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INTERACTIVE COMPUTER-AIDED INSTRUCTION IN TEACHING SCIENCE 4

RIA CLARE S. PALAD
Institute of Graduate and Professional Studies,
Lyceum-Northwestern University
Dagupan City

Abstract :

This study sought to propose Interactive Computer-Aided Instruction in teaching Science 4 in District 2 of Urdaneta City Division during the school year 2025-2026. It was delimited to the level of performance in Science of Grade 4 learners based on the first quarter grades; teacher-made Computer-Aided Instructional materials; level of performance of Grade 4 learners in Science after the implementation of the Computer-Aided Instructional materials. The researcher used the questionnaire as the main data-gathering tool. The data gathered were properly coded, recorded, tallied, tabulated and interpreted using the Statistical Package for Social Science. Frequency counts, percentages and weighted mean were used for descriptive analysis and t-test for significant differences. The study found out that majority of the Grade 4 learners in Science obtained a satisfactory performance. The Computer-Aided Instructional materials were based on the least learned skills of the Grade 4 learners in Science. Majority of the Grade 4 learners in Science obtained outstanding performance after the utilization of computer-aided materials. The performance of the Grade 4 learners in Science exposed to the computer aided materials is significantly different when compared to their performance before exposure to computer-aided instruction. The suggested computer-aided instructional materials will improve the performance of the Grade 4 learners in Science. The researcher recommended that teachers should be encouraged to use the Computer-Aided Instruction strategy in order to provide alternative challenging lessons in Science. Introducing the Computer-Aided Instruction is one way of orienting the students to our fast developing and advancing technological world. It is therefore recommended that the government should support the DepEd thrust of modernizing instruction by allocating national and local funds to public schools to purchase computer units and other computer paraphernalia. Computer education should be enhanced in schools to expose learners to computer-aided instruction. There should be in-service seminars and training of teachers on the use of computer in teaching their subjects specifically Science. More researches must be done to test the effectiveness of other Computer-Aided Instructional materials in other topics or in other subjects. The design and development of Computer-Aided Instructional materials/modules is encouraged. Filipino teachers know better than foreign teachers about the strengths and weaknesses of Filipino learners. Hence, we should not depend solely on the Computer-Aided products developed by foreigners.

Keywords: computer-aided instruction, instructional materials

INTRODUCTION

In the 21st century, the world is becoming more and more technologically oriented. Thus, the Industrial Age gave way to the Information Age, an info-tech era which is as vital as the air we breath because this has brought changes to society, business, education, and our lives.

Indeed, the education sector is no exemption in the participation of an information-rich computerized society. To keep abreast with the emerging technological changes in the global, national and regional environment, our present educational system is continuously upgrading the resources through the modernization of the various elements of the system. Modernization can be pursued through the introduction of modern instructional aids and materials such as multimedia gadgets like computers. VHS, CD-ROM, TV, internet and the like.

Hence, the Department of Science and Technology (DOST), the Department of Education, the Commission on Higher Education (CHED), and the Technical Education and Skills Development Authority (TESDA) unanimously endorsed a new proposal on the use of more technologically oriented instruction in the government schools. This is contained in a document entitled, "Education Technology Master Plan."

Past Secretary Ricardo T. Gloria conceived the "Schools of the Future" to meet the needs of the modern times for the purpose of improving the quality of education particularly Science and Technology so as to produce graduates who are proficient in basic literacy, numeracy and critical thinking skills. This is to enable them to compete in the domestic and international labor market.

The schools of tomorrow shall be equipped with facilities, equipment, materials as well as new learning or delivery system like science laboratories, language laboratories and computer laboratories. It also aims to improve the quality of education to produce globally competitive graduates through its major features: the use of more instructional interventions using multi-media

technology, redefinition of the role of the teacher from provider of knowledge to facilitator of learning and greater opportunities for individualized learning.

Access to effective educational technologies to improve the teaching and learning process. Its national mission is to make the Filipino students from second to bottom among the 42 countries included in the Third International Mathematics and Science Survey (TIMS) (Gonzales, 2008). Hence, the urge to improve science education has stepped up the production of computer-related materials like Computer-Aided Instruction (CAI) which gears towards the modernization of education.

Computer-Aided Instruction is one of the new approaches of instruction, computer-based instruction, computer-assisted learning and other combinations of these words (Lockard et al., 2010). This study involves not only computer hardware but also softwares such as operating systems, programmed wares and other new ways of teaching, learning and organizational classroom experience.

It does not only concern the state of the art instructional materials but it is also concerned in making the teachers modern in their outlook, thinking and behavior. Therefore, a modern teacher in science is the challenge of the 21st century, one who can integrate technology and information into teaching and learning, on e who can adapt modern ways and employ invigorating teaching and learning approaches that facilitate efficient science education, a teacher who can capture students desire to acquire and use targeted skills making them more pleasant and scientific in their attitudes.

Science and Technology teachers then must make science interesting and challenging by introducing computer-aided instruction in the teaching and learning process. This challenge to re-engineer and reinvent our educational system aims to improve the academic performance of students.

The use of the computer as an instructional aid offers hope to students who could grasp science concepts through the traditional methods. Hence, its growing applications of motivated the researcher to determine its effectiveness in teaching Science concepts, Science processes and Scientific attitudes.

Technological support for inquiry would not the implementation of one application but a bundle of applications (German and Sasse, 1997). Consequently, teacher education courses must make appropriate pedagogy visible through the complex interactions among students and classroom technologies. Technology can support student investigations and direct collection and presentation of data through real-time data collection via computer. Powerpoint or spreadsheet functions support presentations that demonstrate the relationship between hypothesis and data. Further manipulations of the display can help students formulate conclusions based on data. For example, by examining various graphical formats, students can be guided to think about implications by looking for trends, identifying categories, or making comparisons. Through these, teachers should become aware of how applications of technology help students share and collaborate in building their knowledge of science and scientific inquiry.

Rogers (2011) stated that the widespread use of Information and Communication Technology in education in recent decades has required the design and delivery of a variety of teacher training programs in all countries. Many programs have focused on providing teachers with technical skills necessary for operating the hardware and software involved, but there has been longstanding evidence that such operational skill alone is insufficient to produce learning gains in students, and that the role of the teacher in mediating the use of ICT is of crucial importance. Established teaching skills such as planning , organizations, instructions, communication and intervention retain a vital role, but their adaptation to the qualities of software –based materials so that the full learning potential many be exploited leads to a consideration of a pedagogy for teaching with ICT.

The new Basic Education Curriculum of 2002 approaches is now being implemented. Generally, the restructured curriculum aims to raise the quality and graduates of Filipino learners including empowering them for life long learning. It also promote reciprocal or two way interaction between students and teachers, between students themselves by collaborative learning and between students and instructional materials and multi-media sources and between teachers of different subjects by collaborative teaching. The Department of Education (DepED) is currently expanding the reach of Information and Communications Technology in public schools to enable Filipino teachers and students to face the challenges in the Agee of Technology.

"Our advocacy in integrating ICT in education can only redound to the benefit of Filipino public school children as it will make quality education easily accessible to as many learners as possible ," (Lapus, 2008).

The concept of educational technology provides a fundamental theoretical basis for research and practice in teaching and learning. The field of educational technology is relatively new and has been struggling to establish it's boundaries.

According to the Association for Educational Communication and Technology (AECT, 2008) it is possible to define educational technology as "the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources".

When defining educational technology, it is necessary to distinguish between how engineers and social scientists use the term "technology". Engineers, technicians, and technologists view technology as a tool for material construction based on a systematic engineering knowledge of how to design artifacts. Social scientists view technology as a process for material construction based on the organization of knowledge for the achievement of practical purposes and also based on any tool or technique of doing or making by which capacity is extended.

Educational technology as a goal oriented problem solving approach utilizing tools, techniques, theories, and methods from multiple knowledge domains to design, develop, and evaluate, human and mechanical resources efficiently and effectively in order to facilitate and leverage all aspects of learning, and to guide change agency and transformation of educational systems and practices in order to contribute to influencing change in society. In general, it is possible to illustrate educational technology as a system. The main approach to educational technology was to consider it as a tool. The history of educational technology as a tool is marked with significant innovations.

This list includes various hardware, e.g., portable storage devices, portable CDs, DVD players, calculators, notebook PCs, handheld PCs, pocket computers, personal digital assistants (PDAs), MP3 players, iPods, digital video cameras, and so on. In general, the advent of any new technology (i.e., software and hardware), especially in the field of entertainment, usually results in its being adopted for educational purposes, and universities are increasingly promoting the use of technology in the classroom (Palmer and Devitt 2007).

Furthermore, the spread of the www, the Internet and other media, such as radio and TV, coupled with evolving social networking software and communication applications (e.g., Skype, Facebook, messenger and various forums, blogs, wikis) have

Educational Technology Techniques, theories & methods form multiple knowledge domains which are standardized and reproducible (i.e., computer science, psychology, communications) Tools (i.e., film, video, computers)

. Nowadays the term "virtual education" may be used as an umbrella term. According to a business dictionary, the term "virtual" means having most properties, the appearance, essence, or effect, of something without being that thing. The following features can be associated with virtual education: (1) a learning process is based on some technology partly or entirely replacing a human teacher, (2) a teacher and learner can be separated by time and place, but they are able to communicate freely, (3) a student can choose time, pace, place and amount of learning by him/ herself.

To help improve the quality of education and to better prepare students for our technologically rich society, schools have invested large amounts of money in computers and other equipment. Simply providing access to computers is not a guarantee of an increase in student achievement, however. House (2007) performed an analysis of the relationship between computer activities and science achievement, using the TIMSS achievement test scores. He found that high scores on the science achievement test were correlated with frequent computer use at home and at school, especially when the computer was used for school work. Lower scores were correlated with frequent use of the Internet before or after school, or use of the computer for playing games before or after school. In this large national sample, the researcher found that a 7.3% variance of scores could be attributed to the type of computer use reported by the students. When used for academic purposes, therefore, House's research contends that computers can have a strong positive effect on students" science achievement.

By contrast, in a recent dissertation conducted by Davis (2012), no significant difference was found in fifth grade students" achievement after using instructional technology. Even though the computers were used for academic purposes, the students" learning in math and science as measured by the 2010 and 2011 Criterion Referenced Competency Test scores in science and math did not increase significantly more than the scores of those in the control group. The same teacher instructed both the control and treatment groups which would control for many extraneous factors.

Statement of the Problem

This study sought to assess the effect of Computer-Aided Instructional materials in teaching Science 4 in District 2 of Urdaneta City Division during the school year 2025-2026.

Specifically, it sought to answer the following sub-problems:

1. What is the level of performance in Science of Grade 4 learners based on the first quarter grade?
2. What teacher-made Computer-Aided Instructional materials can be implemented to address the needs of Grade 4 learners in Science?
3. What is the level of performance of Grade 4 learners in Science after the implementation of the Computer- Aided Instructional materials?
4. Is there a significant difference between the performances of the Grade 4 learners in Science before and after exposure to Computer-Aided Instruction?
5. Based on the findings, what final form of Computer-Aided Instructional Materials can be proposed to improve the performance of the Grade 4 learners in Science?

METHODOLOGY

This chapter presents the research design, sources of data, instrumentation and data collection and tools for data analysis.

Research Design

The descriptive-developmental design was employed in this study. Descriptive research includes studies that purport to present facts concerning the nature and the status of anything. It gives meaning to the quality and standing of facts. This study will focus on the level of performance in Science for Grade 4 learners based on the first quarter grade; teacher-made Computer-Aided Instructional materials; level of performance of Grade 4 learners in Science after the implementation of the Computer-Aided Instructional materials; and significant difference between the performance of the Grade 4 learners in Science before and after exposure Computer-Aided Instructional materials.

Sources of Data

This study was conducted in District 2 of Urdaneta City Division during the school year 2025-2026 with 200 Grade 4 learners from the said district.

Instrumentation and Data Collection

The instrument in gathering the data that was used in the study is a questionnaire-checklist designed by the researcher since there are no available standardized instruments pertinent to the problems of the study. The researcher-made questionnaire was presented to the adviser and then the members of the Research Committee for initial evaluation. Then the instrument was submitted for final evaluation and validation by experts on questionnaire construction and content.

A validation questionnaire was utilized in this regard. The product of this process was the questionnaire in its final form.

Approval and permission to conduct the study was obtained by the researcher from the Schools Division Superintendent of Urdaneta City Division.

The questionnaire was personally administered by the researcher to the teacher-respondents to ensure fast and immediate response and 100% retrieval.

The gathered data were subjected to appropriate statistical treatment analysis and interpretation.

Tools for Data Analysis

To derive valid and accurate results, appropriate statistical measures were employed.

To answer sub-problem number 1, level of performance in Science of Grade 4 learners was based on the first grading grades, frequency counts and percentages were used.

$$\text{Percentage} = \frac{F}{N} \times 100$$

Where:

F = Frequency

N = total number of respondents

To answer sub-problem 2, the researcher utilized the developed Computer Aided Instructional materials in Science 4.

To answer sub-problem 3, level of performance of Grade 4 learners in Science after the implementation of the Computer-Aided Instructional materials, frequency counts and percentages were used.

$$\text{Percentage} = \frac{F}{N} \times 100$$

Where:

F = Frequency

N = total number of respondents

The performance of the students was classified in terms of the following:

Outstanding (90 and above)
Very Satisfactory (85-89)
Satisfactory (80-84)
Fair (75-79)
Did not meet expectations (74 and below)

To answer sub-problem 4, significant difference between the performance of the Grade 4 learners in Science before and after exposure to computer-aided instruction, t-test was used.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

RESULTS AND DISCUSSION

This chapter was devoted to the presentation, analysis and interpretation of the data gathered relative to sub-problems in the study**.**

1. Level of Performance in Science of Grade 4 Learners Based on the First Quarter Grade

Table 1
Level of Performance in Science of Grade 4 Learners

Performance	Frequency	Percentage
Outstanding (90-100)	48	24.00
Very Satisfactory (85-89)	16	8.00
Satisfactory (80-84)	103	51.50
Fair (75-79)	33	16.50
Total	**200**	**100**

It can be seen in Table 1 that majority of the Grade 4 learners in Science obtained a satisfactory performance (80-84) with 103 or 51.50%. There are also 48 or 24% of learners who had an outstanding performance (90-100). It is further revealed by the table that there are 16 or 8% who had very satisfactory performance (85-89) while 33 or 16.50% got fair performance with 75-79 grades.

The result shown that Grade 4 learners in Science performed quite low during the third quarter examination which means that their performance should be improved. One way to do this is by using computer-aided materials so that they can study well the lesson.

2. Teacher-Made Computer-Aided Instructional Materials to Address the Needs of Grade 4 Learners in Science

The computer aided instructional materials were based on the least learned skills of the Grade 4 learners in Science.

3. Level of Performance of Grade 4 Learners in Science after the Utilization of the Computer-Aided Instructional Materials

Table 2
Level of Performance in Science of Grade 4 Learners after the Utilization of the Computer-Aided Instructional Materials

Performance	Frequency	Percentage
Outstanding (90-100)	122	61
Very Satisfactory (85-89)	46	23
Satisfactory (80-84)	32	16
Total	**200**	**100**

It can be seen in Table 2 that majority of the Grade 4 learners in Science obtained outstanding performance (90-100) with 122 or 61%. There are also 46 or 23% who had very satisfactory performance (85-89). It is further revealed by the table that there are 32 or 16% who had satisfactory performance (80-84).

The result shown that computer aided instructional materials are very helpful in improving the performance of the Grade 4 learners in Science. It is therefore suggested/recommended that teachers should continue doing Computer-Aided Instructional materials for the benefit of the learners.

4. **Significant Difference Between the Performance of the Grade 4 Learners in Science Before and After Exposure to Computer-Aided Instructional Materials**

$$t = \frac{M_1 - M_2}{\sqrt{\frac{(SD)^2}{N} \quad \frac{(SD)^2}{N}}}$$

By substitution:

$$\frac{4.58 - 2.93}{\sqrt{\frac{(2.14)^2}{24} + \frac{(1.71)^2}{18}}}$$

$$\frac{1.65}{\sqrt{0.19 + 0.16}}$$

$$\frac{1.65}{.59}$$

T = 2.80
> at the .01 level

The computed t was 2.80 and such value was more than 2.58 at the .01 level of significance. Meaning there really was significant difference in the perception of both respondents.

This is true the findings of Newton (2005), who identified several problem issues which explain why educational technology is not used in teaching.

Research suggests that in any topic, including benefits of educational technology, it has been difficult to change teachers' beliefs about teaching and learning. Administrators sometimes fail to budget enough funds for hardware, software, maintenance, and professional development for teachers to provide support for incorporating technology in the curriculum. Careful planning is vital to build up a technology budget that provides for all these factors.

According to Grabe (2007), technologies can play a role in pupil skills, motivation and knowledge. He claims that educational technology can be used to present information to pupils and help them complete learning tasks.

Summary

This study sought to propose Interactive Computer-Aided Instruction in teaching Science 4 in c District 2 of Urdaneta City Division. It was delimited to the level of performance in Science of Grade 4 learners based on the first quarter grades; teacher-made interactive Computer-Aided Instructional materials; level of performance of Grade 4 learners in Science after the implementation of the Computer-Aided Instructional materials; and significant difference between the performance of the Grade 4 learners before and after exposure to interactive Computer-Aided Instructional materials.

1. **Level of Performance in Science of Grade 4 learners in Based on the First Quarter Grades**

Majority of the Grade 4 learners in Science obtained a satisfactory performance (80-84) with 103 or 51.50%. There are also 48 or 24% of learners who had an outstanding performance (90-100); 16 or 8% who had very satisfactory performance (85-89) while 33 or 16.50% got fair performance with 75-79 grades.

2. Teacher-Made Interactive Computer-Aided Instructional Materials to Address the Needs of Grade 4 Learners in Science

The interactive computer-aided instructional materials were based on the least learned skills of the Grade 4 learners in Science.

3. Level of Performance of Grade 4 Learners in Science after the Implementation of the Computer-Aided Instructional Materials

Majority of the Grade 4 learners in Science obtained outstanding performance (90-100) with 122 or 61%. There are also 46 or 23% who had very satisfactory performance (85-89). It is further revealed by the table that there are 32 or 16% who had satisfactory performance (80-84).

4. Significant Difference Between the Performance of the Grade 4 Learners in Science before and after Exposure to Interactive Computer-Aided Instructional Materials

The computed t was 2.80 and such value was more than 2.58 at the .01 level of significance.

Conclusions

Based on the findings of this study, the following conclusions were discussed:

1. Majority of the Grade 4 learners in Science obtained a satisfactory performance.
2. The Interactive Computer-Aided Instructional materials were based on the least learned skills of the Grade 4 learners in Science.
3. Majority of the Grade 4 learners in Science obtained outstanding performance after the utilization of interactive computer-aided materials.
4. The performance of the Grade 4 learners in Science is significantly different before and after exposure to interactive computer aided instruction.
5. The suggested interactive computer-aided instructional materials will improve the performance of the Grade 4 learners in Science.

Recommendations

On the basis of the foregoing findings and conclusion, the following were recommended:

1. It is hereby recommended that teachers should be encouraged to use the Interactive Computer-Aided Instruction strategy in order to provide alternative challenging lessons in Science.
2. Introducing the Interactive Computer-Aided Instruction is one way of orienting the students to our fast developing and advancing technological world. It is therefore recommended that the government should support the DepEd thrust of modernizing instruction by allocating national and local funds to public schools to purchase computer units and other computer paraphernalia.
3. Computer education should be enhanced in schools to expose students to interactive computer-aided instruction.
4. There should be in-service seminars and training of teachers on the use of computer in teaching their subjects specifically Science.
5. More researches must be done to test the effectiveness of other Interactive Computer-Aided Instructional materials in other topics or in other subjects.
6. The design and development of Computer Aided Instructional materials/modules is encouraged. Filipino teachers know better than foreign teachers about the strengths and weaknesses of Filipino learners. Hence, we should not depend solely on the Interactive Computer-Aided products developed by foreigners.

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