Crafting Creativity and Innovation: The Transformative Power of Different Learning Pedagogies

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Abstract— This This study examines the impact of diverse learning pedagogies on fostering creativity and innovation among Grade 7 Technology and Livelihood Education students in the Philippines. Grounded in Constructivism, Social Cognitive Theory, and the Theory of Multiple Intelligences, the research employed a quasi-experimental, pretest-posttest design to compare Direct Instruction, Inquiry-Based Learning (IBL), Project-Based Learning (PBL), and Collaborative Learning (CL), with student mental ability as a moderating factor. Data were collected through creativity and innovation assessments, expert-validated instructional materials, and student perception surveys. Results revealed that IBL significantly enhanced creativity and engagement, while CL also demonstrated positive effects. Surprisingly, PBL showed a slight decline, suggesting the need for further investigation into its implementation. Direct Instruction yielded reduced scores, reinforcing the superiority of student-centered approaches. A significant interaction between pedagogies and mental ability was observed, with "Very high average" students benefiting most. Expert validation confirmed the instructional materials' quality and suitability. The study concludes that student-centered methods, particularly IBL and CL, are more effective in nurturing creativity and innovation, emphasizing the need for differentiated instruction. These findings advocate for continued research and teacher training to align policy, pedagogy, and practice in Philippine education

Keywords— Learning Pedagogies, Student-centered learning, Quasi-experimental design, Philippine education, Creativity, Innovation.

I. INTRODUCTION

In today's complex and rapidly evolving world, creativity and innovation are indispensable skills for learners navigating modern academic and professional challenges. Contemporary educational research increasingly emphasizes the importance of student-centered pedagogies, such as inquiry-based learning [4] [11] and project-based learning [5] [9], in cultivating creative thinking and problem-solving abilities. These pedagogies encourage learners to explore, question, and co-construct knowledge, contrasting starkly with passive, lecture-based methods that often stifle innovation [14]. Teacher facilitation also plays a critical role in shaping students' reasoning and problem-solving skills in collaborative settings [3], while the integration of digital tools, including augmented reality and virtual environments, has shown promise in enhancing student engagement and scientific creativity [12] [8] These findings underscore a growing global consensus: to thrive in the 21st century, learners must be immersed in dynamic and participatory learning experiences that nurture higher-order thinking.

Despite this momentum, there is still a limited body of comparative research on the effectiveness of these pedagogies within the Philippine context. Data from TIMSS and PISA assessments reflect persistent underperformance among Filipino students in science and mathematics—subjects that heavily rely on creative and analytical competencies [1]. This raises critical concerns about the effectiveness of current teaching practices and calls for a reassessment of dominant instructional approaches. Studies such as those by [7] [13] suggest that guided inquiry and computer-supported collaborative learning positively impact students' process skills and collective efficacy. Similarly, [2] found that project-based learning in Philippine science high schools offers a more contextualized and engaging model of instruction. Despite growing interest, comparative studies on pedagogical approaches in Filipino classrooms remain limited [2]. This study addresses that gap by examining how various teaching models foster creativity and innovation, contributing to the development of instructional practices aligned with both local educational needs and global standards [1].

Statement of the Problem

This study seeks to investigate the impact of four distinct teaching pedagogies on student performance, considering their mental abilities, through an analysis of pre-test and post-test mean scores, the interaction between pedagogies and mental abilities, expert content validation of developed materials, and the perceptions of teachers, master teachers, and education program supervisors regarding these materials, ultimately aiming to propose an enhanced output based on the findings. Specifically, it aimed to find answers to the questions:

1. What is the pretest -post-test mean scores of the students based on the four teaching pedagogies?
2. Is there a significant difference between the pretest and post-test mean scores of the four teaching pedagogies?
3. Is there a significant difference between the pretest and post-test mean scores of the four teaching pedagogies when grouped according to mental ability?
4. Is there a significant interaction of the identified strategies and the mental abilities of the students?
5. What is the result of the content validation as experienced by the experts?
   a. Teachers

b. Master Teachers
c. EPS

6. What are the perception of the three groups of respondents on the developed material as to:
   a. Content
   b. Format
   c. Presentation and organization
7. What enhanced output can be proposed based on the findings of the study?

II. MATERIALS AND METHOD

Employing a quasi-experimental pretest-post-test non-equivalent groups design at Gamut National High School in Tago, Surigao del Sur, Philippines, this study will investigate the impact of Direct Instruction, Inquiry-Based Learning, Project-Based Learning, and Collaborative Learning on the creativity and innovation of 42 Grade 7 SPJ students, utilizing a validated Creativity and Innovation Assessment Tool, Expert Validation Forms from teachers, master teachers, and EPS, and a Perception Questionnaire, with data gathered through the implementation of the pedagogies and analysed using descriptive statistics, t-tests, ANOVA, ANCOVA, and moderation analysis, guided by the IPO framework to determine pedagogical effectiveness while considering student mental ability and expert/respondent feedback to inform potential output enhancements.

III. RESULTS AND DISCUSSION

Pre-test and Post-test Mean Scores

TABLE 1. Pre-test and Post-test Mean Scores

Groups	Pretest		Post test	
	Mean	SD	Mean	SD
Inquiry based learning	7.643	1.527	8.452	1.173
Collaborative learning	5.071	1.332	5.857	1.354
Project-based learning	5.357	1.898	5.071	1.745
Direct Instruction Learning	7.524	1.383	7.143	1.458

The data reveals that Inquiry-Based Learning (IBL) yielded the most significant learning gains, increasing from a pretest mean of 7.643 to a posttest mean of 8.452, aligning with literature [12] emphasizing its positive impact on learning and creativity through active exploration. Collaborative Learning also showed improvement, increasing from a pretest of 5.071 to a posttest of 5.857, consistent with research [8] [3] on its benefits for creative problem-solving. Conversely, Project-Based Learning (PBL) surprisingly showed a slight decrease from a pretest of 5.357 to a posttest of 5.071, contrasting with general literature support [5] [9] and necessitating further investigation into implementation factors. Direct Instruction Learning also decreased from a pretest of 7.524 to a posttest of 7.143, reinforcing the literature [10] favoring student-centered approaches, which are theoretically grounded in constructivism, social cognitive theory, and theory of multiple intelligences. Overall, while IBL and Collaborative Learning outcomes strongly align with existing research, the unexpected PBL result warrants further scrutiny regarding its application in this specific context.

Presents the statistical significance of the difference between pretest and post-test mean scores for the four teaching pedagogies.

TABLE 2. Statistical Significance of the Difference Between Pre-test and Post-test Mean Scores

Sources of Variation	Computed f	P-value	Decision	Conclusion
Pretest	29.77	0.000	Reject Ho	Highly significant
Post Test	13.2	0.000	Reject Ho	Highly significant

The highly significant difference (p<0.001) between overall pretest and posttest scores in Table 2 indicates a significant change in student performance across the four teaching pedagogies, a finding supported by theoretical frameworks like Constructivism and empirical evidence emphasizing the impact of teaching methods on learning outcomes. Specifically, literature highlights the effectiveness of student-centered pedagogies such as Inquiry-Based Learning, Collaborative Learning, and Project-Based Learning [12] [11] [8] [5] in fostering positive student changes, contrasting with the limitations of traditional direct instruction. Consequently, this significant difference underscores the transformative potential of effective teaching pedagogies, particularly student-centered approaches, in enhancing student learning and development.

Presents the statistical significance of the difference between pretest and posttest mean scores for the four teaching pedagogies, grouped by mental ability.

TABLE 3. Significant Difference Between Pre-test and Post-test Grouped According to Mental Ability

Sources of Variation		Computed f	P-value	Decision	Conclusion
Pretest	Very high average	4.601	0.006	Reject Ho	Significant
	High average	8.430	0.000	Reject Ho	Significant
	Average	0.730	0.543	Failed to Reject Ho	Not Significant
Post test	Very high average	4.800	0.003	Reject Ho	Significant
	High average	0.150	0.929	Failed to Reject Ho	Not Significant
	Average	0.130	0.718	Failed to Reject Ho	Not Significant

Pretest analysis revealed significant differences based on mental ability for the 'Very high average' (p=0.006) and 'High average' (p<0.001) groups, but not for 'Average' ability (p=0.543), a pattern that persisted in post-test results for the 'Very high average' group (p=0.003) only. This suggests that the teaching pedagogies may disproportionately affect students with "Very high average" mental ability. This aligns with the Theory of Multiple Intelligences, advocating for differentiated instruction, and the literature supporting learner-centered approaches like Inquiry-Based Learning, Collaborative Learning, and Project-Based Learning, which might effectively engage higher-ability students. The lack of significant differences in the 'Average' group could indicate insufficient scaffolding, as highlighted [3] [10]. Recognizing individual learner differences, these findings underscore the need for further research into how specific pedagogical

elements interact with student mental ability to optimize learning for all.

Statistical significance of the interaction between teaching pedagogies and students' mental abilities

TABLE 4. Significance of the Interaction Between Teaching Pedagogies and Students' Mental Abilities

Sources of Variation	Computed f	P-value	Decision	Conclusion
Factor A(Pedagogies)	0.13	0.717	Failed to reject Ho	Not Significant
Factor B (Mental Ability)	61.89	0.000	Reject Ho	Significant
A*B (Interaction Effect)	3.07	0.0196	Reject Ho	Significant

While the main effect of teaching pedagogies (Factor A) was not significant (p=0.717), indicating no overall difference in their effects across all mental abilities, the significant main effect of mental ability (Factor B, p<0.001) shows that students with different mental abilities performed differently regardless of the pedagogy. Crucially, the significant interaction effect (A*B, p=0.0196) reveals that the impact of a teaching pedagogy depends on the student's mental ability. This aligns with the Theory of Multiple Intelligences, suggesting varied cognitive strengths influence how students respond to different pedagogies, and underscores the importance of differentiated instruction rooted in constructivism. Learner-centered approaches, like Inquiry-Based Learning, Collaborative Learning, and Project-Based Learning, often incorporate differentiation to better accommodate diverse mental abilities, and effective teacher facilitation [3] can further support this. In essence, the significant interaction highlights the need to consider individual cognitive differences and implement differentiated, learner-centered instruction.

The results of the content validation as experienced by the experts (Teachers, Master Teachers, and EPS - Education Program Supervisor)

The data in Table 5 indicates a high level of agreement among the experts regarding the quality of the developed material. Notably, all indicators received an "Excellent" rating from the teachers. In contrast, Master Teachers and EPS gave "Very Good" ratings, with overall means of 4.86 and 4.71, respectively. Collectively, this suggests that the material is well-clarified, presented, suitable, adequate, purposeful, objective, and has a sound scale and evaluation system.

Perception of the three groups of respondents on the developed material as to: Content, Format, and Presentation and Organization.

Table 6 indicates a positive perception of the developed material across all respondent groups (Teachers, Master Teachers, and EPS). Teachers and Master Teachers "Strongly Agreed" on content (Grand Mean 4.33) and format (Grand Mean 4.56), while EPS "Agreed." All groups "Agreed" on presentation and organization (Grand Mean 4.00). The overall grand mean of 4.30 corresponds to a "Strongly Agree" rating, highlighting the positive validation of the material's design and alignment with learner-centered principles [9]. Furthermore, "Excellent" ratings for clarity and objectivity suggest the material supports effective teacher facilitation [3] and the cultivation of 21st-century skills. In conclusion, this positive expert validation reinforces the literature's emphasis on well-designed, learner-centered materials crucial for effective teaching and skill development.

TABLE 5. Presents the Results of the Content Validation as Perceived by Experts

Indicators	Teacher		Master Teacher		EPS		Grand Mean	Over all Adjectival rating
	Mean	Adj Rating	Mean	Adj Rating	Mean	Adj Rating		
1. Clarify the direction and items	5.00	Excellent	5.00	Excellent	5.00	Excellent	5.00	Excellent
2.Presentation/Organization of items	5.00	Excellent	4.00	Very Good	4.00	Very Good	4.33	Very Good
3. Suitable of items	5.00	Excellent	5.00	Excellent	4.00	Very Good	4.67	Very Good
4. Adequateness of items per category	5.00	Excellent	5.00	Excellent	5.00	Excellent	5.00	Excellent
5. Attainment of the purpose	5.00	Excellent	5.00	Excellent	5.00	Excellent	5.00	Excellent
6.Objectively	5.00	Excellent	5.00	Excellent	5.00	Excellent	5.00	Excellent
7.Scale and Evaluation in Rating system	5.00	Excellent	5.00	Excellent	5.00	Excellent	5.00	Excellent
Over-all Mean	5.00	Excellent	**4.86**	Very Good	**4.71**	Very Good	**4.86**	Very Good

TABLE 6. Perception of the Three Groups of Respondents on the Developed Material

Indicators	Teacher		Master teacher		EPS		Grand Mean	Over-all Adjectival rating
	Mean	Adj Rating	Mean	Adj Rating	Mean	Adj Rating		
Content	5.00	Strongly Agree	4.00	Agree	4.00	Agree	4.33	Strongly Agree
Format	4.67	Strongly Agree	5.00	Strongly Agree	4.00	Agree	4.56	Strongly Agree
Presentation & Organization	4.00	Agree	4.00	Agree	4.00	Agree	4.00	Agree
Over All Mean	**4.56**	**Strongly Agree**	**4.33**	**Strongly Agree**	**4.00**	**Agree**	**4.30**	**Strongly Agree**

Enhance Output of Differentiated Instruction Lesson Plan

Differentiated instruction emphasizes tailoring learning experiences to diverse student needs, and an enhanced output in a lesson plan reflects varied, meaningful ways for students to demonstrate understanding beyond standardized assessments, aligning with their strengths and learning styles. While the developed material was well-received by Teachers, Master Teachers, and EPS, the evaluation suggests a focused revision on "Presentation and Organization" to further enhance the output. Although content and format were rated highly, improving the flow, visual cues, or layout could optimize usability and comprehension.

IV. CONCLUSIONS

The findings suggest that Inquiry-Based Learning holds significant promise as an effective pedagogical approach, while Project-Based Learning requires careful implementation and further investigation. The choice of pedagogy significantly influences student performance, with its impact being moderated by students' mental abilities, highlighting the need for differentiated and learner-centered instruction. The developed material demonstrates strong content validity and is generally well-received, though enhancements to its presentation and organization are recommended to optimize its impact and usability.

Recommendations

Based on the comprehensive analysis of pedagogical approaches, student performance across varying mental abilities, and expert/user validation of learning materials, the overarching recommendation is to adopt a nuanced and adaptive approach to instructional design and implementation. This involves strategically prioritizing Inquiry-Based Learning, refining Project-Based Learning, and supplementing Direct Instruction, while also tailoring pedagogical choices to students' diverse mental abilities. Furthermore, it is crucial to continuously evaluate and enhance the presentation and organization of learning materials to ensure optimal usability and engagement, thereby maximizing the effectiveness of educational interventions and fostering improved learning outcomes for all students.

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