

TEACHING AND LEARNING RESOURCES FOR TECHNOLOGY ORIENTED SECONDARY SCIENCE INSTRUCTION

Norrie E. Gayeta

College of Teacher Education, Batangas State University, Batangas City, Philippines

Email address: norrie_junegayeta@yahoo.com.ph

Maries R. Recto,

Santo Rosario Academy, Batangas City, Philippines

Email address: marries.recto@yahoo.com.ph

Abstract

Science education has been identified as an effective instrument toward the attainment of goals for global competitiveness; hence use of technological-oriented resources in science instruction in all levels of secondary education system is advocated to respond to the compelling demand of the present time. This study, assessed the teaching and learning resources for technology-oriented secondary science instruction. The study covered the profile of the secondary science teachers in Oblates schools in terms of age, educational attainment and trainings attended related to the use of technology; and the extent of their application of technology-oriented resources in teaching. It also looked into differences in the extent of application of technology-oriented resources when teachers are grouped according to profile variables. Researcher-made questionnaire was used to gather the data complemented by interviews. Thirty five science teachers from Oblates of Saint Joseph schools served as respondents. Weighted mean, frequency and t-test/f-test were the statistical tools used to treat data. Findings revealed that science teachers are relatively young, bachelor's degree holders who upgraded themselves by attending district level trainings related to the use of technology oriented science instruction. Powerpoint presentation, used of laptop and LCD projectors were technology-oriented resources applied in a great extent while interactive board, simulations and application software were applied in a slight extent. No significant differences exist between the application of technology oriented resources when grouped according to age and educational attainment.

Keywords: science instruction, teaching and learning resources, technology-oriented instruction

1. Introduction

The success in teaching and learning in the classroom depends not only on the teachers' skills but also a great extent on the created atmosphere and learning resources used. Supplements to teaching are educational tools which support teaching and learning processes. Tools that help the teachers in eliciting students' interest to learn and may affect both learning and performance.

Learning resources are used by the educators to enhance the learning cycle of the students within the classroom. It is noted that through these resources, the mind of the learners were motivated to learn more about the thing around him. The most commonly used learning resources in today's modern way of teaching are the high technological tools including computer set, video and recording materials, projector, television, E-learning set, laptops, scanners, DSL access, portable files, digital pictures and frauds. These resources support the teaching and learning process.

The use of instructional technology is now pervasive in educational endeavours and this technological change is one of the key factors in improving the knowledge and skills in facing the challenges to be globally competitive and truly ready for life. Technology is one of the many tools that classroom teachers can use for the enhancement of teaching and learning. Thus, technology that motivates students to engage in learning should be made available (Newby, 2011).

Technology has the power to transform teaching by ushering in a new model of connected teaching. It will links teachers to their students and to professional content, resources and systems to help them improve their own instruction and personalize learning. These help the students remember important information and provide evidences and new ideas. When properly used, they help gain and hold the attention of student. According to Lemon (2007), it is important that technology has been ever present in classroom and has become more advanced as the technology available evolved. Memorable learning often happens when using technology to make personal links and connections to the topic. Its application helps students to interact and exchange information with others from different parts of the world, other schools and other classrooms.

The internet-spurred learning or knowledge revolution transform how and what people learn throughout their live. E-learning has become a central priority of many governments and academic institutions. They are now racing to harness and capitalize on the internet as a learning tool. Moreover, (ICT's) has become an essential part of the solution to poverty and other socioeconomic ills. It can provide opportunities for capacity-building and people empowerment. It has opened up a wide range of new communication methods.

Rigor (2006) cited the types of ICT and other media resources. It includes the audio visual, non-projected visual, projected visual, audio media, multimedia, film and video, simulation and gaining books and duplicated materials. These materials are aids to teaching and learning which is appropriate to make lesson interesting and increase the effectiveness of the teachers. It enables self-paced learning which provides access to wide range of up-to-date learning materials through interaction and collaboration. It can stimulate interest, simplify, clarify subject matter and increase understanding and motivate the learner to learn. Perez (2011)in his study concluded that new technologies may also help to increase student motivation, facilitate clearer thinking, and develop interpretation skills with data.

The study of Trinidad (2007) focused on different educational technology in teaching and learning process. Study revealed that internet is an empowering tool that enriches the understanding of the learner. It offers the wide public an unparalleled access to a vast store of information and knowledge. It allows students, particularly the poor and disenfranchised, to have the same access to education. He added that through e-learning learners were no longer bounded by four walls of the classroom.

Meanwhile, the success of technology used in education mostly depends on educators' attitudes towards technology. This is being used for the development of educators' positive attitude towards ICT which is a key factor in the enhancement of the ICT integration and avoidance of the resistance to ICT use. The frequency and effectiveness of ICT usage in classroom is largely related to educators' attitude. These technologies enable teachers to do more with fewer resources.

Ertmer and Ottenbreit-Leftwich(2010) argue that technology knowledge and skills should be considered as indispensable to a teacher's toolkit. They go as far as suggesting that effective teaching cannot occur unless relevant technology tools or resources are employed in some way. They highlight that technology can support traditional teaching approaches and also provides educators with new and arguably better instructional strategies which necessitate a new approach to teaching and learning.

Simon (2008) study assessed the use of internet in science education. She found out that high computer literacy levels in in-service-trainings influenced the teachers' frequency of internet use, high self-efficacy and positive attitude towards the internet. Teachers' frequency of internet use increased their self-efficacy and attitude, while a highly positive attitude motivated teachers to frequently use internet thus, improving their internet efficacy. Similarly, Avila (2012) examined the importance of in-service-trainings for teachers. It was revealed that in-service-trainings provided teachers opportunities to teach effectively by equipping them with knowledge and competencies that had measurable impact on students' learning and achievement level. The study also showed that teachers who lacked opportunities for professional growth were intellectually depleted and classes became intellectually unproductive.

Study of Tobeo (2016) assessed the integration of Genyo E-learning technology in science teaching. Results of the study revealed that majority of the teachers had earned master's units, upgraded themselves through local seminars and trainings and were provided with moderately adequate teaching-learning infrastructure. Moreover, there was significant relationship between the extent of application and the status of integration of Genyo E-learning technology in teaching.

Based on the foregoing discussions, the researcher decided to assess the teaching-learning resources for technology-oriented secondary science instruction. The researchers believe that building innovation with technologies in school education will provides educators and learners with the opportunity to reconceptualise teaching and learning. The use of technological advancements can enhance students' general learning performance and strengthen their learning motivation.

1.1 Objectives of the Study

This study, assessed the teaching and learning resources for technology-oriented secondary science instruction. This covered the profile of the secondary science teachers in Oblates schools in terms of age, educational attainment and trainings attended related to the use of technology; and the extent of their application of technology-oriented resources in teaching. The study also looked into differences in the extent of application of technology-oriented resources when teachers are grouped according to profile variables.

1.2. Research Hypothesis

There are no significant differences on the extent of application of technology oriented resources when responses are grouped according to profile variables.

2. Research Methodology

This study used descriptive research method in assessing the teaching and learning resources for technology-oriented secondary science instruction in Oblates schools during the academic year 2017-2018. The respondents of the study were 35 science teachers from private secondary schools in Oblates of Saint Joseph Schools. The main instrument used in the study was the researcher made – questionnaire which was evaluated, validated, administered, tallied and scored according to the accepted practices in research. Interview was also conducted to science teachers and administrators to substantiate the findings of the study. The data were submitted to the statistician for treatment after which the data are analyzed and interpreted.

3. Results and Discussions

3.1 Profile of the Secondary Science Teachers in Oblates Schools

The profile of the secondary science teachers in Oblates Schools in terms of age is presented in Table 1.

Table 1: Profile of the Secondary Science Teachers in Terms of Age

Age	Frequency	Percentage
25 and below	14	40.00
26-35	11	31.43
36 and above	10	28.57
Total	35	100

As shown in the table, 14 or 40.00 percent of the teachers were at the age range of 25 and below, 11 or 31.43 percent were at the age range of 26-35, and only ten or 28.57 percent were 36 years old and above age bracket.

The profile of secondary science teachers in terms of educational attainment is presented in Table 2.

Table 2: Profile of the Secondary Science Teachers in terms of Educational Attainment

Educational Attainment	Frequency	Percentage
Bachelor's Degree	25	71.43
With M.A units	8	22.86
With Doctoral units	2	5.71
Total	35	100

It can be gleaned in the table that 25 or 71.43 percent of the respondents were Bachelor's degree holder, eight or 22.86 percent with masters' units and only two or 5.71 percent earned doctoral units. The finding showed that majority of the science teachers were not enrolled in masters' programs. It may be because teachers were not well oriented on the importance of enrolling in graduate studies. Results suggest that a sort of encouragement must be provided by the school heads for their teachers to enrol in masters' or doctoral programs. This finding is in contrast with the findings of Bico, et. al (2016) which showed that majority of secondary science teachers in Oblates schools understand the importance of engaging in graduate studies for continuous personal and professional development.

Active participation in different seminars/trainings served as one significant factor for teachers to update their skills as educators. Table 3 presents the trainings attended related to the use of technology oriented science instruction by the respondents.

Table 3: Trainings Attended related to the Use of Technology Oriented Science Instruction

TITLE OF SEMINAR	LEVEL							
	Regional		Division		District		School	
	f	%	f	%	f	%	f	%
Innovative Teaching and Learning Resources in Science	8	22.86	4	11.43	25	71.43	12	34.29
Using a Twitter as a tool in STEM classes	1	2.86	1	2.86	12	34.29	10	28.57
Scientific Approach to fun and game play	2	5.71	1	2.86	6	17.14	6	17.14
Inquiry Based Approach to Teaching and Learning Science	1	2.86	1	2.86	6	17.14	5	14.29
Science Model as Effective Teaching Aid	2	5.71	2	5.71	5	14.29	3	8.57

Note: (Multiple Responses, N=35)

It can be noted from the table that 25 or 71.43 percent of the respondents attended district level training on innovative teaching and learning resources in science. It only implies that Oblates schools administrators are aware of the importance of providing in-service training to teachers. This supports the findings of Avila (2012) at in-service trainings provided teachers opportunities to teach effectively by equipping them with knowledge and competencies that has measurable impact on students' learning and achievement level. Teachers who lacked opportunities for professional growth become intellectually depleted and classes become intellectually unproductive. In-service training enhance teachers' knowledge and insights to make them effective in designing lessons suited to the ability and capacity of the learners.

Using twitter as teaching tool in STEM classes was participated by 12 respondents or 34.29 percent during the district level seminar. It is an indication that Oblates schools administrators considered the importance of using twitter in science teaching. They provided this kind of seminar because they believe that this can improve learning of the students through the use of this technology oriented resource. This finding is in line with the idea of Newby (2011), that computer applications such as twitter incorporate collaboration from among and within the students. The use of this technology resource can transform science teaching by ushering in a new model of connected teaching-learning process.

Trainings on scientific approach to fun and game play, inquiry based approach to teaching and learning science and science model as effective teaching aid were attended by only few science teachers. Around 5 (14.29%) to 6 (17.14%) attended these trainings in the district level and only 1 to 2 teachers attended the regional level. It is good to note that science teachers were provided trainings on fun and game play, inquiry based and science model approaches. These are approaches that involve practical activities that encourage students' interest and critical thinking. This affirms the idea of Alcantara (2012) that teaching science should provide actual and practical activities that will enhance and hone the skills and understanding of learners in order to produce science literate individuals.

It can be gleaned also from the table that one to two teachers only were sent to regional and division level trainings. Based from the interview conducted, only key teachers were sent to division and regional level because of limited fund allocated for each seminar. They added that even few teachers attended the said seminars their school heads required the attendees to conduct a re-echo seminars on their respective schools. This justifies the idea of Sidawi (2007) that teachers should be given further training in the use of technology to make them ready to use technology-driven strategies. They must go out their shell and not be contented with the traditional method of teaching if they want their students to survive in today's technologically-oriented and competitive society.

3.2 Extent of Application of Technology Oriented Resources in Science

There is a growing body of evidence that technology integration positively affects student achievement and academic performance. Thus, the application of technology oriented resources yielded better learning. Table 4 presents the extent of application of technology oriented resources in science.

Table 4: Extent of Application of Technology Oriented Resources in Science

Items	WM	VI
Powerpoint presentation	3.80	GE
Laptop	3.66	GE
LCD projector/s	3.54	GE
Video tutorials	3.14	ME
Smart television	3.00	ME
Android phones	2.97	ME
Wireless internet connection	2.71	ME
Digital cameras/video cameras	2.66	ME
Interactive board	2.37	SE
Simulators	2.37	SE
Application software	2.20	SE
Composite Mean	2.79	ME

Legend: WM=Weighted Mean GE= Great Extent ME=Moderate Extent
 VI= Verbal Interpretation SE= Slight Extent

It can be gleaned from the table that the technology-oriented resources that the teachers applied in a great extent was the powerpoint presentation as reflected by the weighted mean value of 3.80. Interview from the teachers revealed that they usually prefer to use powerpoint because it is the most common and easy to prepare technology-oriented resources. They are knowledgeable on how to prepare and used this kind of instructional materials. This confirms the idea cited by Lemon (2007) that in many classroom students has access to powerpoint slides presentation.

The respondents indicated that they utilized laptops to great extent in science instruction. This obtained a weighted mean of 3.66. This is a clear indication that the teachers nowadays are equipped with their personal and school-owned laptop used in the teaching-learning process. The use of the laptop in the classroom provides interactive, meaningful and valuable learning experiences for students compared to the desktop. The laptop has fast access to materials as it is portable and therefore can be used easily. This finding conforms to Richman's (2013) idea that teachers utilized laptop in educating students to be visually and cognitively stimulated and make the learning interesting and relevant.

Table also reveals that another technology oriented resources that the teachers applied in a great extent was the LCD projectors as reflected by the weighted mean value of 3.54. This maybe because it is the most available and easy to operate. LCD projectors can provide a lot of things in order to promote understanding. This can be used in projecting pictures, powerpoint presentations, videos and educational films. This finding support the study of Sagus (2006) that using LCD projector was necessary for teaching purposes most especially in science topic.

The respondents indicated that they utilized interactive board and simulators to a slight extent in science instruction. Both obtained a weighted mean of 2.37. This is a clear indication that it is the least available resources in Oblates schools. It is not surprising since these are quite expensive. In addition, interview revealed that teachers encountered difficulty in operating these resources because they are not really familiar on how it works. They added that it is good tools in enhancing student achievement since it arouses learners' interest and promotes

active participation. This support the idea cited by Lemon (2007) that interactive board, and simulators can make personal links and connections to the topic. Students can also interact and exchange information with each other using these advanced technology.

The used of application software got the lowest weighted mean of 2.20 this kind of technology oriented resources were applied by science teachers in a slight extent. Presumably, the teachers found it difficult to let students engage in every activity using these resources. As revealed by teachers in the interview, they rarely use application software because they are not familiar on how to use it. They added that there is no training related on the use of software provided. Thus, they are afraid to use such resources because they are unexperienced in using it.

3.3 Differences on the Assessments when Teachers are grouped according to Profile Variables

The differences on the assessments when respondents are grouped according to age and educational attainment is presented in Table 5.

Table 5: Differences on the Assessments when Teachers are grouped according to Profile Variables

Variable	t_c/F_c^*	p – value	Decision on H_0	Interpretation
Age	1.415*	0.258	Do not Reject	Not Significant
Educational attainment	0.416*	0.663	Do not Reject	Not Significant

$$\alpha = 0.05$$

Based on the table, the computed values of 1.415 and 0.416 with p-values 0.258 and 0.663 which are greater than 0.05 level of significance indicates that the null hypothesis is not rejected. This means that there are no significant differences on the extent of application of technology oriented resources when teachers are grouped according to profile variables. It only means the teachers age and educational attainment does not affect their extent of application of technology oriented resources. That regardless of teachers' age and educational attainment there is equal chances and opportunities of applying technology in teaching. As long as the teachers have initiative to integrate different technology resources, enhancing student's learning performance are possible.

4. Conclusions

Science teachers in Oblates schools are relatively young and bachelor's degree holders who upgrade themselves by attending district level trainings. Technology oriented resources were applied by science teachers. Groupings by profile variables did not show differences on the extent of technology application.

5. Recommendation

It was recommended that science teachers should be provided with more in-service trainings and seminars relative to teaching-learning resources for technology oriented science instruction particularly on the use of interactive board, simulations and application software.

References

- Alcantara, A. (2012). *Teaching for innovative learning*. Quezon City.
- Avila, T. (2012). *Computer-aided instruction as influenced by the teacher teaching performance*. Eugelio Amang Rodriguez Institute of Science and Technology. Unpublished Master's Thesis.
- Bico, A.A., et al. (2016), *Preparedness of Mathematics teachers in the implementation of K to 12 program in San Juan District, Division of Batangas*, Unpublished Master's Thesis, Batangas State University, Batangas City.
- Ertmer, P. and Ottenbreit-Leftwich, A. (2010). *New teacher and student roles in technology-supported classroom*, Journal of Research on Technology in Education
- Lemon, K., (2007). *Technology in classroom*. New York; McGraw-Hill Companies, Inc.
- Newby, G. (2011). *Teaching and learning in the digital environment*. Educational Technology Research and Development.
- Perez, C. M. (2011). *Proposed computer assisted lessons in Mathematics IV for secondary students in the University of Batangas*, Unpublished Master's Thesis, Batangas State University, Batangas City.
- Richman, S. D., et al., (2013). *Successful teaching*. Rowman & Littlefield Publishers, Inc.
- Rigor, D. V., (2006). *Principle of teaching 2*. LORIMAR Publishing Inc., Quzon City, Manila.
- Sagus, J. B. (2006). *The development of audio visual collection of the biblical seminaries of the Philippine library UP Diliman*, Unpublished Master's Thesis.
- Sidawi, M. M. (2007). *Technology: A catalyst for teaching and learning in the classroom*. U.S.: Pearson Education Company.
- Simon, A., (2008). *Teacher's use, self-Efficacy and attitudes toward the internet*, Unpublished Master's Thesis, University of the Philippines.
- Tobeo, M. M. C. (2016). *Integration of genyo e-learning technology in science teaching*, Unpublished Master's Thesis, Batangas State University, Batangas City.
- Trinidad, R. I., (2007). *Effectiveness of educational technology in learning*. Philippine Normal University. Unpublished Master's Thesis.