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Digital Technology of Indigenous Grade 3 Learners of San Jose North District, Occidental Mindoro and Their Academic Performance in Mathematics

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Abstract

This study examined the relevance of digital technology in developing the behavioral, cognitive, and constructive skills of Indigenous Grade 3 learners in the Indigenous Peoples Education (IPEd)-implementing schools of San Jose North District, Occidental Mindoro, Philippines, and its relationship with their academic performance in mathematics during the school year 2024–2025. A descriptive-correlational design, supplemented by qualitative interviews with six Grade 3 teachers, was employed. Using Slovin's formula and proportionate stratified random sampling, 104 respondents were selected from a population of 140 learners across three IPEd-implementing elementary schools. Data were gathered using a researcher-made, expert-validated survey questionnaire (Cronbach's alpha = 0.71) and analyzed using percentage, mean, Spearman rho correlation, and moderation analysis. Results showed that respondents were predominantly 9 years old (40.38%), male (53.85%), and of Hanunuo ethnicity (60.38%). Learners rated digital technology as Very Relevant in developing behavioral ($\bar{x}$ = 4.56), cognitive ($\bar{x}$ = 4.71), and constructive ($\bar{x}$ = 4.74) skills. Academic performance improved from the first to the second quarter across all three indicators: learners who always observed DepEd core values increased from 51.9% to 74.0%, satisfactory-or-higher performance-task ratings increased, and compliance with written works increased from 61% to 64%. Only the relevance of digital technology in developing behavioral skills was significantly associated with observed values ($\rho = 0.236$, $p = 0.016$ in Quarter 1; $\rho = 0.201$, $p = 0.041$ in Quarter 2); no other skill–performance relationships reached significance. The age, sex, and tribal affiliation of the respondents did not significantly intervene in the overall relationship between digital technology and academic performance in mathematics. The study concludes that digital technology functions primarily as a motivational and behavioral catalyst rather than a direct driver of measured academic outcomes among Indigenous learners.

Keywords: Academic Performance; Digital Technology; Grade 3 Learners; Indigenous Peoples Education; Mathematics

1. Introduction

The Philippine Department of Education (DepEd) has long recognized the unique educational needs of Indigenous Peoples (IP) through DepEd Order No. 62, s. 2011, which established the Indigenous Peoples Education (IPEd) Program. Despite this policy commitment, national assessment data continue to show that elementary learners, including those from geographically isolated and culturally distinct communities, often perform below proficiency standards in mathematics, with learners typically falling within the 8-to-11-year intermediate elementary age range targeted by such programs [16]. Indigenous learners in particular continue to face socio-demographic and linguistic barriers that shape their mathematics achievement independently of how interactive or learner-centered their teachers' instructional strategies may be [4]. Broader research on Indigenous student outcomes similarly indicates that meaningful improvement depends on targeted, context-sensitive support rather than generic interventions alone [19].

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In response, IPEd-implementing schools in Occidental Mindoro have received expanded digital infrastructure—including satellite internet connectivity, digital libraries, and portable devices—intended to modernize instruction for Indigenous learners [3]. Comparable initiatives in other Indigenous and remote-community contexts have shown that offline and infrastructure-appropriate digital technologies can meaningfully support classroom learning when adapted to local conditions [30]. However, there remains limited empirical evidence on whether these investments in Occidental Mindoro have translated into measurable gains in the specific skills digital technology is intended to cultivate, or into improved mathematics performance among the Indigenous learners who use them.

This study is anchored on Albert Bandura's Social Learning Theory, which posits that learning and behavior emerge from the interplay of direct experience, observation, and reinforcement, shaped by both external environmental cues and learners' intrinsic cognitive states [7]. Applied to digital technology, the theory suggests that interactive tools such as mathematics applications, videos, and games can command learners' attention more effectively than traditional instructional methods, thereby strengthening the encoding and retention processes central to observational learning. The study is further anchored on the Unified Theory of Acceptance and Use of Technology (UTAUT), which identifies performance expectancy, effort expectancy, social influence, and facilitating conditions as the primary determinants of technology acceptance and use [28]. Within Indigenous communities, collective values, community infrastructure, and the availability of culturally relevant digital content are expected to shape whether learners and teachers embrace digital tools for mathematics instruction.

Despite the theoretical plausibility of these mechanisms, few studies have examined how Indigenous elementary learners themselves assess the relevance of digital technology to their own skill development, or whether this self-assessment relates to concrete academic performance indicators such as observed values, performance tasks, and written work. Addressing this gap, the present study examined the relevance of digital technology in developing the behavioral, cognitive, and constructive skills of Indigenous Grade 3 learners of San Jose North District, Occidental Mindoro, Philippines, and its relationship with their academic performance in mathematics during the school year 2024–2025, including whether this relationship was intervened upon by learners' age, sex, and tribal affiliation.

Specifically, the study sought to: (1) determine the profile of the learners in terms of age, sex, and tribe; (2) determine how learners assess the relevance of digital technology in developing their behavioral, cognitive, and constructive skills; (3) determine learners' academic performance in mathematics in terms of observed values, performance tasks, and written works; (4) determine whether a significant relationship exists between the assessed relevance of digital technology and academic performance in mathematics; and (5) determine whether the profile of the learners significantly intervenes in this relationship. It was hypothesized that no significant relationship exists between digital technology and academic performance in mathematics, and that the learners' profile does not significantly intervene in this relationship.

2. Material and Methods

2.1. Research Design

This study employed a descriptive-correlational research design, supplemented by a qualitative component consisting of key-informant interviews with six Grade 3 teachers, consistent with established research practice in which qualitative data are used to contextualize and enrich quantitative findings [15]. The quantitative component determined how learners assessed the relevance of digital technology in developing their behavioral, cognitive, and constructive skills, examined their academic performance in mathematics, and tested whether a relationship existed between these variables and whether this relationship was intervened upon by the learners' profile.

2.2. Study Site

The study was conducted among Grade 3 learners enrolled in three Indigenous Peoples Education (IPEd)-implementing elementary schools of San Jose North District, Occidental Mindoro, Philippines, during the school year 2024–2025: Naibuan Elementary School, Lagnas Elementary School, and Yabat Elementary School. These schools serve learners belonging primarily to the Hanunuo and Buhid Indigenous cultural communities.

2.3. Population, Sample Size, and Sampling Technique

The population consisted of 140 Grade 3 Indigenous learners across the three schools. The sample size was computed using Slovin's formula at a 0.05 margin of error, yielding a required sample of 104 respondents. Table 1 presents the population and proportionate sample size per school. Proportionate stratified random sampling was used to ensure fair representation across schools, and the fishbowl (lottery) technique was used to select respondents within each stratum, with the assistance of the research adviser to ensure transparency. In addition, six Grade 3 teachers from the three schools were purposively selected as key informants for the qualitative interview component, based on their direct involvement in teaching mathematics to Indigenous learners and their experience implementing localized and indigenized instructional practices.

Table 1 Population and Sample Size

Indigenous Elementary School	Population	Sample Size
Naibuan Elementary School	59	44
Lagnas Elementary School	39	29
Yabat Elementary School	42	31
Total	140	104

2.4. Research Instruments

Data were gathered using a two-part researcher-made survey questionnaire. Part 1 gathered the learners' profile (age, sex, tribe). Part 2 measured learners' assessment of the relevance of digital technology in developing behavioral skills, cognitive skills, and constructive skills (10 items each), rated on a five-point Likert-type scale (1 = Strongly Disagree/Very Irrelevant to 5 = Strongly Agree/Very Relevant), interpreted as Very Irrelevant (1.00–1.80), Irrelevant (1.81–2.60), Moderately Relevant (2.61–3.40), Relevant (3.41–4.20), or Very Relevant (4.21–5.00). Academic performance in mathematics was operationalized using three indicators drawn from official class records for the first and second quarters of school year 2024–2025: observed values (learners' demonstration of DepEd's core values), performance-task grades, and compliance with written works.

A parallel interview guide, composed of four open-ended questions on teaching strategies, effective digital practices, cultural influences on engagement, and alignment of digital technology with Indigenous learners' attributes, was used to gather supplementary qualitative data from the six-teacher key-informants. Both instruments, originally developed in English, were translated into Filipino and validated by the research adviser, five content-area professors, and elders (Gurangons) representing the National Commission on Indigenous Peoples, to ensure cultural appropriateness and that no Indigenous rights or beliefs were violated in the conduct of the study. The validated survey questionnaire was pilot-tested among Grade 3 learners at Insulman Elementary School, yielding a Cronbach's alpha of 0.71, interpreted as acceptable internal consistency.

2.5. Data-Gathering Procedure

Prior to data collection, approval was secured from the Schools Division Office of Occidental Mindoro and from the school heads of the participating IPEd-implementing schools. Because respondents were minors, informed parental consent and learner assent were obtained before participation, and participants were informed of their right to withdraw at any stage without penalty. The researcher personally administered the survey questionnaire and explained its purpose to the respondents, while their academic-performance records for the first and second quarters were obtained directly from their Grade 3 advisers. Teacher interviews were conducted verbally, with responses noted and recorded with the interviewees' permission. Confidentiality and anonymity were strictly observed throughout, no personally identifiable information was included in any data-collection form or report, and no monetary compensation was provided to any participant.

2.6. Statistical Analysis

Data were tabulated, encoded, and analyzed using percentage and mean to describe the profile of the respondents, their assessment of the relevance of digital technology, and their academic performance in mathematics. The Spearman rho coefficient of correlation, a non-parametric statistic, was used to determine the significance of the relationship between the assessed relevance of digital technology (behavioral, cognitive, and constructive skills) and academic performance in mathematics (observed values, performance tasks, and written works), interpreted using the following scale: Very Weak (0.000–0.150), Weak (0.151–0.400), Moderate (0.401–0.650), Strong (0.651–0.900), and Very Strong (0.901–1.000). Moderation analysis was used to test whether the learners' profile (age, sex, tribe) significantly intervened in this relationship, using the model:

$$Y = \beta 0 + \beta 1X + \beta 2M + \beta 3XM + \varepsilon$$

where Y is academic performance in mathematics, X is the assessed relevance of digital technology, M is the profile variable under test, XM is the interaction term between X and M, and ε is the error term. All hypotheses were tested at the 0.05 level of significance.

3. Results and Discussion

3.1. Profile of the Respondents

Table 2 Frequency and Percentage Distribution of the Profile of the Respondents

Profile Variable	Category	Frequency	Percentage
Age	8 years old	24	23.08
	9 years old	42	40.38
	10 years old	31	29.81
	11 years old	7	6.73
	Total	104	100.00
Sex	Male	56	53.85
	Female	48	46.15
	Total	104	100.00
Tribe	Hanunuo	63	60.38
	Buhid	41	39.42
	Total	104	100.00

Table 2 presents the profile of the respondents. Of the 104 respondents, 42 (40.38%) were 9 years old, 31 (29.81%) were 10 years old, 24 (23.08%) were 8 years old, and 7 (6.73%) were 11 years old, indicating that most respondents fell within the typical 8-to-11-year intermediate elementary age range for IPEd program learners [16,3]. By sex, 56 (53.85%) were male and 48 (46.15%) were female, indicating a modest male majority consistent with prior observations that boys tend to participate at higher rates than would be predicted by class composition alone [1]. By tribe, 63 (60.38%) belonged to the Hanunuo tribe and 41 (39.42%) to the Buhid tribe, the two principal Indigenous cultural communities served by IPEd-implementing schools in San Jose North District.

3.2. Learners' Assessment of the Relevance of Digital Technology in Skill Development

Table 3 Mean Assessment of the Relevance of Digital Technology in the Development of Behavioral, Cognitive, and Constructive Skills

Skill Domain	Grand Mean	Verbal Description	Highest-Rated Indicators (Mean)
Behavioral Skills	4.56	Very Relevant	Eager to participate in group activities (4.69); inspired to accomplish assignments (4.63); feels satisfied with learning (4.63)
Cognitive Skills	4.71	Very Relevant	Learns application of mathematics in life (4.80); remembers vital information (4.77); identifies correct answers in written tests (4.77)
Constructive Skills	4.74	Very Relevant	Contributes ideas to group activities (4.87); complies with assignments faster (4.85); works effectively with classmates (4.81)

Legend: Very Irrelevant (1.00–1.80); Irrelevant (1.81–2.60); Moderately Relevant (2.61–3.40); Relevant (3.41–4.20); Very Relevant (4.21–5.00).

Table 3 shows that learners rated digital technology as Very Relevant across all three skill domains, with constructive skills obtaining the highest grand mean ($\bar{x}$ = 4.74), followed by cognitive skills ($\bar{x}$ = 4.71) and behavioral skills ($\bar{x}$ = 4.56). For behavioral skills, learners most strongly agreed that digital technology made them eager to participate in group activities and inspired them to accomplish assignments, consistent with evidence that multimedia resources and meaningfully integrated technology enhance learners' classroom participation, motivation, and behavioral engagement [26,14]. For cognitive skills, learners most strongly agreed that digital technology helped them apply mathematics to daily life and retain vital information, aligning with evidence that curriculum-driven digital tools improve arithmetic mastery and that interactive mobile inquiry approaches strengthen problem-solving ability [13,5]. For constructive skills, learners most strongly agreed that digital technology helped them contribute ideas in group activities and comply with assignments more efficiently, consistent with evidence that technology-enhanced learning environments foster collaboration and creativity [17] and that digital tools support the development of creative thinking skills in STEM subjects [29].

3.3. Academic Performance of the Respondents in Mathematics

Table 4 Frequency and Percentage Distribution of Academic Performance in Mathematics, First and Second Quarter

Indicator	Category	Quarter 1 f (%)	Quarter 2 f (%)
Observed Values	Always Observed	54 (51.9)	77 (74.0)
	Sometimes Observed	45 (43.3)	22 (21.2)
	Rarely Observed	5 (4.8)	5 (4.8)
	Not Observed	0 (0.0)	0 (0.0)
Performance Tasks	Outstanding (90–100)	0 (0)	1 (1)
	Very Satisfactory (85–89)	8 (8)	21 (20)
	Satisfactory (80–84)	55 (53)	64 (62)
	Fairly Satisfactory (75–79)	41 (39)	18 (17)
	Did Not Meet Expectations (<75)	0 (0)	0 (0)
Written Works	≥50% Compliance	63 (61)	67 (64)
	<50% Compliance	41 (39)	37 (36)

Table 4 shows a consistent improvement in academic performance from the first to the second quarter across all three indicators. Learners rated as Always Observed for DepEd core values increased from 54 (51.9%) to 77 (74.0%), consistent with evidence that meaningful technology integration positively influences student engagement, participation, and behavioral outcomes over time [27]. Performance-task ratings likewise improved: Very Satisfactory ratings rose from 8 (8%) to 21 (20%) and Outstanding ratings from 0 to 1 learner, while Fairly Satisfactory ratings declined from 41 (39%) to 18 (17%), consistent with evidence that technology integration is associated with improved mathematics achievement and conceptual understanding [11,21]. Compliance with written works improved modestly, from 63 (61%) to 67 (64%) of learners meeting or exceeding the 50% compliance threshold, in line with evidence that project-based digital learning environments and multimedia-assisted instruction can enhance academic output over time [2,6]. Taken together, these trends are consistent with the broader observation that measurable achievement indicators—performance-task grades and written-work compliance in particular—function as meaningful, trackable proxies for learners' academic progress [8].

3.4. Relationship between the Relevance of Digital Technology and Academic Performance in Mathematics

Table 5 Spearman Rho Coefficients of Correlation between the Assessed Relevance of Digital Technology and Academic Performance in Mathematics

Academic Performance Indicator	Skill Developed	Quarter	Coefficient	Interpretation	p-value	Decision
Observed Values	Behavioral	1	0.236	Weak (+)	0.016	Significant
	Cognitive	1	0.063	Very Weak (+)	0.527	Not Significant
	Constructive	1	0.167	Weak (+)	0.090	Not Significant
	Behavioral	2	0.201	Weak (+)	0.041	Significant
	Cognitive	2	0.063	Very Weak (+)	0.810	Not Significant
	Constructive	2	0.167	Weak (+)	0.378	Not Significant
Performance Tasks	Behavioral	1	−0.125	Very Weak (−)	0.208	Not Significant
	Cognitive	1	−0.086	Very Weak (−)	0.386	Not Significant
	Constructive	1	−0.028	Very Weak (−)	0.779	Not Significant
	Behavioral	2	−0.029	Very Weak (−)	0.768	Not Significant
	Cognitive	2	−0.153	Very Weak (−)	0.121	Not Significant
	Constructive	2	−0.043	Very Weak (−)	0.665	Not Significant
Written Works	Behavioral	1	−0.036	Very Weak (−)	0.715	Not Significant
	Cognitive	1	−0.025	Very Weak (−)	0.802	Not Significant
	Constructive	1	−0.081	Very Weak (−)	0.413	Not Significant
	Behavioral	2	−0.034	Very Weak (−)	0.729	Not Significant
	Cognitive	2	−0.019	Very Weak (−)	0.851	Not Significant
	Constructive	2	−0.090	Very Weak (−)	0.365	Not Significant

Scale: Very Weak (0.000–0.150); Weak (0.151–0.400); Moderate (0.401–0.650); Strong (0.651–0.900); Very Strong (0.901–1.000).

Table 5 shows that, of the nine skill–indicator combinations tested across both quarters, only the relationship between behavioral skills and observed values reached statistical significance, in both Quarter 1 ($\rho = 0.236$, $p = 0.016$) and Quarter 2 ($\rho = 0.201$, $p = 0.041$), both weak positive relationships. All remaining relationships—cognitive and constructive skills with observed values, and all three skill domains with performance-task grades and written-work compliance—were not significant, ranging from very weak to weak in magnitude and, for performance tasks and written works, consistently negative in direction. These results indicate that the perceived relevance of digital technology is most closely tied to learners' behavioral engagement and values formation rather than to graded academic outputs. This pattern is consistent with evidence that the perceived usefulness of ICT for studying mathematics does not always translate into a direct, statistically significant association with academic grades [20], and with evidence that digital tools combined with effective pedagogy support critical thinking and problem-solving without guaranteeing proportional gains in measured achievement [23]. It also aligns with meta-analytic findings that digital technology's effects on mathematics achievement, while generally positive in aggregate, vary considerably depending on how technology is implemented and assessed [18]. Performance-task grades and written-work compliance likely depend on additional factors—such as instructional approach, learner readiness, and classroom environment—that were not captured by learners' self-assessed perceptions of digital technology's relevance.

3.5. Intervention of the Learners' Profile on the Relationship between Digital Technology and Academic Performance

Table 6 Moderation Analysis of the Learners' Profile on the Relationship between the Assessed Relevance of Digital Technology and Academic Performance in Mathematics

Profile Variable	Outcome Tested	Quarter	Path	Estimate	p-value	Remark
Age	Observed Values	1	Digital Technology → Observed Values	0.106	0.658	Not Significant
		1	Digital Technology → Age	0.180	0.720	Not Significant
		1	Age → Observed Values	−0.230	0.624	Not Significant
		2	Digital Technology → Observed Values	−0.094	0.713	Not Significant
		2	Digital Technology → Age	0.180	0.720	Not Significant
		2	Age → Observed Values	−0.108	0.030	Significant
Sex	Performance Tasks	1	Digital Technology → Performance Tasks	0.106	0.658	Not Significant
		1	Digital Technology → Sex	0.600	0.036	Significant
		1	Sex → Performance Tasks	−0.007	0.936	Not Significant
		2	Digital Technology → Performance Tasks	−0.094	0.713	Not Significant
		2	Digital Technology → Sex	0.600	0.036	Significant
		2	Sex → Performance Tasks	−0.113	0.194	Not Significant
Tribe	Written Works	1	Digital Technology → Written Works	0.106	0.658	Not Significant
		1	Digital Technology → Tribe	0.683	0.015	Significant
		1	Tribe → Written Works	0.135	0.104	Not Significant
		2	Digital Technology → Written Works	−0.094	0.713	Not Significant
		2	Digital Technology → Tribe	0.683	0.015	Significant
		2	Tribe → Written Works	0.034	0.704	Not Significant

Table 6 shows that age did not significantly moderate the relationship between digital technology and observed values in either quarter; the sole exception was a significant direct path between age and observed values in Quarter 2 (estimate = −0.108, p = 0.030), which did not alter the overall non-significant moderation pattern across both quarters combined. Sex likewise did not significantly moderate the relationship between digital technology and performance-task grades in either quarter, although digital technology itself was significantly associated with sex composition (estimate = 0.600, p = 0.036) in both quarters, suggesting a modest difference in how male and female learners rated the relevance of digital technology without this difference translating into a moderating effect on performance outcomes. Tribe similarly did not significantly moderate the relationship between digital technology and written-work compliance in either quarter, despite a significant association between digital technology and tribal affiliation (estimate = 0.683, p = 0.015).

These findings indicate that, overall, the learners' age, sex, and tribal affiliation did not meaningfully alter the relationship between the assessed relevance of digital technology and academic performance in mathematics, suggesting that the benefits and limitations of digital technology were experienced comparably across these demographic groups. This is broadly consistent with evidence that demographic variables often exert limited influence on the effectiveness of educational technology relative to the quality of implementation itself [27], and it converges with findings that technology-enhanced learning tends to provide comparable benefits across learner subgroups when meaningfully integrated [27]. At the same time, related research indicates that broader gender gaps in mathematics engagement and self-concept can still emerge as learners progress through school [10], that executive-function and other learner-level cognitive factors can meaningfully affect academic performance independent of technology use [9], that digital competence itself may mediate rather than directly determine academic performance [24], and that the functions and roles technology plays in the classroom—rather than technology's mere presence—determine its ultimate effect on mathematics achievement [25]. Together, this suggests that the absence of a significant moderating effect for age, sex, and tribe should not be read as evidence that these factors are irrelevant to learning broadly, but rather that in this specific study they did not alter how the relevance of digital technology related to academic performance.

Several limitations warrant caution in interpreting these findings. The reliance on learners' self-assessed perceptions of digital technology's relevance, rather than objective, technology-use metrics, may not fully capture the mechanisms by which digital tools influence learning; technical support for both teachers and learners in effectively using these tools also plausibly shapes whether digital technology translates into either behavioral or academic gains [12], and learners' own adaptability to digital and remote learning conditions may further condition how digital literacy relates to academic performance [31]. The cross-sectional, single-district design and modest sample size limit the generalizability of these findings to other IPEd-implementing schools or Indigenous communities. Future research employing longitudinal designs and objective measures of technology use would help clarify the causal pathways—rather than merely the correlational associations—linking digital literacy to academic achievement among Indigenous learners [22].

4. Conclusion

Indigenous Grade 3 learners in the IPEd-implementing schools of San Jose North District, Occidental Mindoro were predominantly 9 years old, male, and of Hanunuo ethnicity. Learners consistently and strongly perceived digital technology as Very Relevant in developing their behavioral, cognitive, and constructive skills in mathematics, with constructive skills receiving the highest ratings, followed by cognitive and behavioral skills. Academic performance improved from the first to the second quarter across all three indicators examined—observed values, performance-task grades, and written-work compliance—suggesting a generally positive trajectory in learners' mathematics performance over the school year.

The relevance of digital technology demonstrated a significant, though weak, positive relationship with learners' observed values specifically through the development of behavioral skills, but not through cognitive or constructive skills, and not with performance-task grades or written-work compliance in either quarter. This indicates that digital technology's most reliable, measurable contribution in this context was to learners' values formation and behavioral engagement rather than to graded academic outputs, which likely depend on a broader set of instructional and learner-related factors. Furthermore, the learners' age, sex, and tribal affiliation did not significantly alter this relationship, indicating that digital technology's relevance to academic performance was experienced comparably regardless of these demographic characteristics.

These findings suggest that culturally responsive, indigenized digital instructional materials can be a valuable tool for reinforcing positive values and behavioral engagement among Indigenous learners, but should not be expected, on their own, to produce proportional gains in graded academic performance. Curriculum planners and school administrators are encouraged to pair digital-technology integration with complementary instructional strategies—such as culturally grounded pedagogy, teacher technical support, and individualized learner support—to more directly target gains in performance-task and written-work outcomes. The Department of Education and school administrators are further encouraged to sustain and expand equitable access to digital infrastructure across IPEd-implementing schools, given that its behavioral and motivational benefits were observed consistently across age, sex, and tribal groups. Future studies should incorporate longitudinal designs, objective measures of technology use, and additional learner- and teacher-level variables to further clarify the pathways through which digital technology may come to influence the academic performance of Indigenous learners in mathematics.

Compliance with Ethical Standards

Acknowledgments

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Disclosure of conflict of interest

The author declares no conflict of interest.

Statement of ethical approval

Ethics clearance was obtained prior to data collection, and permission to conduct the study was secured from the Schools Division Office of Occidental Mindoro and the school heads of the participating schools. The research instruments were further reviewed by representatives of the National Commission on Indigenous Peoples to ensure that no Indigenous cultural rights or beliefs were violated in the conduct of the study. The study was conducted in accordance with the ethical principles applicable to research involving minors and Indigenous communities.

Statement of informed consent

Informed parental or guardian consent was obtained for all learner-respondents prior to data collection, and assent was likewise obtained from the learners themselves. Consent was also obtained from the teacher-participants prior to their interviews. Participants were informed of the purpose, procedures, and voluntary nature of the study, and confidentiality and anonymity were maintained throughout.

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