Integration of Information Communication Technology (ICT) in Teaching Intermediate Science

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Abstract

The aimed of this study was to assess the performance of pupils in terms of ICT integration in teaching science in Grade IV-VI learners in Malaban Elementary School Biñan City, Laguna, and their disparity between the level of ICT integration in teaching and non-integration of ICT. In this analysis, the quantitative quasi-experimental method was used. The hypotheses for independent and dependent samples are tested using the t-test. The results revealed that ICT Integration in teaching Science 4,5, & 6 were effective than Non-ICT Integration based on the mean scores performance of the learners' formative test and posttest which can be implied that the academic performance of the learners with ICT integration is much better than that of the non-ICT incorporated learners . Based on the result that the mean quality measures of the two classes of the learners are differently highly significant on their formative test and posttest. The results also revealed that in terms of pretest and posttest of experimental group found highly significance while for the comparison group found not significantly different except for GRADE IV found slightly significant. The authors proposed exploring the use of ICT in the incorporation of the other subjects related to the use of ICT in Science. They also recommend to the school heads that the teachers have as much as possible continuous training and seminars to enhance the skills and confidence of the teacher in using the technology.

Keywords: integration; information communication and technology; teaching; intermediate science.

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1. Introduction

ICTs such as power point presentations and LCD screen, video presentation, monitor/VDU or visual display system, printer, microphone, USB, pocket Wi-Fi, HDMI, VGA, keyboard, LED TV, smartphones, etc. are now being practiced and implemented as directed by the said DepEd Order. To promote highly and globally competent learners, the integration of ICT in teaching and learning is applied. ICT promotes the shift in education from teacher-centric to student-centric training. It also used cooperative training to facilitate role-playing, team problem-solving exercises, and formulated initiatives. Traditional academic activities are replaced by dynamic web-based discussions [1,2,8].

The use of ICT in teaching and learning can be a useful tool to raise the engagement and encouragement of students, which can also lead to improvements in pupils ' academic performance. Academic performance refers to the ability of the learners to show and apply knowledge, skills, abilities and attitudes that are leaning towards a specific goal [3,7,9].

The successful academic achievement was achieved by the use of technology-assisted teaching. Educators should be more familiar with this technology-assisted teaching in order to gain 100 percent of our pupils ' predicted successful academic performance [5].

The authors in [4, 6, 12], stated that Education Department Order No. 78 s. 2010 centered on academic reform through the DepEd Computerization Program (DCP) implementation. The goals of the Department of Education Computerization Program (DCP) are as follows: to provide secondary school computer laboratory packages; to provide elementary schools with e-classrooms; to provide mobile teachers with laptop units; to incorporate ICT into the school system; to increase the ICT literacy of learners, children, graduates, teachers and heads of schools; and to reduce the backlog of computers in public schools.

The researchers' goal in this analysis is to learn the Effectiveness of Information Communication and Technology (ICT) Integration in Intermediate Science teaching. It is the subject chosen by the researcher because the researchers observed that the earners were not performing well.

1.1. Theoretical/Conceptual Framework

This study is anchored from the philosophy of Social Activism theory of John Dewey from the study of [10,11], which emphasized learning as individual growth that comes through social experiences. Learners should be engaged in activities connected to real world issues and problems. Education should also focus to the needs and interest of the pupils. Learning by doing is an effective technique to measure the knowledge and skills of our pupils. It is along the way they discover how some issues and facts about the particular topics affects one another. Dewey's philosophy directly caused some of the trends in current educational practice like interdisciplinary curriculum, hands-on, and experience-based curriculum. Dewey likely approved of technologies like the internet being used to help learners communicate with each other and learn about their society. Dewey emphasize on the need for cooperative learning which blend with technologies use for developing group projects and presentations. Stressed that growth is fostered through hands-on activities

connected to real-world issues and problems.

It was shown in Figure 1, the research paradigm of this study wherein the independent variables consist of the two teaching approaches the ICT integration and the Non-ICT Integration, while the dependent variables are the learners' academic performance on their pretest, formative test and posttest.
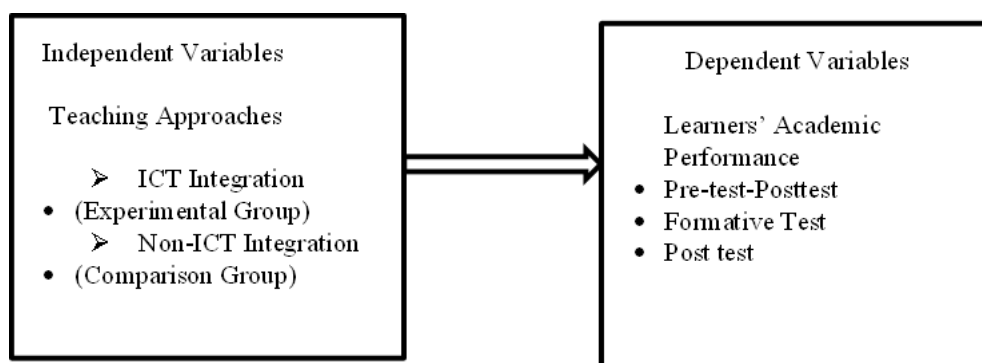
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Independent Variables              Dependent Variables

Teaching Approaches                Learners' Academic
                                   Performance
   ➢  ICT Integration             •  Pre-test-Posttest
 •  (Experimental Group)          •  Formative Test
   ➢  Non-ICT Integration         •  Post test
 •  (Comparison Group)
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Figure 1: Research Paradigm

1.2. Materials and Methods

Descriptive quasi-experimental design, the researcher lacks control over the assignment to conditions and/or does not manipulate the causal variable of interest. With quasi-experimental designs, you can't rule out all alternative explanations, but you can try to minimize them. This will be used since the main purpose of the study is to find out the effectiveness of the respondents of the study were the selected learners through match-pairing consist of 56 Grade IV, 38 Grade V and 32 Grade VI learners during 2nd quarter of S.Y. 2019-2019 in Malaban Elementary School, Biñan City.

Table 1 shows the pretest mean scores of the respondents.

Table 1: Pretest Mean Scores of Grade IV-VI

Group	Sample Size	Mean	SD	Skewness	Verbal Interpretation
Grade IV					
ICT GROUP	28	22.96	3.42	2.06	B
NON-ICT GROUP	28	22.96	3.42	2.06	B
Grade V					
ICT GROUP	19	33.63	0.50	-0.59	B
NON-ICT GROUP	19	33.63	0.50	-0.59	B
Grade VI					
ICT GROUP	16	33.81	0.75	0.33	B
NON-ICT GROUP	16	33.81	0.75	0.33	B

The instrument of this study is the were the 50 items pretest and posttest each for Grade IV-VI, while 20 items per formative test with 10 lessons for Grade IV, while 25 per formative test with 10 lessons for Grade V, same with Grade VI. Mean, Standard Deviation, and Skewness were used in describing pretest, formative test and

posttest mean scores of Grade IV-VI in Science. Independent t-test was used in determining the significant difference between the formative test, and posttest of learners with ICT integration in teaching Intermediate Science and Non-ICT integration. Dependent t-test was used in determining the significant difference between the pretest, and posttest of both experimental and comparison group.

1.3. Results and Discussion

Table 2 shows the mean scores of Grade IV on their 2nd quarter formative test. The results of mean scores of Grade IV on their 2nd quarter formative test in Science 4 from formative 1-10 ranges from 17.50 to 19.64 with composite mean of 18.50 (SD=0.94; Skewness-0.10) for the experimental group which implied of an advanced level of the learners, while for the comparison group is beginning level with mean ranges from 9.21 to 13.79 with composite mean of 11.23 (SD=2.27; Skewness=0.03). This results described that ICT integration in teaching Science 4 is much effective than Non-ICT integration, which is supported by the composite mean wherein the composite mean scores of the experimental group is higher than the composite mean of 11.23 of the comparison group.

Table 2: Mean Scores of Grade IV on their 2nd Quarter Formative Test in Science

Topics/Lessons	ICT Group				Non ICT Group			
	Mean	SD	Skewness	DI	Mean	SD	Skewness	DI
Formative 1. Bone & Muscles	18.14	0.59	2.30	A	9.21	1.45	0.86	B
Formative 2. Stomach & Intestines	18.71	0.90	0.29	A	13.79	1.85	-1.84	B
Formative 3.Kidney	19.39	0.83	-0.88	A	11.96	3.32	-0.18	B
Formative 4.Brain	16.89	1.42	-0.55	A	9.64	1.64	0.35	B
Formative 5. Body Parts of Animals that Live in Water	17.50	1.60	-0.09	A	14.04	1.29	-0.29	B
Formative 6. Live on Land & in Water	18.07	1.84	-0.42	A	12.00	3.46	0.16	B
Formative 7. Specialized Structures of Terrestrial & Aquatic Plants	18.82	0.39	-1.78	A	10.71	1.70	0.24	B
Formative 8. Plants that Live on Land & In Water	19.64	0.78	-1.78	A	10.29	2.85	0.38	B
Formative 9.Seed Germination & Growth	18.57	0.63	0.65	A	10.25	3.11	0.40	B
Formative 10. Life Cycle of Humans	19.25	0.44	1.22	A	10.39	2.02	0.23	B
Composite Mean	18.50	0.94	-0.10	A	11.23	2.27	0.03	B

Legend: 17.90-20.00 Advanced (A); 17:00-17.89 Proficient (P); 16.00-16.89 Approaching Proficiency (AP) 15.00-15.89 Developing (D); and 14.89 & below Beginning (B)

Table 3 presents the Grade V learners mean scores on their 2nd quarter formative tests in Science 5. The results of mean scores of Grade V learners on their 2nd quarter formative test in Science 5 from formative 1-10 ranges from 23.26 to 24.32 with composite mean of 23.68 (SD=1.56; Skewness--1.65) for the experimental group with advanced level of performance, while for the comparison group is beginning and developing level with mean

ranges from 15.53 to 19.21 with composite mean of 17.15 (SD=2.91; Skewness=-0.61). ICT integration shown a good effect on the performance of Grade V learners in Science 5. Table 4 shows the Grade VI learners mean scores on their 2nd quarter formative tests in Science 6. The results of formative 1-10 mean scores of Grade VI learners on their 2nd quarter in Science 6 were at the level of advanced and proficiency which ranges from 21.75 to 24.75 with composite mean of 23.36 (SD=0.92; Skewness--0.95) for the experimental group with advanced level of performance, while for the comparison group is beginning and developing level with mean ranges from 15.63 to 19.69 with composite mean of 17.11 (SD=2.03; Skewness=-0.67). The results revealed that ICT integration shown an effectiveness on the formative test 1-10 than those performance of learners with Non-ICT integration in Science 6. Table 5 reveals the posttest mean scores of both groups Grade IV-VI learners. The results revealed that the posttest mean scores of the Grade IV learners with ICT integration is 48.43 (SD=2.13; skewness=-1.92) is in advanced level while the Non-ICT integration group is in beginning level with 25.54 mean scores (SD=3.55; skewness= 1.528). The Grade V learners with ICT integration were in advanced proficiency level with 41.89 mean scores ((SD=5.62; skewness=-1.29) while NON-ICT integration were at beginning level with 34.68 mean scores (SD=1.00; skewness=-0.593).

Table 3: Mean Scores of Grade V on their 2nd Quarter Formative Test in Science.

Topics/Lessons	ICT Group				Non ICT Group			
	Mean	SD	Skewness	DI	Mean	SD	Skewness	DI
Formative 1. Parts & Functions of Human Reproductive System	23.63	1.80	-1.55	A	19.05	1.58	-0.95	D
Formative 2. The Reproductive System	23.74	1.63	-1.34	A	19.16	1.92	-1.98	D
Formative 3.Parts & Functions (Human)	23.84	1.80	-1.90	A	19.21	3.55	-0.50	D
Formative 4.Ways of Taking Care of Reproductive System	23.53	1.47	-1.42	A	16.53	3.42	-0.56	B
Formative 5. Parts of the Reproductive System of Some Animals	23.74	1.48	-1.88	A	15.95	3.89	0.30	B
Formative 6. Reproductive Parts in Flowering Plants	24.32	0.82	-1.36	A	15.53	3.37	0.18	B
Formative 7. Modes of Reproduction in Plants	23.47	1.50	-1.26	A	15.74	3.60	-1.60	B
Formative 8. Interaction Among Living things	23.42	1.84	-1.79	A	16.37	3.17	-0.54	B
Formative 9.Reasons why We Need to Protect and Conserve Estuaries and Intertidal Zone (Part 1)	23.84	1.77	-2.41	A	15.68	3.43	-0.49	B
Formative 10. Reasons why We Need to Protect and Conserve Estuaries and Intertidal Zone (Part 2)	23.26	1.45	-1.62	A	18.32	1.16	0.02	B
Overall Mean	23.68	1.56	-1.65	A	17.15	2.91	-0.61	B

Legend: 22.38-25.00 Advanced (A); 20:88-22.37 Proficient (P); 19.88-20.87 Approaching Proficiency

(AP)18.63-19.87 Developing (D); and 18.62 & below Beginning (B)

Table 4: Mean Scores of Grade VI on their 2nd Quarter Formative Test in Science.

Topics/Lessons	ICT Group				Non ICT Group			
	Mean	SD	Skewness	DI	Mean	SD	Skewness	DI
Formative 1. Parts & Functions of Human Reproductive System	24.50	0.73	-1.17	A	19.50	3.71	-0.03	D
Formative 2. The Reproductive System	24.50	0.89	-1.28	A	19.56	3.78	-0.34	D
Formative 3.Kidney	24.75	0.45	-1.28	A	19.69	3.89	0.04	D
Formative 4.Brain	23.56	0.51	-0.28	A	15.75	1.18	-0.28	B
Formative 5. Body Parts of Animals that Live in Water	23.38	0.50	0.57	A	16.25	1.29	-2.66	B
Formative 6. Live on Land & in Water	23.94	0.25	-4.00	A	16.13	0.89	-0.27	B
Formative 7. Specialized Structures of Terrestrial & Aquatic Plants	22.63	1.26	-1.01	A	15.63	1.67	-0.20	B
Formative 8. Plants that Live on Land & In Water	22.63	1.26	-1.01	A	16.25	1.48	-1.33	B
Formative 9.Seed Germination & Growth	21.75	1.53	-0.03	P	15.88	1.59	-0.57	B
Formative 10. Life Cycle of Humans	22.00	1.79	0.00	P	16.44	0.81	-1.04	B
Overall Mean	23.36	0.92	-0.95	A	17.11	2.03	-0.67	B

Legend: 22.38-25.00 Advanced (A); 20:88-22.37 Proficient (P); 19.88-20.87 Approaching Proficiency (AP) 18.63-19.87 Developing (D);   and 18.62 & below Beginning (B)

Table 5: Posttest Mean Scores of Grade IV-VI

Group	Sample Size	Mean	SD	Skewness	Verbal Interpretation
Grade IV					
ICT GROUP	28	48.43	2.13	-1.92	A
NON-ICT GROUP	28	25.54	3.55	1.528	B
Grade V					
ICT GROUP	19	41.89	5.62	-1.29	AP
NON-ICT GROUP	19	34.68	1.00	-0.593	B
Grade VI					
ICT GROUP	16	43.39	5.28	-0.36	P
NON-ICT GROUP	16	35.44	3.46	0.325	B

Legend: 44.75-50.00 Advanced (A); 42:25-44.74 Proficient (P); 39.75-42.24 Approaching Proficiency (AP 37.25-39.74 Developing (D); and 37.24 & below Beginning (B)

The performance level of Grade VI learners with ICT integration were at proficiency level with 43.39 mean scores (SD=5.28; skewness=-0.36) while NON-ICT integration were at beginning level with 35.44 mean scores (SD=3.46; skewness= 0.325). Table 6 shows the posttest mean scores test of significance between Grade IV experimental and comparison groups.

Table 6: Test of Significance on Posttest Mean Scores of Grade IV Comparison and Experimental Groups

Formative Test/Lessons	Group	Mean	Difference	df	t-value
Formative 1	Experimental	18.14	8.93		**30.186
	Comparison	9.21		54	
Formative 2	Experimental	18.71	4.93		**12.668
	Comparison	13.79		54	
Formative 3	Experimental	19.39	7.43		**11.497
	Comparison	11.96		54	
Formative 4	Experimental	16.89	7.25		**17.681
	Comparison	9.64		54	
Formative 5	Experimental	17.50	3.46		**8.293
	Comparison	14.04		54	
Formative 6	Experimental	18.07	6.07		**8.186
	Comparison	12.00		54	
Formative 7	Experimental	18.82	8.11		**24.643
	Comparison	10.71		54	
Formative 8	Experimental	19.64	9.36		**16.742
	Comparison	10.29		54	
Formative 9	Experimental	18.57	8.32		**13.870
	Comparison	10.25		54	
Formative 10	Experimental	19.25	8.86		**22.618
	Comparison	10.39		54	

**@0.01

It was revealed that the difference were highly significant between the formative test form 1-10 of the experimental and comparison groups (t-value= 8.186 to 30.186; df=54; mean difference = 3.46 to 8.86). The results determined that the experimental group performed better than the comparison group in terms of formative test 1-10 in Science 4.

Table 7 shows the test of significance of between mean scores of Grade V learners form experimental and comparison groups in terms of their formative test 1-10.

Table 7: Test of Significance on Posttest Mean Scores of Grade V Comparison and Experimental Groups

Formative Test/Lessons	Group	Mean	Difference	df	t-value
Formative 1	Experimental	23.63			
	Comparison	19.05	4.58	36	**8.329
Formative 2	Experimental	23.74	4.58		**7.924
	Comparison	19.16		36	
Formative 3	Experimental	23.84			
	Comparison	19.21	4.63	36	**5.068
Formative 4	Experimental	23.53			**8.196
	Comparison	16.53	7.00	36	
Formative 5	Experimental	23.74	7.79		**8.147
	Comparison	15.95		36	
Formative 6	Experimental	24.32	8.79		**11.038
	Comparison	15.53		36	
Formative 7	Experimental	23.47	7.73		**8.637
	Comparison	15.74		36	
Formative 8	Experimental	23.42	7.05		**8.401
	Comparison	16.37		36	
Formative 9	Experimental	23.84			
	Comparison	15.68	8.16	36	**9.205
Formative 10	Experimental	23.26			**11.639
	Comparison	18.32	4.95	36	

**@0.01

It was discovered that there are highly significant difference between the experimental and comparison groups ' formative test from 1-10 (t-value= 8.196 to 11.639; df=36; mean difference= 4.58 to 8.79) . The results determined that in Science 5, the experimental group performed better in terms of formative test 1-10 than the comparison group.

Table 8 reveals the significant difference between posttest mean scores of Grade VI learners on their 10 formative tests.

It was found that formative test 1-10 (t-value= 5.166 to 33.979; df=30; mean difference= 4.94 to 7.81) are highly significant on the difference between the experimental and comparison groups. The results showed that the experimental group performed better in Science 6 than the comparison group in terms of formative test 1-10.

Table 8: Test of Significance on Posttest Mean Scores of Grade VI Comparison and Experimental Groups

Formative Test/Lessons	Group	Mean	Difference	df	t-value
Formative 1	Experimental	24.50	5.00	30	**5.295
	Comparison	19.50			
Formative 2	Experimental	24.50	4.94	30	**5.089
	Comparison	19.56			
Formative 3	Experimental	24.75	5.06	30	**5.166
	Comparison	19.69			
Formative 4	Experimental	23.56	7.81	30	**24.236
	Comparison	15.75			
Formative 5	Experimental	23.38	7.13	30	**20.586
	Comparison	16.25			
Formative 6	Experimental	23.94	7.81	30	**33.979
	Comparison	16.13			
Formative 7	Experimental	22.63	7.00	30	**13.399
	Comparison	15.63			
Formative 8	Experimental	22.00	6.38	30	**13.110
	Comparison	16.44			
Formative 9	Experimental	22.63	5.88	30	*10.671
	Comparison	16.25			
Formative 10	Experimental	21.75	5.56	30	**11.321
	Comparison	15.88			

**@0.01

Table 9 shows the test of significance between posttest mean scores of experimental and comparison groups.

Table 9: Test of Significance on Posttest Mean Scores of Comparison and Experimental Groups

Grade Level	Group	Mean	Difference	df	t-value
Grade IV	Experimental	48.43	13.61	54	**28.480
	Comparison	34.82			
Grade V	Experimental	41.89	6.39	36	**8.258
	Comparison	35..50			
Grade VI	Experimental	43.39	10.64	30	*13.896
	Comparison	32.75			

**@0.01; *0.05

As shown in the table above, it was determined that based on findings and analysis there are highly significant difference between mean scores of experimental and comparison groups for Grade IV (t-value=28.480; df=54; mean difference =13.61), Grade V (t-value=8.258; df=36; mean difference =6.39), & Grade VI (t-value=13.896; df=30; mean difference =10.64)

Table 11 shows the test of significance on the difference between pretest mean scores and posttest mean scores of experimental group.

Table 11: Test of Significance Between Pretest and Posttest Mean Scores of Experimental Group from Grade IV to VI

Grade Level	Test	Mean	Difference	df	t-value
Grade IV	Posttest	48.43	25.46		
	Pretest	22.96		27	**27.612
Grade V	Posttest	44.74	11.11		
	Pretest	33..63		18	**13.728
Grade VI	Posttest	43.39			
	Pretest	32.75	12.94	15	**17.789

**@0.01

It was shown in table above that there are highly significant difference between the pretest and posttest mean scores of experimental group from Grade IV-VI with t-value ranges from 13.728 to 27.612 and mean differences ranges from 11.11 to 25.46.

This results revealed that ICT integration helps the learners to enhance their learning in Science 4, 5, & 6. Table 12 shows the test of significance on the difference between pretest mean scores and posttest mean scores of comparison group.

Table 12: Test of Significance Between Pretest and Posttest Mean Scores of Comparison Group from Grade IV to VI

Grade Level	Test	Mean	Difference	df	t-value
Grade IV	Posttest	25.53	2.57	27	*6.840
	Pretest	22.96			
Grade V	Posttest	34.68	1.05	18	4.472
	Pretest	33..63			
Grade VI	Posttest	35.44	1.63	15	2.702
	Pretest	33.81			

**@0.01; *0.05

Table above showed that no significant difference between the pretest and the posttest mean scores of the Grade V & VI comparison group with t-value of 4.472 and 2.702 and mean differences of 1.06 & 1.63 respectively except for Grade IV which found out that there is a slight significance on their pretest and posttest mean scores.

2. Conclusion and Recommendation

The researchers concluded that the findings showed that there is highly significant difference between the formative test and posttest mean scores of experimental and comparison groups, same with the pretest and posttest mean scores of the experimental group but the comparison group only Grade IV found significance while Grade V and Grade VI mean scores found not significant.

Based on the results of this study, the researchers recommended to continue exploring the use of ICT in the incorporation of the other subjects related to the use of ICT in Science. They also recommend to the school heads that the teachers have as much as possible continuous training and seminars to enhance the skills and confidence of the teacher in using the technology.

References

[1] Department of Education Memorandum Order No. 78 (2010). "Guidelines on the Implementation of DepEd Computerization Program". Retrieved from http://www.deped.gov.ph/orders/do-78-s-2010.

[2] Mbugua, S. N., Kibbos, J., & Tanui, E. (2015). Influence of Integration of Information Communication Technology in Teaching on Students' Academic Performance. Journal of Education and Practice.

[3] Lucrecio, M. (2012). Breaking Barriers in Education, Creating Future Schools Today. The Modern Teacher, p. 44-46

[4] Moreno, M. L. (2010) Readiness of Teachers on the Implementation of Information and Communication Technology (ICT) in Basic Education at Lubao West District, Division of Pampanga (Unpublished Master Thesis)

[5] Ogunbameru, M. (2013). Effective Utilization and Maintenance of ICT facilities for Quality Teaching and Learning Outcome in Secondary Schools in Ondo State, Nigeria.Volume 2 Number 2, p.27-40. Retrieved from www.learntechlib.org/d/148152.

[6] Orcino, J.D. (2012). Hope for Filipinos To Be Great Again. The Modern Teacher, p. 43-44

[7] Pernia, E. E. (2008). Strategy Framework for Promoting ICT Literacy in the Asia- Pacific Region. Publication of UNESCO Bangkok Communication and Information Unit. Asia and Pacific Regional Bureau for Education, Bangkok 10110, Thailand. Retrieved from http://unesdoc.unesco.org/images/0016/001621/162157e.pdf

[8] Roblyer, M.D. (2006). Integrating educational technology into teaching. Upper Saddle River, NJ: Pearson Education, Inc. Retrieved from http://www.personal.kent.edu/~sarnold7/edtech/articles/chapter1.pdf

[9] San Diego, C. D. (2012) ICT in Education. Retrieved from http://www.deped net/?page=news&action=details&code01= AI12100001

[10] Song, H. & Kang, T. (2012). Evaluating The Impacts of ICT Use: A Multi-level Analysis with Hierarchical Linear Modeling. The Turkish Online Journal of Educational Technology (TOJET). v11 n4 p132-140. Retrieved from eric.ed.gov/?id=EJ989262

[11] Trimmer, K. (2006). Teacher ICT Skills: Evaluation of the Information and Communication Technology Knowledge and Skill Levels of Western Australian Government School Teachers. 2006 International Conference Holiday Inn Esplanade, Darwin, Australia 4 – 7 September 2006 Final Papers

[12] Tinio, V. L. (2002). Survey of Information & Communication Technology Utilization in Philippine Public High Schools. Retrieved from http://www.fit-ed.org/downloads/ICT%20Utilization%20Survey.pdf