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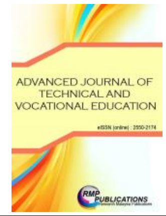

Drill and Practice Courseware in IT Fundamentals

Caren A. Pacol , Frederick Patacsil
IT Department, Pangasinan State University
Urdaneta City, Pangasinan, Philippines

Abstract: This research is based on student-centered and constructivist model of educational software. In particular, it utilizes computer-assisted instruction as a constructivist educational alternative tool in a student learning environment. The application is aimed to provide a self paced and practice learning material targeting the topics perceived difficult to learn by students by providing sufficient drills and practice exercises delivered through computer-assisted instruction. The methodology employed descriptive and developmental research design. The data gathering results revealed that students are having difficulty on topics related to types of number system and its operations while number conversion was regarded as very difficult topic as perceived by their teachers. In addition, teacher respondents suggest drill and practice and problem solving as intervention tools to help students learn number system. With that, the proponents focused the development of a drill and practice with problem solving system that will cater the needs of the students in the area of the number system with emphasis on number system operations and conversion. Ina ddition, the results clearly implied that the drill and practice courseware created and its content is very valuable to the intended audience. The developed courseware will be utilized in IT Fundamentals classes to determine its difference from the traditional method of intervention. In future work, the proponents plan to determine the effectiveness of the proposed drill and practice courseware.

Key words: *courseware; IT fundamentals; drill and practice; constructivist model*

INTRODUCTION

Background of the Study

The primary benefit of Information Technology (IT) is that it empowers people to do what they want to do. It lets people be creative and productive and it lets people learn things they didn't think they could learn before, translating many possibilities as reality. Furthermore, technology is one of the key tools for the modernization of this era that made life better and human works easier, and one key to implement technology is through automation. Nowadays, different educational organizations and institutions desire IT technology as one instrument of learning and a tool for improving their educational instructional delivery. Today, instructional multimedia developer gives more emphasis on developing improved and effective multimedia learning systems, but this learning system should provide more advanced and interactive multimedia environments. In addition, it should also include applications that enable teachers to make technical courses more attractive and effective for students. At this point, it is important to use more effective methods and techniques to present technical problems or complex course as simple as possible. To this end, interactive animations are widely used in today's e-learning systems [1]. There have been several attempts to create taxonomies for the use of IT in academic institutions. In the past years, there were enormous research efforts to create, design and develop different types of e-learning systems [2]. Other researchers described potential roles of e-learning it may be as a tutor, tool, or tutee. In this categorization, the student can be tutored by the computer, the student can use the computer as a tool, or the student can tutor the computer through languages or commands. More recently, categories of computer-based learning in mathematics, including drills, tutorials, games, simulations, hypermedia, and tools (open-ended learning environments) [3]. Students and faculty members involved in the design and development of elearning material to increase effectiveness and acceptability the developed

Corresponding Author: Frederick Patacsil, IT Department, Pangasinan State University, Urdaneta City, Pangasinan, Philippines, Email : Frederick_patacsil@yahoo.co.uk

application [4]. The learning materials were developed to cater the needs of different types of learners in a student-centered environment employing educational materials that were displayed in various formats which enable students to interact with the materials being presented as needed in their own time. Educators and researchers are thinking of different approach and techniques that will enhance teaching difficult subjects and they thought to include the "drill and practice". Drill and practice is a method learning which involves repetition of specific skills and review of previously learned concepts. Furthermore, it promotes the acquisition of knowledge or skill through repetitive practice. However, the skills built through drill-and-practice should become the building blocks for more meaningful learning. Information Technology (IT) Fundamentals is a required course for freshman students under the Bachelor of Science Information Technology (BSIT) program. While the subject is a basic for freshman IT students, it is the foundation of future programming courses since it tackles the principle and operations of number systems. Naturally, some students that come with basic knowledge of mathematics have the difficulty of studying the basic concept of number systems. Intervention is very important at this point and drill and practice can serve a very important role in bringing the learner to a level that the learner can more readily perform higher level complex skill. Objectives of the Study The main objective of the study was to design and develop a Drill and Practice System in IT Fundamentals. Specifically, this study aimed to accomplish the following: 1.To determine the topics that will be included in the Drill and Practice System in Information Technology Fundamentals. 2.To determine the validity and acceptability of the Developed Drill and Practice System in Information Technology Fundamentals.

REVIEW OF RELATED LITERATURE AND STUDIES

Student / Learner Centered and Constructivist Model of Educational Software Learner centered is the perspective which focuses on the learners' experiences, perspectives, backgrounds, talents, interests, capacities, and needs. It creates a learning environment conducive to learning and promotes the highest levels of motivation, learning, and achievement for all learners [5]. Further, a study reports that in student centered learning environment, students play a significant role in designing their own curriculum. In this learning environment, learning is regarded as a meaning making process as learners bring their knowledge, experiences and world view to learning [6]. In a student-centered environment, constructivist model of educational software is an appropriate tool because it pays less attention to instruction and more on the active role of learners in the learning process [7]. In many aspects, computer aided instruction (CAI) is a constructivist educational alternative tool in a student learning environment because it allows teachers of different educational viewpoints to bring creative improvements in teaching and learning. The CAI constructionist educational software focuses more on the learning experiences and the kind of communicative interaction between learners and their tool.

Computer-Assisted Instruction

Instruction assisted by computer offers the potential of better attention to individual student needs than can be met in the typical classroom. Individualized instruction, modelled after the idea of a private tutor, allows a student to proceed at his own pace, to explore his interests, and to receive personal, detailed evaluation and direction [8]. Hence, Computer Assisted-Instruction (CAI) may facilitate such individualized instruction in a more effective, faster, and less costly manner than traditional teaching. CAI is composed of five elements based principle of education theory as follows: tutorial, drill and practice, simulation, an instructional game, and test [9]. CAI is accessible for learning use by students in almost all subjects to practice and enhance the knowledge they have learned. The basic of CAI is a drill and practice which is utilized after the teacher explains the topics and after students learn the basic concept that is being introduced. It is a combination of a tutor in the format of the test and retest. In addition, the content will focus on knowledge and exercises so that the media is being used with other activities, such as normal teaching, remedial and enrichment instruction, etc [10]. What has traditionally been identified as fundamental units of knowledge and skill can often be broken down into still smaller units. It is in learning these "sub-skills" that a drill and practice approach seems to fit best. Cognitive learning suggests that the role of drill and practice in learning may be more important than has previously been realized [11]. In a research entitled "Effects of computerbased teaching on secondary school students" published in the Journal of Education Psychology, the research used quantitative techniques, or metaanalysis, to integrate findings from 51 independent evaluations of computer-based teaching in Grades 6– 12 [12]. The analysis showed that computer-based teaching raised students' scores on final examinations by approximately 32 standard deviation, or from the 50th to the 63rd percentile. Computer-based instruction also had smaller, positive effects on scores on follow-up examinations given to students several months after the completion of instruction. In addition, students who were taught on computers developed positive attitudes toward the computer and toward the courses they were taking. The computer reduced substantially the amount of time that students needed for learning. Same results came out in a study entitled “The Efficacy of Computer Assisted Instruction (CAI): A Meta-Analysis” by Claire M. Fletcher-Flinn and Breon Gravatt, published in 1995 in the Journal of Educational Computing Research, the mean effect size for CAI was 0.24 for the years 1987–1992, with more recent studies showing an average of 0.33. Although moderate, these estimates tended to raise the average student from at least the 50th and 60th percentile. However, studies which controlled for teacher and materials, and were of longer duration, and studies using pencil and paper equivalents of CAI showed no learning advantage over traditional forms of instruction. It is suggested that what accounts for the typical learning advantage of CAI in this meta-analysis and others is the better quality instruction provided by CAI materials. The correctness of the findings was furthered in a research entitled “A Meta-analysis of the Effectiveness of Computer-Assisted Instruction in Science Education” published in the Journal of Research on Technology in Education (2001), the study investigated how effective CAI on student achievement in secondary and college science education when compared to traditional instruction. It was found that an overall effect size of 0.273 was calculated from 42 studies yielding 108 effect sizes, suggesting that a typical student moved from the 50th percentile to the 62nd percentile in science when CAI was used. The results of the study also indicated that some study characteristics such as student-to-computer ratio, CAI mode, and duration of treatment were significantly related to the effectiveness of CAI [13]. The common findings in the researches cited above show that CAI has significant effect in the academic performance of students.

Tutoring System Tutoring

systems need to model the process of problem solving. Problem solving may be modeled as the act of applying a general model to form a situation-specific model [8]. A situation-specific model is a description of any situation in the world, generally an explanation of how a situation came about or a plan for action. Problem solving involves relating a general model to the current situation by applying an inference procedure. In programming, the situation-specific model is the constructed program, as well as unwritten descriptions of the underlying design, relating the code to the goals the program is supposed to satisfy. Tutorials are programs that, in general, engage in the first two phases of instruction [9].

They take the role of the instructor by presenting information and guiding the learner in initial acquisition. They are appropriate for presenting factual information, for learning rules and principles, or for learning problem solving strategies. It begins with an introductory section that informs the student of the purpose and nature of the lesson. After that, a cycle begins. Information is presented and elaborated. A question is asked that the student must answer. The program judges the response to assess student comprehension, and the student is given feedback to improve comprehension and future performance. At the end of each iteration, the program makes a sequencing decision to determine what information should be treated during the next iteration. The cycle continues until the lesson is terminated by either the student or the program [9].

Drills and Practice

Drill-and-practice software provides exercises in which students work example items, usually one at a time, and receive feedback on their correctness. Programs vary considerably in the kind of feedback they provide in response to student input. Drill and practice remain focused on directed strategies that grew out of these theories, delivering information to help students acquire and retain information and skills. However, some software functions can be used in either directed or constructivist ways, depending on how they are designed. Furthermore, drill-and-practice programs may be used whenever teachers feel the need for on-paper exercises such as worksheets [14]. In the case of a computerized drill and practice used primarily for the third aspect of the instructional process, practicing. They are applicable to all types of learning, assuming that initial presentation and guidance have already occurred.

The procedure is almost the same of the tutorials. The difference is that there is a selection of the item instead of the presentation of the information on the second step. Judgment and feedback are related to the item and its related behaviors. Drills may be applied to simple pairedassociate learning, to simple problem solving, such as arithmetic facts, and to complex problem solving, such as problems in the physical and social sciences. However, the use of IT-based based drills can be made more interesting through multimedia, the use of graphics, notifying the learner's progress, and variety of instructional delivery. Furthermore, the use of interactive graphics can increase the motivation factors in ways not possible with workbooks or flashcards [9]. Effect of Drill and Practice Exercises Several factors determine the effectiveness of practice drills [15]. First, the selection of the practice items is critical. There is no value to practicing already mastered items, and items that are too difficult will lead to frustration rather than learning. Certain characteristics of feedback are also critical. Another is the immediate feedback which is much more valuable than delayed feedback, since it enables students to catch their errors and learn the correct response while they are still actively involved in the drill. Immediate feedback also helps keep students' attention on their work. Also important is whether the feedback helps students understand and correct their errors. Feedback that explains why the responses are incorrect leads to much more effective learning than the feedback which simply tells students whether their answers are correct or incorrect. Several studies conducted on effects of computerized drill and practice as an instructional intervention. The results suggest that instructional games and computerized drill and practice are promising for the classroom [16-18]. Furthermore, performance in mathematics improved and motivation was slightly higher in the computerized drill and practice condition as compared with traditional drill and practice method. Learning activities labeled as "drill and practice" are often looked down upon because they only address low-level skills or knowledge. However, a study points out that "recent research on cognitive learning suggests that the role of drill and practice in learning may be more important than has previously been realized" (p.23) [19].

METHODOLOGY

Research Design The proponents utilized the descriptive and developmental research design. Descriptive was employed to define the needed requirements as an input information while developmental researchwas utilized in the actual design, development and evaluation of the proposed Drill and Practice in IT fundamentals. The Development Process The development process of the proposed drill and practice is composed of three (3) major phases, which are the following:

1. Need Analysis.

This phase determines the needed topics that will be included in the proposed drill and practice courseware. A survey was conducted to analyze the opinions of faculty members in IT Fundamentals on which topics should be included and how to deliver exercises in the said topics. The answers from the survey provided the needed topics that were included in the proposed drill and practice application. Further, the survey also gave information to the proponents about their nature of the exercises based on the theory of learning and teaching.In completing the needs analysis tool, respondents were required to choose responses either1 – Very difficult, 2 – Difficult, 3 – Neutral, 4 – Easy, 5 – Very easy and identify the intervention tools if there is a need.

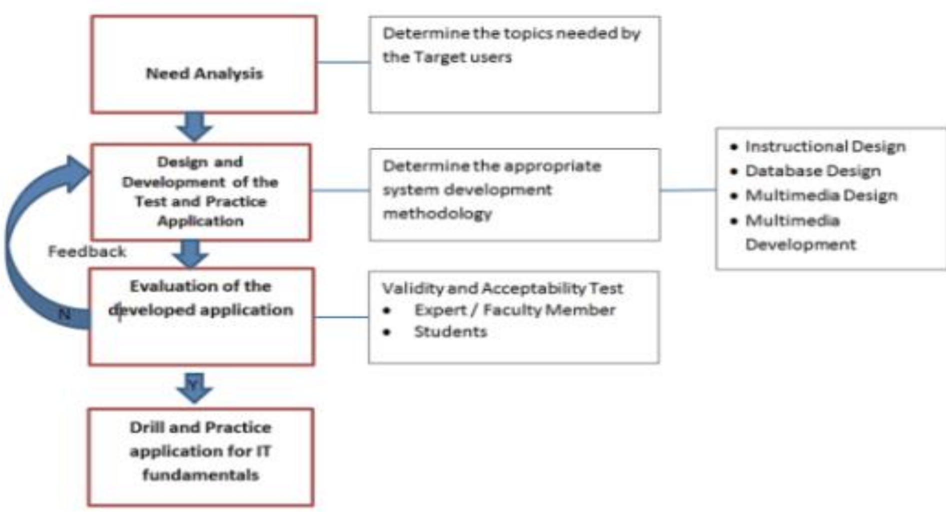

Figure 3. The Development Process of the Proposed Drill and Practice Courseware

2. Design and development of the proposed drill and practice application.

Instructional design.

This phase focused on proper selection of appropriate methods and toolsfor determining the content, interface, and instructional design of the drill and practice courseware. The formative evaluation was adopted which contained two principal facets. The first consisted of students reviewing prototype activities and offering feedback which would be included in our design. The second phase came as expert reviews from experienced faculty members who taught this subject for many years, suggested the needed intervention to facilitate understanding the difficult topics in IT Fundamentals.

Database Design. For this phase, the database design was created based on the inputs coming from the students and faculty members. Further, the database design was normalized to maximize the performance of the proposed application. The DBMS used in this is study is MySQL, an open source software that manages databases.

Multimedia Design and Development. This is another phase under design and development stage, which focuses on the selection of multimedia design and the tools that were used to develop the proposed application. The proponent utilized Authorware as actual development and open source image editor for the graphics. However, Authorware was the main tool for the animations and multimedia organization of the content of the developed application.

Validity and Acceptability

Validity Phase. The subject was divided into several topics according to the needs analysis.

In this phase, the students used an assessment checklist and the result defined the validity of the developed drill and practice courseware in terms of appearance, attractiveness, capability, appropriateness, adaptability, sequence presentation and feedback mechanism. In completing the questionnaire, student participants were required to choose either strongly agree with the questions provided, or agree, or disagree, or strongly disagree.

Acceptance Phase*:* After the experts and faculty members had validated the content of the modules, the proposed drill and practice courseware was presented to the former students of IT Fundamentals course to test its acceptability. Respondents' assessment focused on content like the objectiveness of the system, design, appropriateness of questions and assessment, information content and presentation of information. In completing the assessment tool, respondents were required to choose either strongly agree with the questions provided, or agree, or disagree, or strongly disagree.

Output Phase: After undergoing design, development, validation and acceptance phases, the final output of this study is a tutorial-based drill and practice courseware. The proposed courseware can be used by the students to support them in learning of difficult topics in IT Fundamentals course. Figures showing the interfaces of the developed drill and practice courseware are shown below.

Selection of the respondents

The population for this research study is composed of (a)faculty members teaching IT fundamentals who provided the topics included in the courseware, (b)content validators and (c) students who tested the acceptability of the developed courseware. The first respondents are faculty members teaching IT fundamentals and they will provide topics that will be included in the courseware. The selection is based on what topics their students find to be difficult and hard to understand. Further, they suggested interventions like tutoring, drill and practice and additional lecture to improve learning. The second group of respondents is the content validator. These are faculty members who taught this subject for more than 5 years. The proponents developed the courseware using their recommendations and observations. They are the one who validated the content of the developed courseware. The last respondents are IT students who enrolled and passed the said subject.

Statistical Treatment

The following statistical analysis were employed.

Needs Analysis

To be able to capture the topics that were included in the proposed drill and practice, the difficulty of the topics was the bases of the needs analysis. The table below shows the description and the mean range.

Proposed Interventions

The following interventions were proposed to help students to tackle difficult topics in IT Fundamentals. The frequency of the selected interventions by the respondents were proposed to be the main focus of the development of CAI that will help students in learning topics in the said subject.

The following codes and descriptions were adopted:

D-P - Drill and Practice
S - Simulation
P-S - Problem Solving
N - None

Validity and Acceptability

Description	Range
Strongly Disagree (SD)	1.0 – 1.80
Disagree (D)	1.81 – 2.60
Not Agree (NA)	2.61 – 3.40
Agree (A)	3.41 – 4.20
Strongly Agree(SA)	4.21 – 5.00

To determine the topics included in the courseware, weighted mean (WM) was utilized to give equal importance to all topics.

On the case of needs analysis, the selection of topics was based on the level of difficulty of the topics. If the topics were found out to be difficult hen topics were included in the proposed drill and practice module.

In the validity and acceptability level, mean average is also utilized to determine the level of validity and acceptability of the developed courseware. Respondents agree or disagree with the design, suitability, practicality, accuracy and appropriateness of the courseware. Furthermore, same statistical tool was used to define the acceptability of the courseware

Description	Range
Very difficult	1.0 – 1.80
Difficult	1.81 – 2.60
Neutral	2.61 – 3.40
Easy	3.41 – 4.20
Very easy	4.21 – 5.00

in terms of design, performance, maintainability and security.

The proposed drill and practice courseware

After undergoing needs, design, development, validation and acceptance phases, the final output of this study will be utilized by the IT fundamental IT students of PSU-Urdaneta City Campus. The developed courseware can be used by the faculty members and students as interventions in the process of teaching and learning of number systems under IT Fundamentals course then topics were included in the proposed drill and practice module.

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The proposed drill and practice courseware

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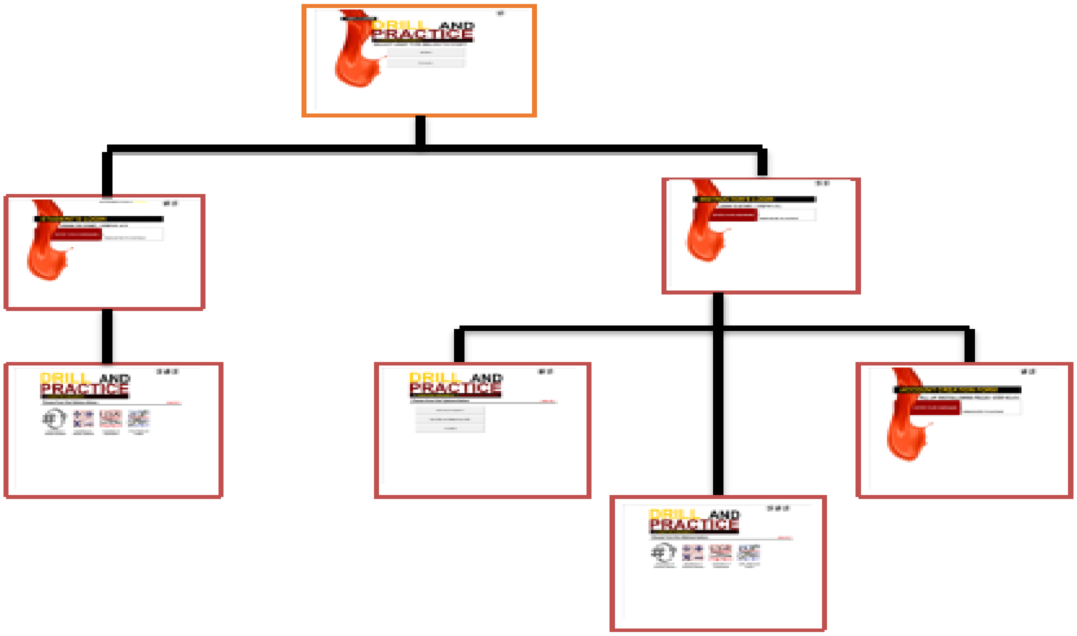

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Figure 4. System Menu of the Drill and Practice Proposed System

The user clicks the start button to enable the log-in tab where he would be asked to enter his username and password. Once the log-in is successful, the user on their learning pace as well as their preferred learning styles. The following Figures show the interfaces that will be used by faculty members. can already use the system.

Faculty members manage the developed system in terms of account creation, adding problems/exercises, and trying the sample problems/exercises that were included. In the case of the students, they can practice to solve problems in number system based

RESULTS AND DISCUSSIONS

The data were collected and analyzed to determine whether the developed system is accepted in terms of content validity and acceptability. The table 1 shown the topics under information technology fundamentals and it also reveals the topics that students have difficulty in learning as perceived by IT fundamentals teachers. Overall, the topics in IT fundamental found to be very easy except in the topic number system. This topic obtained a weighted mean of 2.64 and considered to be neutral. In addition, Types of Number System and its operations with a WM of 1.71 and Conversions from One Base to Another also obtained a WM of 1.0.These results revealed that students are having difficulty with the type of the number system and its operation and students considered conversion of the number system as a very difficult topic as perceived by their teachers.

This indicates that students under IT fundamentals are having a hard time dealing with the number system.

In addition, respondents suggest drill and practice and problem solving as intervention tools to help students learn number system. With that the proponent focused the development of a drill and practice with problem solving system that will cater the needs of the students in the area of the number system with emphasis on number system operations and conversion.

TABLE 1: Topics to be included in the proposed Drill and Practice courseware

TOPICS	5	4	3	2	1	AWM	Intervention			
							D & P	S	P-S	N
A. Computer Basics										
1. Introduction of Computers	7	0	0	0	0	5.00	0	0	0	7
2. Characteristics of a Computer	7	0	0	0	0	5.00	0	0	0	7
3. History of Computers	7	0	0	0	0	5.00	0	0	0	7
4. Generations of Computer	7	0	0	0	0	5.00	0	0	0	7
5. Classification of Computers	7	0	0	0	0	5.00	0	0	0	7
6. Applications of Computers	7	0	0	0	0	5.00	0	0	0	7
7. Basic Components of PC	7	0	0	0	0	5.00	0	0	0	7
8. Computer Architecture	5	2	0	0	0	4.71	5	2	0	0
Total AWM						**4.96**				
B. Hardware										
9. Definition of Hardware	7	0	0	0	0	5.00	0	0	0	7
10. Input Devices	7	0	0	0	0	5.00	0	0	0	7
11. Output Devices	7	0	0	0	0	5.00	0	0	0	7
12. Storage Devices	7	0	0	0	0	5.00	0	0	0	7
Total AWM						**5.00**				
C. Software										
13. Definitions of Software	7	0	0	0	0	5.00	0	0	0	7
14. Types of Software	7	0	0	0	0	5.00	0	0	0	7
Total AWM						**5.00**				
D. Number System										
15. Introduction to Number System	5	0	2	0	0	4.43	4	0	3	0
16. Classification of Number System	0	4	2	1	0	3.43	5	0	2	0
17. Types of Number System and operations	0	0	0	5	2	1.71	6	0	1	0
18. Conversions from One Base to Another	0	0	0	0	7	1.00	6	0	1	0
Total AWM						**2.64**				
E. MS Word										
19. Introduction to MSWord	7	0	0	0	0	5.00	0	0	0	7
20. Customizing the Word Application	7	0	0	0	0	5.00	0	0	0	7
21. Basic Formatting in MS Word	7	0	0	0	0	5.00	0	0	0	7
22. Advanced Formatting	5	1	1	0	0	4.57	2	5	0	0
Total AWM						**4.89**				
F. MS PowerPoint										
23. Introduction to MS PowerPoint	7	0	0	0	0	5.00	0	0	0	7
24. Creating a Presentation	7	0	0	0	0	5.00	0	0	0	7
25. Basic Formatting in PowerPoint	7	0	0	0	0	5.00	0	0	0	7
26. Advanced Formatting	4	1	1	1	0	4.14	0	4	0	3
27. Using Templates	5	2	0	0	0	4.71	0	3	0	4
28. Inserting charts	5	1	1	0	0	4.57	0	4	0	3
29. Inserting tables	6	1	0	0	0	4.86	0	2	0	5
Total AWM						**4.75**				

Legend :

Description	Range	Intervention
1 – Very difficult	1.00 – 1.80	D-P – Drill and Practice
2 – Difficult	1.81 – 2.60	S - Simulation
3 – Neutral	2.61 – 3.40	P-S - Problem Solving
4 – Easy	3.41 – 4.20	N - None
5 – Very easy	4.21 – 5.00	

Table 2. Validity of the drills and practices in Fundamental of Computer courseware

Acceptability Criteria		5	4	3	2	1	WM	Interpretation
DESIGN	1. The design of the system is appealing to the eye of the user	6	8	4	1	1	3.85	A
	2. The graphics used in the system is attractive	6	10	4	0	0	4.1	A
AWM							**3.98**	**A**
PERFORMANCE	1. The system has the capability to view the quiz results of the user	10	6	4	0	0	4.30	SA
	2. The system to inform the user about the lessons to be reviewed	7	10	3	0	0	4.2	A
	3. The system has the capability to display questions or items properly	12	6	2	0	0	4.5	SA
AWM							**4.33**	**SA**
MAINTAINABILITY	1. The system can easily correct the faults	8	10	2	0	0	4.3	SA
	2. The system can adapt to the system environment	9	9	2	0	0	4.35	SA
AWM							**4.33**	**SA**
SECURITY	3. The system can be edited only by the server	13	6	1	0	0	4.60	SA
AWM							**4.60**	**SA**
Total AWM							**4.31**	**SA**

Legend : Description	Range
5–Strongly Agree(SA)	4.21 - 5.00
4–Agree (A)	3.41 - 4.20
3– Neither Agree or Disagree (NAD)	2.61 - 3.40
2– Disagree (D)	1.81 - 2.60
1 – Strongly Disagree (SD)	1.00 - 1.80

TABLE 3: Content Acceptability on the Drills and Practices in Fundamentals of Computer

Validity Criteria	5	4	3	2	1	WM	Interpretation
1. Representativeness of the objectives of the system.	10	18	1	0	1	4.20	A
2. Design supports the system's purpose and target audience	7	20	2	1	0	4.10	A
3. Suitability of the question items to the lessons in number system of computer among the students	12	16	1	0	1	4.27	SA
4. Practicality of the question items used	11	16	1	1	1	4.17	A
5. System of assessment appropriate and designed to guide teachers' instructional methods of learning	9	20	0	0	1	4.20	A
6. Information valuable to the intended audience	11	19	0	0	0	4.37	SA
7. Information is accurate and up- to- date	11	16	3	0	0	4.27	SA
8. Contents are organized by related information	9	17	4	0	0	4.17	A
9. The system provides information related to a specific topic	7	22	1	0	0	4.20	A
10. The text used in the items are well- written	11	16	3	0	0	4.27	SA
11. Text used are clear and as concise as possible	10	19	1	0	0	4.30	SA
12. Text is free from spelling errors	7	20	3	0	0	4.13	A
13. Sentences grasp the rules of sentence structure, grammar, and punctuation	7	18	5	0	0	4.07	A
Average Weigthed Mean						**4.21**	**SA**

Legend : Description	Range
5–Strongly Agree(SA)	4.21 - 5.00
4–Agree (A)	3.41 - 4.20
3– Neither agree or disagree (NAD)	2.61 - 3.40
2– Disagree (D)	1.81 - 2.60
1 – Strongly Disagree (SD)	1.00 - 1.80

The above table shows the student's acceptability of the proposed drilling and practice system and rated by the respondents from the Information Technology Department of PSU Urdaneta Campus.

Overall, respondents strongly agree with the proposed system in terms of the design, performance, maintainability, and security with an average weighted mean of 4.31. Security obtains the highest WM of 4.60 and this indicate that the respondents strongly agree that the content of the developed system can be edited only in the server. Table 2 also shows that design obtains the lowest WM of 3.98, respondent agreed with the design however, there is a need to enhance the appearance of the proposed system to be attractive and to have an appeal to the end users.

Both performance and maintainability obtained WM of 4.33 which indicate that the respondents strongly agree. With regards to the performance of the system, item no. 3 attained the highest weighted mean of 4.5 and an indication that the proposed system has the capability to display questions or items properly based on the user needs. Respondents also strongly agree with other items in criteria 2. In the case of maintainability of the system, respondents strongly agree that the developed system can easily correct the found faults and can adapt to its new system environment. The above table shows the content validity on the drills and practices in IT fundamentals. Overall, the results reveal that respondents strongly agree with the validity of the content of the proposed drill and practice module with a total average weighted mean of 4.21. Respondents also strongly agree on the valuableness of the information to the intended user, accuracy of the information, construction of text in terms of conciseness and is well written, and also the sustainability of the questions. Other criteria obtained the range from 4.10 to 4.20 which indicate that the respondents agree with the validity of the content of the proposed drill and practice courseware.

The result clearly implied that the courseware created and its content is very valuable to the intended audience.

SUMMARY

Computer Aided instruction (CAI) has flourished in almost every academic discipline and at all levels of our education system from basic school to postgraduate studies. This research proposed drill and practice courseware for number systems under IT Fundamentals since it offers a lot of benefits over traditional methods of delivering educational intervention. Furthermore, this research proposed a multimedia courseware which provides a self-paced and practice learning material for number system under IT Fundamentals students. This research involved the participation of IT Fundamentals faculty members and IT students in the development of the proposed drill and practice courseware.

Based on needs analysis, the topics in IT fundamental found to be very easy except in the topic number system. Furthermore, these results revealed that students are having difficulty with the type of the number system and its operation and they considered conversion of the number system as a very difficult topic. They also suggest drill and practice and problem solving as intervention tools to help students learn number system.

The validity and acceptability test indicates positive acceptance from both faculty members and students, however, there are still rooms for improvement before gaining maximum acceptance from the students. The introduction of computer aided instruction (CAI) technology into the learning process offers an opportunity to reconsider as an intervention strategy to be introduced in a student-centered environment. This alternative intervention tool is aimed to address the opportunities for encouraging learning through the use of this CAI technology. Hence, a variety of courseware materials have been developed primarily to replace traditional methods of teaching. In future work, the proponents plan to determine the effectiveness of the proposed drill and practice courseware. The proposed courseware will be experimented to determine its difference from the traditional method of intervention.

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