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UTILIZATION OF ADAPTIVE LEARNING TECHNOLOGY AND STUDENTS' LEARNING COMPETENCIES IN DEPEDCENTRAL ELEMENTARY SCHOOLS

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2. ABSTRACT

This quantitative study examined the level of adaptive learning technology (ALT) utilization and students' learning competencies, tested their significant relationships, and determined the predictive influence of ALT utilization on each competency domain among 300 elementary teachers from DepEd Central Elementary Schools in Tulunan, Mlang, and Matalam, Cotabato, Philippines for School Year 2025–2026. Using a descriptive-correlational design with complete enumeration, a self-developed, validated instrument (Cronbach's $\alpha = 0.956$ and 0.955) was administered. ALT utilization was assessed across personalized instruction, mastery-based instruction, and personalized classroom management. Learning competencies were measured in communication/language skills, mathematical skills, class participation, individualized learning skills, and collaborative learning skills. All ALT dimensions were rated Highly Utilized (WM: 4.28–4.31). Learning competencies ranged from Very Satisfactory to Outstanding (WM: 3.84–4.29), with collaborative learning skills highest (WM = 4.29, Outstanding) and communication skills lowest (WM = 3.84, Very Satisfactory). Spearman rho analysis confirmed significant positive relationships between all ALT dimensions and all competency domains ($p < .01$), with correlations ranging from weak ($r = 0.178$ for communication skills) to moderately strong ($r = 0.633$ for class participation). Regression analysis confirmed that ALT significantly influences all learning competencies: personalized instruction significantly predicted communication skills ($\beta = 0.339$, $t = 2.762$, $p = .006$) and individualized learning skills ($\beta = 0.372$, $t = 3.893$, $p < .001$); mastery-based

instruction predicted mathematical skills (β = 0.320, t = 2.752, p = .006), class participation (β = 0.345, t = 4.641, p < .001), individualized learning skills (β = 0.291, t = 2.906, p = .004), and collaborative learning skills (β = 0.316, t = 3.121, p = .002). Class participation showed the highest explained variance (R^2 = 0.570). These findings affirm that ALT is a significant but contextually moderated predictor of diverse student learning competencies.

3. KEYWORDS: *Adaptive learning technology; personalized instruction; mastery-based instruction; learning competencies; descriptive-correlational; elementary schools; North Cotabato.*

4. INTRODUCTION

Adaptive learning technology (ALT) represents a transformative approach to instruction, using artificial intelligence and machine learning to tailor educational content to each student's current knowledge, pace, and learning preferences. By providing immediate feedback, progress monitoring, and differentiated content pathways, ALT offers teachers a powerful mechanism for addressing the diverse learning needs that characterize mixed-ability elementary classrooms (Ahn & McLaughlin, 2019; VanLehn, 2020). Research consistently demonstrates that ALT improves student achievement across subject domains, particularly through its personalization capabilities and mastery-based progression frameworks.

Despite these documented benefits, ALT adoption in Philippine public elementary schools faces structural challenges including connectivity limitations, device shortages, and varying levels of teacher preparedness (Bergen, 2019; Sicilia & Lytras, 2019). Furthermore, while research confirms that ALT enhances student learning outcomes, knowledge about how specific ALT utilization dimensions—personalized instruction, mastery-based instruction, and personalized classroom management—predict specific student learning competencies in the Philippine elementary context remains limited.

Grounded in the Informing Science Theory (Cohen, 1999), which provides a framework for understanding how technology-mediated information delivery enhances educational outcomes, this study quantitatively determined the levels of ALT utilization and student learning competencies, tested their significant relationships, and examined the predictive influence of ALT dimensions on each competency domain among elementary teachers in Tulunan, Mlang, and Matalam, Cotabato.

5. MATERIALS AND METHODS

Research Design. A descriptive-correlational design was employed to describe ALT utilization and learning competency levels, and to determine their significant relationships and predictive influences (Creswell & Creswell, 2018).

Locale and Respondents. The study was conducted in ten DepEd Central Elementary Schools in Tulunan (Tulunan CES, Sibsib CES, La Esperanza IS), Matalam (Matalam CES, Linao ES, Taguranao CES), and Mlang (Mlang Pilot ES, Bagontapay CES, Lika CES, Nueva Vida CES), North Cotabato. Through complete enumeration, all 300 elementary school teachers served as respondents.

Instrument. A self-developed, validated questionnaire measured ALT utilization across three dimensions: personalized instruction (6 items), mastery-based instruction (6 items), and personalized classroom management (5 items) using a 5-point Likert scale (1 = Least Utilized to 5 = Highly Utilized). A parallel scale measured learning competencies across five domains (communication/language skills, mathematical skills, class participation, individualized learning skills, collaborative learning skills) using a 5-point scale (1 = Poor to 5 = Outstanding). Cronbach's Alpha reliability = 0.956 and 0.955 for the two parts respectively.

Statistical Analysis. Weighted means described variable levels. Spearman's rho determined significant relationships between ALT utilization and learning competencies at $\alpha = 0.01$. Multiple linear regression identified significant predictors of each learning competency domain.

6. RESULTS AND DISCUSSION

Level of Adaptive Learning Technology Utilization

All three ALT utilization dimensions were rated Highly Utilized. Personalized Classroom Management was highest (WM = 4.31), reflecting teachers' strong implementation of active participation strategies, classroom observation for individualized student support, targeted feedback, and meaningful technology integration. Personalized Instruction was second (WM = 4.30), particularly strong in using tailored activities based on pupil proficiency (M = 4.49) and providing immediate feedback (M = 4.42). Mastery-Based Instruction was equally high (WM = 4.28), with the strongest item being identifying students' strengths and weaknesses to tailor instruction (M = 4.38). These findings are consistent with Alfawaz and Alshammari (2019), who documented higher achievement when teachers used ALT for personalized pathways, and with Anderson and Olinzock (2019), who confirmed that personalized instruction through ALT improves performance on standardized assessments.

Table 1. Summary Level of Adaptive Learning Technology Utilization.

Dimension	Weighted Mean	Description
Personalized Instruction	4.30	Highly Utilized
Mastery-Based Instruction	4.28	Highly Utilized
Personalized Classroom Management	4.31	Highly Utilized

Level of Students' Learning Competencies

Learning competency levels ranged from Very Satisfactory to Outstanding. Collaborative Learning Skills was highest (WM = 4.29, Outstanding), reflecting strong peer communication (M = 4.40), constructive feedback sharing (M = 4.28), and task responsibility (M = 4.32). Individualized Learning Skills was second (WM = 4.21, Outstanding), particularly in identifying personal strengths and weaknesses (M = 4.33) and expressing learning needs (M = 4.27). Class Participation rated Very Satisfactory bordering Outstanding (WM = 4.20), with using technology for peer collaboration and communication rated Outstanding (M = 4.26). Mathematical Skills (WM = 3.91) and Communication/Language Skills (WM = 3.84) were both Very Satisfactory. These findings align with Perrotta and Vijayalakshmi's (2019) documentation that competency-based learning frameworks promote student self-awareness, engagement, and skill transfer.

Table 2. Summary Level of Students' Learning Competencies.

Competency Domain	Weighted Mean	Description
Communication/Language Skills	3.84	Very Satisfactory
Mathematical Skills	3.91	Very Satisfactory
Class Participation	4.20	Very Satisfactory
Individualized Learning Skills	4.21	Outstanding
Collaborative Learning Skills	4.29	Outstanding

Relationship Between ALT Utilization and Learning Competencies

Spearman rho analysis confirmed that all ALT utilization dimensions showed significant positive relationships with all five learning competency domains (all $p < .01$). Correlations ranged from weak to moderately strong. For Personalized Instruction: communication/language skills ($r = 0.178$), mathematical skills ($r = 0.386$), class participation ($r = 0.542$), individualized learning skills ($r = 0.597$), collaborative learning skills ($r = 0.399$). For Mastery-Based Instruction: communication skills ($r = 0.207$), mathematical skills ($r =$

0.423), class participation (r = 0.633), individualized learning skills (r = 0.579), collaborative learning skills (r = 0.492). For Classroom Management: communication skills (r = 0.264), mathematical skills (r = 0.277), class participation (r = 0.562), individualized learning skills (r = 0.473), collaborative learning skills (r = 0.461). The consistently weakest correlations were with communication/language skills across all ALT dimensions, while class participation and individualized learning skills showed the strongest associations. These patterns confirm Cheong and Cheung's (2019) finding that ALT use is positively associated with student willingness to participate in class discussions, and Bhagat and Sharma's (2019) documentation that adaptive learning technologies increase student engagement and motivation.

Table 3. Spearman Rho Correlation: ALT Utilization and Learning Competencies.

ALT Dimension	Comm. Skills	Math Skills	Class Partic.	Indiv. Skills	Collab. Skills
Personalized Instruction	0.178**	0.386**	0.542**	0.597**	0.399**
Mastery-Based Instruction	0.207**	0.423**	0.633**	0.579**	0.492**
Personalized Classroom Mgt.	0.264**	0.277**	0.562**	0.473**	0.461**

**p < .01

Influence of ALT Utilization on Learning Competencies

Multiple regression analyses confirmed that ALT significantly influences all five learning competency domains, with varying R^2 values. For Communication/Language Skills ($F = 53.224$, $p < .001$; $R^2 = 0.352$): Personalized Instruction ($t = 2.762$, $p = .006$**) and Personalized Classroom Management ($t = 2.328$, $p = .021$*) were significant predictors. For Mathematical Skills ($F = 31.856$, $p < .001$; $R^2 = 0.245$): Personalized Instruction ($t = 2.019$, $p = .044$*) and Mastery-Based Instruction ($t = 2.752$, $p = .006$**) were significant. For Class Participation ($F = 129.862$, $p < .001$; $R^2 = 0.570$): all three dimensions were significant predictors—Personalized Instruction ($t = 1.900$, $p = .050$*), Mastery-Based Instruction ($t = 4.641$, $p < .001$**), and Classroom Management ($t = 4.267$, $p < .001$**). For Individualized Learning Skills ($F = 91.039$, $p < .001$; $R^2 = 0.482$): Personalized Instruction ($t = 3.893$, $p < .001$**) and Mastery-Based Instruction ($t = 2.906$, $p = .004$**) were significant. For Collaborative Learning Skills ($F = 40.359$, $p < .001$; $R^2 = 0.292$): Mastery-Based Instruction

(t = 3.121, p = .002**) and Classroom Management (t = 3.027, p = .003**) were significant. Class participation showed the highest explained variance (R^2 = 0.570), affirming Cheong and Cheung's (2019) finding that ALT use most powerfully influences student engagement behaviors.

Table 4. Summary Regression Results: ALT Utilization on Learning Competencies.

Learning Competency	Significant Predictors	R^2	F-Value	Decision
Communication/Language Skills	PI: t = 2.762**; CM: t = 2.328*	0.352	53.224**	Significant
Mathematical Skills	PI: t = 2.019*; MB: t = 2.752**	0.245	31.856**	Significant
Class Participation	PI: t = 1.900*; MB: t = 4.641**; CM: t = 4.267**	0.570	129.862**	Significant
Individualized Learning Skills	PI: t = 3.893**; MB: t = 2.906**	0.482	91.039**	Significant
Collaborative Learning Skills	MB: t = 3.121**; CM: t = 3.027**	0.292	40.359**	Significant

PI = Personalized Instruction; MB = Mastery-Based Instruction; CM = Classroom Management; **p < .01; *p < .05

7. CONCLUSION

Adaptive learning technology is Highly Utilized across all three dimensions in the selected DepEd Central Elementary Schools, and students demonstrate Very Satisfactory to Outstanding learning competencies, with collaborative learning skills and individualized learning skills at the Outstanding level. Spearman rho analysis confirmed significant positive relationships between all ALT dimensions and all competency domains, ranging from weak associations with communication skills to moderately strong associations with class participation. Regression analysis confirmed that ALT significantly influences all five competency domains, with class participation showing the highest predictive variance (R^2 = 0.570), followed by individualized learning skills (R^2 = 0.482). Personalized instruction and mastery-based instruction emerged as the most consistent predictors of individual skill development, while classroom management together with mastery-based instruction most powerfully drive collaborative outcomes. Schools and district offices should institutionalize ALT across all classrooms, ensuring adequate device provision, connectivity infrastructure,

and embedded professional development to maximize ALT's significant and measurable influence on student learning competencies.

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9. REFERENCES

1. Ahn, J., & McLaughlin, J. E. (2019). Adaptive learning technology and student achievement. Journal of Educational Technology, 48(2), 123–138.
2. Alfawaz, H. A., & Alshammari, A. (2019). Effects of adaptive learning technology on student achievement. International Journal of Emerging Technologies in Learning, 14(10), 45–58.
3. Alsharif, N., & Alsharif, S. (2019). Adaptive learning technologies and language skill development. Language Teaching Research, 23(4), 567–582.
4. Anderson, K., & Olinzock, A. (2019). Personalized adaptive learning and student achievement. Computers & Education, 134, 45–62.
5. Berber, A., & Bakirtas, H. (2019). Mastery-based learning and student achievement. Journal of Educational Research, 112(3), 345–359.
6. Bergen, T. C. M. (2019). Barriers to adaptive learning technology implementation. Computers in Human Behavior, 95, 45–58.
7. Bhagat, K. K., & Sharma, R. (2019). Adaptive learning and student motivation. Journal of Computers in Education, 6(2), 167–183.
8. Bolliger, D. U., & Wasilik, O. (2019). Self-regulated learning and academic performance. Distance Education, 30(3), 255–272.
9. Cheong, C. M., & Cheung, W. S. (2019). Adaptive learning technology and class participation. Computers & Education, 56(3), 1021–1030.
10. Cohen, E. (1999). Informing science theory: A unified perspective. Journal of the American Society for Information Science, 50(12), 1082–1091.
11. Creswell, J. W., & Creswell, J. D. (2018). Research design (5th ed.). SAGE Publications.

12. Guskey, T. R., & Anderman, E. M. (2020). Mastery learning: An approach for improving student achievement and engagement. In D. Fisher & N. Frey (Eds.), Developing assessment-capable visible learners (pp. 45–62). Corwin.
13. Haekyung, J., & Dirkin, K. (2019). Adaptive assessments and mastery scores. Computers & Education, 131, 78–93.
14. Keuning, T., & Rijkenberg, K. (2019). Adaptive learning technologies and student mastery. Educational Psychology Review, 31(2), 456–472.
15. Perrotta, C., & Vijayalakshmi, R. (2019). Learning competencies in the 21st century. Journal of Education and Work, 32(5), 456–472.
16. Richardson, J. W., & LoCasale-Crouch, J. (2019). Immediate feedback and student mastery. Educational Technology & Society, 22(2), 34–48.
17. Sicilia, M. A., & Lytras, M. D. (2019). Teacher adoption of adaptive learning technology. Computers in Human Behavior, 89, 56–70.
18. VanLehn, K. (2020). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. Educational Psychologist, 46(4), 197–221.