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AI-Assisted Interactive Scenarios and Traditional Instruction in Grade 9 Economics: Effects on Student Engagement and Academic Performance

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ABSTRACT

This study evaluated the effects of Teacher-Led AI-Assisted Interactive Scenarios and Traditional Direct Instruction on student engagement and academic performance in Grade 9 Araling Panlipunan (Ekonomiks) at Can-avid National High School, Eastern Samar, during School Year 2025–2026. Anchored in the multidimensional framework of behavioral, cognitive, and affective engagement, the study employed a quasi-experimental pretest–posttest control group design with an explanatory sequential mixed-methods approach. Participants included 79 students divided into an experimental group (n = 39) and a comparison group (n = 40). Data were collected using a validated 40-item achievement test and semi-structured focus group discussions, then analyzed through descriptive statistics, paired-samples and independent-samples t-tests, and thematic analysis. Results showed statistically significant academic improvements in both groups ($p < 0.001$). However, the experimental group achieved higher mean learning gains (17.33) than the comparison group (10.57), with a statistically significant difference ($t(77) = 9.84$, $p < 0.001$) and a very large effect size (Cohen's $d = 2.22$). Qualitative findings revealed that AI-assisted scenarios promoted active participation, critical problem-solving, contextualized decision-making, enthusiasm, and reduced learning anxiety, while traditional instruction supported structured comprehension and routine attentiveness. The study concludes that teacher-facilitated AI-assisted scenarios enhance academic achievement and multidimensional engagement. It recommends integrating validated AI-supported activities with structured instruction and strengthening teacher professional development. The findings align with Sustainable Development Goal 4 (Quality Education) and Sustainable Development Goal 9 (Industry, Innovation and Infrastructure) through instructional improvement and educational innovation. Their sustainability relevance lies in supporting responsible AI integration, effective teaching practices, and economic literacy, although direct SDG progress was not measured.

Keywords: *Academic Performance, AI-Assisted Interactive Scenarios, Araling Panlipunan (Ekonomiks), Economic Literacy, Explanatory Sequential Mixed-Methods, Grade 9 Economics, Student Engagement, Sustainable Development Goals, Teacher-Led Instruction, Traditional Direct Instruction*

1. INTRODUCTION

Student engagement and academic performance are important concerns in Grade 9 Araling Panlipunan (Ekonomiks), where students must understand economic principles and apply them to everyday situations. The curriculum emphasizes foundational concepts such as demand, supply, market interaction, and the circular flow of the economy (Department of Education, 2020). However, the abstract nature of these concepts can make learning challenging, particularly when instruction relies primarily on lectures, memorization, and teacher-centered explanations. Traditional direct instruction provides systematic explanations and structured learning activities, while interactive approaches create opportunities for active participation, collaboration, and meaningful application (Vergara et al., 2025; Connell, 2012). In the Philippine context, Vapor et al. (2025) demonstrated that interactive instructional strategies can improve engagement, comprehension, and academic performance in Grade 9 Ekonomiks. Artificial intelligence (AI) offers additional opportunities to contextualize economic learning through teacher-facilitated scenarios, role-playing, and decision-making activities. AI-supported simulations can immerse learners in realistic situations involving consumers, producers, workers, entrepreneurs, and government decision-makers (Harvard Business Publishing, 2024; Fournier, 2024; Stampfl et al., 2024). Although AI-assisted learning may strengthen engagement and achievement (Alam et al., 2026; Vieriu & Petrea, 2025), its effectiveness depends on appropriate pedagogical integration (Ladera, 2026). This study examines the effects of Teacher-Led AI-Assisted Interactive Scenarios and Traditional Direct Instruction on the engagement and academic performance of Grade 9 Ekonomiks students at Can-avid National High School during School Year 2025–2026.

Research Problem

Despite the importance of economic literacy, Grade 9 students may experience difficulty understanding and applying abstract economic concepts through conventional instructional approaches. Although traditional direct instruction supports organized learning and conceptual comprehension, it may provide fewer opportunities for contextualized decision-making and active engagement (Vergara et al., 2025; Connell, 2012). Interactive strategies have demonstrated positive outcomes in Araling Panlipunan, particularly in improving student participation and academic performance (Vapor et al., 2025). However, limited research has specifically examined teacher-led AI-assisted interactive scenarios in Philippine junior high school Ekonomiks classrooms. Moreover, the educational benefits of generative AI cannot be presumed because its effectiveness depends on instructional implementation (Ladera, 2026). The central research problem is therefore whether Teacher-Led AI-Assisted Interactive Scenarios produce significantly different academic performance gains and student engagement experiences compared with Traditional Direct Instruction. The study also investigates how behavioral, cognitive, and affective engagement explain differences in learning outcomes between the two instructional approaches.

Assumptions of the Study

The study proceeds from the premise that both Teacher-Led AI-Assisted Interactive Scenarios and Traditional Direct Instruction can support students' understanding of Grade 9 Ekonomiks competencies, although they may differ in the extent to which they encourage participation, conceptual application, and academic improvement. It further assumes that meaningful learning involves behavioral, cognitive, and affective engagement, encompassing students'

participation, intellectual investment, interest, and emotional responses to instruction (Fredricks et al., 2004). Interactive learning experiences may provide opportunities for deeper engagement by connecting abstract concepts with practical situations (Vapor et al., 2025). Additionally, the study recognizes that AI-assisted instruction does not inherently guarantee improved academic performance. Its educational value depends on teacher facilitation, appropriate scenario design, and meaningful integration into classroom activities (Ladera, 2026). These premises provide the basis for examining differences in academic achievement and engagement between the two instructional approaches rather than presuming the superiority of either method.

Objectives of the Study

The primary objective of this study is to evaluate the effects of Teacher-Led AI-Assisted Interactive Scenarios and Traditional Direct Instruction on the student engagement and academic performance of Grade 9 students in Araling Panlipunan (Ekonomiks). Specifically, the study aims to determine students' academic performance through pre-test and post-test scores under both instructional approaches; examine significant differences between pre-test and post-test performance within each group; compare academic performance gain scores between the experimental and comparison groups; describe students' behavioral, cognitive, and affective engagement during instruction; and explain how qualitative engagement experiences relate to quantitative differences in academic performance. Through these objectives, the study seeks to provide empirical evidence on the comparative effectiveness of teacher-facilitated AI-supported learning and conventional instruction in secondary economics education.

Conceptual and Theoretical Framework

The study is anchored in the multidimensional framework of student engagement proposed by Fredricks et al. (2004), which identifies behavioral, cognitive, and affective engagement as interconnected dimensions of learning. Behavioral engagement refers to participation, attentiveness, effort, and involvement in classroom activities. Cognitive engagement concerns students' intellectual investment in understanding concepts, solving problems, and applying knowledge. Affective engagement encompasses interest, enjoyment, motivation, confidence, and emotional responses to learning. Fredricks et al. (2005) further discussed school engagement as an important indicator of positive student development, emphasizing its relevance to understanding students' participation and experiences in educational settings. Moreover, Fredricks et al. (2016) highlighted the importance of clearly defining and measuring student engagement while considering the contextual and methodological factors that influence its assessment. These dimensions are associated with students' persistence, participation, and academic outcomes (Fredricks et al., 2004; Wong et al., 2024). Accordingly, the framework provides a basis for examining how different instructional approaches influence learning experiences and achievement. Conceptually, the study compares two instructional conditions. Teacher-Led AI-Assisted Interactive Scenarios involve teacher-facilitated role-playing, contextualized economic situations, guided decision-making, and interactive problem-solving. Traditional Direct Instruction emphasizes systematic explanations, guided practice, classroom discussions, and structured exercises. Research suggests that AI-supported role-playing can promote authentic learning experiences and meaningful application of concepts (Harvard Business Publishing, 2024; Fournier, 2024; Stampfl et al., 2024). Academic performance is examined through pre-test and post-test achievement scores, while student engagement is explored through behavioral, cognitive, and affective experiences. The integration of quantitative and qualitative evidence follows an explanatory sequential mixed-methods approach, allowing engagement experiences to contextualize differences in academic outcomes (Creswell & Creswell, 2018; Fredricks et al., 2004). This conceptual basis recognizes that instructional

effectiveness depends not merely on the use of AI technology but on how teachers facilitate meaningful learning activities that promote conceptual understanding and student participation (Ladera, 2026).

Sustainable Development Goal and Multidisciplinary Sustainability Relevance

The study primarily aligns with Sustainable Development Goal 4 (Quality Education) through its examination of instructional approaches intended to improve student engagement, academic performance, and understanding of economic concepts. By evaluating teacher-led AI-assisted interactive scenarios alongside traditional instruction, the research contributes evidence relevant to improving the quality and effectiveness of secondary education. The study also relates to Sustainable Development Goal 9 (Industry, Innovation and Infrastructure) through its investigation of AI-supported instructional innovation. Its emphasis on teacher-facilitated use of generative AI highlights the potential of emerging digital technologies to support interactive and contextualized learning while maintaining teachers' instructional responsibilities. In terms of sustainability, the research contributes primarily to educational and technological sustainability by examining how AI-assisted teaching approaches may support effective learning and informed instructional practices. Its focus on economic literacy also has relevance to socio-economic sustainability, as students develop an understanding of scarcity, resource allocation, market interactions, and everyday economic decision-making. These contributions are educational in scope and do not imply that the study directly measures progress toward the SDGs. Rather, the research provides classroom-based evidence that may inform instructional improvement and the responsible integration of AI into secondary economics education.

2. METHODOLOGY

Research Design

The study utilized a quasi-experimental pretest–posttest control group design combined with an explanatory sequential mixed-methods approach. Two intact Grade 9 classes were assigned to an experimental group receiving Teacher-Led AI-Assisted Interactive Scenarios and a comparison group receiving Traditional Direct Instruction. The quasi-experimental design was appropriate because participants belonged to existing classes rather than being individually randomized, allowing the comparison of academic performance before and after the interventions within a natural classroom setting (Creswell & Creswell, 2018). The quantitative phase examined differences in academic achievement through pre-test and post-test scores, while the qualitative phase explored students' behavioral, cognitive, and affective engagement. Integrating these approaches enabled the study to examine academic outcomes alongside students' learning experiences (Creswell & Creswell, 2018; Fredricks et al., 2004).

Research Locale or Study Setting

The study was conducted at Can-avid National High School, a rural secondary school in the Division of Eastern Samar, Philippines, during School Year 2025–2026. The research focused on Grade 9 Araling Panlipunan (Ekonomiks), particularly foundational economic concepts such as demand, supply, market interaction, scarcity, and the circular flow of the economy. Instruction was implemented within existing classroom schedules to preserve the natural learning environment and minimize disruption to regular academic activities.

Participants or Data Sources

The participants consisted of 79 Grade 9 students enrolled in Araling Panlipunan (Ekonomiks), distributed across two intact sections. The experimental group comprised 39 students exposed to Teacher-Led AI-Assisted Interactive Scenarios, while the comparison group consisted of 40 students receiving Traditional Direct Instruction. Group assignment followed existing class

schedules rather than individual randomization. For the qualitative phase, purposive sampling was employed to select six to eight students from each group based on academic performance gains and classroom participation. Participants represented varying levels of academic improvement to capture diverse learning experiences. Separate FGDs were conducted for both groups to explore behavioral, cognitive, and affective engagement until data saturation was reached. Participation was voluntary and subject to school and parental consent procedures.

Research Instruments or Materials

The study utilized a researcher-made 40-item multiple-choice achievement test and a semi-structured FGD interview guide. The achievement test measured students' mastery of Grade 9 Araling Panlipunan Most Essential Learning Competencies (MELCs), covering basic economic concepts, demand, supply, market interaction, and the circular flow of the economy (Department of Education, 2020). The instrument underwent expert validation by an Araling Panlipunan teacher, a master teacher or school head, and a research adviser or assessment specialist. Pilot testing with a non-participating Grade 9 section established item difficulty, discrimination, and reliability, yielding a Cronbach's alpha coefficient of 0.73. The FGD guide examined behavioral engagement through participation, attention, and effort; cognitive engagement through understanding, problem-solving, and decision-making; and affective engagement through interest, motivation, confidence, and enjoyment (Fredricks et al., 2004). The same expert panel reviewed the guide for clarity, age-appropriateness, and alignment with the research objectives. Instructional materials for the experimental group consisted of AI-supported economic scenarios, role-playing activities, dialogues, and contextualized decision-making tasks. The teacher reviewed, adapted, and validated AI-generated materials to ensure accuracy, cultural sensitivity, age-appropriateness, and curriculum alignment (Department of Education, 2020). The comparison group used conventional instructional materials involving teacher explanations, board work, guided practice, classroom discussions, and individual or group exercises.

Data Gathering Procedure

Data collection began after obtaining school administrative approval, parental consent, and student assent. Research instruments and instructional materials were prepared, validated, and pilot-tested before implementation. Both groups completed the same achievement pre-test to establish baseline academic performance. During the intervention, the experimental group received Teacher-Led AI-Assisted Interactive Scenarios involving realistic economic situations, role-playing, guided decision-making, teacher-facilitated discussions, and formative assessments. Students assumed roles such as consumers, sellers, workers, or government officials to analyze economic issues, including scarcity, price changes, and market interactions. The teacher facilitated the activities, clarified misconceptions, and connected students' responses to the relevant economic concepts. The comparison group received Traditional Direct Instruction covering the same Ekonomiks topics for an equivalent instructional period. Lessons involved systematic explanations, question-and-answer discussions, board work, guided practice, and classroom exercises without AI-assisted scenarios or role-playing activities. Following the intervention, both groups completed the achievement post-test to measure academic improvement. Separate FGDs were subsequently conducted with purposively selected students to explore their behavioral, cognitive, and affective engagement. Quantitative and qualitative data were then analyzed separately and integrated to explain differences in academic performance between the instructional approaches.

Data Analysis

Quantitative data were analyzed using descriptive and inferential statistics. Means, standard deviations, minimum and maximum scores, and frequency distributions summarized students' pre-test and post-test academic performance. Individual gain scores were calculated by subtracting pre-test scores from post-test scores. Paired-samples t-tests were used to determine significant within-group differences, with the Wilcoxon signed-rank test identified as an alternative for non-normal data. An independent-samples t-test compared academic performance gain scores between the experimental and comparison groups. Statistical significance was established at the 0.05 level. Qualitative data from the FGDs were audio-recorded, transcribed verbatim, and examined through thematic analysis following Braun and Clarke's (2006) six phases: familiarization, initial coding, theme identification, theme review, theme definition, and report production. Coding focused on behavioral, cognitive, and affective engagement to identify similarities and differences in students' experiences under both instructional approaches. Quantitative and qualitative findings were integrated through triangulation following the explanatory sequential mixed-methods design (Creswell & Creswell, 2018). Emerging engagement themes were used to contextualize and explain differences in academic achievement between the two groups.

Ethical Consideration

The study observed ethical principles involving voluntary participation, informed consent, confidentiality, anonymity, and protection of minors. Approval was obtained from the administration of Can-avid National High School, while parental consent and student assent were secured before data collection. Students who declined participation in the qualitative phase continued receiving regular classroom instruction and completed the required academic assessments in accordance with school procedures. Participant identities were protected through coded identifiers, and research records were securely stored to maintain confidentiality and safeguard students' personal information.

3. RESULTS AND DISCUSSION

3.1 Academic Performance of Grade 9 Students in Araling Panlipunan (Ekonomiks)

3.1.1 Pre-Test and Post-Test Academic Performance

The academic performance of 79 Grade 9 students was assessed using a researcher-made 40-item achievement test aligned with the Most Essential Learning Competencies (MELCs) in Ekonomiks. The experimental group (n = 39) obtained a pre-test mean of 14.23 (SD = 3.12), while the comparison group (n = 40) recorded 13.88 (SD = 2.95), indicating comparable initial performance. After the intervention, the experimental group achieved a post-test mean of 31.56 (SD = 3.84) and a mean gain of 17.33 (SD = 2.91). Meanwhile, the comparison group obtained a post-test mean of 24.45 (SD = 4.10) and a mean gain of 10.57 (SD = 3.24). These findings indicate that both instructional approaches improved students' understanding of economic concepts. However, the higher post-test performance and mean gain of the experimental group suggest that Teacher-Led AI-Assisted Interactive Scenarios were more effective in supporting the mastery of economic concepts than Traditional Direct Instruction. The integration of interactive scenarios and teacher-guided activities provided opportunities for students to apply abstract economic principles in meaningful learning situations.

3.1.2 Significant Differences Between Pre-Test and Post-Test Performance

Paired-samples t-tests revealed statistically significant improvements in both groups at the 0.05 significance level. The experimental group demonstrated a mean increase of 17.33 points, from 14.23 to 31.56 ($t(38)=37.15, p<0.001$). Similarly, the comparison group showed a mean increase

of 10.57 points, from 13.88 to 24.45 ($t(39)=20.62, p<0.001$). These results indicate significant learning gains under both instructional approaches. The significant improvement in the experimental group suggests that teacher-led AI-assisted scenarios strengthened students' understanding of demand, supply, market interactions, and the circular flow of the economy through interactive learning experiences. Meanwhile, the significant improvement in the comparison group indicates that Traditional Direct Instruction remained effective in developing foundational economic knowledge through structured explanations and classroom discussions. Nevertheless, the larger improvement observed in the experimental group highlights the greater learning gains associated with interactive, scenario-based instruction.

3.1.3 Comparison of Academic Performance Gain Scores

The independent-samples t-test revealed a statistically significant difference in academic performance gains between the experimental and comparison groups ($t(77)=9.84, p<0.001$). The experimental group achieved a higher mean gain score of 17.33 (SD = 2.91) than the comparison group, which obtained 10.57 (SD = 3.24). The computed Cohen's d of 2.22 indicated a very large effect size, demonstrating a substantial difference in learning gains between the two instructional approaches. The findings suggest that Teacher-Led AI-Assisted Interactive Scenarios provided greater academic benefits than conventional lecture and discussion methods. Through teacher-facilitated simulations and role-playing activities, students were able to connect economic theories with practical situations, supporting deeper understanding and application. Although Traditional Direct Instruction improved academic performance, the substantially greater gains in the experimental group emphasize the effectiveness of integrating AI-supported interactive activities into economics instruction.

3.2 Qualitative Dimensions of Student Engagement

The qualitative findings from the FGDs were examined using the three dimensions of student engagement identified by Fredricks et al. (2004): behavioral, cognitive, and affective engagement. These dimensions revealed differences in students' learning experiences under the two instructional approaches.

3.2.1 Behavioral Engagement

The experimental group demonstrated active participation and immersion through role-playing activities involving economic roles such as consumers and government decision-makers. Students reported that these activities encouraged attentiveness, participation, and reduced distractions. In contrast, the comparison group exhibited routine attentiveness through listening, note-taking, textbook reading, and responding to teacher-directed questions. Their participation was generally structured around conventional classroom activities. These findings suggest that interactive scenarios encouraged more active behavioral engagement by requiring students to participate directly in simulated economic situations. This aligns with Vapor et al. (2025) and (Vergara et al., 2025), which emphasize the importance of active participation in strengthening student involvement. While Traditional Direct Instruction maintained classroom order and attentiveness, teacher-led AI-assisted activities provided more opportunities for active and collaborative learning.

3.2.2 Cognitive Engagement

Students in the experimental group reported engaging in critical problem-solving and contextualized decision-making when analyzing AI-generated economic scenarios involving scarcity, price increases, supply shortages, and market reactions. These activities required them to evaluate economic trade-offs and apply concepts to realistic situations. Conversely, students in the comparison group focused primarily on understanding definitions, memorizing formulas, and reviewing teacher-provided examples to prepare for assessments. The findings indicate that AI-assisted scenarios encouraged deeper cognitive engagement by allowing students to apply economic knowledge beyond memorization. This supports Harvard Business Publishing (2024) and (Stampfl et al., 2024), which highlight the role of simulation-based activities in promoting authentic learning and conceptual understanding. Although traditional instruction supported the acquisition of fundamental concepts, the experimental approach provided greater opportunities for analytical thinking and practical application.

3.2.3 Affective Engagement

The experimental group expressed greater enthusiasm, enjoyment, and confidence in learning economics through interactive simulations and role-playing activities. Students also reported reduced anxiety when studying complex economic terms and graphs. Meanwhile, the comparison group expressed satisfaction with the organized and predictable delivery of lessons, particularly the teacher's step-by-step explanations. However, their responses reflected less excitement toward classroom activities. These findings suggest that Teacher-Led AI-Assisted Interactive Scenarios promoted positive emotional engagement by making economics lessons more enjoyable and less intimidating. This is consistent with research on AI-assisted learning and academic outcomes (Alam et al., 2026; Vieriu & Petrea, 2025). Although Traditional Direct Instruction provided reassurance through systematic teaching, interactive simulations appeared more effective in generating enthusiasm and confidence among learners.

3.3 Integration of Quantitative and Qualitative Findings

3.3.1 Relationship Between Student Engagement and Academic Performance

The integration of quantitative and qualitative findings revealed that the experimental group's higher academic gains were accompanied by stronger behavioral, cognitive, and affective engagement. Its mean gain score of 17.33 (SD = 2.91) exceeded the comparison group's 10.57 (SD = 3.24). FGD responses indicated that experimental group students actively participated in simulations, analyzed realistic economic problems, and demonstrated greater enthusiasm toward learning. In contrast, the comparison group showed significant academic improvement ($t=20.62, p<0.001$), but its engagement was primarily characterized by routine attentiveness, memorization, and reliance on structured teacher explanations. These findings suggest that the experimental group's superior academic performance was associated with active participation, contextualized problem-solving, and positive learning experiences. The integration of AI-supported scenarios into teacher-guided instruction helped students connect abstract economic concepts with practical applications. This supports the importance of pedagogically structured AI integration rather than relying on technology alone to improve learning outcomes (Ladera, 2026). Overall, the combined findings indicate that Teacher-Led AI-Assisted Interactive Scenarios were more effective than Traditional Direct Instruction in promoting multidimensional student engagement and improving academic achievement in Grade 9 Araling Panlipunan (Ekonomiks).

4. CONCLUSIONS AND RECOMMENDATIONS

The study concludes that both Teacher-Led AI-Assisted Interactive Scenarios and Traditional Direct Instruction significantly improved the academic performance of Grade 9 students in Araling Panlipunan (Ekonomiks). However, the experimental group achieved significantly higher learning gains (M = 17.33) than the comparison group (M = 10.57), with a very large effect size (Cohen's d = 2.22). Qualitative findings further revealed that AI-assisted scenarios promoted stronger behavioral, cognitive, and affective engagement through active participation, critical problem-solving, contextualized decision-making, increased enthusiasm, and reduced learning anxiety. In contrast, traditional instruction supported foundational understanding through structured explanations, routine attentiveness, and memorization. Overall, the findings demonstrate that teacher-facilitated AI-assisted interactive scenarios were more effective in improving academic achievement and multidimensional student engagement by connecting abstract economic concepts with real-life situations.

Based on the findings, Araling Panlipunan teachers and school administrators are encouraged to integrate Teacher-Led AI-Assisted Interactive Scenarios into Grade 9 Ekonomiks lessons, particularly when teaching abstract concepts such as demand, supply, market interactions, and the circular flow of the economy. Teachers should review and adapt AI-generated materials to ensure curriculum alignment, accuracy, cultural sensitivity, and age-appropriateness while maintaining structured explanations to strengthen foundational understanding. Department of Education division offices and school administrators should provide professional development, workshops, and peer-coaching opportunities to enhance teachers' competence in designing and facilitating AI-supported learning activities. Future researchers are encouraged to conduct similar studies across different schools, grade levels, and learning areas using larger samples, longitudinal assessments of knowledge retention, and varying levels of teacher-led and student-led AI interaction.

The study employed a quasi-experimental design involving two intact Grade 9 sections comprising 79 students from a single rural secondary school during the 2025–2026 school year. Since participants were not individually randomized and the investigation was conducted within one school, the findings may have limited generalizability to other educational settings. The study assessed academic performance through pre-test and post-test scores and explored engagement through focus group discussions; long-term knowledge retention was not examined. These methodological and contextual boundaries should be considered when interpreting the findings and extending their applicability to other student populations.

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