COMPUTER SYSTEMS SERVICING ANDROID-BASED SIMULATION: A STRATEGIC MOBILE LEARNING MODEL FOR STUDENTS WITH LEARNING DISABILITIES

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Abstract— The effect of technology in education today is very evident. Educators and learners are all embracing technology in their daily lives. Mobile is one of the devices or gadgets one cannot live without at present. Different instructional materials have been developed to augment the knowledge and skills of teachers and students.

This study dealt with the efficacy of an android-based simulation app in computer systems servicing. It focused on the development of an app that could be utilized to enhance the acquisition of skills of students with learning disabilities. Eighteen students with learning disabilities from selected schools in the Division of Cavite Province took part in the study. These students were assessed by the SpEd Coordinator, Guidance Counselor, and Class Adviser. These students were enrolled in Grade 9 ICT. The research questions that were used as a guide in the conduct of the study focused on: 1) the stages in the development of a system; 2) the level of acceptability of the developed system based on ISO 25010; 3) improvement in the developed system after the validation process; 4) level of performance of students before and after the simulation training; 5) the extent the simulation training affect the academic performance of students with learning disability in ICT; 6) the strategic model that can be developed to improve the academic performance of students with learning disability. Data were analyzed using a Pre-test/Post-Test questionnaire. The results were scrutinized using the T-test. The actual performance of the students after the simulation training was conducted was also evaluated. Friedman's Two-Way Analysis of Variance by Ranks for Related Samples was used to investigate the level of performance of students with learning disabilities. The study concluded that the students who were able to use the simulation app were able to get a statistically extremely significant difference in their academic performance.

Index Terms— Mobile learning, Learning model, learning disability, M-learning, Computer systems servcing, simulation, mobile app, .

1 INTRODUCTION

Several laws and policies support the learning of the learners with special educational needs (LSENs). They have all the right to learn and be given equal education. They also can acquire knowledge and skills just like regular students. However, not all learners learn the way they are expected to. Some students are considered to have special learning acquisition which requires more patience and perseverance from the teachers. These learners are referred to as Learners with Special Needs (LSENs), previously called students with special needs. LSENs are classified into different categories: Autism, Intellectual Disability, Learning Disability, Attention Deficit Hyperactive Disorder, Attention Deficit Disorder, Hearing Impairment, Visual Impairment, Emotional Disturbance, Multiple Disabilities, Cerebral Palsy, and Speech or Language Disability.

Among these types of disabilities, those students with learning disability are the most common in the classroom. Students with Learning disabilities are those who have problems in listening, reasoning, memory, attention, selecting and focusing on relevant stimuli, and the perception and processing of visual and/or auditory information. These perceptual and cognitive processing difficulties are assumed to be the underlying reason why students with learning disabilities experience one or more of the following characteristics: reading problems, deficits in written language, underachievement in math, poor social skills, attention deficits and hyperactivity, and behavioral problem [1]. These students always show a failing grade in their academic performance. Generally speaking, these students may be diagnosed with learning disabilities if there is a significant discrepancy between their academic achievement and their intellectual ability. The diagnosis of a learning disability is often made by a psychologist trained in administering and interpreting psycho-educational assessments. Psychologists use the results of their assessments to understand how individuals receive, process, integrate, retain, and communicate information. According to National Center for Learning Disability or NCLD (2014), learning disabilities arise from neurological differences in brain structure and function and affect a person's ability to receive, store, process, retrieve or communicate information. While the specific nature of these brain-based disorders is still not well understood, considerable progress has been made in mapping some of the characteristic difficulties of learning disability (LD) to specific brain regions and structures.

Learning disabilities are not a prescription for failure. With the right kinds of instruction, guidance and support, there are no limits to what individuals with LD can achieve [2]. When given the appropriate support, these students will be able to interact with other people, develop their concepts, and perform practical and life skills for everyday life and enhance their function in the society. These skills need to be developed for the SwLDs to live, work and, play in the community for them to be able to interact properly with other people. They can live fairly normal lives with their families and communi-

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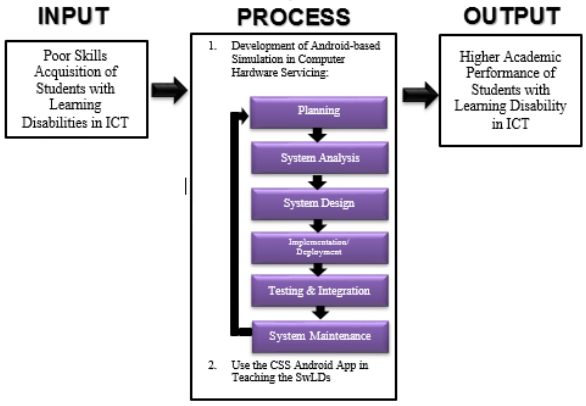
ties. With guided learning, these children can do simple but important work in the community [3]. National Center for Learning Disabilities states that students learn at their own pace with structure and support in challenging areas. Learning aligns with interests, needs and skills, and it takes place in an engaging environment where students gain a better understanding of their strengths.

To develop the skills of SwLDs, there are existing policies and current practices in transitioning students with disabilities which emphasize the importance of school/community-based work experience combined with parents' high expectations for their child's future, collaboration with various agencies outside the school system, summer employment, and attendance at a regular high school (Kennedy, 2016). Successful transitions to postsecondary settings are associated with such adult outcomes as continuing education, independent living, and employment. The Individual with Disabilities Education Act (IDEA) of 2004 requires that the education system facilitate student transition from school to adulthood by providing transition planning and services that include their employment goals. Similarly, the vocational rehabilitation system is required by the Rehabilitation Act to provide transition services that will improve the employment outcomes of eligible individuals with disabilities. In New York State, the education system provides the programmatic components and funds transition planning and related services, including providing a free education as defined in the Individualized Education Program (IEP). The Vocational and Educational Services for Individuals with Disabilities (VESID), on the other hand, provides complementary services to the education system to students leaving school to enter into the workforce, including assisting these individuals to obtain an employment outcome. Together, these two systems are responsible for providing transition services to students with disabilities while they are still in school (Muthumbi, 2008).

The researcher is currently teaching Grade 9 ICT. She is also appointed as SpEd Coordinator in the school that caters to inclusive education. In this setting, learners with special needs are mixed with regular students. This accommodation strategy being implemented by the Department of Education under the K to 12 program is very helpful to learner with special needs. During the high school level, it is very significant for learners with special needs to be given transition trainings. To provide transition training for SwLDs, different accommodation strategies can be used. These accommodation strategies are being used to build the child's strengths. One of the best accommodation strategies that the researcher will use is the use of Android-based simulation in computer hardware servicing. In this strategy, the SwLDs will be able to memorize the steps in computer systems servicing even without reading the instruction. Why android-based? Mobile Learning has been one of the current strategy being used to transfer ideas to the learners today. Several simulations in computer hardware servicing are available online. Now, that all the gadgets are android-based, the researcher thought that it would be better to use this application since most of the students are currently using android-based mobile phones. Besides, most applications today are designed in android mobile phones. Using this application, the SwLDs will be able to simulate the training program wherever the students may be.

2 Procedure

The Computer System Servicing Android-based Simulation App was based on the following framework:



This study was conducted to determine the efficacy of an android-based simulation in computer systems servicing in the acquisition of skills of students with learning disability in ICT subject. Specifically, this research answered the following questions:

1. What are the stages undertaken in the development of the computer systems servicing android-based simulation?
2. What is the level of acceptability based on the perception of selected experts based on ISO 25010 requirement, in terms of:
   a. functional suitability,
   b. usability,
   c. reliability,
   d. performance efficiency, and
   e. portability?
3. What are the improvements in the developed system after it was evaluated by the selected experts?
4. What are the SwLDs' levels of performance in Computer Systems Servicing before and after the simulations training?
5. To what extent does the simulation training affect the academic performance of the student-respondents in ICT?
6. What strategic learning model can be developed to improve the academic performance of SwLDs?

3 Results and Discussions

3.1 Stages Undertaken in the Development of the System

In developing the software application or app, the researcher utilized the waterfall model of the System Development Life Cycle (SDLC). The six phases of SDLC were carefully applied [4].

In the first phase of the cycle called system planning, the researcher first analyzed the problems that can possibly be resolved. It was found out that the poor academic performance in ICT of students with learning disabilities is the main problem that could be resolved.

In the system analysis phase, the researcher studied how to address this problem. A module in computer hardware servicing was the pattern that was used in reference to the

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potential solution to the problem. The topics contained in the module were the basis in the development of the potential software project.

In the third phase, system design, the researcher used a pen and paper to make an architecture of the project, what it will contain and how it will work. The researcher decided to divide the app into three parts: Lecture, Demonstration and Simulation. The app was validated by selected experts such as Software Engineer, SharePoint Developer, TESDA Curriculum Developer, TESDA Assessor and Trainer, ICT Supervisors and Coordinators, ICT teachers and by the SPED teacher during the pilot testing part. The comments and add-ons that the experts commented were then applied to the app.

In the system implementation and deployment, after the simulation app was designed and validated, this was implemented to the target respondents. It was shared to the students' android mobile phone.

In the system testing and integration phase, the designed app was tested and implemented to different school. Students diagnosed with learning disabilities who were considered under the experimental group were the ones who used the app. The researcher shared the app to the ICT teacher and to students who have learning disabilities.

In the system maintenance phase, the researcher made sure that the app will be able for upgrades and updates of the hardware requirements.

It is very important to be guided by the Systems development life cycle (SDLC) to make sure that a quality system software will be developed for the users [5].

3.2 Level of Acceptability Based on the Perception of Selected Experts Based on ISO: 25010 Software Development

In the validation of the app, Likert scale was used to guide the evaluators of the app. Weighted mean was used to obtain the results. The criteria was based on ISO 25010: Software Development. Selected experts were divided into two: Academicians and IT Practitioners.

Weighted Means Obtained from the Experts who Validated the Simulation App Based on ISO 25010

	IT Practitioners		Academicians	
Criteria	WM	VI	WM	VI
a. Functional Suitability	4.00	HE	4.00	HE
b. Usability	4.00	HE	4.00	HE
c. Reliability	4.00	HE	3.97	HE
d. Performance Efficiency	4.00	HE	4.00	HE
e. Portability	4.00	HE	4.00	HE
Overall	4.00	HE	3.99	HE

Legend: WM = Weighted Mean VI = Verbal Interpretation HE = Highly Evident

The table shows that IT Practitioners and Academicians agreed that the simulation app possess a highly evident criterion based on ISO 25010.

A well-engineered quality system software should possess these above-mentioned criteria to make sure that the software will be able to meet the user-requirements [5]. In this case, since it is a simulation app designed for students with learning disabilities, the researcher made sure that the app possess these qualities as functional suitability, usability, reliability, performance efficiency and portability.

3.3 Improvements in the Developed system After It was Evaluated by the Selected Experts

The researcher considered the comments and suggestions provided by the experts carefully. These comments were very helpful in the development of the app. These add-ons and comments were immediately incorporated to the app before it was implemented to training proper. It is important to meet all functional and technical requirements, logically and physically [4]. Simulation app is good for the benefit of teaching process, it also increases students' engagement, retention and academic performance, and provides virtual learning environments to real-life environment [6].

3.4 The SwLDs Levels of Performance in Computer Systems Servicing Before and After the Simulation Training

Comparison of Pre-test of the Control Group and the Experimental Group

Variable	N	$\bar{X}$	SD	$S\bar{D}$	df	t-value	P-value	LS	Decision
Control	9	5.44	2.76	1.07	16	1.348	0.1775	NS	Reject the H_a
Experimental	9	6.89		5					

Critical Vale: 3.355 Two-tailed Test

Comparison of Post-test of the Control Group and Experimental Group

Variable	N	$\bar{X}$	SD	$S\bar{D}$	df	t-value	P-value	Decision
Control	9	9.11	1.45	1.060	16	15.934	0.0001	Failed to reject the H_a
Experimental	9	26.00	3.20					

Alpha .01 Critical Vale: 3.355 Two-tailed Test

Comparison of Pre-test and Post-test of the Control Group

Variable	N	$\bar{X}$	SD	$S\bar{D}$	Df	t-value	P-value	Decision
Pretest	9	5.44	2.05	0.72	8	5.10	0.0001	Failed to reject the H_a
Post-Test	9	9.11						

Alpha .01 Critical Vale: 3.355 Two-tailed Test
Legend: N = number of respondents
$\bar{X}$ = Sample mean
t-value = size of the difference
df = degree of freedom
p-value = calculated probability
SD = standard deviation
$S\bar{D}$ = standard error of the difference
LS = level of significance

Comparison of Pre-test and Post-test of the Experimental Group

Variable	N	$\bar{X}$	SD	$S\bar{D}$	Df	t-value	P-value	Decision
Pretest	9	6.89	3.63	1.28	8	14.93	0.00	Failed to reject the H_a
Post-Test	9	26.00						

Alpha .01 Critical Vale: 3.355 Two-tailed Test

Significant t-test values were registered in the comparisons made between the pretest and post-test of the Control group (t = 5.10 and p = 0.0001), pretest and post-test of the experimental group (t = 14.93, p = 0.000), and post-test of the control group and experimental group (t = 15.934, p = 0.0001). These values were highly significant at .01, hence, the results failed to reject the declarative hypotheses.

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3.5 The Extent the Simulation Training Affect the Academic Performance of the Student-respondents in ICT

Students' performance in ICT was evaluated using the Evaluation Checklist. The subject teacher evaluated the students' performance and the scores were analyzed using mean. If the mean of the students ranges from 1.68 – 2.35, it means that students were able to perform the skill but with verbal cues. In this case, the students have to undergo an intervention program to perform the task independently.

The researcher used the Friedman's Test of Nonparametric for related samples to evaluate the performance of students with learning disabilities who were given remedial session if in case the students were not able to pass a certain task or perform a specific skill.

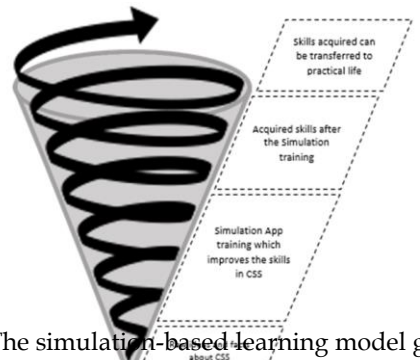
The table below shows the actual results of data obtained from the students. A two-way analysis of variance by ranks for related samples was used. This test was used since remedial classes are done when one participant fail to do a certain task or did not meet the certain score for a specific task.

Friedman's Test Analysis Results

Test Statistics		Level of Significance	Decision
Number of Cases	9		
Chi-square	53.834	.01	Failed to
Degree of freedom	7		reject Ha
P-value	.000		

The distribution of data for the control group and the experimental group are equal with 9 participants for each group. Since the p-value (0.000) is less than the significance level of 0.05, the null hypothesis is rejected. The simulation training affects the academic performance of the students in ICT. The effects of simulation techniques on students' academic performance and found that simulation technique was more effective in comparison to other teaching techniques of teaching especially the teacher-center approaches [7]. Simulation app is good for the benefit of teaching process, it also increases students' engagement, retention and academic performance, and provides virtual learning environments to real-life environment [6].

3.6 A Learning Model Developed to Improve the Academic Performance of SwLDs



The simulation-based learning model guides the users to practice the skills like a real-life training. It will develop the learners' skills and when mastery is assured, it will prevent the hardware components from being damaged. An android-based simulation app in Computer Systems Servicing is a very useful model to improve the academic performance of SwLDs. Using this model, students can acquire the skills using the latest gadgets, and since this is an app, students can memorize the skills using by using the app over and over again even when they are at home or in school. Additionally, their guardians or parents can also monitor their progress and guide them when they fail to do a certain task. Stetter and Hughes (2010) stated that computer assisted instruction provides immediate and dynamic feedback and students with learning disabilities can benefit from this non-judgmental computerized drill and practice.

This model is an example of a widely and modern used technology in today's era – the blended learning. Huang (2016) defined blended learning as a combined instructional environment where face-to-face learning and online learning are mixed within a single teaching and learning environment. Blended learning is an effective strategy in teaching today. In a study conducted by Dziuban, Graham, and Moskal (2018), they were able to conclude that blended learning is a good way for students to access their learning environments and become successful.

3 Conclusions

Based on the findings, the following conclusions were drawn:

1. The development of the Computer Systems Servicing Android-based Simulation App followed a process that involves six phases such as system planning, system analysis, system design, implementation and deployment, system testing and integration, and maintenance.
2. The acceptability in terms of functional suitability, usability, reliability, performance efficiency, and portability is Highly Effective.
3. The improvements in the system involve inclusion of 5S, Safety precautions, Occupational Safety and Health, Personal Protective equipment, SATA, and appropriate actions during mismatch.
4. Both the control group and the experimental group manifest better performance in post-test as compared to the pretest. The experimental group, however, has higher achievement in the ICT.
5. The use of Computer Systems Servicing Simulation app has a strong influence over the performance of students with learning disabilities in ICT.

REFERENCES:

[1] Heward, W.L. (2013). Characteristics of Learning Disabilities in Students. Pearson Allyn Bacon Prentice Hall.

[2] Horowitz, S.H. (2014). The State of Learning Disabilities: Facts, Trends, and Emerging Issues. A publication for National Center for Learning Disabilities. New York.

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ISSN 2229-5518

[3] The Arc (2009). Introduction to Intellectual Disabilities. http://www.thearc.org/ Retrieved on October 24, 2017.

[4] Alwan, M. (2015). What is Systems Development Life Cycle? https://airbrake.io/blog/sdlc/what-is-system-development-life-cycle , Retrieved on January 30, 2018.

[5] Sharma, U., Forlin, C., Deppeler, J., & Guang-xue, Y. (2013). Reforming teacher education for inclusion in developing countries in the Asia Pacific Region, Asian Journal of Inclusive Education, 3-16.

[6] Juan, A.A, Loch, B., Daradoumis, T., & Ventura, S. (2017). Games and Simulation in Higher Education. International Journal in Education Technology in Higher Education.

[7] Adoke, I.M. (2015). Effect of simulation games teaching strategy on academic performance of upper basic level students in civic education in kaduna state: Unpublished Master's Thesis, ABU, Zaria