

Computer Aided Tool in Science for Kindergarten Pupils

Nemia M. Galang^{*}, Eric G. Galang

Ramon Magsaysay Technological University, Philippine

Abstract The learning program for Kindergarten is implemented by way of diverse learning activities that may be enhanced with the used of technologies and as one of the responses to meet the growing need for high quality education. The use of instructional learning materials and other resources that are locally developed and available is encouraged. Teaching Kindergarten has some problems that teachers are good to be aware of. Before deciding to teach Kindergarten, know yourself if you have the ability to not only to enforce behavioral rules but also to handle the stress and disorder that accompanies pupils' behavioral problems. The main objective of the study is to evaluate the level of effectiveness of the proposed computer aided instruction entitled "Computer Aided Tool in Science for Kindergarten Education" according to the perception of the respondents. As the major step in the proposed research study computer aided instruction, the researcher used the descriptive research design and random sampling method. The statistical tools such as frequency distribution, percentage distribution and the weighted arithmetic mean were utilized in order to analyse and interpret the data gathered. T-test was also used to determine if there exist a significant difference on the level of effectiveness of the proposed system according to classification of the respondents. As to the level of effectiveness of the proposed computer aided instruction as to the teachers' respondents they rated 4.71, which is interpreted as Highly Effective in terms of the entire criterion used while according to pupils' respondents, they rated 4.81 with is interpreted as Highly Effective. The hypothesis tested between the two classifications of the respondents is -0.15, describes that there is no significant difference between the two classifications of respondents. The proposed system provides technology enhanced learning in science that leads Kindergarten pupils develop the foundation necessary for the future academic success.

Keywords CAI, Instructional Tool, Learning, Teaching Kindergarten, Science

1. Introduction

Due to the advancement of technology, the mode of teaching has changed from physical learning to virtual learning environment or known as e-learning. The e-Learning exploits interactive technologies and communication systems to improve the learning experience. It has the potential to transform the way we teach and learn across the board. It can raise standards, and widen participation in lifelong learning. It cannot replace teachers and lecturers, but alongside existing methods can enhance the quality and reach of their teaching.

According to some research studies, children who underwent Kindergarten have better completion rates than those who did not. Children who complete a standards-based Kindergarten program are better prepared, for primary education.

The learning program for Kindergarten is implemented by way of diverse learning activities that may be enhanced with the used of technologies and as one of the responses to meet growing need for high quality education. The use of

instructional learning materials and other resources that are locally developed and available is encouraged.

Teaching Kindergarten has some problems that teachers are good to be aware of. Before deciding to teach Kindergarten, determine if you have the ability to not only to enforce behavioral rules but also to handle the stress and disorder that accompanies pupils' behavioral problems. Pupils at such a young age can have difficulty paying attention for a significant period of time. One of the obstacles the teacher will have to face is that of holding pupils attention and interest to the lessons. Especially with a large class size, it may be difficult to keep everyone's focus on a specific activity all the time. This can be frustrating, but you must accept it.

As observation, today children are exposed to advanced technology at an early age, with tablets, e-readers, and mobile phones being some prevalent choices. Experiences with technology can pave the way for unprecedented learning opportunities. However, without an education component, technology cannot reach its full potential for supporting children's learning and development. In early childhood programs, the education component often means adults being nearby, interacting with children and providing opportunities for peer-to-peer learning to encourage children to gain the skills they need for succeeding in school.

^{*} Corresponding author:
miamirgalang@gmail.com (Nemia M. Galang)
Published online at <http://journal.sapub.org/computer>
Copyright © 2017 Scientific & Academic Publishing. All Rights Reserved

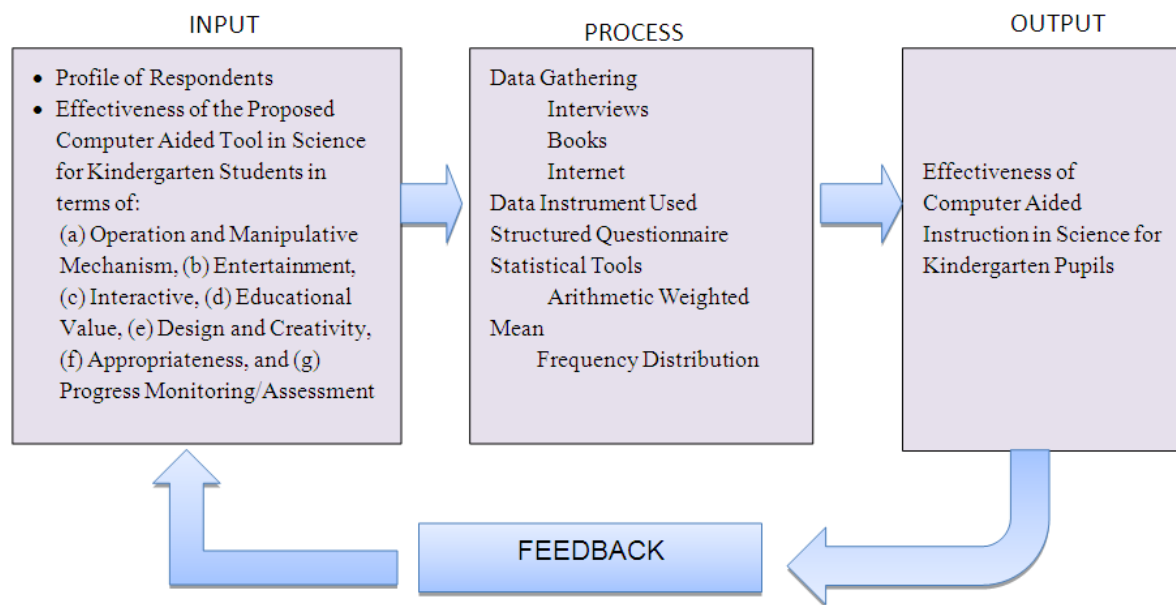


Figure 1. Conceptual Paradigm of the Study

With this problem and observation, motivates the proponents came up with the decision of conducting this study. The development of the “Computer Aided Tool in Science for Kindergarten Pupils” will provide advanced learning tool for developing skills needed to prepare Kindergarten pupils for Grade 1 and catch their attention and interest especially in Science.

The proposed application system is consisting of different kinds of lesson that will be based from the Kindergarten textbooks. The activities in this computer aided tool are based on Kindergarten instructional goals which are the essential skills that encourages creativity, reasoning and problem solving. The system also provides enjoyable and charming illustration with video clippings. The pictures used in the application are embedded with sounds that will add an extra dimension to critical thinking of pupils allowing them to make assumptions and draw conclusions about what is happening.

Conceptual Framework

This study was anchored on the vision of developing an e-learning system in subject for Kindergarten education that will enhance the pupils’ skills needed to prepare them for Grade 1 especially in science subject. A diagram that best illustrates the conceptual framework of the study is shown in Figure 1.

The input frame used for this study are the level of effectiveness of both the traditional teaching tool which and the proposed e-learning system for Kindergarten education in terms of the following criteria: (a) Operation and Manipulative Mechanism, (b) Entertainment, (c) Interactive, (d) Educational Value, (e) Design and Creativity, (f) Appropriateness, and (g) Progress Monitoring/Assessment.

The process frame deals with the process of gathering data using questionnaires and unstructured interviews. The

different statistical tools are Arithmetic Weighted Mean and Frequency Distribution.

The output frame deals with the final objective of the study which is the development of “Enhancement Tool in Science for Kindergarten Education”.

Moreover, it is also geared towards improving the traditional learning tool in such a way that the proposed e-learning system will meet the same objectives and integrity of data and information, much faster in delivering output, and reducing the time and effort necessary to accomplish the task.

Statement of the Problem

The main objective of the study is the development of the Computer Aided Tool in Science for Kindergarten Pupils. Specifically, it aims to answer the following questions:

1. What is the profile of the respondents in terms of the following:

- 1.1 Age
- 1.2 Sex
- 1.3. Classification

2. Effectiveness of the proposed computer aided instruction in terms of the following:

- 2.1 Operation and Manipulative Mechanism;
- 2.2 Entertainment;
- 2.3 Interactive;
- 2.4 Educational Value;
- 2.5 Design Creativity;
- 2.6 Appropriateness; and
- 2.7 Progress Monitoring/Assessment

3. Is there a significant difference on the level of effectiveness in the perception of the respondents on the proposed computer aided instruction according to their classification?

Null Hypotheses

There is no significant difference on the level of effectiveness in the perception of the respondents on the proposed computer aided instruction according to their classification.

Scope of the Study

The proposed “Computer Aided Tool in Science for Kindergarten Pupils” can be used to reinforce what is being taught in school or introduced new skills to a child who needs more challenging material. The introduction of each skill is presented with clear examples and an appropriate amount of practice problems that will not be tiresome for a child to complete. The exercises on the proposed system are grade appropriate and cover essential basics needed for future success in school of Kindergarten pupils. The proposed computer aided instruction covers only the learning areas under Science Kindergarten curriculum. It is intended for Kindergarten pupils with age of 5 and above.

The computer aided tool has been enhanced using different types of images and sounds which are applicable to the interest of Kindergarten pupils. It contains various lessons that could be used by the pupils to become more interested with Science subject. Moreover, the computer aided tool has quizzes where you can see if pupils have learned the lessons that have been discussed in the proposed application. Result or score can be showed and printed to determine the percentage of the pupils who passed the test.

The computer aided tool is functional to any android devices like mobile phones, tablets and even laptops. Kindergarten pupils could easily use the proposed application because of its user friendly feature.

Significance of the Study

The proposed “Computer Aided Tool in Science for Kindergarten Pupils” is significant to the following entities:

Kindergarten Pupils. Pupils will enjoy charming illustrations that lead them through the skills taught in this proposed application. They will have more advanced kind of learning experience with the use of the proposed application. The proposed application will also promote pupils’ engagement in an interactive learning tools like this, improve learners’ motivation and satisfaction. Make them become independent and allow them to learn at their own pace.

Teachers. First and Foremost, the method of teaching becomes more interactive, the proposed application can help to manage and organize course materials more effectively and efficiently. It will reduce the need for certain administrative tasks for example, making paper copies, marking tests, giving out course reminders. It helps to change the teacher’s role from “knowledge provider” to “learning facilitator” promoting self-directed learning and finally encourage the development of flexible learning materials.

Parents. It will be convenient for parents to teach their children their lessons since the proposed application is user friendly and can be installed on tablet and mobile phones.

Definition of Key Terms Used

In order to have a clear understanding of the study and its concepts, the following terms are hereby defined:

Android - a software package for smartphones, including many application programs, a smartphone that uses this software, a robot resembling a human being.

Computer aided tool. A computer based instructional material that serve a tool of a teacher in support to teaching.

Curriculum - refers to a defined and prescribed course of studies, which students must fulfill in order to pass a certain level of education.

Effectiveness - is the capability of producing a desired result. When something is deemed effective, it means it has an intended or expected outcome, or produces a deep, vivid impression.

E-Learning - learning using electronic means; the acquisition of knowledge and skills using electronic technologies such as computer, tablet, smart phone, Internet based courseware and local and wide area network.

Enhancement - to improve or increase to the strength worth or other desirable quality of knowledge and skills.

Entertainment Value - the act or art of entertaining or state of being entertained an act, production, etc., that entertains; diversion amusement.

Entities - Something that exists as a particular and discrete unit: Persons and corporations are equivalent entities under the law.

Facilitator - someone who helps a group of people understand their common objectives and assists them to plan how to achieve these objectives; in doing so, the **facilitator** remains "neutral" meaning he/she does not take a particular position in the discussion.

Interactive Value - This course will introduce you into the concept of a strategy of interactive value creation (IVC) by companies through interaction and integration of external actors, especially users.

Kindergarten - is a preschool educational approach traditionally based around playing, singing, practical activities such as drawing, and social interaction as part of the transition from home to school.

Knowledge Provider - A cross-application and cross-media technical information infrastructure within the framework of SAP Web Application Server. The modularity and openness which is at the heart of Knowledge Provider is demonstrated in its modular services and its clearly defined interfaces.

Self-devoted learning - characterized by total devotion of oneself (as to a cause).

2. Methodology

The descriptive method of research was used for this study. According to the Creswell, he stated that the descriptive method of research is to gather information about the present existing condition. The emphasis is on describing rather than

on judging or interpreting.

Descriptive research on the other hand is a type of research that is mainly concerned with describing the nature or condition and the degree in the detail of the present situation. This method is used to describe the nature of a situation, as it existed at the time of the study and to explore the cause of particular phenomenon. The aim of descriptive research is to obtain an accurate profile of the people, events or situations.

Sampling Technique

Random sampling was used, in this technique, each member of the population has an equal chance of being selected as subject. The entire process of sampling is done in a single step with each subject selected independently of the other members of the population.

Sample size

Table 1. Distribution of Respondents

Categorization	Number	%
Kindergarten Pupils	370	77.08
Parents	100	20.83
Teacher	10	2.08

The total number of respondents is 41, there are thirty seven (37) kindergarten pupils and two (2) teachers figure 2.

The respondents are those pupils and teachers from selected kindergarten schools in Iba Zambales. In order to determine whether the proposed application will be functionally effective, the a total of four hundred eighty (480) respondents have participated. To achieve pertinent information, certain inclusions on criteria were imposed. The participants qualified for sample selection were the Kindergarten pupils, Teachers, and Parents of some

elementary schools which are located in Iba, Zambales. This qualification ensured that the participants understood the nature of the proposed application. All respondents asked on the possible problems they encountered and observation while using the proposed application.

Research Instrument

Questionnaire. The main instrument used was the questionnaires. This instrument was used in this study for data-gathering. The questionnaire were divided into two main sections: the profile and the survey proper. The profile contains socio- demographic characteristics of respondents. The second part of the questionnaires were structured using the Likert format. In this survey type, five choices are provided for every question or statement. The choices represent the degree of agreement each respondent has on the given question. The Likert survey was the selected questionnaire type as this enabled the respondents to answer the survey easily. In addition, this research instrument allowed the research to carry out the quantitative approach effectively with the use of statistics for data interpretation.

Informal Interview. The proponents conducted an interview to gather information in system development. The proponents sent letter to seek permission and an interview was also conducted with the various beneficiaries of the proposed computer aided instruction namely Kindergarten Pupils, Teachers and Parents to know the background of the school, it's existing and present problems.

The proponents also consulted in the internet, books and tutorials that are conducive in developing the system. The proponents visited library to have detailed research and also read different materials that are relevant to the study being conducted.

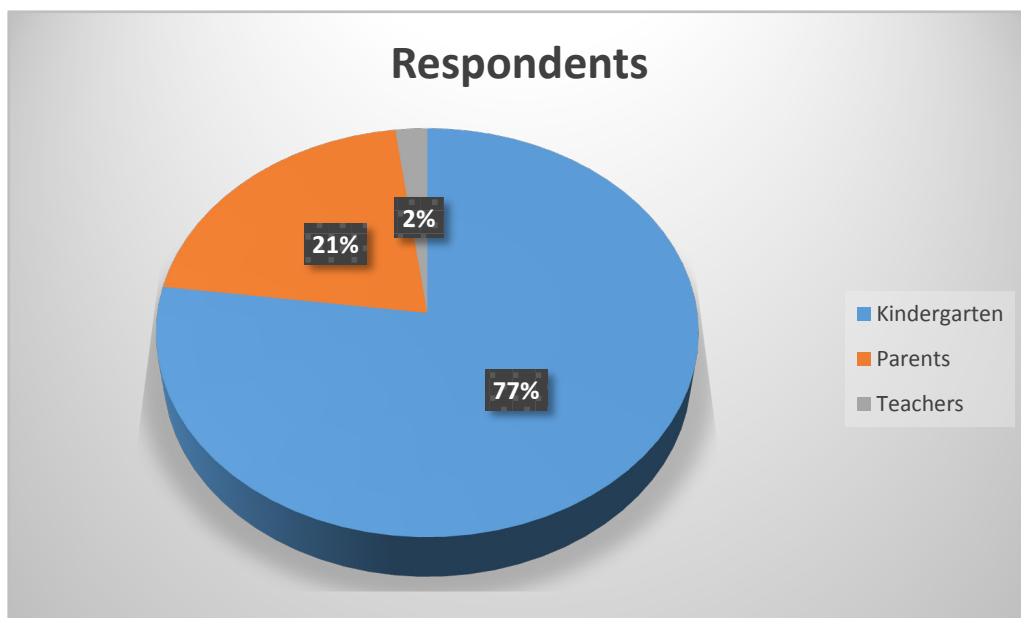


Figure 2. Graphical Representations of the Respondents

Data Gathering and Procedure

The proponents conducted a personal visit to the selected Elementary Schools in Iba, Zambales to ask permission for the proposed computer aided tool to be developed. In order to support the validity of the data, interview has been conducted to gather information. The proponents chose the best-printed materials from those gathered information that would best serve in helping out the proponent in developing the said computer aided instruction.

The survey questionnaires then were distributed to the target respondents and retrieved after they answered.

System Development Life Cycle

The computer aided instruction was developed using the waterfall method (figure 3). The waterfall model is a system development technology in which the work is divided into a number of phases and management is conducted for each phase.

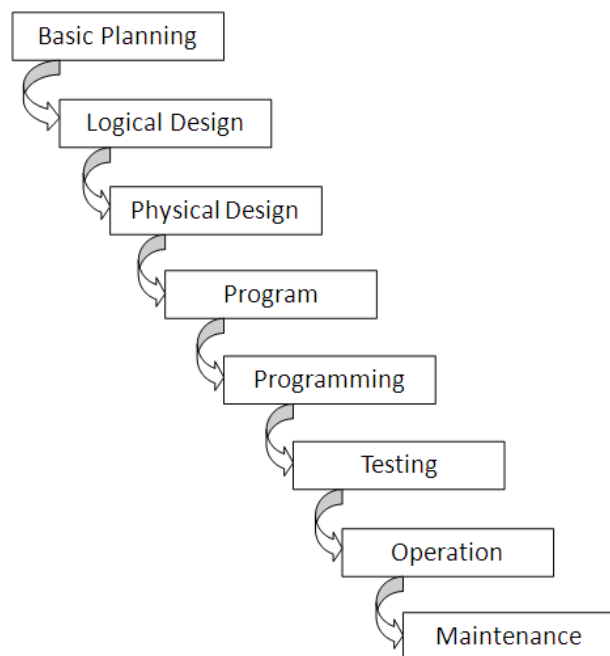


Figure 3. Waterfall Method

On the Testing phase, the proponents have reviewed the requirements, proposed changes and additions on the computer aided instruction. After reviewing, the proponents have conducted a test-run to check and debug the errors to monitor and to prove whether the errors had been corrected or not. The proponents asked thirty nine (39) respondents to test the system.

On the Operation phase, the proponents installed the system on the android phone and run it to see the effectiveness in terms of providing the Kindergarten with technology enhanced learning. The proponents used questionnaires to assess the performance of the computer aided instruction. The questionnaires were distributed to the respondents of the system. The respondents were Kindergarten pupils and teachers, There were thirty nine (39) respondents who tested and evaluated the system.

The instrument is based on the characteristics and sub-characteristics provided by ISO/IEC 9126. It is suggested only five software metrics (Highly Effective, Effective, Moderately Effective, Less Effective and Not Effective).

On the Maintenance phase, once the system is totally implemented, the proponents will check and monitor if it is highly installed and use by the Kindergarten pupils.

Requirement Analysis

After the proponents gathered all information needed, they analyzed the proposed computer aided instruction in developing new method from the traditional method of the elementary schools. The researchers' constructed new idea in developing new android based computer aided instruction from gathered data, problems that will find solution to the student's behavior and attitudes in terms of learning. The proponents reviewed well all the necessary requirements to meet the desired idea for the new proposed e-learning system to be developed.

Design

The researchers considered productive computer aided instruction for the computer aided tool of the science subject. The requirement specifications from first phase are studied in these phase and android-based computer aided instruction design is prepared. The purpose of the application design is to create a technical solution that satisfies the functional requirements for the traditional tool used in teaching in Iba Central.

Development

In this phase, the proponents developed the android-based computer aided instruction. It focuses on the subjects under the Science curriculum of K to 12 for Kindergarten Education. It can be run using android devices like tablet, mobile phone and desktop computers. The researchers identified all the problems throughout the phase and fix it.

Deployment

In this phase, the proposed android-based computer aided instruction is implemented. The proponents conducted testing of the system, explain how to use or operate. It will also include the maintenance and can be solution to the problems being encountered by the Teachers, Pupils, and Parents in teaching-learning process.

Operation and Maintenance

In this phase, the proponents maintain the android-based computer aided instruction's availability and performance in executing the work for which it was designed is maintained.

Statistical Tools

Statistics is one way of getting the information's organized. To have a general view of the whole scenario of the study, statistical tool is used. This also includes the scaling system, which was used by the proponents as a technique to monitor the respondent's interpretation of facts. The Likert scale was used to interpret items in the questionnaire. These responses were based on the

respondents. The range and interpretation of the five point scale are shown in the table 2.

Table 2. The Five-point Likert Scale

Scale	Range	Interpretation
5	4.20 – 5.0	Highly Effective (HE)
4	3.40 – 3.19	Effective (E)
3	2.60 – 3.39	Moderately Effective (ME)
2	1.80 – 2.59	Less Effective (LE)
1	1.00 – 1.79	Not Effective (NE)

Weighted mean. This was used to measure the general response of the survey samples, whether they agree to a given statement or not.

t-test. This was utilized to determine if there is a significant difference on the mean responses of the subjects to their perception on the level of effectiveness of both the existing and the proposed system in terms of accuracy, design, performance, maintainability, and security.

Degree of Freedom. This was used to derive at the tabular value of *t* at a certain level of significance at a certain degree of freedom.

Based on the analysis data, the findings were as follows:

From the analysis of data results from previous chapter, the following findings and summarize are as follows:

Profile of the Respondents. The respondents of the study were composed of the pupils, teachers and parents of the selected Kindergarten in Iba, Zambales. Majority of the respondents were the kindergarten pupils which is the target of the study.

Level of Effectiveness

1. **Operation and Manipulative Mechanism** - It has a result of 4.92 in overall rating from the criterion with the interpretation of Highly Effective, which revealed that the “Computer Aided Tool in Science in Kindergarten Education” is very much effective. Most of The respondents agreed on the easy access and easy to operate.
2. **Entertainment Value** - It has a result of 4.79 in overall rating from the criterion which is interpreted as Highly Effective, which revealed that the proposed application is capable to provide activities that capture the attention of the pupils.
3. **Interactive Value** - It has a result of 4.84 in overall rating from the criterion with the interpretation of Highly Effective to the interactive value which stated the system can boost the interest of the user because of the interactivity elements.
4. **Educational Value** - It has a result of 4.82 in overall rating from the criterion which is interpreted as Highly Effective to the educational value which revealed that the proposed application is capable to help improve and develop the learning skills of the pupils and provide more knowledge.
5. **Design Creativity** - It has a result of 4.76 in overall

rating from the criterion which is interpreted as Highly Effective which revealed that the proposed application is well designed with animation images and realistic graphics appealing to intended user.

6. **Appropriateness** - It has a result of 4.75 in overall rating from the criterion which is interpreted as Highly Effective which revealed that the proposed application is capable to provide appropriate cognitive skills/subject matter and free from bias.
7. **Progress Monitoring/Assessment** - It has a result of 4.6 in overall rating from the criterion which is interpreted as Highly Effective to which cover all the key areas, easy to use and interpret and give appropriate use of rewards.

Hypothesis

The hypothesis tested is there exist no significant difference according to the classification of the respondents. Based on the computed value of *t* at 5% of significance and 39 degree of freedom, the proponents have established that since the computed value of *t* in comparing the mean level of effectiveness of the two classifications of the respondents is less than the Tabular value of *t* at the mentioned level of significance and degrees of freedom ($t(0.5,39)=1.68$), the proposed system which has gained a higher mean than the existing can be deemed as effective between the classifications of respondent.

3. Conclusions

After the presentation, analysis, and interpretation of all data gathered, the proponents have come up with the following conclusions:

1. As to the level of effectiveness of the proposed computer aided tool, the respondents rated Highly Effective in terms of the entire criterion used.
2. The proposed computer aided tools provides technology to improve learning in science that leads Kindergarten pupils develop the foundation necessary for the future academic success.
3. The system helps to meet the goal of K To 12 program on learning development with advanced learning system.
4. Provides new opportunities to the teaching and learning process because it is a useful tool.
5. The computer aided instruction is appropriately developed for Kindergarten education.

4. Recommendations

In light of all the conclusions drawn, the proponents hereby make the following recommendations:

1. The proposed computer aided instruction should be implemented to help the teachers improve their teaching process to their pupils.
2. That continuous development of the computer aided

instruction should be undertaken to be able to adapt to the constantly improving trends in Information Technology.

3. That this computer aided instruction should not only be limited to the Kindergarten pupils but should also be introduced to other grade levels, considering as one of the support tools in learning science.

REFERENCES

- [1] Al-Hogali, M. A. (2006). The effectiveness of using the internet in the teaching of geometry and conversion courses on students "achievement at teachers" college in Madinah. Ph.D. Umm Al-Qura University, Saudi Arabia.
- [2] Al-Jasser, N. M. (2005). The effectiveness of learning based on the internet on the achievement of female students taken the basis of human nutrition course in the faculty of computer at king Saud University. MA. King Saud University, Saudi Arabia.
- [3] Al-Zahrani, A. J. (2008). Designing and implementing interactive computer software for educational technology course to measure its impact on the academic achievement of teacher college's students at Albaha zone. Ph.D. University of Umm Al-Qura, Saudi Arabia.
- [4] Al-Mubarak, A. (2004). The effects of Teaching by using virtual classrooms through the worldwide web 'Internet' on the achievement of the learners of the education technologies at the faculty of education, King Saud University. MA. King Saud University, Saudi Arabia.
- [5] Bryner, B. S. Saddawi-Konefka, D. & Gest, T. R. (2008). The impact of interactive, computerized educational modules on preclinical medical education. *Anatomical sciences education*, 1 (6), pp. 247-251.
- [6] D. R. Paudyal, (2006). E-Learning Experiences and Sustainability: A Piloting of Distance.
- [7] Ernst, H. & Colthorpe, K. (2007). The efficacy of interactive lecturing for students with diverse science backgrounds. *Advances in Physiology Education*, 31, pp.41-44.
- [8] Khan, B. (2005). Managing e-learning strategies: design, delivery, implementation and evaluation. Hershey, PA, USA: idea group Inc.
- [9] O'Leary, M. B. (2008). A case study of student learning outcomes based on the implementation of a blended course format in introductory Spanish. Ph.D. University of Alabama, Tuscaloosa, USA.
- [10] Pereira, J. et al. (2007). Effectiveness of using blended learning strategies for teaching and learning human anatomy. *Medical Education*, 41, pp. 189-195. Republic Act No., 10533, "An Act Enhancing the Philippine Basic Education System by Strengthening its Curriculum and Increasing the Number of Years for Basic Education, Appropriating Funds Therefore and for Other", <http://www.gov.ph/2013/05/15/republic-act-no-10533/>.
- [11] Reynato C. Arimbuyutan, Seoksoo Kim, Jae-gu Song, and Wooyoung So, 2007 "A Study on e-Learning for Philippines", www.sersc.org/journals/IJMUE/vol2_no4_2007/5.pdf.
- [12] Salamh, A. M. J. (2005). The effectiveness of using the internet on the achievement of Jerusalem Open University students in the use of computer in education course. *Journal of Educational and Sciences*. Bahrain, 3 (1).
- [13] Taradi, S. Taradi, M. Radic, K. & Pokrajac, N. (2005). Blending problem- based learning with web technology positively impacts student learning outcomes in acid base physiology. *Advances in Physiology Education*, 29, pp.35- 39. Towards a Unified e-Learning Strategy, DfES 200 Republic Act No., 10533, "An Act Enhancing the Philippine Basic Education System by Strengthening its Curriculum and Increasing the Number of Years for Basic Education, Appropriating Funds Therefore and for Other", <http://www.gov.ph/2013/05/15/republic-act-no-10533/>.
- [14] S. Knight, 2004, "Effective Practice with e-Learning", <http://www.jisc.ac.uk/media/documents/publications/effectivepracticelearning.pdf>.
- [15] Systems Development in Information Systems Research JAY F. NUNAMAKER, JR., MINDER CHEN, and TITUS D. M. PURDIN.
- [16] Systems Development in Information Systems Research JAY F. NUNAMAKER, JR., MINDER CHEN, and TITUS D. M. PURDIN, Towards a Unified e-Learning Strategy, DfES 200.

Online Resources

- [17] <http://iisit.org/Vol6/IISITv6p299-308Sunhaloo603.pdf>
- [18] http://www.jisc.ac.uk/uploaded_documents/Stage%20%20Learning%20Models%20%28ersion%201%29.pdf
- [19] http://etheses.dur.ac.uk/817/1/PhD_Thesis_final.pdf?DDD29+
- [20] <http://www.gov.ph/downloads/2012/01jan/KINDERGARTE N-Curriculum-Guide.pdf>
- [21] http://www.naeyc.org/yc/files/yc/file/201205/McManis_YC_0512.pdf <http://journals.upd.edu.ph/index.php/kasarinlan/article/view/1659/1587>
- [22] <http://www.gov.ph/k-12/>
- [23] <http://www.jisc.ac.uk/media/documents/publications/effectivepracticelearning.pdf>
- [24] <http://iisit.org/Vol6/IISITv6p299-308Sunhaloo603.pdf>
- [25] http://www.jisc.ac.uk/uploaded_documents/Stage%20%20Learning%20Models%20%28Version%201%29.pdf
- [26] http://etheses.dur.ac.uk/817/1/PhD_Thesis_final.pdf?DDD29+
- [27] <http://www.gov.ph/downloads/2012/01jan/KINDERGARTE N-Curriculum-Guide.pdf>
- [28] http://www.naeyc.org/yc/files/yc/file/201205/McManis_YC_0512.pdf
- [29] <http://journals.upd.edu.ph/index.php/kasarinlan/article/view/1659/1587>