

A Computer-Aided Instruction in Mathematics for Grade I Pupils Application Game on Android Devices

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ABSTRACT

Access to mobile phones has increased significantly over the recent years. Many people have access to devices on a wide basis and a large number of children play electronic games. But, the electronic games has positive and negative impacts to children. This research study were developed to provide an alternative and interactive educational game for the Grade I pupils. The title of the study is A Computer-Aided instruction in Mathematics for Grade I Pupils Application Game on Android Devices that will focus on the basic arithmetic operations in Mathematics such as addition, subtraction, multiplication and division.

The flash for android were used for animation. Sql lite for its database in order to store mathematical problems or equation and results. For programming language, the researchers used an android programming. With the development of the study, the application can only be installed to all the Android mobile phones and PC tablets.

The main objective of this research is to develop and design An Application Game on Android Devices. Specifically, sought to find the profile of the respondents, respondents perception on the level of effectiveness proposed application Respondents' perception on the level of acceptance of the proposed application in terms of the systems quality metrics used; accuracy, functionality, reliability, speed of processing and efficiency. In the context of the findings and conclusions, the researchers draw that the application must be used by Grade I Pupils as an alternative tool in learning, the continuous study and development to widen the scope and enhance the design and purpose, and inclusion of electronic manual in the mobile application should take into consideration.

Keywords

Computer Aided Instruction, Mathematics, Android-based application, Mobile Phone apps

INTRODUCTION

Over the years as technology keeps improving, more and more people are using it in their lives. It has become significant in all our lives. Now, robots assemble cars and airplanes in manufacturing plants. New high end appliances and devices are out in the market patronizing it by the people. To name a few, these are notebooks, PC tablets and smartphones that they can use and bring anywhere they want because of its portability. Software applications are also embedded in the gadgets like global positioning systems (GPS), calendar, video and music players. The software applications can easily be accessed over the internet, iTunes and Play Store and downloaded on the gadget for free of charge such as Flappy Bird, Pou, Temple Run, Facebook, Twitter, Insta Weather, Instagram, Retrica and Camera 360, etc. Electronic game is one of the most popular applications that people used to download. This is the current trends in smartphones such as Android and iPhone. Several electronic games were installed in their devices for entertainment and educational purposes.

Nowadays, access to mobile phones has increased significantly over recent years many people have access to devices on a wide basis and a large number of children play electronic games. The electronic games has positive and negative impacts to children. Concerns have been raised about the prolific use of computer games by children, much of this related to the violence they contain. For instance, many games involve children helping their character to kill, kick, stab and shoot. This may lead to increased aggressive feelings, thoughts and behaviours. In order to address the concern and minimize the negative impacts, parent should need to take certain steps. Parents should check the application if it is suitable for his children and set a limits on the length of time in playing. The researcher is directed toward this concern to develop an electronic computer aided instruction game entitled The Computer Aided Instruction in Mathematics for Grade I Pupilsrun on Android Devices. This application is an educational game focuses on the basic arithmetic

operations for Grade I pupils. The Computer Aided Instruction in Mathematics for Grade I Pupils is designed for Android devices.

CONCEPTUAL FRAMEWORK OF THE STUDY

The input frame shows the respondents' profile in terms of age and sex. It also shows the respondents' perception on

the level of effectiveness of the existing system and the proposed Computer-Aided Instruction Application Game on Android Devices in terms of the following criteria: aesthetic value, interactive value, performance, portability and usability. It also presents the respondents' perception on the level of acceptability of the proposed Computer-Aided Instruction Application Game on Android Devices in terms of the following criteria: accuracy, functionality, reliability, efficiency, user-friendliness and efficiency.

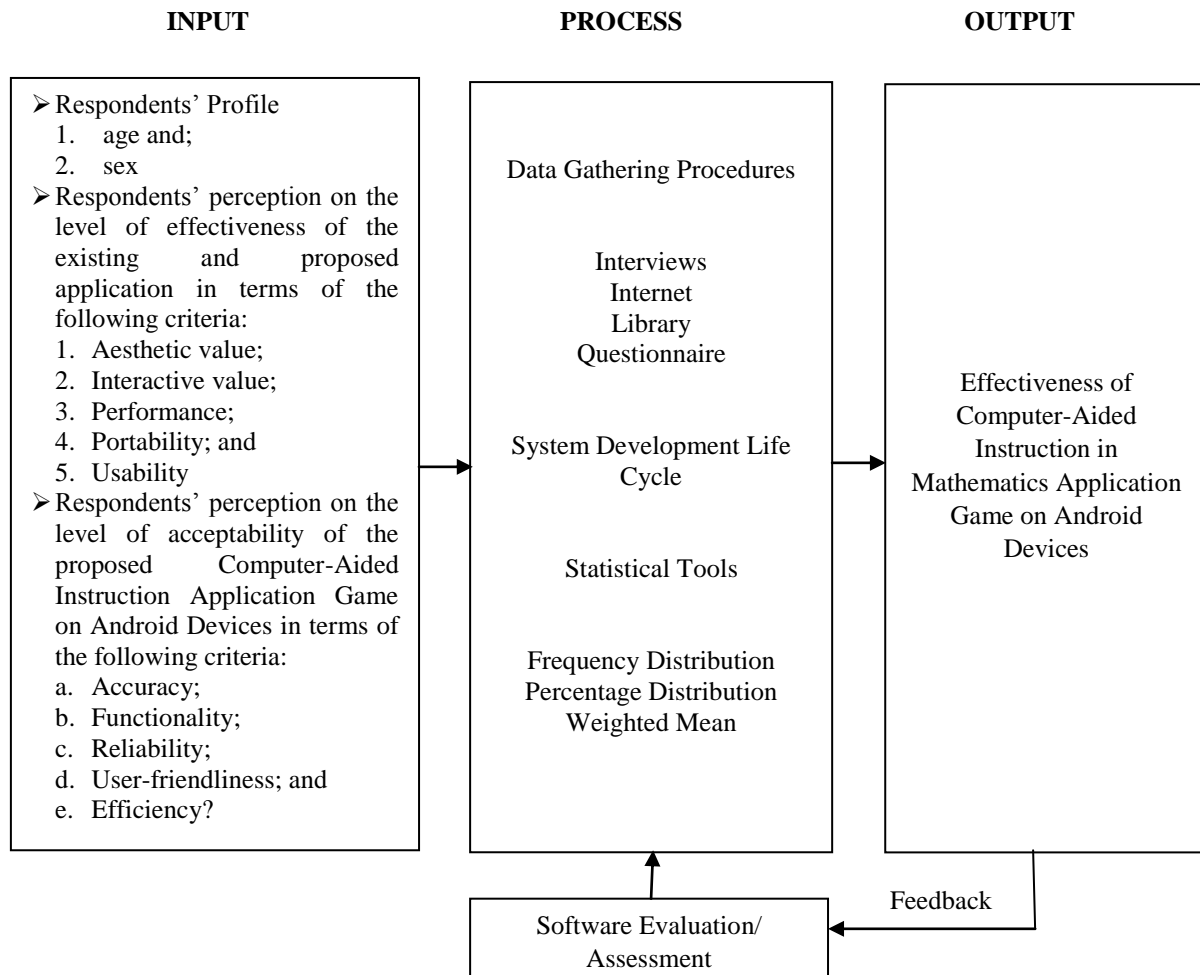


Figure 1. Research Paradigm of the Study

The process frame shows the data gathering procedures that will be used by the researchers in the development of the software such as interviews, internet, library and questionnaire. The researchers will use the system development life cycle for this study. Different statistical tools are presented such as frequency, percentage distribution and weighted mean scale.

The output frame shows the development of Computer-Aided Instruction Application Game on Android Devices which is the main objective of the study.

The feedback frame shows the software evaluation of the developed software that will be implemented by the researchers to test its effectiveness and acceptability to the respondents.

STATEMENT OF THE PROBLEM

Specifically, it seeks to find answers the following questions:

1. What is the profile of the respondents in terms of:
 - 1.1 Age; and
 - 1.2 Sex;
2. What are the respondents' perception on the level of effectiveness of the proposed Computer-Aided Instruction in Mathematics Application Game on Android Devices in terms of the following criteria:
 - 2.1 Aesthetic value;
 - 2.2 Interactive value;
 - 2.3 Performance;
 - 2.4 Portability; and
 - 2.5 Usability?
3. Respondents' perception on the level of acceptability of the proposed Computer-Aided Instruction in Mathematics Application Game on Android Devices in terms of the following criteria:
 - 3.1 Accuracy;
 - 3.2 Functionality;
 - 3.3 Reliability;
 - 3.4 User- friendliness; and
 - 3.5 Efficiency?

SCOPE AND LIMITATION OF THE STUDY

The study will be developed to provide an alternative and interactive educational game for the Grade I pupils.

The study was named as Computer-Aided Instruction in Mathematics for Grade I Pupils Application Game on Android Devices that will focus on the basic arithmetic operations in Mathematics such as addition, subtraction, multiplication and division. The gamer should register his name before the start of the game. The application has two (2) categories namely single mode and random mode. For single mode category, the gamer will answer the problem

given by completing the equation based on the selected operation. For a random category, the gamer will select the level of difficulty. The game will choose the answer that will complete the randomly generated problem based on the selected level of difficulty. At the end of the game, the top or high scorer will be recorded in the database. Time constraints also will be designed in the game. For more interactive and interesting for the gamer, an animation, graphics design and audio will be embedded in the application.

The flash for android cc will be using for animation. Sql lite for its database in order to store mathematical problems or equation and results. For programming language, the researchers will be using android programming.

With the development of the study, the application can only be installed to all the Android mobile phones and PC tablets. All other matter not mentioned were therefore not covered by this study.

SIGNIFICANCE OF THE STUDY

The researchers believe that this study is beneficial to the following:

Grade I Pupils. The pupils will be able to benefit from this study in improving their analytical skills in basic mathematics operations in the form of educational game. For he/she will have an alternative learning aid. The pupils will experience enjoyment using this developed game.

Parents. The parents could help their children to be motivated and encourage to have more interest in this subject matter. The parents will be able to have an easy way of teaching their children.

Teachers. The teacher will have a new teaching material or tool for teaching the pupils.

Future Researchers. With the development of the Computer-Aided Instruction Application Game on Android Devices could use this system in their future study to improve or enhance its features and usage.

DEFINITION OF TERMS

The following terms are defined operationally and conceptually for a better understanding of the study:

Aesthetic Value. This refers to the design of the application including the concept, text, graphics, images and animation used in the entire application.

Android. This refers to a mobile operating system based on the Linux kernel and currently developed by Google.

Database. This refers to an organized collection of data. The data are typically arranged to model aspects of reality in a way that supports processes requiring information.

Game. This refers as structured playing, usually undertaken for enjoyment and used as educational tool.

Interactive value. This refers to the degree of the application in response time, facilities needed by the user is provided and clear instructions is stated.

Computer-Aided Instruction Application Game on Android Devices. This refers to the computer aided instruction android- based game designed as educational tool in basic arithmetic operations for Grade I pupils.

Performance. This refers to the degree to generate the required reports, faster time response, speed of processing and achieve desired output.

Portability. This refers to the easiness of the application to be installed and used in the other environment like operation system.

Record. This refers to the collection of related items of data treat as a unit.

Speed of processing. This refers to the degree of processing time using the application.

Software. This refers to the instructions that tells the computer what to do.

Usability. This refers to the set of attributes that bear on the effort need for use, and on the user assessment of such use, by a stated or implied set of users.

User- friendliness. This refers to the degree of ease of using the application.

METHODOLOGY

The researchers used the descriptive research to carefully study the present condition between the nature of the procedures used and problems that exists in methods of teaching.

Table 1. Distribution of Respondents

Respondents	Frequency
Grade 1 Teachers	10
Parents	20
Grade 1 Pupils	20
No of Respondents	50

Table 1 shows respondents of the proposed study is fifty (50). These respondents are the Grade I teachers, parents and Grade I pupils.

SAMPLING TECHNIQUE

The purposive convenient sampling technique will be employed by the researchers in the research undertaking. With this kind of sampling, the researchers will choose the respondents who are available at the time questionnaire will be distributed to immediately collect a data.

RESEARCH LOCALE

The research study will be conducted in Iba, Zambales, Philippines and the identified beneficiaries and target users are the Grade I pupils.



Figure 2. Map showing the location of Iba, Zambales

RESEARCH INSTRUMENTS

The following are the various instruments to be used in the research undertaking in data gathering procedures.

Interviews. Interviews was conducted by the researchers with the Grade I Elementary Teachers to know the present procedures in their methods of teaching Basic Mathematics. With this methods, the researchers were able to gather relevant information in the research undertaking.

Internet. The researchers made use of internet in data gathering which can contribute in the development of the documentation and system. Surfing the internet is useful to the researchers in gathering review of related literature and studies, both local and foreign. Online journals was used as reference in the progress of the research.

Library. The researchers utilized the library in data gathering procedures. Magazines, journals and books was used to collect relevant information. The researchers spent time in reading in library for gathering also the review of related literature and studies, both local and foreign.

Questionnaire. The researchers constructed a questionnaire to gather the profile of the respondents and know the respondents' perception between the existing and the proposed study. Several software criteria was used by the researchers to evaluate and assess the effectiveness of the proposed system.

VALIDATION OF THE RESEARCH INSTRUMENT

Questionnaire was drafted by the researchers and was corrected. The questionnaire was refined such as omitting irrelevant questions and changed words that would be deemed difficult to the respondents.

After these validation, reproduction of copies of questionnaire was made for the distribution to their respondents.

DATA GATHERING PROCEDURES

After the careful validation, the questionnaire was distributed to the respondents personally and explained how their responses would give importance in completing the study to have he expected output.

The gathered data were tallied, tabulated, presented, analysed and interpreted based on the information that is needed to answer the stipulated problems in Chapter 1.

STATISTICAL TREATMENT

These are the statistical tools that will be employed by the researchers in data analysis and interpretation of data:

- 1. Frequency and Percentage Distribution.** These was used to determine the frequency counts and percentage distribution of the respondents' profile variables using this formula:

$$P = \frac{f}{n} \times 100\%$$

where:

P = Percentage

f = frequency

n= total number of respondents

- 2. Weighted Arithmetic Mean.** This tool were utilized to determine the weight of the individual criterion in verifying the respondents' perception on the proposed Computer-Aided Instruction Application Game on Android Devices.

$$X_w = \frac{\sum f(x)}{n}$$

where:

X_w = Weighted mean

$\sum f(x)$ = summation of the product of x and f

x = weight of each portion

f = frequency

n = total

The weights and their options are as follows:

Table 2. Statistical Assignment of Class Interval with Its Corresponding Qualitative Value

Scale	Class Interval	Qualitative Value	
		Level of Effectiveness	Level of Acceptance
5	4.20-5.00	Very Highly Effective (VHE)	Very Much Accepted (VMA)
4	3.40-4.19	Highly Effective (HE)	Much Accepted (MA)
3	2.60-3.39	Effective (E)	Accepted (A)
2	1.80-2.59	Less Effective (LE)	Less Accepted (LE)
1	1.00-1.79	Not Effective (NE)	Not Accepted (NA)

Table 2 shows the class intervals which includes the lower and upper limits per class and its corresponding qualitative

value used in interpretation of the computed weighted mean.

RESULTS

1. Respondents' profile in terms of:

1.1 Typical respondents belonged to 6-7 years old.

1.2 Most of the respondents were males.

2. Respondents' perception on the level of effectiveness of the proposed Computer-Aided Instruction Application Game on Android Devices in terms of:

2.1 Aesthetic values. Graphical user interface is applied to the system perceived as very highly effective (VHE) with a weighted mean of 4.80. Design such as background color, font, font color and audio are appropriate for the user system perceived as very highly effective (VHE) with a weighted mean of 4.38. Texts and images are readable and can be visualized, respectively perceived as very highly effective (VHE) with a weighted mean of 4.20. Appropriateness and completeness of animation perceived as highly effective (HE) with a weighted mean of 4.08.

2.2 Interactive value. System responds to the command chosen by the user perceived as very highly effective (VHE) with a weighted mean of 4.40. Set of instructions is provided in the application perceived as very highly effective (VHE) with a weighted mean of 4.33. Audio setting is provided perceived as very highly effective (VHE) with a weighted mean of 4.48. Availability of the output or results perceived as very highly effective (VHE) with a weighted mean of 4.48.

2.3 Performance. System responds to the command chosen by the user perceived as very highly effective (VHE) with a weighted mean of 4.60. Set of instructions is provided in the application user perceived as very highly effective (VHE) with a weighted mean of 4.40. Audio setting is provided perceived as effective (E) with a weighted mean of 2.85. Availability of the output or results perceived as very highly effective (VHE) with a weighted mean of 4.30.

2.4 Portability. Easy to be installed on tablets and mobile phones perceived as very highly effective (VHE) with a weighted mean of 4.90. Runs on the different Android operating system perceived as very highly effective (VHE) with a weighted mean of 4.45. Software adhere to standards or conventions relating to portability perceived as very highly effective (VHE) with a weighted mean of 4.50. Round a clock availability portability perceived as very highly effective (VHE) with a weighted mean of 4.48.

2.5 Usability. Easy to use and understand perceived as very highly effective (VHE) with a weighted mean of 4.60. User- friendly system perceived as very highly effective (VHE) with a weighted mean of 4.45. Effort required to learn perceived very highly effective (VHE) with a weighted mean of 4.35. Instructions is provided to the user learn perceived as very highly effective (VHE) with a weighted mean of 4.38

3. Respondents' perception on the level of acceptance of the proposed Computer-Aided Instruction Application Game on Android Devices in terms:

3.1 Accuracy. Text are grammatically correct perceived as very much accepted (VMA) with a weighted mean of 4.60. Lessons/ exercises are appropriate indicated and presented perceived as very much accepted (VMA) with a weighted mean of 4.35. Answers are correctly provided perceived as very much accepted (VMA) with a weighted mean of 4.38. No typographical errors perceived as very much accepted (VMA) with a weighted mean of 4.30.

3.2 Functionality. Presence and appropriateness of a set of functions for specified tasks perceived as very much accepted (VMA) with a weighted mean of 4.53. Provision of right or agreed results or effects perceived as very much accepted (VMA) with a weighted mean of 4.48. Ability to interact with specified systems perceived as very much accepted (VMA) with a weighted mean of 4.53. Adhere to application related standards or conventions or regulations in laws and similar prescriptions perceived as very much accepted (VMA) with a weighted mean of 4.30.

- 3.3 Reliability. Attributes of software that bear on the frequency of failure by faults in the software perceived as very much accepted (VMA) with a weighted mean of 4.90. Ability to maintain a specified level of performance in case of software faults or of infringement of its specified interface perceived as very much accepted (VMA) with a weighted mean of 4.40. Capability to re-establish its level of performance and recover the data directly affected in case of a failure perceived as accepted (A) with a weighted mean of 2.85. Capability of the software to recover on the time and effort needed for it perceived as very much accepted (VMA) with a weighted mean of 4.30
 - 3.4 Speed of processing. Promptness of loading and exiting of the application perceived as very much accepted (VMA) with a weighted mean of 4.90. Faster response time perceived as very much accepted (VMA) with a weighted mean of 4.28. One click access tools or menus perceived as very much accepted (VMA) with a weighted mean of 4.30. Easy and fast of producing the output perceived as very much accepted (VMA) with a weighted mean of 4.45.
 - 3.5 Efficiency. Response and processing times and on throughput rates in performances its function perceived as very much accepted (VMA) with a weighted mean of 4.60. Amount of resource used and the duration of such use in performing its function perceived as very much accepted (VMA) with a weighted mean of 4.30. Effort needed for validating the modified software perceived as very much accepted (VMA) with a weighted mean of 4.45. Risk of unexpected effect of modifications perceived as very much accepted (VMA) with a weighted mean of 4.45.
3. Respondents' perception on the level of effectiveness of the proposed Computer-Aided Instruction Application Game on Android Devices in terms of:
 - 3.1 Aesthetic value. The average weighted mean of the respondents' perception on the level effectiveness of the Computer-Aided Instruction Application Game on Android Devices in terms of usability is 4.44 with a qualitative interpretation of very highly effective (VHE).
 - 3.2 Interactive value. The average weighted mean of the respondents' perception on the level effectiveness of the Computer-Aided Instruction Application Game on Android Devices in terms of interactive value is 4.38 with a qualitative interpretation of very highly effective (VHE).
 - 3.3 Performance. The average weighted mean of the respondents' perception on the level effectiveness of the Computer-Aided Instruction Application Game on Android Devices in terms of performance is 4.04 with a qualitative interpretation of highly effective (HE).
 - 3.4 Portability. The average weighted mean of the respondents' perception on the level effectiveness of the Computer-Aided Instruction Application Game on Android Devices in terms of portability is 4.58 with a qualitative interpretation of very highly effective (VHE).
 - 3.5 Usability. The average weighted mean of the respondents' perception on the level effectiveness of the Computer-Aided Instruction Application Game on Android Devices in terms of usability is 4.44 with a qualitative interpretation of very highly effective (VHE).

CONCLUSIONS

From the aforementioned findings, the researchers concluded that:

1. Most of the respondents in terms of age ranges from 6- 7.
2. Distinctive respondents are males.

4. Respondents' perception on the level of acceptance of the proposed Computer-Aided Instruction Application Game on Android Devices in terms:
 - 4.1 Accuracy. The average weighted mean of the respondents' perception on the level of acceptance of the Computer-Aided Instruction Application Game on Android Devices in

terms of accuracy is 4.41 with a qualitative interpretation of very much accepted (VMA).

4.2 Functionality. The average weighted mean of the respondents' perception on the level of acceptance of the Computer-Aided Instruction Application Game on Android Devices in terms of functionality is 4.46 with a qualitative interpretation of very much accepted (VMA).

4.3 Reliability. The average weighted mean of the respondents' perception on the level of acceptance of the Computer-Aided Instruction Application Game on Android Devices in terms of reliability is 4.11 with a qualitative interpretation of much accepted (MA).

4.4 Speed of processing. The average weighted mean of the respondents' perception on the level of acceptance of the Computer-Aided Instruction Application Game on Android Devices in terms of speed of processing is 4.49 with a qualitative interpretation of very much accepted (VMA).

4.5 Efficiency. The average weighted mean of the respondents' perception on the level of acceptance of the Computer-Aided Instruction Application Game on Android Devices in terms of speed of efficiency is 4.49 with a qualitative interpretation of very much accepted (VMA).

RECOMMENDATIONS

In the context of the findings and conclusions, the researchers draw the following recommendations:

1. The Computer-Aided Instruction Application Game on Android Devices must be used by Grade I Pupils as an alternative tool in learning.
2. The continuous study and development to widen the scope and enhance the design and purpose.
3. Inclusion of electronic manual in the mobile application should take into consideration.
4. Acquisition of the Android devices is needed to install the mobile educational application.

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