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Classroom assessment approaches and student learning outcomes: the moderating role of teaching experience

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ABSTRACT

Maximizing student learning requires the use of effective classroom assessment. In this study, we examined the association between student learning outcomes (SLOs) and three classroom assessment approaches: assessment as learning (AaL), assessment for learning (AfL), and assessment of learning (AoL), while taking teacher experience into account as a potential moderator. Positive correlations between all three assessment techniques and SLOs were found in the research, suggesting that classrooms emphasizing student participation in assessment to receive feedback and improve learning achieve better outcomes. Interestingly, we uncover that teaching experience did not moderate this relationship, indicating that the positive effects of these practices were consistent across teachers with varying levels of experience within the studied range. Our findings emphasize the importance of incorporating comprehensive assessment practices encompassing AaL, AoL, and AfL into classroom instruction to optimize student learning. Future research should explore reasons behind differences in effect size and explore deeper into specific strategies most beneficial for each approach to create learning environment that foster deep learning for all students, regardless of teacher experience.

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1. INTRODUCTION

Effective assessment practices are fundamental to a successful learning environment. They provide educators with valuable insights into student understanding, allowing them to design instruction and identify areas where students may be struggling [1]. This continuous feedback loop between teachers and students is essential for improving learning outcomes and ensuring students' progress towards established goals [2], [3]. Student learning outcomes (SLOs) serve as the foundation of effective education [4], providing a roadmap for educators to design instruction [5] and measure student progress towards achieving essential knowledge, skills, and understanding [6]. Assessment plays a significant role in this process by providing educators valuable insights into student learning and identifying areas where instruction might need improvement [7]. When aligned with SLOs, assessment data can inform instructional decisions, leading to enhanced student achievement and overall educational success.

Classrooms are dynamic environments where teachers employ various assessment approaches, each offering unique advantages and considerations. Traditionally, classroom assessment has been dominated by summative approaches, which focus on measuring student achievement at the end of a learning unit or course [8]. While summative assessments provide valuable data, they often overlook the ongoing learning process [9]. In recent years, there has been a growing emphasis on formative assessment, which involves frequent

checks for understanding throughout the instructional cycle [10]–[13]. This shift allows for adjustments to be made in real-time, promoting deeper learning and closing knowledge gaps. In addition to the traditional summative and formative assessment, self-assessment is being used by educators in assessing student learning [14]. The use of self-assessment encourages students to reflect on their understanding and learning strategies and to take ownership of their learning, thus helping students become more metacognitive independent and self-directed learners.

While research acknowledges the positive impact of each assessment approach on SLOs attainment [15]–[19], a critical research gap exists in our understanding of their comparative effectiveness. Limited research explores how different assessment approaches influence SLOs relative to one another [20]–[22]. Another under-explored area is the moderating role of teacher experience [23], [24]. While it is reasonable to assume that experienced teachers may be more adept at implementing various assessment strategies, research is needed to determine how their experience interacts with specific assessment approaches to influence SLOs.

Understanding these factors can equip educators to utilize different assessment practices strategically to maximize student learning and achievement, considering the diverse needs of their student populations [25]–[27]. This study aims to investigate the influence of formative, summative, and self-assessment approaches on SLOs as well as potential moderating role of teacher experience in this relationship. Understanding which assessment approaches lead to better learning outcomes can serve as inputs to professional development programs.

2. METHOD

2.1. Research design

This study employed a correlational design to examine the relationship between teachers' utilization of assessment approaches and the attainment of SLOs with the expected moderating role of teaching experience. In a study with correlational research design, the researcher aims to explain and predict phenomena with no cause-effect relationships [28]. This design is appropriate in this study since the method used is non-experimental and does not establish causality.

2.2. Respondents

The respondents of the study were 110 mathematics teachers in the junior high school department from two school divisions in the Province of Oriental Mindoro. They were selected using convenience sampling technique. Respondents were not limited to gender, seniority, education level, geographic location of assignments, and school status. This diverse sample allowed for a broad representation of teachers' perspectives on the integration of SLOs and assessment in their practice.

2.3. Instruments

The main instrument used in this study was a standardized classroom assessment practices scale questionnaire (CAPSQ) adapted from Gonzales and Callueng [29] which consists of 14 statements across the same three domains, namely: assessment of learning (AoL), assessment for learning (AfL), and assessment as learning (AaL). This standardized questionnaire has an internal consistency of α=0.95 indicating a reliable and valid estimate of classroom assessment practices. SLOs attainment was measured using the grades of the students in the report card. On the other hand, data on teacher experience was collected through a questionnaire.

2.4. Data gathering and analysis

The researcher implemented the data gathering for 2 weeks by personally administering the instruments to the teacher-respondents. In order to comply with ethical standards, the researchers made sure that the respondents' involvement was entirely voluntary, that they were not in any kind of risk, and t measures for data privacy were explained clearly. The data gathered was analyzed by computing appropriate descriptive and inferential statistics. To examine the moderating effect of teacher experience on the relationship between classroom assessment practices and SLOs, moderation analysis was conducted using bootstrapping with 5,000 resamples. The statistical software Jamovi was utilized for these analyses.

3. RESULTS

Inter-variable correlational analysis was carried out to satisfy the basic theoretical assumptions of this study. A significant positive correlation has been observed among the three classroom assessment practices, as indicated by the data in Table 1: AaL and AfL (r=0.469, p<0.01); AaL and AoL (r=0.433, p<0.01); and AfL and AoL (r=0.756, p<0.01). Comparably, there is a significant positive correlation between SLO and all three classroom assessment practices: AaL and SLO (r=0.359, p<0.01), AfL and SLO (r=0.499,

p<0.01), and AoL and SLO (r=0.291, p<0.01). Teaching experience, however, is not significantly associated with SLOs (r=0.149, p>0.05).

Table 1. Inter-variable correlational analysis

Variables	AaL	AfL	AoL	TE
AaL	-			
AfL	0.469**	-		
AoL	0.433**	0.756**	-	
TE	0.149	0.122	0.206*	-
SLO	0.359**	0.499**	0.291**	0.076

Note: *means significant and **means highly significant

Table 2 shows that a positive and statistically significant estimate for AaL (4.0467, p<0.001). It indicates that students in classrooms where AaL was more prevalent tend to have higher learning outcomes compared to classrooms with less AaL. On the other hand, in this particular model, there is no main effect of teacher experience on SLOs (0.0308, p=0.880). Similarly, the interaction term, AaL * teaching experience (0.6574), is also not statistically significant (p=0.354). This means that the relationship between AaL and SLOs is not moderated by teacher experience.

Consistent with the previous analysis, it can be seen in Table 3, the positive and significant estimate for AaL at the average teacher experience level (4.05, p<0.001). This reaffirms the positive association between AaL and SLOs. Similarly, results show that the significant positive estimates for AaL at both low experience (3.15, p=0.028) and high experience levels (4.94, p<0.001). This suggests that AaL benefits SLOs regardless of teacher experience.

As can be noted in Table 4, the significant positive estimate for AfL (5.3783, p<0.001) indicates that classrooms emphasizing AfL strategies are associated with higher SLOs. However, based on the result, teaching experience does not have a main effect on the SLOs (0.0505, p=0.792). Additionally, teaching experience does not moderate the relationship between AfL and SLOs (AfL * teaching experience, -0.2501, p=0.798). On the other hand, Table 5 indicates a statistically substantial positive correlation between the AfL method and SLOs, as well as a statistically significant positive correlation to all levels of teaching experience. Teachers with low experience had the highest effect (5.72, p=0.001), followed by those with average experience (5.38, p<0.001) and high experience (5.04, p=0.008).

Table 2. Moderation estimates of the AaL approach and teaching experience

Variables	Estimate	SE	Z	p
AaL	4.0467	1.132	3.573	<0.001
Teaching experience	0.0308	0.204	0.151	0.880
AaL ✻ teaching experience	0.6574	0.709	0.927	0.354

Table 3. Simple slope analysis of the moderation effect of the teaching experience in the relationship between AaL approach and attainment of SLOs

Teaching experience	Estimate	SE	Z	p
Average	4.05	1.12	3.62	<0.001
Low (-1SD)	3.15	1.43	2.20	0.028
High (+1SD)	4.94	1.49	3.31	<0.001

Table 4. Moderation estimates of AfL approach and teaching experience

Variables	Estimate	SE	Z	p
AfL	5.3783	1.304	4.125	<0.001
Teaching experience	0.0505	0.191	0.264	0.792
AfL ✻ teaching experience	-0.2501	0.977	-0.256	0.798

Table 5. Simple slope analysis of the moderation effect of the teaching experience in the relationship between AfL approach and attainment of SLOs

Teaching experience	Estimate	SE	Z	p
Average	5.38	1.30	4.14	<0.001
Low (-1SD)	5.72	1.78	3.21	0.001
High (+1SD)	5.04	1.90	2.65	0.008

As demonstrated in Table 6, there is a significant positive estimate for AoL (3.12144, p=0.018) which suggests that classrooms emphasizing AoL practices are linked to better learning outcomes for students. On the other hand, teaching experience does not have a main effect on SLOs (-0.00782, p=0.975). Additionally, the effect of AoL on SLOs is not moderated by teacher experience within the range examined in this study (AoL * teaching experience, 0.54009, p=0.628). On the other hand, Table 7 shows the significant positive estimate for AoL (3.12, p=0.018) confirming a positive association between AoL and SLOs. While the estimates suggest a potentially positive effect of AoL on SLOs for both low-experience (2.39, p=0.061) and high-experience teachers (3.86, p=0.130), these results did not reach conventional levels of significance.

Table 6. Moderation estimates of the AoL approach and teaching experience

Variables	Estimate	SE	Z	p
AoL	3.12144	1.323	2.3600	0.018
Teaching experience	-0.00782	0.251	-0.0311	0.975
AoL ✻ teaching experience	0.54009	1.116	0.4841	0.628

Table 7. Simple slope analysis of the moderation effect of the teaching experience in the relationship between AoL approach and attainment of SLOs

Teaching experience	Estimate	SE	Z	p
Average	3.12	1.32	2.36	0.018
Low (-1SD)	2.39	1.27	1.88	0.061
High (+1SD)	3.86	2.55	1.51	0.130

4. DISCUSSION

One of the most notable findings in this research is the significant positive associations between all three types of classroom assessment practices, AaL, AfL, and AoL with one other. These findings align with the previous researches that emphasize the interconnected nature of effective assessment practices [29]–[32]. When teachers effectively integrate these practices, they create a more holistic and supportive learning environment. The strong positive correlations between AaL, AfL, and AoL suggest that these practices often occur together in effective classrooms. When teachers use AaL to direct instruction and provide feedback, it leads to a more frequent and effective AfL activities [14], [33]. Additionally, strong AfL practices likely contribute to a more rigorous and comprehensive AoL at the end of a unit or course [34]. The iterative process of using AaL to inform instruction, employing AfL to monitor student progress, and culminating in AoL to evaluate overall achievement appears to be a powerful approach to enhancing student learning.

Similar to previous studies, our findings show a positive link between all three assessment practices and SLOs [15]–[19], [34], [35]. This strengthens the idea that assessments are beneficial for students. Assessments help them understand their strengths and weaknesses, track their progress, and adjust their learning strategies. This suggests that using a variety of assessment methods can improve student achievement. Moreover, these results emphasize the importance of a comprehensive assessment framework in supporting student success. Providing opportunities for self-reflection, formative feedback, and summative assessment can promote deeper understanding, increased engagement, and more importantly, improved student achievement.

On the other hand, the lack of significant correlation between teaching experience and SLOs is somewhat surprising. This finding challenges the common assumption that experienced teachers are inherently more effective. Our results suggest that effective assessment is a skill that can be developed through training and practice, regardless of tenure. While experience may contribute to expertise, it is not a guaranteed predictor of successful assessment implementation. However, it is possible that other factors, such as specific teaching methods or professional development opportunities, play a larger role in influencing SLOs [35], [36]. Furthermore, the non-significant correlation between teaching experience and SLOs requires further exploration. It is possible that the impact of experience is more nuanced and depends on the quality of past experiences or professional development opportunities.

Another significant finding is the consistently positive and statistically significant relationship between all three assessment practices (AaL, AfL, and AoL) and SLOs. These findings align with existing research that emphasizes the importance of effective assessment for promoting student learning [15]–[19]. Providing formative feedback, encouraging self-reflection, and involving students in the assessment process foster deeper understanding and increased learning engagement. AaL practices likely empower students to take ownership of their learning and adjust their strategies. AfL provides valuable feedback to guide ongoing learning. Finally, AoL helps assess student mastery at the end of a unit or course.

An unexpected finding is the lack of a significant main effect for teacher experience on SLOs and the non-significant interaction terms between assessment practices and teacher experience. This suggests that AaL, AfL, and AoL all benefit SLOs regardless of a teacher's experience level. The lack of a significant moderating role for teacher experience is intriguing. Effective assessment practices involve specific skills like providing clear feedback, using diverse assessment methods, and designing them to learning goals. Experience can develop these skills, but it does not guarantee them. A new teacher who actively seeks training in best practices might be more effective than an experienced one who relies on outdated methods. However, the study might not have captured the full range of teacher experience or how it interacts with specific assessment practices, thus, a follow up study utilizing a larger sample is recommended.

5. CONCLUSION

This study investigated the relationship between classroom assessment practices, SLOs, and teaching experience. Our findingsw revealed positive associations between all three assessment practices (AaL, AfL, and AoL) and SLOs. Classrooms emphasizing these strategies, where students actively participate in the assessment process to receive feedback and improve learning, achieved higher SLOs. This aligns with existing research on the benefits of students learning assessment. Interestingly, the moderation analyses for all three approaches showed that teacher experience did not moderate the relationship between these practices and SLOs. In simpler terms, the positive effect of these assessment approaches on student learning appears to be consistent across teachers with different experience levels within the range examined in this study.

These findings emphasize the importance of incorporating comprehensive classroom assessment practices, encompassing AaL, AoL, and AfL into classroom instruction for better student learning. While the overall effect of AoL was slightly weaker than the effect observed for AfL and AaL in previous analysis, all approaches share core principles and likely have positive impacts on student learning. The findings of this study have significant implications for educational practice. Schools and districts should prioritize professional development opportunities focused on assessment literacy for all teachers. Equipping educators with the knowledge and skills to effectively implement AaL, AfL, and AoL into the classroom can enhance SLOs across all grade levels.

Future research could explore the specific mechanisms through which these assessment practices influence student learning. Additionally, investigating how teacher beliefs about assessment impact implementation and student outcomes would be valuable. Longitudinal studies tracking the development of assessment expertise over time could also provide insights into how teachers can be best supported in this area.

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AUTHOR CONTRIBUTIONS STATEMENT

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Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Polemer M. Cuarto	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Harieth C. Cuarto	✓	✓		✓	✓	✓		✓	✓	✓	✓			✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [PMC], upon reasonable request.

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