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Does Computer-Assisted Instruction (CAI) Influence Academic Performance of High School Students in Social Studies? Evidence from the Philippines

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ABSTRACT

The study investigates the impact of computer-assisted instruction (CAI) on Grade 9 students' academic performance and attitudes towards learning *Araling Panlipunan* (Social Studies) at San Jose National School and Goa National School in the Philippines. Using a descriptive correlational design, it explores the relationships between the perceived effectiveness of CAI, attitudes towards its use, and academic performance. Students at both schools view CAI positively, recognising its benefits in enhancing assessment performance, critical thinking skills, and information retention. While they appreciate the supplementary materials, traditional teaching methods are slightly favoured for overall effectiveness and real-world application of knowledge. A low positive correlation exists between academic performance and perceived effectiveness at San Jose National School, implying that a better perception of CAI effectiveness may boost academic performance. Conversely, at Goa National School, a moderate positive correlation exists between academic performance and perceived effectiveness and attitude towards CAI, suggesting that a positive view and effectiveness of CAI correspond to improved academic outcomes. Enhancing students' perceptions of CAI could improve academic performance, highlighting the need for continued refinement of CAI strategies for enhanced learning experiences in *Araling Panlipunan*.

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1. INTRODUCTION

Education has always been an important part of human civilisation since the advancement of a country's educational system is inextricably related to its future development [1]. Namitha [2] argues that education extends beyond literacy to developing critical thinking, knowledge, and self-reliance in students. Due to the emergence of various

technologies, educational paradigms are also shifting to incorporate technologies to enrich the educational experience and facilitate school learning. Integrating technology into education corresponds with Sustainable Development Goal 4 or Quality Education, as it improves access to quality learning resources, fosters interactive and individualised learning experiences, and helps to achieve inclusive and equitable education for everyone.

According to Nagasubramani and Raja [3], using computers in educational settings has facilitated the transmission of knowledge by teachers and its assimilation by students, increasing overall satisfaction with the teaching and learning process. Using technology in education prioritises successful learning by concentrating on students' mastery of specific abilities and taking advantage of technology support rather than depending entirely on traditional educational frameworks and arbitrary, age-based standards [4].

In this modern world, the notion of technology is essential in various fields, particularly education, where it has emerged as the key means of knowledge diffusion. Tolbert [5] defines computer-assisted instruction, or CAI, as using computers in educational settings to help teaching and learning processes while offering supplementary instruction for evaluating comprehension. This type of instruction is now seen as a valuable and efficient way of teaching in many countries, and it can be used in both formal and informal education at all levels. Utilising CAI is one of the most effective approaches in modern educational practices. Teachers use this training to improve student learning, allowing them to teach effectively and deliver lessons more efficiently, especially when teaching complicated subjects where technology is essential for addressing the lesson.

The initial use of computer-aided instruction in school may be traced back to the United States, specifically the University of Illinois' PLATO (Programmed Logic for Automatic Teaching Operations) system program, which was developed in 1960 [6]. The system enabled students to actively participate in educational activities and complete schoolwork with computer peripherals. Meanwhile, the United Kingdom, Australia, Canada, and Japan are among the countries that have achieved significant advances in educational technology, frequently gaining inspiration from US innovations and research [7].

In Southeast Asia, notable countries integrate ICT into their national education systems. Singapore formalised educational technology in 1997, propelling it to global recognition and listing it among the top educational systems among advanced countries worldwide [8]. In Malaysia, technology is seen as an important factor in shaping the country's future development, and the country's Ministry of Education recognises the significance of integrating technology-based education into the national curriculum through its latest Education Blueprint 2013-2025 [9]. In Thailand, there is an ongoing initiative where the country is investing more in educational technology to enhance the quality of its educational system as part of its initiative to transform the country into a "Smart Nation" [10].

Schools are gradually adopting integrated technology in the Philippines, particularly in basic education. The Department of Education started ICT implementation in all schools in 2010 through its Department Order No. 78, s' 2010, or the “Guidelines on the Implementation of the DepEd Computerization Program (DCP),” which mandates the integration of ICT in the educational setting. The initiative undertaken by the DepEd is an

agreed-upon response to address the 21st-century adversities and to keep pace with other countries in the educational setting.

In 2012, the country adopted the "Enhanced Basic Education Curriculum," necessitating the incorporation of technology to deliver most of the topics across various learning subjects to achieve the specified learning competencies in the curriculum guides. In this new curriculum, all subjects must be taught in a spiral progression approach, which was developed to build on the same concepts in each grade level and develop in increasing complexity from kindergarten to grade 10. The scheme introduces learners to diverse concepts and disciplines at a young age, revisiting them with increasing complexity in subsequent years until mastery is achieved [11].

Araling Panlipunan (Social Studies), an essential subject in the K–12 curriculum, has a considerable impact on shaping national identity. Recent changes and adjustments in primary and secondary education have stressed the value of civic competency in the current curriculum. This learning area focuses on human interactions and societal functions. History, politics, governance, economics, civics, sociology, geography, and anthropology are all studied to understand social relationships and how societies work. Social studies has been a part of our human existence. Social studies are part of the curriculum to develop the learners' logical and rational thinking abilities and help them understand other social sciences. It improves learner's understanding of themselves and their environment and helps them become better at solving problems in day-to-day living. Mezieobi and Onyeanusi [12] argue that a course of study fosters the necessary knowledge, values, abilities, and attitudes to function efficiently within the community.

Traditional teaching approaches are deemed insufficient or unsuitable for effectively supporting students in their learning within the diverse disciplines encompassed by *Araling Panlipunan*. This assertion is corroborated by Derraco [13], who found that traditional methods like lectures and textbooks often make students perceive *Araling Panlipunan* as an uninteresting subject. This highlights the need for more engaging and dynamic instructional strategies to foster greater interest and comprehension among students in this expansive subject area.

CAI is a method of using computer technology to provide instructional materials or gain learners' interest. Because this generation is considered technology-savvy and digitally literate, using CAI is a relevant approach for Gen Z learners in teaching Social Studies [14]. Additionally, CAI can be used for motivation, material discussion, application, and evaluation, among other lesson components. Mobile technology and computer tools such as Microsoft PowerPoint or Prezi can be used to access and utilise CAI [15].

According to Ekpenyong and Akwagiobe [16], by providing knowledge and skills, creating challenges, locating information, and critically assessing that information in light of the given problems, computer technology plays the role of the teacher when utilising CAI. Collaborating with this assertion, Ezeokeke [17] supported the idea that CAI is a teaching method that involves applying tutorials, drill and practice, simulation, and problem-solving approaches while presenting topics in the classroom setting. The application of CAI, which could be used for a more vivid and precise presentation of unknown, abstract, and complex

concepts, ideas, and information, as well as knowledge retention, is necessary for the active, participatory, and effective learning of Social Studies [18].

Apart from offering chances for tailored education and self-evaluation by learners, CAI has the potential to promote cooperative learning [19]. CAI holds promise in aiding students to attain crucial 21st-century skills necessary for the social studies curriculum. These skills are vital for students' academic development. The study examines how students perceive CAI's effectiveness and their attitudes toward its utilisation in the *Araling Panlipunan* classroom setting. Additionally, the study aims to investigate the correlation between these factors and students' academic performance.

This study was conducted at two public secondary schools, San Jose National High School and Goa National High School, in Partido District in the Province of Camarines Sur, Philippines. This study seeks to address several key queries. Firstly, it explores students' perceptions regarding the efficacy of computer-assisted instruction. Secondly, it delves into the attitudes exhibited by students towards incorporating computer-assisted instruction, specifically within the context of *Araling Panlipunan*. Lastly, the study endeavours to ascertain whether there exists a correlation between students' perceived effectiveness of computer-assisted instruction, their attitudes towards its utilisation, and their academic achievements in *Araling Panlipunan* among Grade 9 students. Through these investigations, the research aims to offer valuable insights into the interplay between student perceptions, attitudes, and academic performance in computer-assisted instruction within the *Araling Panlipunan* curriculum.

This study is grounded in three key learning theories: Skinner's Operant Conditioning (1990), Sweller's Cognitive Load Theory (1988), and Piaget's Constructivism (1980). These theories provide a strong foundation for understanding how technology-enhanced learning can affect students' academic outcomes. Operant Conditioning highlights how reinforcement and feedback within CAI can shape positive student behaviours and attitudes, ultimately boosting performance. Sweller's Cognitive Load Theory emphasises the importance of managing mental effort through multimedia and interactive tools that simplify content and support diverse learners. Meanwhile, Piaget's Constructivism underlines the value of active, experiential learning, which CAI encourages through problem-solving tasks and engaging presentations. Together, these theories support the study's goal of examining how CAI influences the academic performance and learning attitudes of Grade 9 students in social studies.

The findings of this study have the potential to benefit various stakeholders. Firstly, students stand to gain significantly as the research aims to improve their academic performance, shape positive attitudes towards technology use, and enhance their retention of *Araling Panlipunan* topics. *Araling Panlipunan* teachers could leverage computer-assisted instruction (CAI) to introduce innovative teaching methods and engage students more effectively with AP subjects. On the other hand, parents could benefit by understanding how CAI influences their child's academic progress, enabling them to play a more informed role in their child's education. Schools might find the study helpful in optimising the use of CAI and structuring courses that impart knowledge about this instructional approach. The Department of Education (DepEd) could utilise the study's insights to inform evidence-based

strategies for integrating technology into classroom instruction, potentially reshaping curricula, teacher training programs, resource distribution, and ultimately enhancing educational outcomes in the digital age. Lastly, future researchers could use this study as a foundation for exploring related topics, offering valuable insights and methodological approaches for addressing similar research inquiries.

The study covered the Grade 9 students of San Jose National High School in San Jose, Camarines Sur, and Goa National High School in Goa, Camarines Sur, from 2022-2023 as the respondents. The Grade 9 level was selected because the topics in *Araling Panlipunan* subject focus on economics, making it an ideal stage for incorporating computer-assisted instruction. Based on its curriculum guide, incorporating technology is crucial, as multimedia resources like videos, animations, and infographics can vividly illustrate complex economic concepts, enhancing student engagement and understanding more effectively than traditional textbooks. Researchers chose the said schools as they are primary public secondary schools in their respective municipalities.

2. METHOD

2.1 Research Design

The study used the descriptive correlational design deemed appropriate for this study as it allows for examining relationships between the perceived effectiveness of computer-assisted instruction, attitudes toward its utilisation in the Araling Panlipunan classroom setting, and students' academic performance. This design will enable the researchers to describe the current state of these variables and investigate potential associations among them.

2.2 Respondents of the Study

The study respondents were Grade 9 students from San Jose National High School and Goa National High School for the school year 2022-2023. Simple random sampling was used to select responses from the two schools. The study intends to collect various experiences and viewpoints on computer-assisted instruction and its impact on academic performance. The selection of Grade 9 students of the specific school year from these two schools using simple random sampling will ensure a varied sample, enhancing the study findings' generalizability to similar educational settings. The researchers used Slovins's Formula as a sampling strategy to calculate the sample size. The population of Grade 9 students in San Jose National High School is 304, while Goa National High School has a population of 442 grade 9 students.

Slovin's Formula

$$n = N/(1 + Ne^2) \quad (1)$$

Where:

n = sample size
N = Population size
e = margin of error (0.05 for 95% acceptable margin of error)

The study had 173 and 210 respondents from San Jose National High School and Goa National High School, respectively.

2.3 Research Instruments

The Likert Scale survey questionnaire was the primary data collection instrument. It was carefully developed to gather pertinent information from the respondents, focusing on several aspects relevant to the research questions. This instrument was subjected to the experts for validation. The questionnaire was divided into two sections with 10 questions each to address the specific aspects of the study—the first part focused on assessing how students perceived the effectiveness of computer-assisted instruction. Meanwhile, the second part focused on students' attitudes towards computer-assisted instruction in *Araling Panlipunan*.

2.4 Data Gathering Procedure

Before conducting the study, the researchers ensured that all the suggestions and recommendations provided by the panel members during the title defence, as well as the comments and suggestions of the validators of the survey questionnaire, were complied with. The pilot testing of the survey questions was conducted at Ocampo National High School in Ocampo, Camarines Sur, with permission from the school-in-charge. It was participated by 35 Grade 10 students. Its purpose was to ensure validity and reliability and to identify any technical problems in the survey administration process before these were given to a larger population. The researchers asked permission from the San Jose National High School and Goa National High School principals. Upon approval, the researchers scheduled the administration of the survey questionnaire to avoid inconvenience and unpreparedness on the part of the respondents. The final grades of Grade 9 students in *Araling Panlipunan* were also obtained with the permission of their respective schools. This is crucial in determining the correlation between students' perceptions of the effectiveness of computer-assisted instruction, their attitudes toward its utilisation, and their academic performance in this learning area.

2.5 Data Analysis

Students' perceived effectiveness regarding computer-assisted instruction and their attitudes towards its utilisation were determined using a Likert scale approach, using modal and ranking techniques. The following is the description of the results:

Table 1. Interpretation of Likert Scores by Mode

Range	Mode	Verbal Interpretation
4.20 – 5.00	5	Strongly Agree
3.40 – 4.19	4	Agree
2.60 – 3.39	3	Neutral
1.80 – 2.59	2	Disagree
1.00 – 1.79	1	Strongly Disagree

The final grades of students in *Araling Panlipunan* were tallied using frequency count. Students' grades will serve as a basis for further analysis and interpretation.

Correlation is a statistical tool to measure the association of two or more quantitative variables. It is concerned with the relationship between two variables, change and movements. It is also defined as the measure of the linear relationship between two random variables, x and y, denoted by r. It measures the extent to which the points cluster in a straight line.

Correlation analysis is concerned with the relationship between the changes of variables.

Three Degrees of Correlation or Relationship Between Two Variables:

1. Perfect correlation (positive and negative)
2. Some degree(s) of correlation (positive and negative)
3. No correlation

The quantitative interpretation of the degree of linear relationship existing:

Table 2. Interpretation of the Degree of Relationship Based on the Correlation Coefficient

Correlation Coefficient	Interpretation
±1.00	Perfect positive (negative) correlation
±0.91 - ±0.99	Very high positive (negative) correlation
±0.71 - ±0.90	High positive (negative) correlation
±0.51 - ±0.70	Moderately positive (negative) correlation
±0.31 - ±0.50	Low positive (negative) correlation
±0.01 - ±0.30	Slight positive (negative) correlation

Spearman's rank correlation coefficient was employed to investigate the relationship between the perceived effectiveness, attitudes towards using computer-assisted instruction, and the academic performance of Grade 9 students in *Araling Panlipunan*.

Spearman rank correlation coefficient

$$\rho = 1 - \frac{6 \sum D^2}{N^3 - N} \quad 2)$$

Where:

N = number of pairs of measurement

$\sum D^2$ = sum of the square of the difference in ranks of each of the given pair of ranks

2.6 Ethical Considerations

The study was conducted following established ethical standards for research. Prior informed consent was obtained from all the respondents. Researchers sought permission from the respondents and their class advisers before distributing the survey questionnaires. Additionally, the purpose of the study was explained to the respondents, who were informed that their participation was voluntary and that they had the option to withdraw at any time. The researchers did not force the respondents to answer the questionnaire and also made sure that all personal information of the respondents would be kept confidential.

3. RESULTS AND DISCUSSION

3.1 Perceive Effectiveness of Computer-Assisted Instruction in *Araling Panlipunan*

Table 3. Summary of Responses from Grade 9 Students of San Jose National High School on their Perception of the Effectiveness of CAI in *Araling Panlipunan*

Item No.	Statement	5	4	3	2	1	Total
1	Computer-assisted instruction significantly improved my understanding of *Araling Panlipunan* topics	36	65	62	10	0	173
2	I believe that using computer-assisted instruction helps me retain information better in *Araling Panlipunan* topics	24	79	57	13	0	173
3	I meet the intended learning objectives/outcomes through the use of computer-assisted instructions	27	69	68	9	0	173
4	I feel that computer-assisted instruction positively impacts my performance on assessments in *Araling Panlipunan*	21	85	59	6	2	173
5	Computer-assisted instructions help me grasp complex *Araling Panlipunan* concepts more	37	79	41	11	5	173
6	I find that computer-assisted instructions provide useful supplementary materials which help me enhance my learning in *Araling Panlipunan*	54	72	39	4	4	173
7	Computer-assisted instruction enhances my critical thinking skills in relation to *Araling Panlipunan* topics	48	83	37	5	0	173
8	I believe that computer-assisted instruction is more effective than traditional teaching methods for *Araling Panlipunan*	52	64	53	4	0	173
9	I scored higher in activities and quizzes whenever CAI was used for instruction	51	69	32	15	6	173
10	Computer-assisted instructions enhance my ability to apply the knowledge I have learned to real-world situations	56	63	31	15	8	173

Table 3 summarises the responses of 173 Grade 9 students from San Jose National High School regarding their perception of the effectiveness of Computer-Assisted Instruction (CAI) in *Araling Panlipunan*. It lists ten statements addressing various aspects of CAI, including its impact on understanding, retention, critical thinking, and application of concepts to real-world situations.

Table 4 presents a Likert scale analysis of Grade 9 students' perceptions at San Jose National School regarding the effectiveness of computer-assisted instruction (CAI) in *Araling Panlipunan*. The data is ranked from items with the highest perceived effectiveness to those with the lowest, providing a clear view of how students value various aspects of CAI. In all cases, the most common response is "agree," indicating a generally positive perception of CAI among students.

Table 4. Likert Analysis Using Modal and Ranking Techniques Based on the Responses of Grade 9 Students of San Jose National High School on How They Perceive the Effectiveness of CAI in *Araling Panlipunan*

Item No.	5 (SA)	4 (A)	3 (N)	2 (D)	1 (SDA)	Total	MODE	Verbal Interpretation	Rank
1	20.81	**37.57**	35.84	5.78	0.00	100	4.00	A	8
2	13.87	**45.66**	32.95	7.51	0.00	100	4.00	A	3.5
3	15.61	**39.88**	39.31	5.20	0.00	100	4.00	A	6.5
4	12.14	**49.13**	34.10	3.47	1.16	100	4.00	A	1
5	21.39	**45.66**	23.70	6.36	2.89	100	4.00	A	3.5
6	31.21	**41.62**	22.54	2.31	2.31	100	4.00	A	5
7	27.75	**47.98**	21.39	2.89	0.00	100	5.00	A	2
8	30.06	**36.99**	30.64	2.31	0.00	100	4.00	A	9
9	29.48	**39.88**	18.50	8.67	3.47	100	5.00	A	6.5
10	32.37	**36.42**	17.92	8.67	4.62	100	4.00	A	10

Legend: SA= Strongly Agree, A=Agree, N=Neutral, D= Disagree, SDA=Strongly Disagree

Ranked highest, students overwhelmingly agree that CAI positively impacts their assessment performance in *Araling Panlipunan*. This suggests that using CAI tools helps students better prepare for and excel in their tests, possibly due to interactive and engaging study methods that reinforce learning and understanding. Following closely, the second highest rank indicates that students feel CAI significantly enhances their critical thinking skills. This is crucial as critical thinking is essential for analysing and understanding complex topics within *Araling Panlipunan*. CAI might provide interactive problem-solving exercises and scenarios promoting deeper cognitive engagement.

Both items tied for the third position reflect that students find CAI effective in helping them retain information and grasp complex concepts. This suggests that CAI's multimedia and interactive elements make it easier for students to remember and understand the material than traditional teaching methods. Ranked fifth, students appreciate the supplementary materials provided by CAI, which they find helpful in enhancing their overall learning experience. This includes access to additional resources such as videos, quizzes, and interactive content that support and extend their learning beyond the textbook.

Items tied for the sixth position indicate that students believe CAI helps them meet their learning objectives and achieve higher scores in activities and quizzes. This reflects the effectiveness of CAI in reinforcing learning objectives and providing frequent, formative assessments that help students gauge their understanding and progress. Students agree that CAI significantly improves their understanding of *Araling Panlipunan* topics, underscoring the clarity and comprehensiveness of the instruction provided through CAI tools. This indicates that CAI might be helping to break down complex topics into more understandable segments. Although still positively perceived, students rank CAI's effectiveness slightly lower when compared to traditional teaching methods. This shows a general preference for CAI but also suggests that some students might still find value in conventional methods or see them as complementary to CAI. Ranked lowest, students feel that CAI is less effective in helping them apply the knowledge they have learned to real-world situations.

Table 5. Summary of Responses from Grade 9 Students of Goa National High School on their Perception of the Effectiveness of Computer-Assisted Instruction in *Araling Panlipunan*

Item No.	Statement	5	4	3	2	1	Total
1	Computer-assisted instruction significantly improved my understanding of *Araling Panlipunan* topics	57	93	42	11	7	210
2	I believe that using computer-assisted instruction helps me retain information better in *Araling Panlipunan* topics	50	95	45	12	8	210
3	I meet the intended learning objectives/outcomes through the use of computer-assisted instructions	52	98	44	10	6	210
4	I feel that computer-assisted instruction positively impacts my performance on assessments in *Araling Panlipunan*	58	85	47	12	8	210
5	Computer-assisted instructions help me grasp complex *Araling Panlipunan* concepts more	60	88	45	11	6	210
6	I find that computer-assisted instructions provide useful supplementary materials which help me enhance my learning in *Araling Panlipunan*	62	89	40	12	7	210
7	Computer-assisted instruction enhances my critical thinking skills in relation to *Araling Panlipunan* topics	59	93	41	10	7	210
8	I believe that computer-assisted instruction is more effective than traditional teaching methods for *Araling Panlipunan*	56	94	43	9	8	210
9	I scored higher in activities and quizzes whenever CAI was used for instruction	55	97	44	8	6	210
10	Computer-assisted instructions enhance my ability to apply the knowledge I have learned to real-world situations	57	92	41	12	8	210

Table 5 summarises the responses of 210 Grade 9 students from Goa National High School regarding their perception of the effectiveness of Computer-Assisted Instruction (CAI) in *Araling Panlipunan*. It lists ten statements addressing various aspects of CAI, including its impact on understanding, retention, critical thinking, and application of concepts to real-world situations.

Table 6 presents a Likert scale analysis of Grade 9 students' perceptions at Goa National School regarding the effectiveness of computer-assisted instruction (CAI) in *Araling Panlipunan*. Each item is ranked based on the level of agreement, providing a clear view of how students value various aspects of CAI. In all cases, the most common response is "agree," indicating a generally positive perception of CAI among students.

Table 6. Likert Analysis Using Modal and Ranking Techniques Based on the Responses of Grade 9 Students of Goa National High School on How They Perceive the Effectiveness of Computer-Assisted Instruction in *Araling Panlipunan*

Item No.	5 (SA)	4 (A)	3 (N)	2 (D)	1 (SDA)	Total	Mode	Verbal Interpretation	Rank
1	27.14	44.29	20.00	5.24	3.33	100	4.00	A	5.5
2	23.81	45.24	21.43	5.71	3.81	100	4.00	A	3
3	24.76	46.67	20.95	4.76	2.86	100	4.00	A	1
4	27.62	40.48	22.38	5.71	3.81	100	4.00	A	10
5	28.57	41.90	21.43	5.24	2.86	100	4.00	A	9
6	29.52	42.38	19.05	5.71	3.33	100	4.00	A	8
7	28.10	44.29	19.52	4.76	3.33	100	4.00	A	5.5
8	26.67	44.76	20.48	4.29	3.81	100	4.00	A	4
9	26.19	46.19	20.95	3.81	2.86	100	4.00	A	2
10	27.14	43.81	19.52	5.71	3.81	100	4.00	A	7

Legend: SA= Strongly Agree, A=Agree, N=Neutral, D= Disagree, SDA=Strongly Disagree

Ranked highest, students feel that CAI helps them meet their intended learning objectives and outcomes. This suggests that CAI is highly effective in aligning with and fulfilling educational goals, possibly through clear and structured instructional design that resonates well with students' learning needs. Following closely, students agree that they score higher in activities and quizzes whenever CAI is used for instruction. This indicates that CAI tools aid in better performance, likely through interactive and engaging content that enhances understanding and retention. Ranked third, students believe using CAI helps them retain information better in *Araling Panlipunan* topics. The interactive nature of CAI, which often includes multimedia elements, may contribute to improved memory retention compared to traditional methods.

Students rank the statement that CAI is more effective than traditional teaching methods for *Araling Panlipunan* as fourth. This reflects a strong preference for CAI over conventional approaches, highlighting its perceived superiority in delivering educational content. The statements tied for the fifth position indicate that CAI significantly improves students' understanding of *Araling Panlipunan* topics and enhances their critical thinking skills. This suggests that CAI helps comprehend the subject matter and promotes higher-order thinking skills, which are crucial for analysing and understanding complex concepts. Ranked seventh, students agree that CAI enhances their ability to apply the knowledge they have learned to real-world situations. While positive, this slightly lower ranking suggests room for improvement in making the learning experiences more applicable to practical scenarios.

Ranked eighth, students appreciate the supplementary materials provided by CAI, which help enhance their overall learning experience. This includes additional resources such as videos, quizzes, and interactive content that support and extend their learning beyond the textbook. In the ninth position, students feel that CAI helps them more effectively grasp complex Araling Panlipunan concepts. This indicates that CAI's multimedia and interactive elements make complex topics more accessible and understandable. Ranked lowest, students agree that CAI positively impacts their assessment performance in *Araling Panlipunan*.

3.2 Attitude Towards the Utilisation of Computer-assisted Instruction in *Araling Panlipunan*

Table 7. Summary of Responses from Grade 9 Students of San Jose National High School Regarding Their Attitudes Toward the Utilisation of CAI in *Araling Panlipunan*

Item No.	Statement	5	4	3	2	1	Total
1	I prefer using computer-assisted instruction over traditional learning methods	52	63	39	17	2	173
2	I feel comfortable using technology as a learning tool	62	62	37	7	5	173
3	I find computer-assisted instruction clear and helpful for learning.	63	73	24	7	6	173
4	I enjoy the interactive nature of computer-assisted instruction activities	59	64	38	11	1	173
5	I feel motivated to engage more in learning when using computer-assisted instruction	64	72	34	3	0	173
6	I believe computer-assisted instruction provides access to a variety of learning resources	66	78	20	9	0	173
7	I feel confident in answering a question when computer-assisted instruction is being utilised	69	68	29	3	4	173
8	I believe computer-assisted instruction allows me to learn at my own pace	57	69	35	9	3	173
9	I enjoy answering activities using computer-assisted instruction	63	57	39	8	6	173
10	I believe computer-assisted instruction will be beneficial for my future academic and professional endeavors	62	68	42	0	1	173

Table 7 summarises the responses of 173 Grade 9 students from San Jose National High School regarding their attitudes toward Computer-Assisted Instruction (CAI) in *Araling Panlipunan*. It lists ten statements evaluating students' preferences, comfort, clarity, motivation, and perceived benefits of CAI.

Table 8. Likert Analysis Using Modal and Ranking Techniques Based on the Responses of Grade 9 Students of San Jose National High School Regarding Their Attitudes Towards the Utilisation of CAI in *Araling Panlipunan*

Item No.	5 (SA)	4 (A)	3 (N)	2 (D)	1 (SDA)	Total	MODE	Verbal Interpretation	Rank
1	30.06	36.42	22.54	9.83	1.16	100	4.00	A	9
2	35.84	35.84	21.39	4.05	2.89	100	4 & 5	A	10
3	36.42	42.20	13.87	4.05	3.47	100	4.00	A	4
4	34.10	36.99	21.97	6.36	0.58	100	4.00	A	8
5	36.99	41.62	19.65	1.73	0.00	100	4.00	A	5
6	38.15	45.09	11.56	5.20	0.00	100	4.00	A	3
7	39.88	39.31	16.76	1.73	2.31	100	5.00	SA	1
8	32.95	39.88	20.23	5.20	1.73	100	4.00	A	6
9	36.42	32.95	22.54	4.62	3.47	100	5.00	SA	2
10	35.84	39.31	24.28	0.00	0.58	100	4.00	A	7

Legend: SA= Strongly Agree, A=Agree, N=Neutral, D= Disagree, SDA=Strongly Disagree

Table 8 shows a Likert scale analysis of Grade 9 San Jose National High students regarding their attitudes toward computer-assisted instruction (CAI) across various statements. The analysis ranks each statement based on the level of agreement, providing insights into how students perceive different aspects of CAI. The responses are interpreted based on the mode and verbal interpretation, indicating that the most common response across the items is 'Agree,' with some statements rated as 'Strongly Agree'. The ranking is based on the weighted mean, reflecting the overall degree of agreement with each statement. Ranked highest, students feel confident answering a question when computer-assisted instruction is utilised. This suggests that CAI boosts their confidence in responding to academic questions, likely due to the supportive and interactive nature of the technology.

Following closely, students enjoy answering activities using computer-assisted instruction, indicating that CAI makes learning activities more engaging and enjoyable. In the third position, students believe that computer-assisted instruction provides access to various learning resources. This reflects a positive view of CAI as a rich source of diverse educational materials which can enhance their learning experience. Ranked fourth, students feel computer-assisted instruction is explicit and helpful for learning, appreciating its clarity and effectiveness in conveying information.

The fifth-ranked statement shows that students feel motivated to engage more in learning when using computer-assisted instruction. This indicates that CAI has a motivational effect, encouraging students to participate more actively in their learning process. In sixth place, students agree that computer-assisted instruction allows them to learn at their own pace, emphasising the flexibility of CAI to accommodate individual learning speeds and styles. Ranked seventh, students believe that computer-assisted instruction will benefit their future academic and professional endeavours. This suggests a positive outlook on the long-term advantages of CAI, including better preparedness for future challenges.

In eighth place, students find computer-assisted instruction clear and helpful for learning, reflecting an appreciation for the interactive elements that make learning more engaging. Ninth-ranked students prefer computer-assisted instruction over traditional learning methods, indicating a general preference for CAI due to its modern and practical approach to education. Lastly, ranked tenth, students feel comfortable using technology as a learning tool, which shows a high level of comfort and familiarity with technological tools in their educational activities.

Table 9 summarises the responses of 210 Grade 9 students from Goa National High School regarding their attitudes toward Computer-Assisted Instruction (CAI) in *Araling Panlipunan*. It lists ten statements evaluating students' preferences, comfort, clarity, motivation, and perceived benefits of CAI.

Table 9. Summary of Responses from Grade 9 Students of San Jose National High School Regarding Their Attitudes Toward the Utilisation of CAI in *Araling Panlipunan*

Item No.	Statement	5	4	3	2	1	Total
1	I prefer using computer-assisted instruction over traditional learning methods	55	92	42	10	11	210
2	I feel comfortable using technology as a learning tool	62	99	34	9	6	210
3	I find computer-assisted instruction clear and helpful for learning.	58	100	36	8	8	210
4	I enjoy the interactive nature of computer-assisted instruction activities	60	105	28	11	6	210
5	I feel motivated to engage more in learning when using computer-assisted instruction	61	103	32	8	6	210
6	I believe computer-assisted instruction provides access to a variety of learning resources	64	101	29	9	7	210
7	I feel confident in answering a question when computer-assisted instruction is being utilised	55	102	38	11	4	210
8	I believe computer-assisted instruction allows me to learn at my own pace	56	96	39	10	9	210
9	I enjoy answering activities using computer-assisted instruction	57	97	35	11	10	210
10	I believe computer-assisted instruction will be beneficial for my future academic and professional endeavors	54	111	30	9	6	210

Table 10. Likert Analysis Using Modal and Ranking Techniques Based on the Responses of Grade 9 Students of Goa National High School Regarding Their Attitude Towards the Utilisation of CAI in *Araling Panlipunan*

Item No.	5 (SA)	4 (A)	3 (N)	2 (D)	1 (SDA)	Total	Mode	Verbal Interpretation	Rank
1	26.19	43.81	20.00	4.76	5.24	100	4.00	A	10
2	29.52	47.14	16.19	4.29	2.86	100	4.00	A	7
3	27.62	47.62	17.14	3.81	3.81	100	4.00	A	6
4	28.57	50.00	13.33	5.24	2.86	100	4.00	A	2
5	29.05	49.05	15.24	3.81	2.86	100	4.00	A	3
6	30.48	48.10	13.81	4.29	3.33	100	4.00	A	5
7	26.19	48.57	18.10	5.24	1.90	100	4.00	A	4
8	26.67	45.71	18.57	4.76	4.29	100	4.00	A	9
9	27.14	46.19	16.67	5.24	4.76	100	4.00	A	8
10	25.71	52.86	14.29	4.29	2.86	100	4.00	A	1

Legend: SA= Strongly Agree, A=Agree, N=Neutral, D= Disagree, SDA=Strongly Disagree

Table 10 presents a Likert scale analysis of Grade 9 Students of Goa National High regarding their attitudes toward computer-assisted instruction (CAI) across various statements. The analysis ranks each statement based on the level of agreement, providing insights into how students perceive different aspects of CAI. The responses are interpreted based on the mode and verbal interpretation, indicating each statement's most common response.

Ranked highest, students believe that computer-assisted instruction will benefit their future academic and professional endeavours. This suggests that CAI is seen as a valuable tool for long-term success, reflecting a strong positive outlook on its future advantages. Following closely, students enjoy the interactive nature of computer-assisted instruction activities, indicating that CAI makes learning more engaging and enjoyable. In the third position, students feel motivated to engage more in learning when using computer-assisted instruction. This highlights CAI's motivational effect, encouraging active participation in the learning process.

Ranked fourth, students feel confident answering questions when computer-assisted instruction is utilised, likely due to the supportive and interactive nature of the technology. The fifth-ranked statement shows that students believe computer-assisted instruction provides access to various learning resources. This reflects a positive view of CAI as a rich source of diverse educational materials which can enhance their learning experience. In sixth place, students find computer-assisted instruction clear and helpful for learning, appreciating its clarity and effectiveness in conveying information.

Ranked seventh, students feel comfortable using technology as a learning tool, indicating high comfort and familiarity with technological tools in their educational activities. In eighth place, students enjoy answering activities using computer-assisted instruction, emphasising the engaging nature of CAI tasks. Ninth-ranked students believe that computer-assisted instruction allows them to learn at their own pace, underscoring the flexibility of CAI to accommodate individual learning speeds and styles. Lastly, ranked tenth, students prefer using computer-assisted instruction over traditional learning methods, suggesting a general preference for CAI due to its modern and practical approach to education.

3.3 Relationship Between the Perceived Effectiveness, Attitudes Towards the Utilisation of CAI and the Academic Performance

Researchers obtained the final grades of Grade 9 students, specifically in the *Araling Panlipunan* subject covered during the school year 2022-2023. These grades represent the student's academic performance in this learning area, which is crucial for further analysis.

Table 11. Final Grades of Grade 9 Students at San Jose National High School in *Araling Panlipunan*

Final Grades in AP	No. of Students	Final Grades in AP	No. of Students
97	1	86	12
96	2	85	10
95	3	84	8
94	8	83	7
93	3	82	5
92	11	81	7
91	11	80	7
90	17	79	2
89	19	77	1
88	18	76	1
87	19	75	1

Table 11 presents the distribution of final grades in *Araling Panlipunan* among student respondents at San Jose National High School in AP. Grades range from 97, the highest, to 75, the lowest.

Table 12. Final Grades of Grade 9 Students at Goa National High School in *Araling Panlipunan*

Final Grades in AP	No. of Students	Final Grades in AP	No. of Students
96	12	88	12
95	21	87	13
94	12	86	12
93	21	85	13
92	17	84	17
91	13	83	14
90	12	82	7
89	14	-	-

Table 12 presents the distribution of final grades in *Araling Panlipunan* among student-respondents at Goa National High School in AP. Grades range from 96, the highest, to 82, the lowest.

Table 13. Spearman's Rank Correlation Among, Effectiveness, and Attitude Toward the Utilisation of CAI, and Academic Performance for Grade 9 Students at San Jose National High School.

	Academic Performance	Effectiveness	Attitude
Academic Performance	1		
	173		
Effectiveness	0.4416*	1	
	0.0000		
	173	173	
Attitude	0.1278	0.5510*	1
	0.0939	0.0000	
	173	173	173

Table 13 presents the correlation coefficients among effectiveness, attitude towards utilising Computer-Assisted Instruction (CAI), and academic performance for Grade 9 students at San Jose National High School. There is a low positive correlation (0.4416) between academic performance and effectiveness, suggesting that as the perceived effectiveness of CAI increases, academic performance tends to improve. In contrast, a slight positive correlation (0.1278) between academic performance and attitude implies that a more positive attitude towards CAI has a minimal association with better academic performance. However, this correlation is not statistically significant, given the p-value of 0.0939. The correlation between effectiveness and attitude is moderate and positive (0.5510), indicating that students who perceive CAI as more effective tend to have a more positive attitude towards its use. Therefore, the null hypothesis is rejected, which states that there is no significant correlation between the perceived effectiveness, attitudes towards the utilisation

of computer-assisted instruction and the academic performance of Grade 9 students in Araling Panlipunan. The study's results conform to previous studies' findings that CAI is a helpful tool in increasing students' academic performance [20]. These findings are also consistent with the study of Reyes [21] on the effects of computer-aided instruction in enhancing the attitude and academic performance in chemistry lessons, which showed that students obtained higher performance levels and had a strong positive attitude after implementing CAI. The findings also revealed a significant correlation between academic performance and attitude towards CAI lessons. It is also supported by the findings of Owede [22] in his study, which showed that students exposed to Computer-Aided Instruction had a higher performance than those taught with conventional methods. This indicates that the teacher's methods and tools enhanced student motivation, improved students' understanding of the lessons, and enabled a greater commitment to their learning.

Table 14. Spearman's Rank Correlation Among, Effectiveness, and Attitude Toward the Utilisation of CAI, and Academic Performance for Grade 9 Students at Goa National High School.

	Academic Performance	Effectiveness	Attitude
Academic Performance	1		
	210		
Effectiveness	0.5617*	1	
	0.0000		
	210	210	
Attitude	0.5288*	0.9839*	1
	0.0000	0.0000	
	210	210	210

Table 14 presents the correlation coefficients among effectiveness, attitude towards using Computer-Assisted Instruction (CAI), and academic performance for Grade 9 students at Goa National High School. A moderate positive correlation (0.5617) between academic performance and effectiveness indicates that academic performance tends to improve as the perceived effectiveness of CAI increases. Similarly, a moderate positive correlation (0.5288) between academic performance and attitude suggests that a more positive attitude towards CAI is associated with better academic performance. The strongest correlation is observed between effectiveness and attitude (0.9839), showing a very high positive relationship where higher perceived effectiveness of CAI corresponds with a more positive attitude towards its use. These results corroborate the previous study that CAI and conventional methods improve the student's academic performance [23]. However, when the effectiveness of the two methods is compared, there is no significant difference in their impact on academic achievement. Therefore, CAI can be considered a viable alternative teaching method.

3.4 Perceived Effectiveness of CAI

The study revealed that Grade 9 students from San Jose National High School and Goa National High School generally perceived CAI as effective in enhancing their learning in *Araling Panlipunan*. This includes its ability to improve assessment performance, critical

thinking skills, and information retention. Students valued CAI's multimedia resources, interactive features, and clarity in presenting complex concepts, which aligns with the study's findings from Mangahas [24] that highlight CAI's potential to engage students and foster understanding through dynamic instructional methods. However, students ranked the impact of CAI on real-world application and overall effectiveness slightly lower than traditional teaching methods. This finding resonates with Rosali [23], who observed that while CAI enhances performance, it is most effective when combined with practical and experiential learning strategies.

3.5 Students' Attitude Towards CAI

San Jose National High School and Goa National High School reported a positive student attitude towards CAI. Respondents highlighted its flexibility, which allowed them to learn at their own pace, and its variety of learning resources. The interactive and engaging activities within CAI motivated students and boosted their confidence in addressing academic challenges. These findings align with Jesse et al. [25], who concluded that CAI enhances student motivation and participation. Similarly, Reyes [21] emphasised CAI's ability to foster a positive learning disposition by offering immediate feedback and tailoring content to individual learning needs. The students' favourable perceptions underscore CAI's role in creating a supportive and adaptable learning environment accommodating diverse preferences.

3.6 Relationship Between Effectiveness, Attitude, and Academic Performance

The analysis revealed a positive relationship between students' perceptions of CAI effectiveness and their academic performance in both schools, though varying degrees. The correlation was weak but statistically significant at San Jose National High School, while the correlation was moderate at Goa National High School. This suggests that as students perceive CAI to be more effective, their academic performance improves. Similarly, attitudes toward CAI were positively correlated with academic performance, with a stronger link observed at Goa National High School. These findings align with Owede [22], who identified a positive attitude toward CAI as a key predictor of enhanced academic performance. Furthermore, the moderate to strong correlation between perceived effectiveness and attitude supports the work of Chevalère et al. [26], who emphasised that students who view CAI as effective are more likely to develop a positive attitude toward its use.

3.7 Discussions

The findings indicate that Grade 9 students at San Jose National School positively perceive computer-assisted instruction (CAI) in *Araling Panlipunan*. They find CAI particularly effective in enhancing assessment performance and critical thinking skills. Students also appreciate CAI for its ability to help them retain information and understand complex concepts, along with the supplementary materials provided. However, CAI is rated slightly lower than traditional teaching methods in effectiveness and ability to apply knowledge to real-world situations. Similarly, Grade 9 students at Goa National School also

view CAI in *Araling Panlipunan* positively. They feel that CAI helps them meet learning objectives, score higher on activities and quizzes, and retain information better than traditional methods.

Students believe that CAI enhances their understanding of complex topics and critical thinking skills. However, they rate the impact of CAI on real-world application and assessment performance slightly lower. Significant positive perceptions emerged from both schools in exploring Grade 9 students' attitudes towards computer-assisted instruction (CAI) in Araling Panlipunan. At San Jose National High School, students demonstrated a strong sense of confidence and engagement with CAI, highlighting its supportive role in academic endeavours and the provision of diverse learning resources. Similarly, students at Goa expressed enthusiasm for CAI's interactive activities, emphasising its motivational impact on learning and its perceived clarity and utility compared to traditional methods. These findings underscore the widespread recognition of CAI's potential to enhance educational experiences, motivating students and equipping them for future academic and professional pursuits.

The analysis of Grade 9 students at San Jose National High School and Goa National High School reveals varying correlations among academic performance, perceived effectiveness, and attitude toward CAI. At San Jose National High School, a low positive correlation is found between academic performance and effectiveness, suggesting that as students perceive CAI to be more effective, their academic performance tends to improve. However, while a slight positive correlation exists between academic performance and attitude toward CAI, it is not statistically significant. It means that the observed connection between attitude and academic performance could have happened by random chance rather than being a genuine reflection of their relationship. A moderate and significant positive correlation is observed between the perceived effectiveness and attitude, indicating that students who perceive CAI as more effective tend to have a more positive attitude toward its utilisation.

In contrast, similar correlations are found at Goa National High School, but with different magnitudes. A moderate positive correlation exists between academic performance and perceived effectiveness and attitude toward CAI. This suggests that as students perceive CAI to be more effective and hold a more positive attitude toward it, their academic performance tends to improve significantly. Furthermore, the strongest correlation between effectiveness and attitude indicates a positive relationship. This implies that the higher perceived effectiveness of CAI corresponds with a more positive attitude toward its use.

4. CONCLUSION

The researchers conclude that there is a positive perception of computer-assisted instruction (CAI) among Grade 9 students at two different schools, particularly in *Araling Panlipunan*. Students acknowledge CAI's efficacy in enhancing assessment performance and critical thinking skills and facilitating information retention and comprehension of complex topics. However, the slight preference for traditional teaching methods over CAI concerning real-world application implies a need for CAI programs to incorporate more practical activities. Despite this, the overall positive perception of CAI underscores its

potential to enhance learning experiences. This suggests that CAI can continue to be a valuable educational tool, with ongoing refinement to address specific concerns. The researchers conclude that Grade 9 students' attitudes towards computer-assisted instruction (CAI) in *Araling Panlipunan* indicate a positive reception at San Jose National High School and Goa National High School.

Students at San Jose exhibit confidence and active engagement with CAI, recognising its supportive role in academics and its diverse learning resources. Similarly, students at Goa express enthusiasm for CAI's interactive activities, noting its motivational impact on learning and perceived clarity compared to traditional methods. These findings affirm CAI's potential to enhance educational experiences, motivating students and preparing them for future academic and professional pursuits. The researchers conclude that there are varying correlations among academic performance, perceived effectiveness, and attitude toward CAI among Grade 9 students at two secondary schools.

At San Jose NHS, a low positive correlation exists between academic performance and perceived effectiveness and a slight, statistically insignificant correlation between performance and attitude, suggesting the latter may be due to random chance. However, a moderate, significant positive correlation is found between perceived effectiveness and attitude. At Goa NHS, moderate positive correlations are found between academic performance, perceived effectiveness, and attitude, with the strongest correlation between perceived effectiveness and attitude, indicating that students who view CAI as more effective also have a more positive attitude toward its use, which correlates with better academic performance.

It is recommended that both San Jose National School and Goa National School continue to integrate computer-assisted instruction (CAI) into their *Araling Panlipunan* curriculum while addressing the identified concerns. To address the slight preference for traditional teaching methods in terms of real-world application, educators should consider incorporating more practical and hands-on activities to enhance students' ability to apply learned concepts in real-life scenarios. Additionally, ongoing professional development and training for teachers can help them effectively leverage CAI tools to maximise their impact on student learning outcomes. Moreover, establishing regular feedback mechanisms involving students can provide valuable insights into their CAI experiences and help identify areas for improvement.

Based on the findings and conclusion presented, it is recommended that both San Jose National High School and Goa National High School continue to foster positive attitudes towards computer-assisted instruction (CAI) by enhancing its interactive and engaging elements. Schools should incorporate diverse and stimulating activities that maintain student interest and motivation. Additionally, providing ongoing support and training for teachers to utilise CAI effectively can help sustain and improve students' positive attitudes. It is recommended that schools continue integrating computer-assisted instruction (CAI) to meet current curriculum guidelines and enhance educational outcomes. Given the positive correlations observed, CAI should be further utilised to support student engagement and performance. However, additional research is necessary to explore underlying factors

that may influence the effectiveness of CAI, especially to understand the variations in academic performance and attitudes observed between different schools.

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