Journal of Practical Studies in Education
ISSN: 2634-4629

MIAP Teaching and Learning Management Together with Computer-Assisted Instruction Lessons to Develop Academic Achievement Computer Project Course

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Received: 16/03/2025
Accepted: 22/06/2025
Published: 01/07/2025

Volume: 6 Issue: 4

How to cite this paper: Potoon, S. (2025). MIAP Teaching and Learning Management Together with Computer-Assisted Instruction Lessons to Develop Academic Achievement Computer Project Course. *Journal of Practical Studies in Education*, *6*(4), 67-75
DOI: https://doi.org/10.46809/jpse.v6i4.123

Abstract

Since the Computer Project course is a subject that integrates the knowledge of fourth-year students before graduation, students are required to develop computer-assisted instructional (CAI) lessons to be used as a tool for their teaching practicum in educational institutions. However, most students are unable to complete the development of CAI lessons within the designated one-semester timeframe, resulting in delayed graduation and various disadvantages, such as missing opportunities to take the assistant teacher recruitment exam, pursuing higher education, or entering professions that require proof of graduation. This research aims to: 1) develop computer-assisted teaching lessons using Scratch programming, 2) compare learning outcomes before and after teaching using MIAP instructional management with computer-assisted teaching lessons using Scratch programming, and 3) explore students' perspectives on MIAP instructional management with computer-assisted teaching lessons using Scratch programming. The sample group consists of 37 students majoring in Computer Education enrolled in a computer-related course. The research methodology involves selective sampling. The research tools include: 1) MIAP instructional management plan, 2) assessment of learning outcomes using MIAP instructional management with computer-assisted teaching lessons using Scratch programming, and 3) questionnaire on students' perspectives on MIAP instructional management with computer-assisted teaching lessons using Scratch programming. Statistical analysis includes mean ($\bar{x}$) and standard deviation (S.D). The research findings indicate that: 1) computer-assisted teaching lessons using Scratch programming, 2) the learning outcomes of students through MIAP instructional management with computer-assisted teaching lessons using Scratch programming, significantly improved at a statistical significance level of .05, and 3) students' perspectives on MIAP instructional management with computer-assisted teaching lessons using Scratch programming are at the highest level.

Keywords: MIAP, Teaching, Computer Assisted Instruction, Learning Achievement

1. Introduction

Effective use of technology in teaching and learning processes requires integrating teaching approaches that align with student characteristics. One approach that has gained attention is MIAP (Motivation, Information, Application, Progress), a teaching model that emphasizes stimulating student interest through diverse and effective multimedia (Majid et al.,2018). This approach not only helps students become enthusiastic about learning but also enables instructors to convey content clearly and creatively, making learning vibrant and sustainable (Rahim et al., 2017).

Sustainable learning fosters a more profound understanding of concepts and encourages lifelong learning habits. By employing the MIAP model, educators can tailor their instruction to meet the varied needs of students, ultimately enhancing engagement and academic achievement. The fostering of a dynamic learning environment, the MIAP model is not only addresses different learning styles but also promotes collaboration among students. It can enrich the educational experience and contributing to a supportive classroom community.

MIAP teaching management has 4 processes: 1) Motivation is the stimulation of interest before entering the lesson. 2) Information is the process of providing content, details and various knowledge to learners. 3) Application is the step that needs to check the learner whether their behavior has changed according to the desired objectives or not. It may use a test, ask questions, or demonstrate in real practice and 4) Progress is a step that is continuous with the Application phase. It is the process of taking the results of the examination and practice to check whether it has passed the objectives or not and then giving feedback. (Department of Computer Studies, King Mongkut's University of Technology North Bangkok, 2021).

In the context of computer project courses in Thailand, which fourth-year students in Computer Education must complete before graduation, this subject is crucial for reviewing and processing all knowledge students have acquired throughout their curriculum. Based on topic proposals, most students choose to develop Computer-Assisted Instruction (CAI) projects, which present challenges requiring the integration of both theoretical and practical knowledge. However, the complexity of CAI development and time constraints often cause students to struggle with time and project management, resulting in delayed graduation and affecting their preparation for future careers.

This study aims to explore and evaluate the effectiveness of using the MIAP model with computer-assisted instruction to improve lesson development processes and increase student academic achievement. It is expected that the research results will help reduce the time required for CAI development and increase students' confidence in managing projects efficiently. Furthermore, the research aims to fill educational gaps in applying technology to support learning in challenging and complex subjects, thereby enhancing teaching and learning approaches that truly respond to needs and challenges in the digital era, especially in the context of education in Thailand, where there is still a need to develop technology use in education that aligns with the country's social and cultural context.

2. Research Methodology

2.1. Sample Group

The researchers purposively selected a sample of 37 third-year students (11 males, 26 females) enrolled in Computer Project courses who had problems in learning and developing CAI, including: Lack of understanding of the systematic development process of computer-assisted instruction lessons, lack of confidence in using lesson design principles including using time to develop lessons beyond the time specified in the curriculum's teaching plan.

2.2. Research Tools

The research tools consisted of MIAP teaching plans, learning achievement tests, and questionnaires on students' perspectives towards MIAP teaching with computer-assisted instruction.

2.2.1. MIAP Teaching Plans

MIAP teaching is a format with a teaching process that stimulates learners' interest in the content that instructors want them to learn. It encourages students to find ways or methods to solve problems and includes measurement and evaluation that verify students' knowledge (Weerasin et al., 2015). The researchers organized the teaching plan as follows:

Week 1: Explain the MIAP teaching approach with computer-assisted instruction. After that, students take a pre-test.

Week 2: Begin creating computer-assisted instruction (Motivation stage). The instructor starts by stimulating students' interest using questions to engage them in the teaching-learning process. After that, lecture using PowerPoint presentations and divide students into groups to research computer-assisted instruction topics they are interested in.

Weeks 3-5: Design computer-assisted instruction (Information stage). The instructor lectures on the topic of designing computer-assisted instruction using PowerPoint presentations. After that, students design computer-assisted instruction of their interest by examining sample CAI case studies about creating websites with Google Sites, and students practice to understand and remember the content learned.

Weeks 6-10: Develop computer-assisted instruction (Information stage). After allowing students to spend 3 weeks designing CAI, the instructor lectures using PowerPoint presentations on the topic of developing computer-assisted instruction, providing case study examples about creating websites with Google Sites, and students continue practicing from the previous weeks.

Weeks 11-13: Test the computer-assisted instruction (Application stage). Students present the computer-assisted instruction they developed to measure their ability to apply the knowledge learned to solve real problems.

Weeks 14-15: Evaluate the quality of computer-assisted instruction (Application stage). After students have completed their CAI, the instructor lectures on the topic of evaluating the quality of computer-assisted instruction using PowerPoint presentations, and students study from case examples and practice.

Week 16: Evaluation (Progress stage). After proceeding with the MIAP teaching plan until the final week, the instructor has students take a post-test and complete a questionnaire about their perspectives, including interviewing at least 10 students on their opinions about MIAP teaching with computer-assisted instruction, to measure learning progress throughout the specified period.

2.2.2. Learning Achievement Test for MIAP Teaching with Computer-Assisted Instruction

The learning achievement test is a closed-ended test consisting of 30 multiple-choice questions, each with 4 options, for a total of 30 point. It is designed and developed to assessed student engagement, content retention, and ability to apply knowledge. It included items measuring content appropriateness, sequencing, instructional design, accuracy of results and conclusions, completeness of media, and presentation quality. Content validity was confirmed by three subject matter experts using the Index of Item-Objective Congruence (IOC), with values ranging from 0.67 to 1.00.

2.2.3. Questionnaire on Students' Perspectives towards MIAP Teaching with Computer-Assisted Instruction

The questionnaire design to survey students' perspectives began with clear objective setting, which is important for effective planning and question design. The main objective of the questionnaire is to understand students' opinions and feelings about MIAP teaching with computer-assisted instruction. This survey helps evaluate students' satisfaction, understanding, and perception of the content learned. By surveying these opinions, areas needing improvement and development can be identified. The questionnaire design needed a clear structure and appropriate sequence for efficient data collection. Questions focused on evaluating three aspects: content, learning activities, and application.

3. Data Collection

Students completed a pre-test to evaluate their existing knowledge and skills before beginning the MIAP teaching with computer-assisted instruction. The test used questions related to the content to be taught, written in easy-to-understand and unambiguous language. The instructor explained the objectives and instructions for the pre-test, which was a closed-ended test consisting of 30 multiple-choice questions with 4 options each, worth 30 points total. After students completed the pre-test, the instructor explained the MIAP teaching plan with computer-assisted instruction in sequence.

The instructor stimulated students' interest by asking questions to engage their thinking and participation. Afterward, students viewed sample computer-assisted instruction projects created by senior students to connect the content with teaching practice experiences, helping students become interested, understand, and recognize the importance and benefits of MIAP teaching with computer-assisted instruction more easily.

The instructor assigned students to form groups to study and research the design and development of computer-assisted instruction using the ADDIE Model (Aldoobie, 2015; Almelhi, 2021), which consists of 5 steps: Analysis, Design, Development, Implementation, and Evaluation. Applying the ADDIE Model to develop computer-assisted instruction helps students systematically develop lessons that respond to learners' needs and abilities, making learning more effective, with interesting content appropriate for the learning timeframe, and enabling students to learn efficiently.

The instructor assigned students to develop computer-assisted instruction on topics of their interest following the ADDIE Model with these steps: First, Analysis—students analyzed the content of the computer-assisted instruction to align with learning objectives, gathered relevant information from reliable sources, selected content matching learning objectives and appropriate for learners' knowledge levels, divided content into related sub-units that are easy to understand, and arranged content from simple to complex for organized and continuous learning. Second, Design—students planned and designed lessons using computers as teaching tools, designing content for computer-assisted instruction by dividing it into small, continuous units arranged from simple to complex in appropriate sequence. Third, Development—students developed computer-assisted instruction using programs of their interest, incorporating text, images, videos, audio, and animations, as well as creating various interactive elements to enhance learning effectiveness. Fourth, Implementation—students tested the lessons with a sample group of learners to check understanding and responses, collected feedback from learners and instructors to improve content and learning activities, and refined content based on suggestions and test results to increase lesson effectiveness. Finally, Evaluation—the instructor evaluated learning outcomes during use to improve lessons throughout the development process for maximum efficiency.

Students then presented the computer-assisted instruction they had developed. The instructor evaluated the computer-assisted instruction developed by students by considering work progress and achievement of teaching objectives to measure the success and effectiveness of the lessons in developing students' knowledge and skills after actual use. Evaluation is an important tool in development and management to ensure that processes and activities are carried out efficiently and achieve set goals.

Students completed a post-test on MIAP teaching with computer-assisted instruction. Students completed a questionnaire about their perspectives on MIAP teaching with computer-assisted instruction.

4. Study Results

The collected data was analyzed by the researchers using SPSS version 16.0, employing descriptive statistics to summarize important characteristics of the population or sample group, including mean, standard deviation (Vanichbuncha, 2012), and t-test values.

4.1. Results of Computer-Assisted Instruction Development

Examples of computer-assisted instruction development are shown in Figure 1.

(a) Example of Lesson Development 1 Grade 4
(b) Example of Lesson Development 2 Grade 4
(c) Example of Lesson Development 3 Grade 5
(d) Example of Lesson Development 4 Grade 5
(e) Example of Lesson Development 5 Grade 6
(f) Example of Lesson Development 6 Grade 7 (Matthayom 1)
(g) Example of Lesson Development 7 Grade 7 (Matthayom 1)
(h) Example of Lesson Development 8 Grade 9 (Matthayom 3)
(i) Example of Lesson Development 9 Grade 11 (Matthayom 5)

Figure 1. Examples of Computer-Assisted Instruction Development

From the examples of students' computer-assisted instruction development, which began with analyzing elementary and secondary education curricula in the Science and Technology learning group (Technology), the development of computer-assisted instruction by each student depended on which educational level they were practicing teaching at and what topics they were assigned to teach. Examples (a) - (e) show results of computer-assisted instruction development for grades 4-6 elementary school on topics including Creative Internet Use, Computer Networks, Safe Internet Usage, Information Data, and Information Technology Usage. Examples (f) - (h) show results of computer-assisted instruction development for lower and upper secondary school levels on topics including Website Creation with Google Sites, Safe Information Technology Usage, Information Management, and Big Data.

4.2. Results of Comparing Students' Learning Achievement through MIAP Teaching Method with Computer-Assisted Instruction

The researcher conducted teaching using the MIAP method with computer-assisted instruction for Computer Education students, with pre-tests and post-tests. The learning results were analyzed using basic statistical values compared against criteria and summarized as shown in Table 2.

Table 2. Results of Comparing Learning Achievement through MIAP Teaching Method with Computer-Assisted Instruction

Topic	Test Score	N	Mean $\bar{x}$	S.D	t-test	p-value	Cohen's d
Content Appropriateness	Before Learning	37	13.75	6.90	11.96	0.00	2.21
	After Learning		26.72	4.58			
Content Sequencing	Before Learning	37	15.55	4.27	11.37	0.00	1.96
	After Learning		25.72	5.95			

Topic	Test Score	N	Mean $\bar{x}$	S.D	t-test	p-value	Cohen's d
Design	Before Learning	37	13.47	6.74	11.91	0.00	1.98
	After Learning		25.66	5.48			
Accuracy of Study Results	Before Learning	37	15.41	4.53	12.82	0.00	2.50
	After Learning		26.58	4.37			
Accuracy of Conclusion	Before Learning	37	14.86	7.97	10.23	0.00	1.89
	After Learning		26.91	4.14			
Completeness of Media	Before Learning	37	15.19	4.52	11.65	0.00	2.38
	After Learning		26.25	4.77			
Presentation	Before Learning	37	12.77	6.91	11.22	0.00	1.96
	After Learning		25.41	5.93			
Overall Average	**Before Learning**	**37**	**14.42**	**5.97**	**11.59**	**0.00***	**2.12**
	After Learning		**26.17**	**5.03**			

The study results from Table 2 show the comparison of learning achievement through MIAP teaching method with computer-assisted instruction. It was found that students had higher post-test achievement scores than pre-test scores with statistical significance at the .05 level ($t=11.59$, $p < .01$). And has a Cohen's d value of 2.12, which is considered at a very high level (Very large effect size) according to the criteria of Cohen (1988).When considering individual items, content appropriateness had a post-learning achievement of ($\bar{x} = 26.72$), demonstrating that the content was aligned with learning goals, consistent with students' prior knowledge, and appropriately adjusted to students' understanding and abilities. Second was content sequencing with post-learning achievement of ($\bar{x} = 25.72$), meaning students planned their teaching by specifying the content to be taught and appropriate learning sequence. Third was design with post-learning achievement of ($\bar{x} = 25.66$), showing that students designed learning content with planning processes and created computer-assisted instruction in advance to achieve desired quality results appropriate for intended use. Fourth was accuracy of study results with post-learning achievement of ($\bar{x} = 26.58$), meaning students could create appropriate and accurate assessment tools or methods, collecting and analyzing learning outcomes using appropriate and efficient technology. Fifth was accuracy of conclusion with post-learning achievement of ($\bar{x} = 26.91$), showing that students could make reasonable conclusions based on reliable data or evidence from their studies or research. Sixth was completeness of media with post-learning achievement of ($\bar{x} = 26.25$)

4.3. Results of Studying Students' Perspectives on MIAP Teaching Method with Computer-Assisted Instruction

Table 3. Results of Studying Students' Perspectives on MIAP Teaching Method with Computer-Assisted Instruction in 3 Aspects

Evaluation Items	Satisfaction Level		
	Mean $\bar{x}$	S.D.	Interpretation
Content	4.55	0.48	Highest
Learning Activities	4.49	0.50	High
Application	4.48	0.49	High
Overall	**4.50**	**0.49**	**Highest**

The study results from Table 3, examining students' perspectives on the MIAP teaching method with computer-assisted instruction, found that the overall satisfaction was at the highest level ($\bar{x} = 4.50$). When considering individual aspects, the highest satisfaction was in content ($\bar{x} = 4.55$), followed by learning activities ($\bar{x} = 4.49$), and third was application ($\bar{x} = 4.48$)

Table 4. Results of Studying Students' Perspectives On MIAP Teaching Method with Computer-Assisted Instruction in Terms of Content

Evaluation Items	Satisfaction Level		
	Mean $\bar{x}$	S.D.	Interpretation
Content Aspect			

Evaluation Items	Satisfaction Level		
	Mean $\bar{x}$	S.D.	Interpretation
1. The course content aligns with the learning objectives.	4.54	0.50	Highest
2. The content is clear, facilitating learning and easy understanding.	4.46	0.50	High
3. The course content is important and beneficial for practical application.	4.75	0.43	Highest
4. The content is appropriate for students' prior knowledge.	4.43	0.49	High
5. The strategies for delivering content are engaging and not redundant with other courses.	4.61	0.50	Highest
Overall	**4.55**	**0.48**	**Highest**

The study results from Table 4 show that students have positive perspectives toward the MIAP teaching method with computer-assisted instruction regarding content. Starting with the importance of the content and its practical application ($\bar{x}$= 4.75), which demonstrates that the content was well-designed to meet needs for daily life and work application. Next, the content delivery was interesting and not redundant with other subjects ($\bar{x}$ = 4.61), reflecting that the content presentation was creative and effectively captured students' interest without causing boredom or repetition with content from other courses. Additionally, the course content was well-planned to align with established learning objectives ($\bar{x}$ = 4.54), which benefited students by allowing them to clearly see the overview and goals of the learning. Students found the content easy to learn and understand ($\bar{x}$ = 4.46), showing that the content was systematically designed and effectively conveyed knowledge, allowing students to understand without excessive effort. Finally, the content was appropriate for students' basic knowledge ($\bar{x}$ = 4.43), indicating that the course content was adjusted to match students' knowledge levels and understanding, enabling them to learn efficiently without feeling overwhelmed or finding it too difficult. The overall evaluation was at a high level ($\bar{x}$= 4.55), showing that students were highly satisfied with the MIAP teaching activities combined with computer-assisted instruction.

Table 5. Results of Studying Students' Perspectives on MIAP Teaching Method with Computer-Assisted Instruction in Terms of Learning Activities

Evaluation Items	Satisfaction Level		
	Mean $\bar{x}$	S.D.	Interpretation
Learning Activities Aspect			
1. Learning activities encourage students to express their opinions.	4.43	0.49	High
2. Learning activities promote teamwork among students.	4.68	0.47	Highest
3. Learning activities emphasize thinking processes and diversity.	4.43	0.56	High
4. Learning activities focus on hands-on practice and knowledge construction.	4.47	0.49	High
5. The instructor provides opportunities for students to ask questions throughout the learning process.	4.46	0.50	High
Overall	**4.49**	**0.50**	**High**

The study results from Table 5 show that students have positive perspectives toward the MIAP teaching method with computer-assisted instruction regarding learning activities. Starting with how learning activities helped promote teamwork among students ($\bar{x}$ = 4.68), demonstrating that organizing activities with shared goals allowed students to learn how to work with others and manage time and shared resources effectively. Next, learning activities emphasized student practice and knowledge construction ($\bar{x}$ = 4.47), reflecting that these learning activities encouraged students to work with clear goals, using their acquired knowledge and skills to solve problems and create products. Additionally, these activities helped students gain direct experience and apply their knowledge in real situations. The instructor also provided opportunities for students to ask questions ($\bar{x}$ = 4.46), which benefited students by making them feel they could express opinions and ask questions freely, creating an open learning atmosphere without pressure. Students also felt confident expressing their opinions ($\bar{x}$ = 4.43), showing that learning activities promoted student confidence and readiness to share their thoughts. Finally, learning activities emphasized thinking processes and differences ($\bar{x}$ = 4.43), indicating that the activity design encouraged students to develop various aspects of thinking and to accept and respect individual differences. The overall evaluation was at a high level ($\bar{x}$ = 4.49), showing that students were highly satisfied with the MIAP teaching activities combined with computer-assisted instruction.

Table 6. Results of Studying Students' Perspectives on MIAP Teaching Method with Computer-Assisted Instruction in Terms of Application

Evaluation Items	Satisfaction Level		
	Mean $\bar{x}$	**S.D.**	**Interpretation**
Evaluation Items			
1. Students can independently learn and review the content freely.	4.50	0.50	Highest
2. Students are satisfied with the learning environment and feel happy.	4.46	0.50	High
3. Students experience increased learning and participation in activities.	4.50	0.50	Highest
4. Students gain more knowledge after learning through the MIAP teaching model.	4.64	0.48	Highest
5. Students would like additional computer-assisted lessons on other topics.	4.32	0.47	High
Overall	**4.48**	**0.49**	**High**

The results from Table 6 show that students have a positive view of the MIAP teaching method combined with computer-assisted instruction in terms of application. Starting with students gaining more knowledge after the MIAP teaching method ($\bar{x}$ = 4.64), which clearly demonstrates the success of this teaching method in enhancing students' knowledge. Next, students were able to learn and review content independently ($\bar{x}$ = 4.50), reflecting that this learning approach effectively promotes self-study. Students also experienced increased learning and participation in activities ($\bar{x}$ = 4.50), which positively affected the development of collaborative skills and effective learning. Students were satisfied with the learning atmosphere and enjoyed learning ($\bar{x}$ = 4.46), demonstrating the ability of technology to create an interesting learning environment and stimulate student learning. Finally, students expressed a desire to use computer-assisted instruction in other subjects ($\bar{x}$ = 4.32), indicating satisfaction and confidence in the effectiveness of this teaching method. The overall assessment was at a high level ($\bar{x}$ = 4.48), showing that students were very satisfied with the MIAP teaching method combined with computer-assisted instruction.

5. Discussion

From the results of implementing the MIAP teaching method combined with computer-assisted instruction, it was found that the number of students with incomplete (I) evaluations decreased. Previously, incomplete evaluations accounted for 32.43%, but after implementing the MIAP teaching method with computer-assisted instruction, incomplete evaluations decreased to 8.10%. The MIAP teaching method, according to Sirisukpaiboon's theory (2011), consists of 4 steps: Motivation, Information, Application, and Progress. When learners go through all 4 steps, they are able to solve problems or accomplish tasks. In applying this learning theory to teaching, it was found that the Motivation stage, where teachers need to stimulate students' interest, is quite difficult. This may be because developing materials independently to align content with learning objectives for each skill requires designing media or learning activities that can be applied in daily life. This aligns with research by Saenboonsong and Sintanakul (2017) who studied the development of a blended learning model according to competency standards using the MIAP learning process at the undergraduate level. They found that the efficiency of the developed teaching model was 1.26, meeting Meguigans' standard criteria. Learners' knowledge increased by 79.00%, and learners were highly satisfied with the developed teaching model.

The comparison of learning achievement using computer-assisted instruction showed that the average post-test scores were higher than the average pre-test scores. This indicates that the MIAP teaching method combined with computer-assisted instruction for Computer Education students, developed by the researcher, can significantly improve students' learning development at the .05 level. This is consistent with Raikham (2016) who researched the development of learning outcomes using project-based learning activities on making boneless fermented fish in the Career and Technology learning group for Grade 6 students. The evaluation of the learning activity's effectiveness was tested with 21 sixth-grade students in the second semester of the 2014 academic year at Ban Lawa School, Khon Kaen Primary Educational Service Area Office 2. Students' post-test achievement was significantly higher than pre-test at the .05 level. This is also consistent with Srichim (2014) who researched the development of web-based computer lessons using Google Site based on constructivist theory on the principles of computer projects for Grade 9 students. The comparison of student achievement after learning from web-based computer lessons using Google Site based on constructivist theory showed that student achievement was significantly higher than the 70% criterion at the .05 level. Similarly, Singhapong (2017) researched learning management through online lessons using Google Site to develop learning achievement in Computer Project (N31231) for Grade 10 students at Saipanya Rangsit School. Students' post-test achievement was significantly higher than the 70% criterion at the .05 level. This is also consistent with Boonyanee Phetsingoen (2017) who researched creating web-based computer lessons using Google Site for Information and Communication Technology courses and surveyed student satisfaction with the web-based computer lessons. The statistics used for data analysis included mean ($\bar{x}$), standard deviation (S.D.), and hypothesis testing using Paired sample t-test. The comparison of learning achievement in Information and Communication Technology courses showed that post-test scores were significantly higher than pre-test scores at the .05 level. Similarly, Kaewkhamjaeng (2018) researched the development of web-based lessons using project-based learning on creating web pages with HTML for Grade 9 students. The comparison of pre-

test and post-test scores of students learning through web-based lessons using project-based learning showed that post-test scores were significantly higher than pre-test scores at the .05 level, which was consistent with the established hypothesis.

From the study of students' perspectives on the MIAP teaching method combined with computer-assisted instruction for Computer Education students, it was found that students' satisfaction was at the highest level ($\bar{x}$ = 4.52, S.D. = 0.49). This is because learning through computer-assisted instruction emphasizes student research according to the learning management model of the Career subject group, which gives students freedom in learning, group work, practical application, research, and experiential learning, resulting in the highest level of student satisfaction. This aligns with Srichim (2014) who researched the development of web-based computer lessons using Google Site based on constructivist theory on the principles of computer projects for Grade 9 students. It was found that 40 Grade 9 students who learned using web-based computer lessons had the highest level of satisfaction ($\bar{x}$ = 4.62, S.D. = 0.46). This is also consistent with Singhapong (2017) who researched learning management through online lessons using Google Site to develop learning achievement in Computer Project (N31231) for Grade 10 students at Saipanya Rangsit School. The analysis of student satisfaction with learning management through online lessons using Google Site showed high satisfaction ($\bar{x}$= 4.29, S.D.= 0.52). This is also consistent with research by M. Kerres and C. De Witt (2003) who studied the development of web-based instruction on an online learning management system according to competency-based teaching plans combined with blended learning using the MIAP process in Computer Graphics and Animation. Learners reported high satisfaction ($\bar{x}$ = 4.47, S.D.= 0.73)

6. Conclusion

For the implementation of this research, appropriate time considerations should be made to allow students and teachers to fully prepare in various aspects. Since learning technology subjects requires students to have additional time for activities to achieve maximum benefits, teachers should thoroughly study the computer-assisted instruction lessons, manuals, and the nature of activity implementation to use computer-assisted instruction with maximum efficiency.

Future research should encourage the creation of computer-assisted instruction in other content areas of the Career subject group, especially in areas where students need to learn theoretical knowledge alongside practical applications. This would help improve learning management and teaching efficiency. Additionally, studies should explore other teaching media such as online lessons and mobile learning applications to compare with computer-assisted instruction for Computer Education students. As current teaching models incorporate integrated learning approaches, there is a need for more diverse instructional media. Therefore, studies should be conducted on other media formats to find approaches for developing technology education that effectively achieve educational goals.

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