting formative assessments more effectively.	I effectively participated in seminars/conferences on formative assessment I effectively participated in formative assessment training courses
Self-efficacy in formative assessment	Self-efficacy in formative assessment can be defined as a teacher's judgment and belief in the capability to perform formative assessment activities in their classroom.	I can identify the learning outcomes that need to be assessed I can design observation sheets to collect evidence about students' abilities and qualities
Outcome expectancy in formative assessment	Outcome expectancy in Formative Assessment can be defined as teachers' beliefs in the effectiveness of formative assessment for students and their teaching process.	Formative assessment motivates students to achieve specific learning goals Formative assessment helps me improve my teaching activities.
Formative assessment practice	Formative assessment regarding a set of activities in which student performance is gathered, understood, and utilized by teachers, students, or their peers to guide students' learning process	I often give oral feedback on the students' products and answers I often write comments on the students' homework.

3.2. Settings

Vietnamese primary educators have explicitly been selected as participants in this survey, aligning with Vietnam's ongoing educational reforms since 2018. These reforms have introduced a new curriculum and a substantial emphasis on formative assessment policies. During that time, numerous PD activities have been organized to assist teachers in adapting to these changes. The study employed an online survey, reaching out to 5700 primary teachers using a non-probability, voluntary response self-selection sampling approach. Following data cleansing, the analysis focused on 5,546 cases for examination.

The participant demographic comprised 1,451 male teachers (26.2%) and 4,095 female teachers (73.8%). Geographically, 513 teachers (9.2%) were from mountainous regions, while 4,379 (79.1%) hailed from rural areas, and 1,346 (24.3%) were from urban settings. Regarding educational attainment, 680 teachers (12.3%) held an associate degree, 4,817 (87.1%) had obtained a bachelor's degree, and 49 (.9%) possessed a master's degree. Experience-wise, 319 teachers (5.8%) had less than five years, 645 (11.6%) had 5 to 10 years, 2,971 (53.6%) had 10 to 25 years, and 1,611 (29.1%) had over 25 years of teaching experience.

3.3. Measurement model

We employed the partial least squares method (PLS) for analysis, which relies on examining principal components. We use confirmatory factor analysis (CFA) to analyze the validity and reliability of the questionnaire. Firstly, item factor loading values were calculated to confirm the internal validity. Following Hair *et al.* [33] thresholds, item factor loading for the reflective model needs to be higher than .7. After analysis, the PD construct remained four items; the number of formative assessment values and self-efficacy decreased from 8 to 5 and 7 items, respectively. Assessment practices construct the remaining eight items.

Next, internal reliability, convergent, and discriminant validity were analyzed based on the guidance of Hair *et al.* [33]. The values presented in Table 2 showed Cronbach's alpha values and composite reliability, indicating the internal consistency among the items, all of which exceed .8 as per. For convergent

validity, the average variance for the variables (AVE) should ideally be higher than .50. The value in Table 2 showed that the AVE fell within the range of .586 to .695, indicating strong and acceptable convergent validity. We applied the Fornell-Larcker method to evaluate discriminant validity; the values in Table 3 indicate that all constructs within the model exhibit adequate discriminant validity, as supported by their relationships in terms of shared variance being more significant than their individual AVEs.

Table 2. Reliability and validity

	Cronbach's alpha	Composite reliability	AVE
Assessment practice	.888	.896	.596
Outcomes expectancy	.873	.875	.665
PD	.853	.855	.695
Self-efficacy	.923	.923	.683

Table 3. Fornell-Larcker discriminant validity

	Assessment practice	Outcomes expectancy	PD	Self-efficacy
Assessment practice	.772			
Outcomes expectancy	.301	.815		
PD	.409	.317	.833	
Self-efficacy	.53	.329	.49	.827

4. RESULTS

Following the guidelines, we used the partial least squares structural equation modeling (PLS-SEM) to assess hypotheses and examine the relationships between variables [33]. The evaluation of the structural model was conducted based on specific criteria encompassing variance inflation factor (VIF), direct path coefficient, and coefficient of determination values (R2) [33]. Firstly, the VIF values observed ranged from 1.494 to 2.851, all below the threshold of 5, which indicates that the regression outcomes were not influenced by multicollinearity bias [33]. Then, the path coefficient values were examined through a bootstrap analysis at a 95% confidence level. The findings supported all hypotheses, with p-values lower than .001. For supported H1, the results indicated that teachers with higher self-efficacy conduct more formative assessment activities in their classroom ($\beta=.409$, $p\text{-value}<.001$). Similarly, H2 is accepted and indicates that the more outcome expectancy in formative assessment, the more often formative assessment activities teachers conduct ($\beta=.109$, $p\text{-value}<.001$).

Next the results also support H3, H4 and H5, which indicated that PD attendance positively impact self-efficacy ($\beta=.490$, $p\text{-value}<.001$), outcomes expectancy ($\beta=.317$, $p\text{-value}<.001$) and formative assessment practices ($\beta=.180$, $p\text{-value}<.001$). The R2 values play a crucial role in the model's explanatory power, with benchmarks of .25, .50, or .75 representing weak, moderate, and substantial endogenous construct relationships, as Hair *et al.* [33] outlined. Figure 1 PD shows self-efficacy and outcome expectancy in formative assessment, which accounted for 32.6 % of the SRL variance. PD accounted for 10% of outcome expectancy and 24% of self-efficacy in conducting formative assessment. To sum up, the explanation function of this model is weak but acceptable.

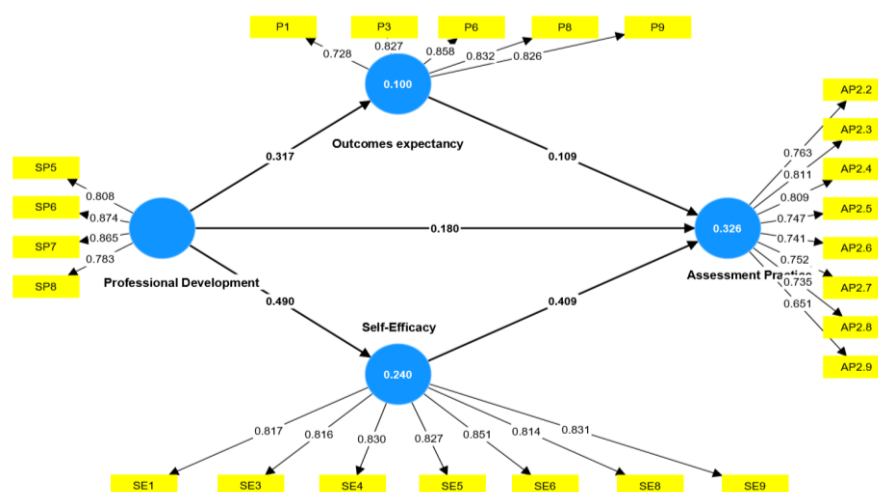


Figure 1. Structural model assessment

5. DISCUSSION

5.1. Teachers' self-efficacy, outcome expectancy impact on their formative assessment practice

In this study, both H1 and H2 were confirmed, indicating the significant roles of self-efficacy and outcome expectancy in shaping teachers' practices. The positive influence of self-efficacy on teachers' practices aligns with findings from previous studies [19], [34]. This finding suggests that teachers who harbor stronger beliefs in their abilities to execute effective formative assessments—such as providing suitable feedback to students and adeptly designing and implementing technological assessment tools - are more likely to engage in formative assessment practices within their classrooms frequently. Similarly, consistent with several studies [11], [27], H2 was affirmed, illustrating that teachers are more inclined to conduct formative assessments when they perceive that these assessments offer valuable information to enhance their students' learning processes and aid in managing their teaching activities. However, in contrast to Enochs *et al.* [18] who stressed the significance of outcome expectancy over teachers' self-efficacy regarding teachers' practices, the findings of this research emphasize that teachers' self-efficacy holds a more substantial influence on their formative assessment practices compared to outcome expectancy.

5.2. Professional development activities impact teachers' self-efficacy, outcome expectancy, and formative assessment practice

H4 and H5 are accepted, indicating that attending PD could significantly impact teachers' self-efficacy and outcome expectancy. The positive impact of self-efficacy on teachers' practice has been proved before [25], [28]. However, this study's findings differ from Coppola [30] study, which showed no relationship between teachers' outcome expectancy and their practices. On the other hand, while PD could explain 24% of teachers' self-efficacy, it can only explain 10% of outcome expectancy. Therefore, finding the factors that can increase teacher expectancy is needed.

The impact of PD on teachers' practices after the training process is used to assess the quality of PD activities [31], [35]. It indicated teachers' ability to apply the achievement from PD activities to their practices. H6 is accepted, indicating that the more PD activities teachers participate in, the more frequently teachers conduct formative assessment activities. The results can reflect the effectiveness of PD in the context of Vietnam. However, the impact of PD attendance on formative assessment practices is lower than the impact of PD attendance on teachers' self-efficacy, which indicates that teachers' self-efficacy is an essential mediator for the relationship between PD attendance and teachers' practice, which provides implications for designing PD activities in Vietnam context.

6. CONCLUSION

This paper aimed to examine the effect of attending formative assessment PD on teacher's formative assessment practices in their classrooms. We used teachers' self-efficacy and outcome expectancy in formative assessment as two mediators for the relationship. The finding confirmed all the hypotheses. These findings could be explained by self-efficacy theory, which explains that beliefs play an even more significant role in shaping human behavior and ultimately influencing outcomes. The theory also highlights the dynamic interplay among personal, behavioral, and environmental factors in determining human actions and achievements.

The study's findings emphasize the pivotal role of teachers' self-efficacy and outcome expectancy in formative assessment, mediating the relationship between PD attendance and teachers' practices. As a result, PD sessions impart essential knowledge and skills for formative assessment and bolster teachers' confidence in their self-efficacy and the efficacy of formative assessment for both student learning and teachers' instructional methods. Engaging teachers in activities to reinforce their self-efficacy can significantly enhance the effectiveness and practical application of PD initiatives. Our future research will delve into crafting formative assessment PD activities tailored to support Vietnamese primary teachers in encouraging their self-efficacy in implementing formative assessment and then elevate the quality of formative assessment practices within the classroom setting.

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