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Using Technology Tools in the Navigation Classroom

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ABSTRACT

Today's education system is faced with the challenge to bridge the gap between how students live and how they learn. This study was aimed to identify if the integration of technology tools (i.e., Electronic Chart Display and Information System or ECDIS) will increase the students' motivation and learning, and consequently, their academic performance. In this study, the pre-test and post-test non- equivalent control group quasi-experimental design was utilized. There were 139 BSMT fourth year student-participants grouped into the experimental group – those exposed to the ECDIS simulator, and the control group – those who were not exposed to the ECDIS simulator. Using pre-test and post-test, the academic performances of the two groups were compared. The study used frequency, percentile, weighted mean and independent sample t-test to analyze the academic performance of the two groups. Data shows that those exposed with the ECDIS simulators obtained a higher mean grade of 89.11 than those not exposed with the ECDIS simulator with mean grade of 84.23. Based on the findings, the researcher concludes that using technology in the navigation classroom increases the students' motivation and learning and consequently their academic performance. It is recommended that the PMMA administration may consider acquiring more up-to-date equipment that will be used during the practical sessions to enhance the academic performance of the students.

KEYWORDS

Maritime education, education technology, academic performance, quasi-experimental design, Philippines

INTRODUCTION

Today's education system is faced with the challenge to bridge the gap between how students live and how they learn. Students will spend their adult lives in a multi-tasking, technology-driven world-and the academe must guarantee that they are equipped to do so. Today's college students expect that technology will be central in their higher education. They have used technology for a variety of reasons (i.e. entertainement, academis, communication with friends and family) starting from a very early age and believe that technology enhances learning (McCabe &Meuter, 2011).

Education technology typically refers to the use of hardware, software and other digital technologies to advance learning, teaching and administration in K-12 and postsecondary education settings. The use of technology in education provides students with technology literacy, information literacy, capacity for life-long learning and other skills necessary for the 21st century workplace.

A growing body of evidence demonstrates that technology is an effective means for addressing educational needs, goals and requirements. Educators also have identified links between technology and intermediate goals that lead to high achievement, including improved student behavior, engagement and attendance; improved opportunities for educator professional development; and increased efficiency in classroom administrative tasks (Grinager, 2006).

Rideout, Foehr and Roberts (2010) states that as technology use continues to rise, especially among young people, , college and university administrators increasingly are feeling pressure to keep their institutions at the cutting edge in technology and urge faculty to utilize technology in their teaching to attract students and facilitate learning.

Honey, MicMillan- Culp, and Spielvoget(2005) revealed positive and consistent patterns when students were engaged in technology-rich environments, including significant academic gains and achievement in all subject areas, increased achievement in preschool through high school for both regular and special needs students, improved attitudes toward learning, and increased self-esteem.

Means, Blando, Olson, Middleton, Morocco, Remz, and Zorfass(1993) state that, "teachers can draw on technology applications to stimulate real-world environments for experimentation, so that students can carry out authentic tasks as real workers would, explore new terrains, meet people of different cultures, and use a variety of tools to gather information and solve problems." Technology has been called a neutral tool, which provides a variety of new ways to communicate and gain information, as well as new ways to match students learning styles (Loertscher & Achterman, 2002). Some studies suggest students who are provided technology are more motivated learners, such as in Halat's (2013) study.

Brand (1998)emphasized that there are many ways that technology can enhance teaching and learning. Examples include: more engagement, greater motivation by students, improved communication skills, assessable to students of all levels and abilities, good assessment tool, excellent research tool, better prepare students for post-secondary education and/or workplace, encourages independent learning, and fosters cooperative learning. Wardlow (2016) emphasized that Technology as a tool helps teachers create and present content and instruction that is interesting and relevant to students. When learning is relevant to students, then they become engaged, active learners. Educators report that increased intensity of student engagement occurs when technology is integrated in the classroom. Siderwicz, M. (2016) stressed that technology is exactly what teachers need to ensure the longevity of their teaching material and promote greater interest and interactivity with the students.

Young (2008) concluded that the impact of technology in schools is somewhere between the "only" way to make a positive change in schools and a new fad. Technology can be a strong tool for positive change if it is used in the right way. Andrews, R. (2003) stressed that information and communication technology had been found to produce positive effects, though often these are small and/or specific on literacy. Godzicki, L., Godzicki, N., Krofel, M., & Michaels, R. (2013)concluded that students were more motivated and engaged in learning when using technology. The technology-supported learning environment improved student motivation and engagement

Pearson (2018),Bragnon and Dowler (2016)reported that according to higher education experts, many educators are turning to technology to enhance the learning experience, deliver improved outcomes, and to manage increasing class sizes and varying learning styles. They are selecting course materials that are available in digital format, and they're using interactive tools to check students' progress and mastery on assignments

when completing course assignments. Many educators are redesigning coursework to blend online activities with classroom experiences. Walker, L., & Logan, A. (2009) found that it is becoming easier to learn in the workplace, home, classroom, community and even on the move, with access available in all these places to high quality digital resources.

The integration of technology into the curriculum and its use are major concerns in our nation's schools. In the field of maritime, the influence of technology is ever increasing as the Commission on Higher Education and even the Maritime Industry Authority mandate its use more and more each year. The Philippine Merchant Marine Academy, the educational institution where the researcher works, all 50 instructors were given the opportunity to apply for new technology tools for their classroom. They were offered open access internet and network connection, SMART Television or Liquid Crystal Display (LCD) projector, a projector that connects to a computer hard drive; and a desktop computer with a wireless keyboard, speaker and monitor. In the navigation room, an Electronic Chart Display and Information System (ECDIS) is also installed. PMMA Superintendent hoped, by offering these tools as well as training teachers to use the tools, student test scores and both teacher and student motivation would improve.

Specifically, the Navigation 6 classroom is newly installed with an Electronic Chart Display and Information System ECDIS Simulator and the researcher endeavours to prove that when teachers use technology tools in the classroom, students become more motivated to learn the material and are more involved in the lesson. The researcher is intrigued with the phenomena of how the attention spans of the students increase when a teacher uses technology tools and the effect of teachers understanding of the importance of integrating technology into their lessons and becoming accustomed to using technology tools to students' leaning and motivation and thus students using technology performs better than those who do not have the technology.

This study is important to the Navigation Professor because navigation is often said to be a very demanding class with respect to the competencies and skills that will prepare them to the seafaring profession once they complete their schooling. It is very important for teachers to understand how technology tools can improve their students' learning skills and motivation. Teachers who have an open mind are more likely to add technology tools to their curriculum and practice new skills, while those using technology tools already can reflect on their program of activities and expectations of and about using the technology.

Moreover, the students will have the greatest benefit since they will be

given the proper teaching style and activities with the use of technology tools that will increase their academic performance.

As educators, a high level of engagement should be a priority. The more students are engaged, the more they learn. Today's students grew up in the digital age. Technology in the classroom allows students to gain a deeper understanding of topics that interest them, collaborate with each other, and direct their learning.

The purpose of the study was to identify if the integration of technology tools will increase the students' motivation and learning and consequently their academic performance. Specifically, it seeks to answer the following questions:

1. What is the performance of the students in Navigation 6 in terms of:
    a) Pre-test grades
    b) Post-test grades
2. Is there a significant difference between the academic performance of students who use and do not use ECDIS Simulator in Navigation 6 in terms of:
    a) Pre-test grades
    b) Post-test grades
3. What proposed program of instruction may be utilized in lecture and practical sessions for technical subjects such as Navigation 6?

The study was limited to the navigation class 1CL midshipmen in the College of Marine Transportation during the first semester SY 2016-2017 and SY 2017-2018. The technology used in the study is the Electronic Chart Display and Information Systems (ECDIS) Simulator in Navigation 6 classroom.

METHODOLOGY

Research Design

In this study, the pre-test and post-test quasi- experimental design was utilized**.** Quasi-experimental research designs, like experimental designs, test causal hypotheses. In quasi-experimental designs, the programme or policy is viewed as an 'intervention' in which a treatment – comprising the elements of the programme/policy being evaluated – is tested for how well it achieves its objectives, as measured by a pre-specified set of indicators. A quasi-experimental design by definition lacks random assignment, howeverassignment to conditions (treatment versus no treatment or comparison) is by means of self-selection (by which participants choose treatment for themselves) or administrator selection (e.g., by officials,

teachers, policymakers and so on) or both of these routes (Angris&Pischke 2010).

In this study, participants of the quasi experiment involved the following groups: the experimental group who were exposed to the ECDIS Simulator, and the control group who were not exposed to the ECDIS Simulator, and then the performance of the two groups are compared.Each group consists of three (3) sections.

Participants

The study potentially observed six (6) navigation classes. The navigation classes consisted139 fourth-year (1CL) students. The students involved in the research come from mixed socioeconomic status, shipboard training assignments, and gender. Students also range in a wide variety of abilities. The school is on a block schedule with 3 hours laboratory and 2 hours lecture in a week for the navigation class. This sampling will yield reliable, valid results because the same teacher provides instruction for all the students in the sample population.

The research involved comparison groups of fourth year (1CL) students one class of 72 who used the ECDIS simulator and one with 67 cadets who did not have the ECDIS simulator in Navigation 6 class.The respondents of this study came from six (6) sections (3 sections per group). Group 1 the control group are sections: Jupiter, Mercury, Saturn enrolled in the SY 2016-2017 and the experimental group are Saturn Uranus, and Venus enrolled in the SY 2017-2018.

Instrumentation

An Electronic Chart Display and Information System (**ECDIS**) is a geographic information system used for nautical navigation that complies with International Maritime Organization (IMO) regulations as an alternative to paper nautical charts.

The International Maritime Organization (IMO) SOLAS V/19 1974 (as amended) Text from January 1st 2011 2.1 states that All ships irrespective of size shall have: 2.1.4 nautical charts and nautical publications to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout the voyage; an electronic chart display and information system (ECDIS) is also accepted as meeting the chart carriage requirements of this sub-paragraph. Ships to which paragraph [2.10] applies shall comply with the carriage requirements for ECDIS detailed therein Para 2.10 further identifies a requirement for ships engaged on international voyages to be fitted with an ECDIS system.

The ECDIS Simulator

Figure 1. Actual ElectronicDisplay& Information

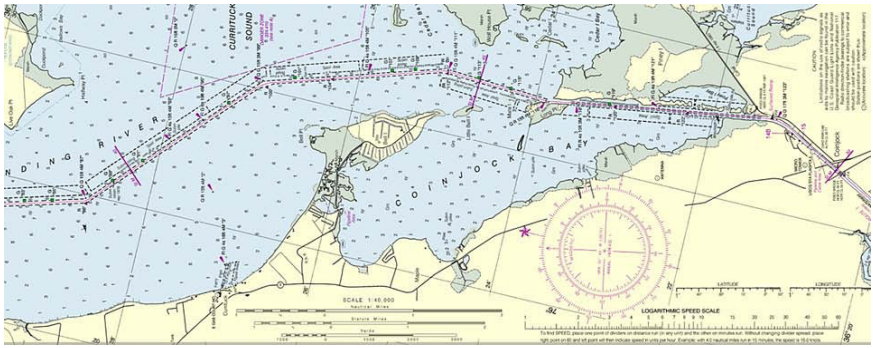
Figure 2. Raster Chart used on ECDIS

Figure 3 Feature of ECDIS simulator

Figure 4 Vector Chart used on ECDIS

Figure 5 Safety Parameters of ECDIS

On the other hand, those who were not exposed to ECDIS simulator used paper nautical charts instead (see example below):



Procedure

The experimental and controlled groups were given the same activity in Navigation 6 class. On the pre-test, both groups used the nautical charts for the activity. The instructor used the ECDIS simulator in teaching the lesson with the experimental group and with the control group he used the paper nautical charts. At the end of the lesson both groups were subjected to the post-test.

Data Collection

As a data collection tool, the study analyzed the pre-test and post-test grades inNavigation 6 submitted by the professor. The grading system is fifty percent (50%) for lecture and fifty percent (50%) for laboratory. The grades of the two groups of students were then compared if there are differences in their motivation, learning and academic performance.

Data Analysis

The data were analyzed using frequency, percentile and mean, and independent samples t-test using SPSS v. 20 in determining the difference between the performance between the groups. The grades were classified as: Excellent=92-100, Very Good=80-91, Good=68-79, Satisfactory=56-67, Pass=50-55 and Fail=0-49.

RESULTS AND DISCUSSION

Performance of Students in Navigation 6 (Operational Use of ECDIS)

Table 1. Pre-Test Performance of Respondents in Navigation 6

	Pre-test			
Numerical Value	Controlled Group		Experimental Group	
	f	%	f	%
92 – 100	1	1.49	30	41.67
80 – 91	58	86.57	27	37.50
68 – 79	8	11.94	10	13.99
56 – 67	0	0	3	4.17
50 – 55	0	0	2	2.78
0 – 49	0	0	0	0
TOTAL	67	100.00	72	100.00
Mean	83.70		84.82	

Table 1 above shows the performance of the respondents in Navigation 6 (Operational Use of ECDIS) in terms of their pre-test grades. For the controlled group (did not use simulator), it can be observed that majority of the respondents got pre-test grades of 80 – 91 (Very Good) with 58 respondents. The mean grades of the students in this group are 83.70 ± 3.14

On the other hand, the pre-test grades of those who used the simulator is slightly higher than those who did not. Most of the students in this group

got a pre-test grades of 92-100 (Excellent) with 30 respondents or 41.67%. The mean grades of the students in this group are 84.82 ± 10.92.

Table 2. Post-Test Performance of Respondents in Navigation 6

Numerical Value	Post-test			
	Controlled Group		Experimental Group	
	f	%	f	%
92 – 100	0	0	33	45.83
80 – 91	60	89.55	31	43.06
68 – 79	7	10.45	8	11.11
56 – 67	0	0	0	0
50 – 55	0	0	0	0
0 – 49	0	0	0	0
TOTAL	67	100.00	72	100.00
Mean	84.23		89.11	

Table 2 above shows the post-test performance of the respondents in Navigation 6. For the controlled group (did not use simulator), it can be observed that majority of the respondents obtained grades of 80 – 91 (Very Good) with 60 respondents or 89.55% The mean grades of the students in this group is 84.23 ± 2.75.

On the other hand, the post-test grade of those who used the simulator (experimental group) is slightly higher than those who did not. Most of the students in this group got a post-test grade of 92-100 (Excellent) 33 respondents or 45.83%. The mean grades of the students in this group is 89.11 ± 6.60.

Difference between the Performance of Controlled and Experimental Group

A. **Pre-Test Performance**

An independent sample t-test was conducted to compare the performance of the students in the pre-test. Table 3 shows that there is no significant difference in the mean for control group (M= 83.70, SD 3.14) and experimental group (M=84.92, SD 10.92), t (137) =57.092, p=.000. The result suggest that the two groups have performed on the same level in the pre-test. This implies that the two groups of students have the same navigation background or foundation.

Table 3. Significant Difference between the Pre-test Grades of Controlled and Experimental Group

			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		57.094	
	Sig.		.000	
t-test for Equality of Means	t		-.810	-.835
	df		137	83.426
	Sig. (2-tailed)		.419	.406
	Mean Difference		-1.12179	-1.12179
	Std. Error Difference		1.38494	1.34304
	95% Confidence Interval of the Difference	Lower	-3.86040	-3.79283
		Upper	1.61683	1.54926

B. **Post Test Performance**

Table 4. Significant Difference between the Post Test Grades of Controlled and Experimental Group

			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		40.047	
	Sig.		.000	
t-test for Equality of Means	t		-5.613	-5.758
	df		137	96.405
	Sig. (2-tailed)		.000	.000
	Mean Difference		-4.88083	-4.88083
	Std. Error Difference		.86950	.84762
	95% Confidence Interval of the Difference	Lower	-6.60021	-6.56324
		Upper	-3.16144	-3.19841

An independent sample t-test was conducted to compare the post- test performance of the controlled group and the experimental group. Table 4 shows that there is a significant difference in the mean for controlled

group (M= 84.23, SD 2.75) and experimental group (M=89.11. SD 6.60); t (137) = -40.047, p=.000. The results suggest that the controlled group and the experimental group have obtained significantly different performance in the post test. This implies that experimental group (those who used the ECDIS) performed significantly better than the controlled group (those who did not use the ECDIS). This implies that practical sessions using the ECDIS simulator have a positive effect to the students' performance in the subject. Thus, it may be encouraged that all of the students should undergo practical sessions using the simulator.

PROPOSED PROGRAM OF INSTRUCTION FOR NAVIGATION 6

Course Title: NAVIGATION 6(OPERATIONAL USE OF ECDIS) Credit Units: Lecture: 2 units (2 hours) Laboratory: 1 unit (3 hours)
GENERAL LEARNING OUTCOME The students shall be able to: Achieve an understanding of type-approved ECDIS in general, and proficiency specifically in the use of system in use in the profession.
Intended Learning Outcomes: Knowledge (Intellectual Competencies) 1. Understand Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats 2. Analyze the functions of ECDIS required by performance standards. 3. Identify the functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings 4. Categorize confirmation of vessel position by alternative means Values (Personal and Civic Responsibilities) 1. Assess the effect of the dangers of over-reliance of ECDIS 2. Generate innovative practices and solutions guided by maritime ethical standards 3. Reflect critically on safe navigational concerns Skills (Practical Skills) 1. Plansafe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced) 2. Demonstrate proficiency in operation, interpretation, and analysis of information obtained from ECDIS, 3. Schedule the use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements 4, Practice adjustment of settings and values to suit the route conditions using ECDIS

MAIN TOPIC	LEC	LAB	MAIN TOPIC	LEC	LAB
Purpose of ECDIS	1	3	Track limit	1	3
Value of ECDIS to navigation	1		Checking plan for safety	1	
Correct and Incorrect use of ECDIS	2	3	Additional chart information	1	3
Understanding chart data	1	3	Coastal and restricted waters (Navigation alarm and route scheduling)	1	
Chart quality and accuracy	1		Users charts in route planning	1	1.5
Chart selection, organization & information	1	3	ARPA/RADAR OVERLAY	2	3
Chart scaling	1		Ais FUNCTION	1	1.5
Information layers	2	3	Installing chart correction	2	3
System and position alarm	2	3	Archiving ECDIS data and data logging	2	3
Depth and contour alarm	1	3	Restricted waters (advanced integrated navigation with ECDIS)	2	3
Vessel's maneuvering characteristic	1		Responsibility	1	3
Route planning by chart	2	3	Effective navigation with ECDIS coastal and restricted waters	1	
TOTAL HOURS	16	24	TOTAL HOURS	16	24

CONCLUSION AND RECOMMENDATION

Students are fond of using technology. The simulator use is an effective learning material. In the traditional approach, students sit passively and wait for information and generally decreases their motivation. The alternative method of using technology provide a learning environment enriched by different senses thus, students more easily and effectively. The use of technology in the navigation classroom increased the academic performance of the students.

Since it was found out that the use of simulator has a positive effect in the students' performance, it is recommended that the PMMA craft a program of instruction for technical subjects and require its technical faculty members to include the use of simulator during their class' practical sessions. In addition, the following recommendations may be considered: allot a time for practical sessions with the use of ECDIS simulator for all technical

subject classes;PMMA administration may consider acquiring other up-to-date equipment that will be used during the practical sessions; and in line with the acquisition of latest equipment, PMMA technical faculty must be continuously given opportunities to enhance and upgrade their skills in using these equipment thru seminars, trainings, advanced studies, etc.

IMPACT OF THE STUDY

The result of the study gave a concrete justification on the procurement of a new 50 million pesos full mission bridge simulator. Moreover, technology tends to have a meaningful impact on student preparation for class, attentiveness, participation in class, and student learning. Finally, it enhanced the overall evaluation of the course and the instructor.

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