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Liquid Crystal Display (LCD) based Instruction and Physics Performance

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The study determined the effectiveness of LCD based instruction to academic performance of students in physics concept, physics problem solving and overall physics performance. Respondents were third year students enrolled in the Physics subject under the course Bachelor of Science in Agribusiness. Result showed that both students with and without LCD instruction based instruction have above average performance level on physics concept and overall performance and an average performance in physics problem solving aspect. Male and female respondents also have same physics performance level on concept aspect, problem solving aspect and overall physics performance for both with and without computer-aided instruction. Conduct of similar research is recommended to confirm results of the study.

Keywords: *LCD, physics performance, sex, PowerPoint presentation, physics concept, problem solving*

Introduction

There are various teaching techniques used by teachers in the teaching-learning process. Usually the technique used is based on the applicability and effectiveness of the technique or method to impart the necessary learning competency to the student. One of these techniques is the LCD based Instruction, specifically using the power point presentation. The integration of such type of instruction offers a wide opportunity to the educational system with its capacity to enhance and integrate wide and meaningful information. It also allows students to have access to concepts beyond the classroom setting. LCD based instruction could be used to maximize student's participation as well as their understanding on concepts presented to them. This tool may aid students in their learning process by enabling them to understand abstract concepts through visualization. Also, LCD based instruction could transform the teaching process by providing aid to teachers because of its ease of use, flexibility and interactivity.

LCD based instruction with using power point presentations has become part of many instructional settings and is an alternative tool for learning, particularly in large classes and in courses more geared toward information exchange. It has the potential to transform the learning process by providing a new learning culture with the use of interactive slides, abstracts concepts can be presented with the aid of visualization, videos and or music can also be incorporated in the lesson process. Power point presentation also opens up various opportunities for learning

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because it enables students to access, transform and share information. PowerPoint presentation with the aid of LCD can be a highly effective tool to aid learning. It allows teachers to explain abstract concepts, while accommodating all learning styles. This tool may also serves as an avenue for collaborative learning and may enhance student's critical thinking, creative thinking and problem solving skills. Used properly, PowerPoint presentation can be one of the most powerful tools for disseminating information, but if not used carefully, may disengage students and hinder learning. It is in this concept that this study was formulated. Objectives of the Study:

One of the teaching techniques used to impart a concept to students is through LCD based instruction with the use of power point presentations. The focus of the study was to compare the performance of students who were taught of physics concepts with the use computer-aided instruction and students using the conventional textbook or hand-outs. The study also intends to compare the performance with the average. The following were the specific objectives of the study:

1. To determine the level of students' concept and problem solving performance in Physics without the LCD based instruction in the learning process.
2. To determine the level of student's concept and problem solving performance in selected topics on Physics with the use LCD based instruction in the learning process.
3. To compare the physics performance level on concept aspect, problem solving aspect and overall performance of students without computer-aided instruction when grouped according to sex.
4. To compare the physics performance level on concept aspect, problem solving aspect and overall performance of students with LCD based instruction when grouped according to sex.
5. To compare the level of student's concept, problem solving and overall performance in Physics with and without the use of LCD based instruction in the learning process

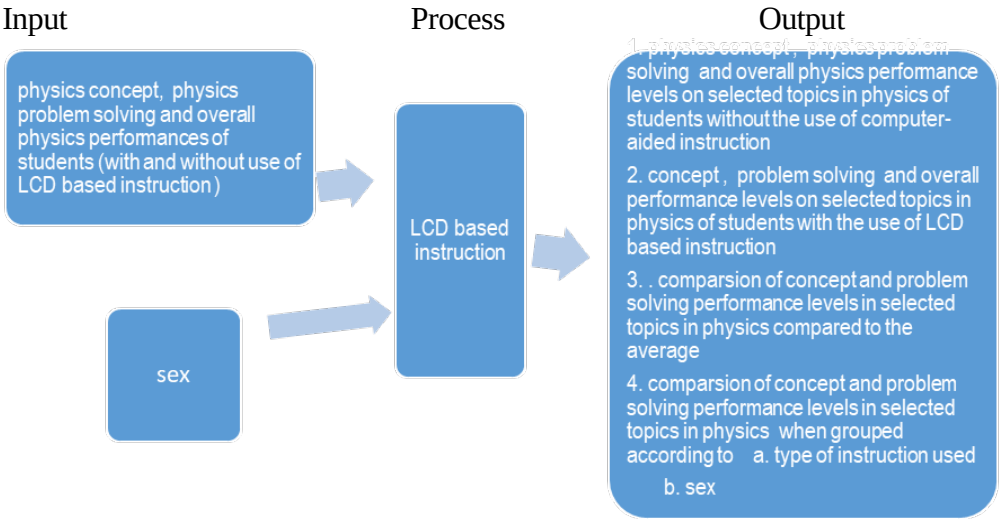
Conceptual Framework

The teaching method used by instructors plays an important role in knowledge and skill acquisition of students. Most classrooms from pre-primary to tertiary institutions are dominated by the conventional method of teaching-learning method using chalkboards, marker-boards and handouts. The study of Iyengar et al. (2014) showed that the conventional method was ineffectiveness for very large group instruction. An inability to allow information storage for future use; and accommodate illustrations to support the teaching was also observed. The health hazard for teachers from chalk particles and it makes learning uninteresting are among the other limitations of the lecture method.

The goal of the study was to know the effect of using LCD based instruction specifically, power point presentation as a technique in the teaching learning

process of students in mathematics and physics. Figure 1 shows the paradigm of the study.

Figure 1. *Paradigm of Study*



The independent variables were the students' concept and problem solving performance on selected topics in Physics 11; and student sex. From the independent variables, the concept and problem solving performance levels in selected topics in Physics 11; the comparison of the performance in Physics 11 of students compared to the average and when grouped according to learning using LCD based instruction and those with not.

Hypotheses of the Study

1. The student's concept, problem solving and overall physics performance level on selected topic in physics taught without using LCD based instruction is on the average.
2. The student's concept, problem solving and overall physics performance level on selected topic in physics taught with the use LCD based instruction is on the average.
3. There is no significant difference in physics performance level on concept aspect, problem solving aspect and overall performance of students without LCD based instruction when grouped according to sex.
4. There is no significant difference in physics performance level on concept aspect, problem solving aspect and overall performance of students with LCD based instruction when grouped according to sex.
5. There is significant difference in the overall performance level in on selected topic in Physics of students when grouped according to learning with or without the use of LCD based instruction.

Literature Review

Different studies show that the use of technology in schools has developed new ways of teaching and learning. It enhances learning by providing a better understanding of the topic as well as motivating students.

The study of Zdaniuk et al. (2019) examined whether self-efficacy and gender influence the effect of PPT slide provision on academic performance. The result showed that there is no evidence for the provision of slide handouts to broaden, unconditional pedagogical value. Rather, it was found that both self-efficacy and gender moderated the extent to which the availability of the handouts enhanced or hindered students' performance. Also, both high self-efficacy and male students performed significantly better when they were provided with handouts. Students with low self-efficacy performed significantly worse when the handouts were provided. Lower performance was also observed for female students when provided with handouts. The result of the study also showed that students with PPT handouts perceived their instructor as more effective, and students felt more prepared. Lastly, it was observed that students considered the of PPT the handouts were more valuable to their learning and course performance than the one-to-one interactions with the professor

Gambari et al. (2015) determined the effectiveness of PowerPoint Presentation in teaching Technical Drawing concepts in Basic Technology. The study revealed that the students taught with Power Point presentation performed better than students taught with Chalk Board method. High achievers also performed better than medium and low achievers. The use of the Power Point presentations was also found to be gender friendly.

According to Bartsch and Cobern (2003), various colleges and universities have rooms equipped with technology necessary for any instructor to display information via PowerPoint presentations. They also emphasized in their study that students believed that they learned more from PowerPoint lectures. It was also shown in a study that students like to be taught using PowerPoint presentations (Craig and Amernic 2006).

Szabo and Hastings (2000) found to have positive attitudes toward PowerPoint lectures because they felt that PowerPoint lectures were interesting, able to get their attention, and help them to have better understanding. However, this did not reflect their achievement; both lecture styles had no significant differences on the students' test result.

Despite of the effectiveness of PowerPoint presentations to both teachers and students, they are one of the most easily misused teaching aids (Priya 2012). Greed (1997) argued about PowerPoint in several points: first, "you may get less feedback from the class because your eyes and theirs are on the screen rather than looking at each other;" second, students don't have a chance to synthesize what they've heard; and third, the emphasis is on the quality of your presentation rather than your students' learning.

Fedisson and Braidic (2009) made a study on the impact of PowerPoint presentations on student achievement and student attitudes. During instruction one class was taught using conventional methods of book work, hand-outs and lecture

and using Power Point for a second class. Result of the study showed that when using power point with the aid of LCD, student test grades increased

Teofilo et al. (2012) made a study on the effect of blended learning on academic performance on problem solving and programming of Bachelor of Science in Information Technology students. Result of the study showed that students with blended learning perform significantly better.

Cladellas Pros et al. (2013) studied the effects of the power point methodology on content learning. This study determined whether the use of PowerPoint technology as a method of transmitting information has an effect on students' learning compared with classes taught without this technology. The study included psychology students, divided into four groups, two of which were taught an ordinary Educational Psychology lesson with the only aid of the blackboard, while other two groups, a PowerPoint presentation was used to deliver the contents. Results showed significant differences with the scores of the groups without PowerPoint and the groups with PowerPoint. The use of technology can have a very positive influence on learning in a specific type of learning.

An examination was done by Bernardo and Bay (2013) on the technology-driven teaching strategies used in Photojournalism course in Lyceum of the Philippines University-Batangas. The study determined the frequency of use, the effectiveness and the problems encountered by the students during the execution of the technology-driven teaching strategies used. The results showed that the effectiveness of the technology-driven teaching strategies depends on how frequently they are used in the class, while effectiveness is not affected by the problems encountered.

Lari (2014) determined the impact of using Powerpoint presentations on students' learning and motivation in the secondary school English (TEFL) process. The subjects were split into two groups, (Experimental and Control). Each group was taught differently, one using technology like video-projector, power-point, in class; and the other through a traditional method such as the use of textbooks. Result showed teaching based on the use of technology had a significant positive effect on learners' scores. Analyses showed that the experimental group learners performed better than the control group.

Enriquez (2014) made a study on students' Perceptions on the Effectiveness of the Use of Edmodo as a Supplementary Tool for learning social science courses. The findings affirmed that majority of participants considered Edmodo as an effective supplementary tool for their learning.

Balmeo et al. (2014) made a study on integrating technology in teaching students with special learning needs in the SPED Schools in Baguio City. The research focused on integration of technologies in the educational environments where students with special learning needs are housed. It determined the availability and effectiveness of technology in the classroom and determined encountered problems in the technology integration. Result showed that there were limited level of availability and effectiveness of technology.

Aquino (1986) as cited by Calisog (2010), and Teofilo et al. (2012) said that teaching is the act of providing activities that facilitates learning. It is the process where gaining knowledge and learning takes place. There are many techniques or

methods used in the teaching-learning process by teachers. The technique or method used is usually based on the applicability and effectiveness of the technique or method to impart the necessary knowledge to the student. Computer-aided instruction like PowerPoint using LCD has become part of many instructional settings and is an alternative tool for learning, particularly in large classes and in courses more geared toward information exchange. PowerPoint can be a highly effective tool to aid learning. PowerPoint can be one of the most powerful tools for disseminating information, but if not used carefully, may disengage students and hinder learning. PowerPoint could potentially confuse students and make learning a difficult process. It is in this concept that this study was formulated.

Based on the result of the study of Tagle (2007), lecture was the most utilized instructional method in teaching by the teachers. Demonstration and problem solving methods are the other methods commonly used. Benguet State University is among schools which make use of lecture method. Hence, it is necessary to consider if the use of other techniques like LCD based instruction will make a significant improvement on students' academic performances.

Significance of the Study

It was hoped that the output of this study would show the technology effect to physics performance level of students. The result of the study would provide relevant information to the faculty of the College about the learner to help the teacher select appropriate strategies, methodologies and the type of instructional materials to be used that would arouse the intellect of the students. It is also hoped that the results of this study could contribute to the research literature in the field of education in general and the improvement of physics instruction in particular.

Methodology

Respondent and Place of Study

The respondents of the study were students enrolled in selected physics subject under one of the researcher Physics classes at Benguet State University, La Trinidad, Benguet.

The researchers utilized complete enumeration on each class. Specifically, two Bachelor of Science in AgriBusiness classes where the respondents three males and twenty four females in the experimental group while there were four males and thirty two females in the control group.

Research Method

The study is a descriptive causal quantitative research which makes use of purposive sampling technique.

Instrumentation

Student were taught of Physics concept on Mechanics using power point presentation with the aid of LCD for one group and another group of students were taught of the same concept using the conventional method of instruction. To avoid other possible intervening factors, two classes of the same year level and same course and subject of each researcher were utilized. A respondent homogeneity test was also conducted and affirmed homogeneity of respondents. A teacher-made exam was given to the students before the conduct of the study to randomize the proper distribution of students according to group. Each group was divided into groups as experimental or control group. The same formulated test was given to the two groups to measure the corresponding performance. Comparison of performance for the two groups was done.

Statistical Analysis

The performance in Physics was grouped into two categories: the concept category and the problem solving category.

The mean was used to determine the categorized performance level of in physics of students with the following scale:

93 or Above	High Performance	H
84 – 92	Above Average Performance	AA
75 – 83	Average Performance	A
66 – 74	Below Average Performance	BA
65 or below	Poor Performance	P

The t-test was used to compare the performances of the students taught using computer-aided instruction and with the control group. One-Sample t test was used to compare level of performance compared to the average. All tests were done at 0.05 level of significance.

Results and Discussion

Level of Performance of Students in Physics without the LCD based Instruction

Table 1 presents the level of physics performance of students who did not use the LCD based Instruction. Analysis showed that the level of performance of students in concept was above average with a mean of 84.85. Specifically, 57.50% of the respondents had either high or above average performance in physics concept, while 42.5% either average of below average performance in physics. On the other hand, the level of performance of students in problem solving was average as presented by the mean of 81.99. Among the students, 45.50% of the students have average performance while the 30.30% have either above average or

high performance level and the remaining 8% performed either below average or poor.

Table 1. *Level of Performance of Students without the Use of LCD based Instruction*

Level	**f**	**%**	**Mean**	**D.E.**	**p-value**
Concept					
High	1	3.00	84.85	AA	0.000**
Above Average	18	54.50			
Average	9	27.30			
Below Average	5	15.20			
Problem Solving					
High	4	12.10	81.99	A	0.063^{ns}
Above Average	6	18.20			
Average	15	45.50			
Below Average	7	21.20			
Poor	1	3.00			
Overall					
Above Average	16	48.50	83.56	A	0.000**
Average	17	51.50			
Total	58	100.00			

Overall, the performance of the students was average with a mean value of 83.56. However, analysis revealed that the level of performance of students who did not use LCD based Instruction is significantly different from average with a p-value of 0.000. Thus, the hypothesis is rejected. This simply suggests that the level of performance of students who did not use Computer-Aided Instruction is higher than average. Result show that 51.50% of the respondents had average performance while 48.50% have above average performance but the variance in performance level in the concept and in problem solving lead to a mean that is significantly higher than the average. This indicates that the traditional method of teaching learning process is still effective method in the transfer of knowledge to students. This is both true for concept aspect and problem solving aspect in physics.

Level of Performance of Students in Physics with the Use of LCD based Instruction

Table 2 presents the performance level in physics of students who undergone the learning process in physics with the use of LCD based instruction. Using the Likert scale, the computed mean values of 82.36%, 81.78% and 82.10% for concept aspect, problem solving aspect, and overall performance, respectively, implies all performance level are on the average. However, further comparison to the average at 0.05 level of significance, and presented by the p values of 0.002, 0.0099, and 0.006, respectively for concept component, problem solving component, and overall performance, the concept and overall performance is above average while the problem solving aspect performance is on the average.

Table 2. *Level of Performance of Students without the Use of LCD aided Instruction*

Area	f	%	Mean	D.E.	p-value
Concept					
Above Average	11	44.00	82.36	A	0.002**
Average	12	48.00			
Below Average	2	8.00			
Problem Solving					
High	2	8.00	81.78	A	0.099^{ns}
Above Average	6	24.00			
Average	12	48.00			
Below Average	5	20.00			
Over – All					
Above Average	11	44.00	82.10	A	0.006**
Average	13	52.00			
Below Average	1	4.00			
Total	58	100.00			

The result indicates that computer-aided instruction is likewise an effective method to be used in the teaching learning process not on just on the impart of concept but also in the problem solving aspect.

The result from Table 2 shows a similar result with students who did not used the computer aided instruction as presented in Table 1. This implies that in imparting knowledge be it concept or problem solving aspect, the traditional way and LCD based instruction are both effective. This result is supported by the study of Daniels (1999) which showed the effectiveness of computer-aided instruction in a tertiary level economics class and found no significant difference in student performance showed that there was no evidence that PowerPoint can enhance students' performance.

Difference on the Performance of Students when Compared According to Sex

Table 3 presents the comparison of performance level in physics without the use LCD based Instruction when students are grouped according to sex. The computed mean values gave difference in performance level along concept and overall performance for male and female. While on problem solving aspect, both male and female have above average performance level. Further testing though, showed p values which were not significant at 0.05 level of significance. This implies that there were no significant differences on the level of performance along concept, problem solving and on the overall of male and female students who did not use LCD based Instruction. Hypothesis is therefore rejected.

Table 3. *Level of Performance of Students without the Use of LCD based Instruction when Compared According to Sex*

AREAS	Male		Female		p-value
	Mean	D.E.	Mean	D.E.	
Concept	89.17	AA	83.00	A	0.055^{ns}
Problem Solving	89.39	AA	84.39	AA	0.111^{ns}
Over-All	85.19	AA	81.67	A	0.522^{ns}

Table 4 shows the comparison of performance level on physics along concept, problem solving and on the overall with LCD Based Instruction when students were grouped according to sex. As indicated by the computed mean values which were categorized as average performances based on the Likert scale used, the performance level along concept, problem solving and on the overall performance of both male and female are on the average. Further testing as presented by the p values computed confirms that the performance level in physics are not significant when grouped according to sex.

Table 4. *Level of Performance of Students with the Use of LCD based Instruction when Compared According to Sex*

AREAS	Male		Female		p-value
	Mean	D.E.	Mean	D.E.	
Concept	81.82	A	82.44	A	0.655^{ns}
Problem Solving	83.33	A	81.57	A	0.839^{ns}
Over-All	80.83	A	82.27	A	0.731^{ns}

Difference on the Physics Performance of Students when Compared According to Method used

Table 5 presents the comparison of physics performance level on concept and problem solving aspect of students grouped according to method used in the teaching learning process. Based from the computed p values which where were not significant at 0.05 level of significance, there were no significant differences on the level of performances of student in physics when compared according to the teaching method used. This simply suggests that students who used LCD Based Instruction have the same performance level with students who did not use LCD Based Instruction.

Table 5. *Level of Physics Performance of Students when Compared According to Method*

AREAS	Without LCD Based Instruction		With LCD Based Instruction		p-value
	Mean	D.E.	Mean	D.E.	
Concept	84.85	AA**	82.36	A**	0.297^{ns}
Problem Solving	81.99	A^{ns}	81.78	A^{ns}	0.067^{ns}
Over-All	83.56	A**	82.10	A**	0.927^{ns}

For students who did not used computer aided instruction, table 1 showed that the performance level on concept and overall physics performance are above average while average performance level is observed on the problem solving aspect. Same result is presented on table 2 showing the same performance levels on the concept, problem solving and overall performance for students with LCD based Instruction. Table 5 confirms the said similar results and indicated that indeed, students both with or without LCD based instruction have above average overall physics performance level and on the concept aspect. Average performance level is observed on the problem solving aspect for both group. This confirms that the conventional and LCD based instruction are both effective teaching method in imparting physics knowledge. Similar result was shown by the study of Fedisson and Braidic (2009) on 2nd level student achievement. Incorporating LCD-aided instruction does not show significant difference in the performance level with those who utilized the conventional method of text book and chalk board way of teaching. Study of Balmeo et al. (2014) likewise showed similar result. Similarly, Savoy et al. (2009), Apperson et al. (2006) Beets and Lobingier (2001), Susskind (2005), and Szabo and Hastings (2000) found little effects of PowerPoint on students' academic achievement; more than the traditional lectures.

Conclusion

Based on the results of the study, the following are concluded:

1. The performance level in the problem solving aspect of physics is average, while the performance level on the concept and also overall physics performance level are both above average for student not using LCD based instruction.
2. The performance level in the problem solving aspect of physics is average, while the performance level on the concept and also overall physics performance level are both above average for student using LCD based instruction.
3. The physics performance level on concept, problem solving aspect and overall performance of both female and male students who had no LCD based instruction, do not differ significantly.
4. The physics performance level on concept, problem solving aspect and overall performance of both female and male students who had LCD based instruction, do not differ significantly.
5. Students' physics performance level on the concept aspect, problem solving aspect and overall performance do not differ significantly when grouped according to method of instruction used.

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