Information and Communications Technology Competencies and Integration Practices of Public Secondary School Teachers in the Philippines

Saddam Bazer, Shaanxi Normal University, China
Elenita Que, University of the Philippines Diliman, Philippines
Wenlan Zhang, Shaanxi Normal University, China
Bin Zhang, Shaanxi Normal University, China

The Asian Conference on Education 2019
Official Conference Proceedings

Abstract
This study investigated the ICT competencies and integration practices of 573 public secondary school teachers in the Philippines, particularly their level of ICT competencies, extent of ICT integration, challenges encountered, and their perceptions on ICT integration. The study employed a descriptive-correlational research design which explored the significant relationship between teachers' level of ICT competencies and their perceptions on ICT integration, and the teachers' extent of ICT integration and their perceptions on ICT integration. Pearson Product Moment Coefficient Correlation was used to analyze the foregoing relationships. The findings revealed that: (1) there is a significant relationship between the level of ICT competencies and the perceptions on ICT integration, and (2) there is no significant relationship between the extent of ICT integration and the perceptions on ICT integration. With the foregoing findings, the researcher proposed recommendations that are relevant to the public secondary school teachers' implementation on ICT integration.

Keywords**:** ICT Competency, ICT Integration, Public Secondary School Teachers

Introduction

The end of the 20th and the beginning of the 21st century saw a transition from industrial to an innovative type of economy based on the priority of new knowledge, production of the new type of information. It has caused the necessity of modernization in the education sphere (Karpovaa, et al., 2016, p. 11228). One of this modernization in education is the proliferation of Information and Communications Technology (ICT) in the teaching and learning process. ICT in education plays an important role in today's new learning landscape. Advances in ICT and its accessibility, provide opportunities for its use in education.

The Department of Education (DepEd) in the Philippines has made initiatives and plans to attain the goal of improving the quality of education through enriching the teaching and learning process by coming up with the ICT4E Vision: "21st Century Education for All Filipinos, Anytime, Anywhere." In which an ICT-enabled education system that transforms students into dynamic lifelong learners and values-centered, productive and responsible citizens (DepEd, 2008, p. 1). It was in the same plan where DepEd states that in order to achieve the abovementioned vision in the next five years, DepEd aims to: (1) completely integrate ICT into the curriculum; (2) intensify competency-based professional development programs; (3) establish necessary ICT infrastructure and applications; and (4) develop processes and systems that ensure efficient, transparent and effective governance.

With the aforementioned aims, it is important to note that DepEd is really trying their best to integrate ICT in education because this will be an important component as they formulate and implement an effective and enhanced K to 12 Basic Education Curriculum (BEC), particularly in the teaching and learning process. In order to effectively implement the enhanced K to 12 BEC, students, school heads and most especially teachers, who are the facilitators of learning, should attain a certain level of competence in the use of ICT.

The integration of ICT in education is a procedure in which instructional technologies such as computers and software are applied regularly to support both teaching and learning across levels and subject matter (cited in Eib and Mehlinger (1998) by Leng, 2008, p. 2). It is important to assure that ICT integration should be utilized effectively and efficiently by the teachers to cater to the needs of 21st-century learners and be able to acquire 21st-century skills. Having that in mind, teachers should also be given the utmost importance since they will be playing an important role in today's learning environment. According to Bonifacio (2013), "Integrating ICT into teaching and learning has become a great concern for many educators in developing countries like the Philippines. ICT must be used and taught in powerful and meaningful ways. With its rapid development, educators should find ways to integrate technology in the learning process" (p. 1). In this way, teachers' role is crucial in the sense that teachers should find ways and means to integrate ICT meaningfully in the teaching and learning process. Also, teachers need to have the ICT competencies to integrate ICT efficiently in the teaching and learning process.

This study is concerned with the ICT integration among public secondary school teachers in a particular province in Mindanao, specifically their level of ICT competencies, the extent of ICT integration, challenges encountered, and their

perceptions of ICT integration. The meager budget for ICT in some areas, coupled with lesser number of teachers professionally developed towards ICT, there is indeed a need to study on the integration of ICT in the public secondary schools, and explore some issues and practices relative to the ICT integration program implementation with the K to 12 Basic Education program. The aforementioned statements also supported by the study of Espinosa and Caro (2011) which states that "schools in the provinces in Mindanao have the lowest incidence of computers specifically the regions IX, X, XI, XII, CARAGA, and ARMM… In public secondary schools, computer training is introduced only as an area of study in Technology and Home Economics (THE)" (p. 342). Further, since ICTs are now common fixtures in communities, workplaces, and schools all over the world (cited in Coiro, et al. (2008) by Hutchison, 2009, p. 17) and even in the Philippines' Department of Education, it is important to determine how teachers are extensively integrating ICT into their classrooms across disciplines and what are the challenges they face when attempting to integrate ICT into the teaching and learning process.

The researcher believes that knowing more about the status of public secondary school teachers' ICT integration will strengthen and improve the teachers' level of ICT competencies and that the delivery of instruction will be more meaningful in response to the needs of 21st-century learners who will then acquire 21st-century skills. Further, this will give the DepEd an idea on how to improve and update ICT integration in public secondary schools most especially in the context of Mindanao through relevant and meaningful professional development and training programs. Essentially, it may suggest reasons that ICT has not been fully integrated into the delivery of instruction and how they might be more fully integrated particularly in the areas of Mindanao.

This study sought to examine ICT competencies and ICT integration practices of public secondary school teachers in a particular province in the Philippines. Specifically, this study focused on the following questions:

1. What is the extent of ICT integration of the public secondary school teachers?
2. What is the level of ICT competencies of the public secondary school teachers?
3. What are the perceptions of the public secondary school teachers on ICT integration?
4. What are the challenges encountered by the public secondary school teachers in the ICT integration?
5. Is there a significant relationship between the teachers' level of ICT competencies and the teachers' perceptions on ICT integration?
6. Is there a significant relationship between the teachers' extent of ICT integration and the teachers' perceptions on ICT integration?

Methodology

This study employed a descriptive-correlational research design. In gathering the data, an adapted survey questionnaire (from the research conducted by Mr. Jayson Bingcang of Philippine Science High School, Quezon City, with permission) and follow-up interviews were used. The following statistical tools were employed in the computation and analysis of the gathered data: Frequency, Percentage Distribution,

Mean, Standard Deviation, Pearson Product Moment Coefficient of Correlation (PPMCC), and Likert Scale.

The study was conducted in 36 public secondary schools in a particular DepEd Division in Mindanao, Philippines. Only one school did not participate in the conduct of the study. A total of 573 public secondary school teachers participated.

Results and Discussion

Teachers' Extent of ICT Competencies

Table 1 presents the extent of ICT integration among the 573 respondents.

Activities	Mean	Remarks
1. Using the Internet for research (web-based information retrieval)	4.15	Often
2. Using computers for information management (databases)	3.91	Often
3. Using computers to enhance my teaching and learning	4.12	Often
4. Using computers for planning and organizing activities	3.94	Often
5. Using computers for online communication (e.g. email)	3.85	Often
6. Using distance learning hardware and software	3.02	Sometimes
7. Using computers to assess student learning	3.76	Often
Overall:	3.8212	Often

Table 1: Teachers' Extent of ICT Integration (N=573)

Table 1 shows that "Using the Internet for research" is "Often" being practiced with a mean of 4.15 and followed by "Using computers to enhance my teaching and learning" (4.12), "Using computers for planning and organizing activities" (3.94), "Using computers for information management (databases)" (3.91), "Using computers for online communication (e.g. email)" (3.85), and "Using computers to assess student learning" (3.76). While "Using distance learning hardware and software" is found to be practiced "Sometimes". These activities help teachers in making their instructional-related tasks easier and fruitful.

Based on the grand mean or overall mean of 3.8212, the extent of ICT integration generally is practiced "Often" by the 573 teacher respondents from the rural and urban teacher respondents across disciplines in the activities enumerated.

The result implies that ICT integration activities are "Often" being practiced by the respondents. This contributed to the fact that most of the schools lack resources (inadequacy of computers). It can also be noted that of all the activities mentioned, "Using the Internet for research" got the highest mean of 4.15 which only shows that teachers of Lanao del Norte are using the advantage of ICT for educational and instructional purposes. This result strengthens the study of Bingcang (2013) who found that the majority of teachers use the internet to find information resources in their lessons which got the highest mean score of 4.33 among the listed activities (p. 47). Likewise, "Using computers to enhance teaching and learning" ranked second which is also similar to Bingcang's study report. Teachers need to keep abreast of the current trends in the teaching and learning process for them to be able to function well in the knowledge economy.

Further, the result shows that "Using distance learning hardware and software" got the lowest mean and labeled as "Sometimes" practiced which is again contributed to the fact the schools don't have strong Internet access. In addition, according to Bingcang (2013), this shows that teachers do not make use of ICT for distance learning in education. Some issues regarding the non-use of distance learning hardware and software are lack of training for teachers and the availability of hardware and software (p. 49).

Teachers' Level of ICT Competencies

Presented hereunder are the teachers' level of ICT competencies based on the National ICT Standards for Teachers (NICT-T) of the Philippines.

Generally, the level of ICT competencies among 573 teacher respondents is "Average" as presented in the table below. The computed grand mean is equal to 3.3031 having a standard deviation statistic of .76769.

	Mean	Std. Deviation
Competency Total	3.3031	.76769

Grand mean: 3.3031
Remarks: Average

Table 2: Teachers' Overall ICT Competencies (N=573)

This result is quite alarming because according to UNESCO (2011), the successful ICT integration into the classroom will depend on the ability of teachers to structure the learning environment in new ways, to merge new technology with a new pedagogy, to develop socially active classrooms, encouraging co-operative interaction, collaborative learning and group work which requires a different set of classroom management skills. Having this statement, it only shows that it is not enough for a teacher to have an "Average" level of ICT competencies, teachers should have above average level of ICT competencies in order to have a successful ICT integration given the fact that teachers of today's Enhanced K to 12 Basic Education Curriculum have complex roles to play. The Senior High School Program started in School Year 2016-2017 and that the Senior High School curriculum has 17 Core Subjects (one of which is the Media and Information Literacy) and four (4) Tracks (Academic, Tech-Voc, Sports, and Arts & Design Tracks) with specialized subjects and applied subjects (i.e. Empowerment Technologies for the strand) (DepEd website). With this, students from Junior High Schools (Public Secondary Schools) or at least Grade 9 and 10 students should already be equipped with necessary ICT skills before entering Senior High School. In the same way, teachers in Junior High School should also have the necessary ICT competencies for them to be able to use it in the teaching and learning process. Thus, teachers should have above average level of ICT competencies if not high-level ICT competencies to develop innovative ways of integrating ICT in the teaching and learning process. Concepcion (2003) further reiterates in his study that knowledge and skills in the use of computers are essential in the application of computers in instruction. This implies that the professional development program is

necessary for the enhancement of the level of ICT competencies that the teachers have. Meaningful and relevant programs for teacher respondents such as ICT skills training and workshops is a must. According to Concepcion (2003), a one-shot training does not make a difference in computer self-efficacy. Thus, longer training and workshop must be encouraged.

Teachers' Perceptions on ICT Integration

The perceptions of the 573 teacher respondents on ICT integration are presented hereunder. The first ten perceptions among the perceptions were laid.

	Mean	Rank
1. I enjoy using ICT for creative purposes; like videos, photo stories, etc.	4.50	5
2. I prefer using ICT in doing research.	4.53	2
3. I am aware of the opportunities that ICT offers like online collaboration, information management, etc.	4.43	11
4. I want to integrate ICT in all of my classes.	4.44	10
5. I think that I can use ICT in class activities more effectively day by day.	4.31	13
6. I like using e-mail, forum, and chat to make communications with my co-teachers and students easier.	4.10	14
7. I think that technology-supported teaching makes learning more effective.	4.49	6
8. I think using ICT in instruction increases the interest of students toward their lessons.	4.52	3
9. I think using ICT in instruction increases the quality of teaching.	4.54	1
10. I think using ICT makes it easier to prepare course materials like assignments, handouts, etc.	4.49	6
11. I think integrating ICT will enable me to handle different learning preferences of my students who have different learning styles.	4.43	11
12. I think integrating ICT makes effective use of class time.	4.46	9
13. I think integrating ICT makes me more productive as a teacher.	4.47	8
14. I think that using technology makes it easier to reach instructional resources.	4.51	4
Overall:	4.4433	Strongly Agree

Rating scale: 1:00 – 1.79 – Strongly disagree
1.80 – 2.59 – Disagree
2.60 – 3.39 – Undecided
3.40 – 4.19 – Agree
4.20 – 5.00 – Strongly agree

Table 3: Teachers' Perceptions on ICT Integration (N=573)

"Using ICT in instruction increases the quality of teaching" revealed to be the number one perception with a mean of 4.54. Ranked second is that "Respondents prefer using ICT in doing research" (4.53). Third among the perceptions is "Respondents think using ICT in instruction increases the interest of students toward their lessons" (4.52). Ranked fourth among the perceptions is "Respondents think that using technology makes it easier to reach instructional resources" (4.51) and followed by the following perceptions: "Respondents enjoy using ICT for creative purposes like videos, photo

stories, etc." (4.50), "Respondents think that technology-supported teaching makes learning more effective" (4.49), "Respondents think that using ICT makes it easier to prepare course materials like assignments, handouts, etc." (4.49), "Respondents think that integrating ICT makes them more productive as a teacher" (4.47), "I think integrating ICT makes effective use of class time" (4.46), "I want to integrate ICT in all of my classes" (4.44), and "I am aware of the opportunities that ICT offers like online collaboration, information management, etc." (4.43).

These findings clearly imply that the 573 teacher respondents have positive perceptions of ICT integration. They believe that ICT integration increases the quality of teaching, ICT integration increases students' interest in the subject matter, and ICT is an important tool in doing research. This only shows that teachers in Lanao del Norte see the importance of ICT integration to both teachers and students, who are important drivers in the teaching and learning process.

Having a grand mean of 4.4433 indicates that the 573 teacher respondents "Strongly agree" that ICT integration in their school activities is important.

Teachers' Challenges on ICT Integration

Table 4 presents the perceived challenges among the 573 teacher respondents on ICT integration.

	Mean	Rank
1. Lack of time to prepare materials based on ICT	3.81	11
2. Lack of teachers' technical knowledge to prepare materials based on ICT	3.64	15
3. Issues about accessibility to existing hardware like computer, LCD projector, etc.	4.02	3
4. Lack of school's computer laboratory	3.91	5
5. Lack of school's technical infrastructure about instructional technology	4.02	3
6. Shortage of computers for use of teachers	4.07	2
7. Absence of reward systems for encouraging ICT use	3.90	6
8. Poor technical and physical infrastructures of learning environments	3.88	7
9. Inadequacy of computers used by learners	4.18	1
10. Inefficiency of guidance and support by administration i.e. School Principal	3.39	17
11. Insufficiency of financial resources for technology integration	3.88	7
12. Inefficiency of instructional software/electronic resources	3.88	7
13. Scarcity in ICT resources for getting information	3.75	13
14. Lack of professional development opportunities for gaining knowledge and skill like ICT trainings, seminars, and workshops	3.73	14
15. Lack of support services in material development/technology usage	3.82	10
16. Lack of interest of teachers in ICT use	3.07	19
17. Lack of teaching methods/strategies for ICT use	3.45	16
18. Inadequacy of the technology courses offered to students	3.76	12
19. Difficult to explain computer applications to students	3.26	18

Table 4: Teachers' Perceived Challenges on ICT Integration (N=573)

The first eight ranking challenges of teacher respondents are enumerated. Based on the table, it can be seen that "Inadequacy of computers used by learners" (4.18) ranks

first. Second identified is the "Shortage of computers for use of teachers" (4.07). "Lack of school's technical infrastructure about instructional technology" (4.02) and "Issues about accessibility to existing hardware like the computer, LCD projector, etc." (4.02) ranked third. The fourth among the identified challenges is "Lack of school's computer laboratory" (3.91). Ranked fifth is the "Absence of reward systems for encouraging ICT use" (3.90) and followed by "Poor technical and physical infrastructures of learning environments" (3.88), "Insufficiency of financial resources for technology integration" (3.88), and "Inefficiency of instructional software/electronic resources" (3.88) which are both in the sixth place. The seventh among the challenges is the "Lack of support services in material development/ technology usage" (3.82)" and finally the eight ranks of the challenges is the "Lack of time to prepare materials based on ICT (3.81).

It can be gleaned from the table that the first eight rankings are about the lack of facilities and infrastructure particularly the inadequacy of hardware (e.g. computers) and software to both students and teachers. This attributed to the fact that many schools don't have a computer laboratory and or if there's one, they cannot afford to connect this to the Internet. Likewise, most of the students of these schools are from far-flung areas who cannot afford to have their own computers. According to Anderson & Plomp (2008), in Thailand, a developing country like the Philippines, limited ICT-infrastructure prohibits the development of many ICT-skills. Having mentioned that, school leaders and service providers should find ways and means on how these ICT-infrastructures will be available to the teachers and students in order to implement ICT integration across disciplines meaningfully and soundly. Furthermore, teachers cannot realize certain pedagogical goals unless information technology equipment and tools are available to them. They need not only sufficient equipment (PCs, printers, Internet connections), but also ready access to software tools (for word-processing, communication, information retrieval) and communication facilities (e.g. email addresses for teachers and students). In addition, the location of equipment, ease of access, and maintenance of equipment are potentially important conditions facilitating the use of ICT for teaching and learning (Pelgrum, 2008, p.74).

Also, the "Absence of reward systems for encouraging ICT use" is another perceived challenge by the teacher respondents. This supports the study of Gulbahar & Guven (2008) who found that the inadequacy of the technology courses offered to teachers and the lack of incentives for encouraging technology are further challenges to ICT usage. This implies that there's really a need to promote ICT integration from school leaders i.e. School Heads and ICT Coordinators for an ICT integration to be fully realized by encouraging teachers thru relevant programs and projects. According to Goh (2015), to attract, develop and retain such knowledge workers, education systems need to reconfigure the leadership and organization of their schools, with a key objective of enabling and empowering teachers and school leaders to develop different leadership practices that can drive school improvements (p. 23). With this, there's really a need for school leaders to get involved in the process and in the implementation.

Relationship between the Teachers' Level of ICT Competencies and the Teachers' Perceptions on ICT Integration

To test the significant relationship between the teachers' level of ICT competencies and the teachers' perceptions of ICT integration, the "Pearson correlation" was the statistical tool used. Table 5 shows the relationship at 0.05 level of significance.

		Perception	Competency
Perception	Pearson Correlation	1	.102*
	Sig. (2-tailed)		.015
	N	573	573
Competency	Pearson Correlation	.102*	1
	Sig. (2-tailed)	.015	
	N	573	573

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5: Relationship between teachers' level of ICT competencies and teachers' perceptions on ICT integration

As shown in Table 5, there is a significant relationship between the level of ICT competencies and the perceptions of ICT integration. As shown, the computed p value (.015) is lesser than the level of significance (0.05). Even if the relationship is weak as indicated by the computed r (.102), still the relationship is significant. Moreover, the relationship is positive which means that perception of ICT integration is associated with the level of ICT competencies, vice versa.

This implies that there is a weak relationship between perceptions of ICT integration and level of ICT competencies. The perceptions of ICT integration is influenced by the level of ICT competencies. As the level of ICT competencies is high, the perceptions of ICT integration is also high. Perceptions of ICT integration, therefore, is a factor relative to the level of ICT integration. However, it can be gleaned from the table above that the relationship is weak, this is because of the teachers' learning environments as evidenced by the revealed challenges that they faced. Challenges such as inadequacy of computers used by learners, issues about accessibility to hardware like computer and LCD projector, access to the Internet and lack of school's infrastructure such as computer laboratory. This only implies that for a positive perception to be fully influenced by the level of ICT competencies, there must be sound and meaningful learning environments in order to maximize its full potential.

The result is in agreement with previous studies which found that pre-service teachers' attitudes toward technology are significantly correlated with technology competencies (Java, 2004). In addition, Lau & Sim (2009) concluded that a positive perception of computer in education was positively related to the ability to apply ICTs [in instruction]. The results suggest that a higher ability to use ICT means there will be a more positive perception of computer use in education [vice-versa] (p. 30). The result is consistent with the findings of the previous study which concluded that teachers who are more competent in using computers have also more favorable attitudes towards computers (cited in Sa'are, et al., 2005 and Jegede et al., 2007 by Lau & Sim, 2009). The aforementioned statement supports the study of Bazer, et al. (2012) which

states that there is a significant positive relationship between students' perception towards ICT and their self-efficacy on the use of ICT.

Relationship between the Teachers' Extent of ICT Integration and the Teachers' Perceptions on ICT Integration

Table 6 presents the correlation of the extent of ICT integration and perceptions on ICT integration. As shown, there is no significant relationship since the computed p-value which is .311 is greater than the level of significance (0.05).

		Extent	Perception
Extent	Pearson Correlation	1	.042
	Sig. (2-tailed)		.311
	N	573	573
Perception	Pearson Correlation	.042	1
	Sig. (2-tailed)	.311	
	N	573	573

Table 6: Relationship between the Teachers' Extent of ICT Integration and the Teachers' Perceptions on ICT Integration

The result is attributed to the fact that though the teacher respondents have high positive perceptions on ICT integration, these perceptions may not be put into action and or realization because of the challenges and limitations that they are facing such as lack of ICT-infrastructure. The result is consistent with the findings of Peralta (2007) and Bandalaria (1995) who found that positive perception towards ICT integration does not assure the integration of ICTs to instruction. This further supports the claim of Chow & Law (2008) on the teachers' perceived impact of ICT-use on self that the levels of perceive positive impact did not bear clear relationships with the levels of reported ICT-use. The aforementioned claim is also consistent with the findings from Law (2008) which show that the higher levels of reported ICT-use did not necessarily equate with higher levels of perceived learning gains from ICT use (p. 270). Indeed, the relationship between the extent of ICT integration and perceptions on ICT integration, as supported by the studies above, is not significant.

Conclusions

The following conclusions were made based on the results of the study: 1) Public Secondary School Teachers' extent of ICT integration is "often" practiced particularly in using the Internet for research and using computers to enhance teaching and learning; 2) Public Secondary School Teachers' level of ICT competency is "average"; 3) Public Secondary School Teachers have positive perceptions towards ICT integration; 4) Public Secondary School Teachers' top perceived challenges to ICT integration are the following: Inadequacy of computers used by learners; Shortage of computers for use of teachers; and the Lack of school's technical infrastructure about instructional technology; 5) There is a significant relationship between the level of ICT competencies and the perceptions on ICT integration; and 6) There is no significant relationship between the extent of ICT integration and the perceptions on ICT integration.

Recommendations

In view of the findings of the study, the researcher recommends the following: 1) Teachers should be given priority because teachers' levels of ICT competencies are only on the "Average" level. Professional development program is necessary for the enhancement of the level of ICT competencies that the teachers have. Meaningful and relevant programs for teacher respondents such as ICT skills trainings and workshops is a must; 2) It is no doubt that teachers of today perceived ICT integration positively, use this as an important avenue for meaningful and longer trainings in order for them to become more equipped and skilled drivers of the teaching and learning process particularly about the *National ICT Competency Standards for Teachers* so that they would know the importance of equipping themselves with these necessary ICT skills and competencies; 3) Sound ICT-infrastructure shall be provided in all of the public secondary schools particularly in the DepEd Division of Lanao del Norte i.e. adequate and sufficient computer laboratories for students and teachers with strong Internet access. The inadequacy of computers in the secondary public schools must be given priority consideration in the acquisition program and budget allocation for the betterment of ICT integration in the fulfillment of school activities deemed necessary, consequently improve the educational system, especially in the rural areas; 4) The need to promote ICT integration among school leaders i.e. Schools Division Superintendent, ICT Coordinators, and School Head for an ICT integration to be fully realized by encouraging teachers thru relevant programs and projects. The need for school leaders to get involve in the process and in the implementation of ICT; 5) There is a need to conduct a *Phase II* of this research where an in-depth study will be conducted employing the use of interviews and actual observations. The respondents will include the Schools Heads and some Teacher respondents to explore some factors relative to the implementation of ICT integration; 6) The present study may be replicated with more participants to increase the generalizability of the result in other areas in Mindanao. Further, this study may also be conducted in Visayas areas to compare the result of this study with other learning contexts and environments; and 7) Conduct another study that may show if geographical condition and culture could affect ICT-pedagogy integration practices of teachers.

References

Anderson, R. & Plomp, T. (2008). National Contexts. In N. Law, W. Pelgrum, & T. Plomp (Eds.). *Pedagogy and ICT Use in Schools around the world*. (p. 62). Hongkong: Springer.

Bandalaria, M. (1995). *Perceptions of UP Faculty on the Potentials of Selected Communication Technologies as Tools for Distance Education* (Unpublished master's thesis). University of the Philippines, Diliman, Quezon City.

Bazer, S., Pardillo, G. & Ruales S. (2012). Status of Students' Perception and Self-efficacy on the Use of ICT. *International Proceedings of Economics Development & Research*, 30, 145-149. Retrieved from www.ipedr.com/vol30/29-ICEMI%202012-M00051.pdf

Bingcang, J. P. (2013). *ICT Competency and Technology Utilization of Philippine Science High School Teachers* (Unpublished master's thesis). University of the Philippines, Diliman, Quezon City.

Bonifacio, A. L. (2013). *Developing Information Communication Technology (ICT) Curriculum Standards for K-12 Schools in the Philippines*. College of Education, University of the Philippines. Retrieved from http://linc.mit.edu/linc2013/proceedings/Session7/Session7Bonifacio.pdf

Chow, A. & Law, N. (2008). Teacher Characteristics, Contextual Factors, and How These Affect the Pedagogical Use of ICT. In N. Law, W. Pelgrum, & T. Plomp (Eds.). *Pedagogy and ICT Use in Schools around the world*. (p 207). Hongkong: Springer.

Concepcion, M.R. B. (2003). *Computer Use & Self-Efficacy of Teachers: Bases for Designing a Computer Training Program* (Unpublished master's thesis). University of the Philippines, Diliman, Quezon City.

Department of Education (DepEd) (2008). *Five-Year Information and Communication Technology for Education Strategic Plan (ICT4E Strategic Plan)*. Retrieved from http://planipolis.iiep.unesco.org/upload/Philippines/Philippines_ICT4E_Strategic_Plan_summary.pdf

Espinosa, K.J. P. & Caro, J. D.L. (2011). Analysis of ICT Integration Initiatives in Basic Education and Lesson Learned: The Case of the Philippines. *First ACIS/JNU International Conference on Computers, Networks, Systems, and Industrial Engineering*.

Goh, J. (2015). Leading and Improving Schools for the 21st Century. *International Conference: Redesigning Pedagogy (June 2-4, 2015). Leaders, Values and Citizenship in 21st Century Education.* p. 23.

Gulbahar, Y., & Guven, I. (2008). A survey on ICT usage and the perceptions of social Studies teachers in Turkey. *Educational Technology and Society*, 11 (3), 37-51. Retrieved from http://www.ifets.info/journals/11_3/4.pdf

Hutchison, A. (2009). *A National Survey of Teachers on their Perceptions, Challenges, and Uses of Information and Communication Technology* (Doctoral dissertation). Available from TigerPrints All Dissertations. (Paper 363)
Java, T.J. (2004). *Technology Attitudes, Competencies, and Use in Practice Teaching: Implication to Pre-service Teacher Education* (Unpublished master's thesis). University of the Philippines, Diliman, Quezon City.

Karpovaa, N.K., Uvarovskyb, A.P., Mareevc, V.I., Petrovac, N.P., & Borzilovc, Y.P. (2016). Methodological Features of Educational System, Modernization in the context of the "Economy of Knowledge". International Journal of Environmental & Science Education, Vol. 11, No. 18, pp. 11227-11237. Retrieved from https://files.eric.ed.gov/fulltext/EJ1120591.pdf

Lau, B. T. & Sim, C. H. (2008). Exploring the extent of ICT adoption among Secondary school teachers in Malaysia. *International Journal of Computing and ICT Research*, Vol. 2, No. 2, pp. 19-36. Retrieved from http://www.ijcir.org/volume2-number2/article 3.pdf.

Law, N. (2008). Summary and Reflections. In N. Law, W. Pelgrum, & T. Plomp (Eds.). *Pedagogy and ICT Use in Schools around the world*. (p. 270). Hongkong: Springer.

Leng, N. W. (2008). Transformational Leadership and the Integration of Information and Communications Technology into Teaching. *The Asia-Pacific Education Researcher* 17:1 (2008), pp. 1-14. Retrieved from http://www.dlsu.edu.ph/research/journals/taper/pdf/200808/1weeleng.pdf

Pelgrum, W. (2008). School Practices and Conditions for Pedagogy and ICT. In N. Law, W. Pelgrum, & T. Plomp (Eds.). *Pedagogy and ICT Use in Schools around the world*. (p. 74). Hongkong: Springer.

Peralta, S.T. P. (2007). *Information and Communications Technology (ICT) Integration in Teacher Education Institutions* (Unpublished master's thesis). University of the Philippines, Diliman, Quezon City.

UNESCO. (2011). *UNESCO ICT Competency Framework for Teachers (Version 2.0)*. France: UNESCO and Microsoft 2011