Integration of Technology in Educational Instruction and Students' Interest in Learning

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***Abstract*— This study discusses the correlation of the integration of technology in educational instruction and students' interest in learning Science 10. It investigated the teachers' extent of integration of technology in the educational instruction in the different curriculum content of Science and the level of students' interest in learning. The study employed a quantitative descriptive correlational and descriptive comparative design. Researcher-made questionnaires were used in data gathering. The study involved twenty (21) Grade 10 Science teachers and five hundred twenty five (525) Grade 10 students handled by the teachers. The study used purposive sampling technique in the selection of teachers and non-probability convenience sampling in the selection of students. The study was conducted in nine (9) public secondary schools in the First Congressional District in the Division of Quezon City. Data were analyzed using descriptive and inferential statistics. The findings of the study indicate that science teachers integrated technology in teaching their subject to a moderate extent. The study also showed that the students' level of interest in the different characteristics observed varied from moderate to high. Likewise, the results of the study revealed that the teachers' extent of technology integration in the educational instruction had a relationship with the level of students' interest in learning.**

Keywords— ***technology integration, educational instruction, learning interest, digital natives***

I. INTRODUCTION

Educational technology tools such as computers, probe ware, data collection and analysis software, digital microscopes, hypermedia/multimedia, student response systems, and interactive white boards can help students actively engage in the acquisition of scientific knowledge and development of the nature of science and inquiry. When educational technology tools are used appropriately and effectively in science classrooms, students actively engage and feel motivated in their knowledge construction and improve their thinking and problem solving skills (Guzey & Roehrig, 2012).

In the United States, the learning of science is an important endeavor because it contributes much for the nation's cultural development and preservation of its cultural identity. Former US President Barack Obama's (2012) said that science holds the key to people's survival as a planet and their security and prosperity as a nation. Science is considered to be indispensable because it helps in solving problems and challenges, keeping a nation's cultural uniqueness and peculiarities intact (Grant, Malloy, & Hollowell, 2013). Furthermore, countries wanting to improve their people's quality of life cannot escape the need to harness their science and technology capability as a way of developing competitiveness. Today's real world problems often have both scientific aspects. Science tries to understand the natural world.

In the Philippines, science and technology education is also of great importance. Like many other countries in the world, it also anchors on to the belief that science is essential for national development and progress. In fact, Article XIV, Sections 10 – 13 of the 1987 Philippine Constitution mandates the government to prioritize this area.

However, science education in the country has always been in a sad plight and it needs to be supported according to Jalmasco (2014). He noticed that students were graduating from high school without understanding much about the world, and they are lagging far behind graduates in other countries.

The last time Philippines participated in international surveys like the 2003 Trends in International Mathematics and Science Study (TIMSS), it ranked 43rd out of 46 countries in Science (The Manila Times, 2014). In addition, the Philippines ranked 112th out of 139 in 2011, and 115th out of 142 in 2012 in quality of math and science education in the 2011-2012 Global Competitiveness Report of the World Economic Forum. This is an indication that Philippines struggled to improve the quality of its science education (Pingol, et. al., 2014). Likewise, in the National Achievement Test administered in 2014 (Department of Education, 2016), the students scored poorly. Science had a very low mean percentage score (MPS) of 47.99, and was below the passing rate of 75 %.

The aforementioned premises and conditions of the Philippine Science education prompted the researcher to select the subject Science 10 being the field of study. Based on the K to 12 Curriculum, concepts and skills in Life Sciences, Physics, Chemistry, and Earth Sciences are presented with increasing levels of complexity from one grade level to another in spiral progression, thus paving the way to a deeper understanding of core concepts (DepEd, 2016). Its scope is quite more intricate and broader in range of application than the sciences in the lower grade levels. Thus, teaching the subject requires intensive effort to facilitate learning.

Unlike previous studies which focused on the benefits of integration of technology integration in the classroom, possible approaches in the integration of technology (Bonifacio, 2013), and requirements for efficient implementation of ICT integration (Adanza, 2012), the present study sought to explore the teachers' extent of integration of technology in educational

instruction and its correlation to the level of students' interest in learning Science in the Grade 10 level. Based on the results of the study, the researcher proposed an action plan that may be used by school heads and Science teachers to promote full utilization of technology for effective teaching and student learning of Science 10 course content.

II. METHODS

The study employed a quantitative descriptive correlational and descriptive comparative design. Researcher-made questionnaires were used in data gathering. The study involved twenty (21) Grade 10 Science teachers and five hundred twenty five (525) Grade 10 students handled by the teachers. The study used purposive sampling technique in the selection of teachers and non-probability convenience sampling in the selection of students. The study was conducted in nine (9) public secondary schools in the First Congressional District in the Division of Quezon City. Data were analyzed using descriptive and inferential statistics.

Weighted mean was employed to evaluate the teachers' extent of integration of technology in educational instruction. Similarly, it was utilized in calculating the level of students' interest in learning in a particular subject, Science 10. Four-point (4) Likert scale was used in determining the teachers' extent of integration of technology in educational instruction and the level of students' interest in learning. Moreover, Pearson Product-Moment Correlation (**r**) was adopted to gauge if there is a significant relationship between the teachers' extent of integration of technology in educational instruction and the students' level of interest in learning. Lastly, the independent t-test (**t**) was employed in to validate if there was a significant difference in the assessment of the teachers and students in the teachers' extent of integration of technology in educational instruction and the level of students' interest in learning. Ethical consideration was observed to ensure that the study was conducted as thoroughly and ethically as possible.

III. RESULTS

Integration of Technology in Educational Instruction

Table 1. Teachers' Extent of Integration of Technology in Educational Instruction as Assessed by Themselves

Type of Technology Used in the Classroom	Earth and Space	Force, Motion, and Energy	Living Things and Their Environment	Overall Mean
A. Computer Devices	2.80 (HE)	2.78 (HE)	2.78 (HE)	2.79 (HE)
B. Blogs and Blog sites	2.05 (ME)	1.72	1.77 (ME)	1.85 (ME)
C. Educational Social Networking Sites	1.98 (ME)	1.76 (ME)	1.9 (ME)	1.88 (ME)
D. Online educational platform	1.99(ME)	1.83 (ME)	2.02 (ME)	1.95 (ME)
E. Simulation Applications	2.10 (ME)	2.09 (ME)	2.11 (ME)	2.10 (ME)
Overall Mean	2.18 (ME)	2.04 (ME)	2.12 (ME)	2.11 (ME)

The types of technology used in the classrooms were divided into five categories: a) computers; b) blogs; c) educational social networks; d) online educational platforms; and e) simulation applications. Based on the teachers' assessment of themselves, they integrated technology in educational instruction to a "Moderate Extent," with an overall mean of 2.11. Teachers integrated technology in teaching the topic Earth and Space to a "Moderate Extent" with a weighted mean of 2.18. When it comes to teaching the topic Force, Energy, and Motion, teachers integrated technology to a "Moderate," with a weighted mean of 2.04. Lastly, teachers used technology in teaching the topic "Living Things and Their environment" to a "Moderate Extent," with a weighted mean of 2.12.

Table 2. Teachers' Extent of Integration of Technology in Educational Instruction as Assessed by the Students

Type of Technology Used in the Classroom	Earth and Space	Force, Motion, and Energy	Living Things and Their Environment	Overall Mean
A. Computer Devices	2.36 (ME)	2.33 (ME)	2.37 (ME)	2.35 (ME)
B. Blogs and Blog sites	1.66 (LE)	1.66 (LE)	1.62 (LE)	1.65 (LE)
C. Educational Social Networking Sites	1.71 (LE)	1.72 (LE)	1.74 (LE)	1.72 (LE)
D. Online educational platform	1.85 (ME)	1.84 (ME)	1.83 (ME)	1.84 (ME)
E. Simulation Applications	1.83 (ME)	1.81 (ME)	1.82 (ME)	1.82 (ME)
Overall Mean	1.88 (ME)	1.87 (ME)	1.88 (ME)	1.88 (ME)

Based on the assessment of the students on the teachers' extent of integration of technology in educational instruction on the topic Earth and Space, Science teachers utilized diverse technologies to a "Moderate Extent" with an overall mean score of 1.88. The findings of the study revealed that teachers employed technology in teaching Force, Motion, and Energy to a "Moderate Extent" with an overall mean score of 1.87. Moreover, the results of the study showed that teachers used technology in teaching Living Things and their Environment to a "Moderate Extent" with a weighted mean of 1.88. Overall, the teachers' extent of integration of technology in educational instruction was perceived by the students as "Moderate."

Students' Interest in Learning

Table 3. Level of Students' Interest in Learning as Assessed by the Teachers

Observed Students' Characteristics	Numerical Interpretation	Verbal Interpretation
A. Focused Attention	2.68	High
B. Active Participation	2.57	High
C. Student Confidence	2.65	High
D. Performance	2.58	High
E. Positive Body Language	2.75	High
Overall Mean	2.65	High

With regard to the teachers' assessment, the level of students' interest in learning the Science subject as assessed by the teachers is described as "High" with an overall mean of 2.65. In terms of focused attention, it was rated "High" as indicated by the weighted mean value of 2.68. As far as students' active participation in class was concerned, the computed mean value was 2.57 which was interpreted as "High." The students' level of interest in learning in terms student confidence was also evaluated by the teachers and it resulted to a mean score of 2.58 which was interpreted as "High." The learners' level of interest in learning in terms of performance was interpreted as "High" as indicated by the weighted mean of 2.58. The students' level of interest as manifested by their positive body language was rated by teachers as "High" as indicated by the mean score of 2.75.

Table 4. Level of Students' Interest in Learning as Assessed by Themselves

Observed Students' Characteristics	Numerical Interpretation	Verbal Interpretation
A. Focused Attention	2.63	High
B. Active Participation	2.44	Moderate
C. Student Confidence	2.45	Moderate
D. Performance	2.45	Moderate
E. Positive Body Language	2.57	High
Overall Mean	2.51	High

Based on their assessment of themselves, the students' level of interest in learning in terms of focused attention was "High" as indicated by the weighted mean of 2.63. With regard to the students' active participation in class, their level of interest was rated as "Moderate" as evidenced by the mean score of 2.44. The students' level of interest in learning in terms student confidence was also evaluated by the students themselves and it resulted to a mean score of 2.45 which was interpreted as "Moderate." In terms of performance, the students' level of interest in learning was viewed as "Moderate" as indicated by the weighted mean of 2.45. Lastly, the students' level of interest as manifested by their positive body language was also rated and it yielded a mean value of 2.57 and was interpreted as "High." The level of students' interest in learning is "High" as indicated by the overall mean of 2.51.

Table 5. Relationship between the Teachers' Extents of Integration of Technology in Educational Instruction in the Different Curriculum Contents and the Level of Students' Interest in Learning as Assessed by the Teachers

Extent of Integration of Technology and Level of Students' Interest as Assessed by Teachers	Computed Pearson-r Value	Degree of Freedom	Tabular Pearson-r Value	Decision	Interpre-tation
A. Earth and Space	0.54	19	0.433	Ho: Rejected HA: Accepted	Significant Relationship
B. Force, Motion, & Energy	0.67	19	0.433	Ho: Rejected HA: Accepted	Significant Relationship
C. Living Things and their Environment	0.73	19	0.433	Ho: Rejected HA: Accepted	Significant Relationship

The teachers' extent of integration of technology in educational instruction in the different curriculum contents and the level of students' interest in learning as assessed by the teachers themselves showed a significant relationship as the statistical treatment yielded the following computed Pearson-r values: 0.54 for Earth and Space; 0.67 for Force, Motion, and Energy; and 0.73 for Living Things and their Environment. The results were statistically higher than the tabular Pearson-r value of 4.33, df = 19 for all the three curricular contents that were evaluated. The data suggest that the teachers' extent of integration of technology in educational instruction correlated with the level of students' interest in learning. The results of the test of significant relationship at 0.05 level in the three (3) curriculum contents are all statistically higher than the tabular Pearson-r value/critical value of 0.433 with (degree of freedom) df = 19.

Table 6. Relationship between the Teachers' Extents of Integration of Technology in Educational Instruction in the Different Curriculum Contents and the Level of Students' Interest in Learning as Assessed by the Students

Extent of Integration of Technology and Level of Students' Interest as Assessed by the Students	Computed Pearson-r Value	Degree of Freedom	Tabular Pearson-r Value	Decision	Interpre-tation
A. Earth and Space	0.51	523	0.103	Ho: Rejected HA: Accepted	Significant Relationship
B. Force, Motion, & Energy	0.47	523	0.103	Ho: Rejected HA: Accepted	Significant Relationship
C. Living Things and their Environment	0.68	523	0.103	Ho: Rejected HA: Accepted	Significant Relationship

In a separate assessment of the students concerning the teachers' extent of integration of technology in educational instruction in the different curriculum contents, it was shown that technology integration was related to the level of students' interest in learning as indicated by the computed Pearson-r values: 0.51 for Earth and Space; 0.47 for Force, Energy and Motion; 0.68 for Living Things and their Environment. Since the computed Pearson-r values are greater than the tabular Pearson-r value - 0.103, df = 523 for all the Science 10 curriculum contents, this suggests that there was a significant relationship between the teachers' extent of integration of technology in educational instruction in the different curriculum contents and the level of students' interest in learning.

In conclusion, the test of significant relationship at 0.05 level in the three (3) curriculum contents are all statistically higher than the tabular Pearson-r value/critical value of 0.103 with (degree of freedom) df = 523. Similar to the teachers' assessment, the students' evaluation of their interest level in learning is also affected by the extent to which their teachers integrate technology in teaching. This is an indication that technology integration in teaching increases the level of students' interest in learning.

Table 7. Difference in the Assessments of the Two Groups of Respondents on the Teachers' Extent of Integration of Technology in Educational Instruction in the Different Curriculum Contents

Teachers' Extent of Integration of Technology in Educational Instruction	Computed t-test Value	Degree of Freedom	Tabular t-test Value	Decision	Interpre-tation
A. Earth and Space	2.86	544	1.976	Ho: Rejected HA: Accepted	Significant Difference
B. Force, Motion, & Energy	2.39	544	1.976	Ho: Rejected HA: Accepted	Significant Difference
C. Living Things and their Environment	3.01	544	1.976	Ho: Rejected HA: Accepted	Significant Difference

The assessments of the two groups of respondents on the teachers' extent of integration of technology in educational instruction in the different curriculum contents indicated a significant difference since the computed t-test values 2.86 for Earth and Space; 2.39 for Force, Motion, and Energy; 3.01 for Living Things and their Environment were all greater than the t-test tabular value of 1.976, df = 544 for all the three curriculum contents. The results showed that the teachers' perception on their extent of integration of technology in educational instruction differed from that of the students'.

8. Difference in the Assessment of the Two Groups of Respondents in the Level of Students' Interest in Learning

Level of Students' Interest in Learning	Computed t-test Value	Degree of Freedom	Tabular t-test Value	Decision	Interpre-tation
A. Focused attention	2.03	544	1.976	Ho: Rejected HA: Accepted	Significant Difference
B. Active Participation	2.37	544	1.976	Ho: Rejected HA: Accepted	Significant Difference
C. Student Confidence	3.54	544	1.976	Ho: Rejected HA: Accepted	Significant Difference
D. Performance	3.24	544	1.976	Ho: Rejected HA: Accepted	Significant Difference
E. Positive Body Language	2.63	544	1.976	Ho: Rejected HA: Accepted	Significant Difference

The results of the study revealed that the assessments of the two groups of respondents in the level of students' interest in learning varied as shown by the computed t-test values: 2:03 for focused attention; 2.37 for active participation; 3.54 for student confidence; 3.24 for performance; and 2.63 for body language. The computed t-test values were greater than the tabular t-test value 1.976, df = 544 for all the observed characteristics, this means that the impressions of the two groups of respondents differed significantly.

IV. DISCUSSION

The chief purpose of this study was to determine the teachers' extent of integration of technology in educational instruction and the level of students' interest in learning Grade 10 Science, specifically, in the three major curriculum contents, namely: Earth and Space; Force, Motion, and Energy; and Living Things and their Environment. Moreover, the study investigated also the relationship between the teachers' extent of integration of technology and the level of students' interest in learning, as assessed by the teachers themselves and their students. The findings of the study indicate that based on their assessment of themselves, science teachers integrated technology in teaching their subject to a moderate extent. On the other hand, the students' assessment of the teachers' extent of technology integration of technology in the educational instruction yielded the same results as the teachers', although, there is a significant difference in their assessments.

The hardware approach to the technology of education implies the application of mechanical materials and equipment in education. In this sense, audio visual like computers and other electronics devices like camera; laptop or desktop; projector; smartphone; tablet; television or smart TV; including internet connection are among the most commonly used. However, they are less adept in the use software and tools like the ones available online. This limits them in exploiting the available resources that can help them enhance learning (Spector, 2016, Mallia, 2014). The results revealed that online tools, though these are beneficial to students, were not fully utilized by teachers and this can be attributed to lack of resources and appropriate infrastructure for implementing ICT in education (Greenhow, et. al., 2015). Moreover, Mercado (2017) said, teachers and students are moderately familiar with the available media technology in the classroom, however, they agreed that these are useful in the teaching and learning process. Based on the teachers' belief, there is a great chance for them to adopt the simulations applications in the future provided that they are supported by the administration. In addition, Trucano (2014) postulated that internet connectivity is lagging behind in most developing countries. Analysis has shown that while countries may have some success in building a computer infrastructure, connecting these devices to the Internet lags behind. Although the number of schools connected to the internet had increased, these were still not enough and those that were connected need better connections.

The study also revealed that based on the teachers' assessment, the students' level of interest in learning is high. However, based on the students' assessment of themselves, their level of interest in the different characteristics observed varied from moderate to high. Interest is a psychological state of engagement, experienced in the moment, and also a predisposition to engage repeatedly with particular ideas, events, or objects over time (Paul, 2014). It effectively arouses or awakens one's thinking. When learners are interested in what they are learning, they pay closer attention. Although,

there are several factors affecting learning. Teacher quality matters. The academic achievement of any student is the result of a complex interplay of various factors, such as study habits, personality trait, and personal interest of student as well as teaching skills of concerned faculties. The quality of students' performance remains at top priority for educators. Educators, trainers, and researchers have long been interested in exploring variables contributing effectively for quality of performance of learners.

Students' interest has always been linked to the integration of technology in the educational instruction. In fact, there are several studies in literature investigating the possibility of using technology in teaching and learning in the different subject areas. This idea is anchored on the belief that today's learners are digital natives. Today's students are not only influenced by social media (cell phones, social networks, gaming, instant messaging, texting, smart phones, programming, etc.), but such media is a part of the language of digital natives; they speak the native (Preznky, 2012). Thus, must speak their language in order to connect with them.

The extent of technology integration in teaching Science 10 determines the level of students' interest in learning. Teachers should develop a basic understanding of their student's readiness, interests, and learning profiles so that they will be able to use the appropriate technologies to adopt in their classrooms.

Information and Communication Technologies (ICTs) are generally accepted as a modern instrumental tool that enables the educators to modify the teaching methods they use in order to increase students' interest (Groff, 2013, Starkey, 2012). In addition, Keengwee, Schnellert, and Mills (2012) and Blair (2012) conducted a research study about the impact of technology integration on student learning and they discovered that the integration of laptop computing increased student engagement and learning, motivation, and ability to work individually. Secondly, the data provided evidence to suggest that the implementation of computing increased the use of technology in the classroom and in the home by students. Finally, the findings also showed evidence to indicate that faculty believed that the integration of technology improved traditional, at-risk, and high-achieving students learning experiences. Similar to the teachers' assessment, the students' evaluation of their interest level in learning is also affected by the extent to which their teachers integrate technology in teaching. This is an indication that technology integration in teaching increases the level of students' interest in learning. Consequently, teachers are encouraged to boost their knowledge on applying computer assisted learning approaches, diverse online platforms and networks that can make teaching Science more interesting, more fun and more fulfilling.

The assessments of the two groups of respondents as regards students' level of interest showed a significant difference, too. Likewise, the results of the study revealed that the teachers' extent of technology integration in the educational instruction had a relationship with the level of students' interest in learning as assessed both by the teachers and the students. The data implies that there is a significant difference in the assessments of the two groups of respondents. This signifies that the respondents view the teachers' extent of technology integration at differently. One may not say that the teachers are projecting a misconception or overstatement of the e-learning scenario in the classroom because they have several students. They might only be building on their personal and general impressions on a particular group of students considering the heterogeneity of their learners. Teachers' observations can be biased towards certain subgroups of students (Timmermans, de Boer, & van der Werf, 2016). The disparity between the teachers' and students' assessments illustrates the need for teachers to seek and listen to their students' opinions. Instead of practices that are inaccurate, and not useful, teacher evaluation can be made to work. Evaluation can reassure teachers that are doing well (Grissom, & Youngs, 2016).

V. CONCLUSION AND RECOMMENDATIONS

Science teachers utilized technologies such as computers, blogs, educational social networks or social media, online educational platforms, and simulation applications. However, they moderately integrate them in their teaching though these are considered to be very useful tools in enhancing and supporting the learning experiences of their students. Nonetheless, it has been noted that, laptop and projector were among the computer devices that were used to a "High Extent." Based on the findings, it can be inferred that public school teachers still have a long way to go when it comes to the full integration of technology in the educational system.

Education is changing rapidly with the current instructional technologies of the 21st century. Teachers may take advantage and intensify the use of these available resources, materials, and facilities (computer hardware and software) because these can support and enhance the learning experiences of the students and generally improve the teaching-learning process. Considering that the present learners are digital natives, teachers may intensify their use of technologies like computers, blogs, educational social networks, online educational platforms, and simulation applications because these can make learning more fun and interactive. Public school teachers may exert effort to continuously enhance their teaching competencies by continuously exploring appropriate technologies and applications that can be integrated into the Science teaching and student learning process. Science teachers may intensify the use of social networking tools, simulation applications and all sorts of online learning materials and resources in providing effective and efficient educational services. There is a need for a pro-active awareness and training to educate both teachers and students on the invaluable importance of utilizing social networking for the purpose information seeking. Schools may allocate budget for the sustainability of the DepEd Computerization Package (DCP) Program. They may provide a stable internet connection so that teachers can make

full use of the available educational hardware and software. Educational institutions including policy makers may look into the possibility of incorporating social media into the curriculum to improve students' learning experiences. They may incorporate a school-based ICT development plan to ensure stability and sustainability of ICT implementation not only in teaching Science subject but also other subject areas. They may also form a monitoring and evaluation team who will oversee the effectiveness and efficiency of the activities.

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