

USING ALDRICH'S MODEL TO DEVELOP A COMPUTER SIMULATION FOR ACQUIRING COMPUTER MAINTENANCE SKILLS AND SATISFACTION TOWARDS LEARNING

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This paper aims to reflect on the experience of designing a computer simulation program to acquire computer maintenance skills according to Aldrich's simulation creation model which is consisting of 13 phases, the activities of this research took place in the Department of Computer Science at Dammam University. The experiment has been made on a sample of (75) female students; in the fact that; the maintenance subject requires practical skills, teachers were facing two main problems in the lab lecture of computer maintenance, first, the learner cannot follow the teacher's practical explanation because the learners bound around her to watch, which might lead the teacher to re-explain more than once, this re-explaining would waste the lecture time and the time needed for practicing, The second problem is that when learners apply what they have learned on one or two computers others have to wait until they finish, this also decreases the time needed for practicing, some learners might not have enough time to master the skill others might not have the time to practice at all; So the suggested solution was a simulated computer maintenance lab environment designed by Aldrich's educational simulation creation model using Gange psychomotor skill teaching model to explain the skills and bloom's mastery learning theory to evaluate them. The simulation has saved the time for the learners to practice what they've learned manually, and reduced the time taken in explanation and training because the learner watches the explanation on the computer and trains to install the parts on the computer too without affecting the time needed to train other learners. The outcomes of the research proved the effectiveness of the proposed simulation in acquiring computer maintenance skills and extending the time needed for practicing, which in turn contributed to accelerate the educational process and improve its outcomes. The results also revealed that; participants were highly satisfied with using simulation software in learning maintenance skills.

Keywords: Computer maintenance, maintenance skills, computer simulation, Aldrich simulation creation model, satisfaction with learning.

The computer maintenance skills are highly needed by learners in their daily lives, and in technical work environment. As a study subject, computer maintenance is a practical skill that requires laboratories equipped with spacious space that allow learners to see explanation and training, and requires sufficient time for each learner to practice what he or she have learned in the lecture. In fact space and time represent a real obstacle in the maintenance practical lectures, because when the teacher explains a practical skill, learners will gather around her to watch the demonstrated skill, which makes it difficult for the rest class to be able to see the explanation forcing the teacher to re-explain more than once for the learners who could not see. Teaching by simulation software as an innovative approach of teaching can reduce the time needed for learners to apply what they have learned. Every learner that apply and practice a skill on the real device will take a time from the lecture which reduces the chance for other learners to practice during the class time. So the search began to find better ways that reduce the time needed for explanation and increase practicing time; some solutions were to increase the practicing time by leaving the laboratories open for learners at specific times of the week, and to reduce the explanation time by showing learners videos on how to install computer parts, so the teacher will not need to re-explain more than once. After reducing the time needed for explanation another problem has shown, the learner still need enough time to practice and to be evaluated, and by offering only two or one computer to practice on, one or two learners will be able to practice at a time, this will reduce the chance for other learners to get enough practices. This justification suggested that; computer simulation appeared as an economical solution for teaching practical skills- a solution that will save the explanation time by showing the learners a video simulation that demonstrates how to install computer parts and to make learners able to see computer parts from all angels by rotating them on a screen, and provide a virtual computer device for each learner to install parts without effecting other learners practicing time or university budget.

The current research aims to discuss how to implement methodological approaches to design electronical solutions based on computer simulation, by applying the Aldrich simulation creation model on developing a Computer Simulation Program to Acquire Computer Maintenance Skills, it also aims to identify the steps and procedures for the formative evaluation of the proposed program.

Previous studies

Simulation is copying a phenomenon or a system that allows learner to keep on learning step by step (Alfar, 2002) By simulation a medical student can practice on anatomy using a computer simulated patient without any risk or fear from diagnosing or treatment mistakes. Also computer maintenance trainees can practice on installing computer parts and setup programs without the need for experts. Simulation actually is a modeling for a system, a situation, or a problem that exists in reality and programmed in an educational integral way that represent the reality for learner minds and allows them to try and practice in computer. Simulation considered as one of the most important uses of computer for effective teaching because it transfers the real situation to the learner and allows him/ her to safely try and enjoy achieving results by applying some experiments and activities using

computer. Many studies and researches confirmed the benefits of using simulation in teaching to enhance its outcomes. Gagne (1987); summarized the specifications of simulation as a learning style, that it shows and forms the situation from the real life with focusing on clarifying the process of the situation, while (Alfar, 2002) told us that; simulation permit learner to practice and control the educational situation in different degrees and give him the ability to change some situations or ignore others or part of it if the learner found it not useful, it also allows learner to effectively contribute in learning.

Since the mid-sixties in the last century; there had been more attention about using simulations in teaching and learning especially after the computer systems had raised. Concepts and activities and experiments had been made by computer simulation, and it had an important role in the teaching process. With computers software, more excited and effective simulations can be developed and used for teaching concepts and different science topics. Also simulation languages and the way it's used in teaching has varied which made it more flexible than before; simulation was also used to reduce the financial costs, for example chemistry experiments and anatomy, that made the simulation an effective and fun activity and helped to strengthen learning bases for some difficult skills and topics that contains some risks in dealing with them in reality, it can simplify some the daily life situations or processes that each member in it will have a role that he or she interacts through it with others in the light of the elements of the simulated situation (Mahfoodh, 2000).

The simulation has approved its usability in training on industrial systems by implementing three dimensional drawings in a manner that meets trainees' needs in different industrial domains. The simulation program can represent a safe environment for users where mistakes are being diagnosed and solved without any risk, one of the examples of this type of simulation programs is Cosimer system which had been discussed in (Freund, 2002) study and achieved a progress in many industrial applications. Alsom (2009) conducted out a study in Sana'a University that aims to investigate the effect of using computer simulation in acquiring skills in solving physics questions for secondary students who study in the second year and to investigate their attitudes toward physics subject. The sample comprised of two groups of students; one act as an experimental with 41 students, and the other as a control group with 36 students. To meet the research objectives; two measuring tools were designed: one is a solving physics questions skill measurement tool and second is an attitude toward physics subject measurement tool, and administrated after teaching with a simulation computer program which was designed also to teach electricity and magnetic units. The results of analyzing of the data of the measurement tool of solving physics questions skill and the measurement tool of attitudes toward physics subject showed that there was a significant difference between student grades means in the two groups control and experimental and a significant difference between the two groups in the attitudes for the experimental group.

Computer simulation has approved its usability not only for normal people; but also for handicapped people, in a study that was performed by *Meching and Brien* (2010) which aims to investigate the effectiveness of teaching by computer based videos to teach three adult handicapped students who suffers of medium intellectual disability about the stop sign for buses and how to take the bus to certain places; a designed street with multi paths that goes through the three students houses was used. All educational activities and exercises were made in an educational environment based on a

simulation that imitates reality. The results in the simulation video program has found that the program is an effective way to create a successful simulation environment to teach the bus way to the three students, and the students were able to generalized the skill to the bus real path with no instructions in live path.

One of the most important features of simulation programs is that; it represents nontraditional educational situations for the learner in a way that stimulate his or her thinking and motivate him to learn. Simulation also employs computer advanced features that other types of medias might not have, also some processes and procedures are easier to be studied by simulation than other traditional ways, it allows learner to apply some skills on situations that he might not have the chance to do in real life, and in most cases the situation skills are suitable to be taught by computer which looks a lot like the real world. Although the simulation has all these features it still needs a lot of work and planning and programming to be effective and similar to real environment, it requires devices and computer systems and hardware with special features to form complicated phenomenon in a clear way, and it needs subject matter experts and programmers and psychologists and teaching styles experts, so this costs a lot of time and money.

Perhaps what discriminates the electronic solutions based on simulation contents is its ability to merge varieties of media to include simulation and demonstrations, where those solutions are organized in a sequential way that helps in learning content and achieving learning objectives, when designing computer simulation programs they have to be designed according to a systematic and methodological educational approaches that employ what is known as instructional designs like ADDIE model, Dick & Carey model, Kemp model and ASSURE and other common instructional models.

Aldrich Model and its Implementation on Developing Computer Simulations: Model Application

This paper uses Aldrich's Simulation Creation Model (Aldrich, 2009) which is consisted of 13 phases:

- 1- Identify target audience.
- 2- Identify learning goals and project goals.
- 3- Define current formal learning processes and short comings.
- 4- Create assessment.
- 5- Identify best practice and subject-matter expert.
- 6- Interview subject-matter expert.
- 7- Assess participant's current access to technology and knowledge.
- 8- Staff the game development effort.
- 9- Define elements for simulation including game, pedagogy and structural content, story, level design.
- 10- Prepare a design document, Story bible and story board.
- 11- Play test and pilot test.
- 12- Prepare an instructor manual.
- 13- Patch the simulation and expect to keep patching it.

Implementing the Model: Identify target audience

The research has been made in Dammam University in computer science department at the first term from academic year 2010-2011 students enrolled in computer maintenance class were 110 females participants, the sample was comprised of 75 students aged between 20 and 22 years, most of the

learners are coming from nearby areas like Jubail, Ras Tanura and Alnuairia, and most of them choose computer science as an expertise domain and field of study for its relevance and important for companies and industries communities that spread around the east coast.

Entry behavior

The entry behaviors required for a computer maintenance participant are stated as follow:

- The ability to switch the computer on and off.
- Count the input, output and manipulating parts.
- Count the initial part off the computer case and their jobs.

Prior Knowledge

In their secondary education, and at the beginning of their college education, learners have learned how to run the computer, they also know the computer parts because they studied them in the introduction course, and this information will be revised in the first lecture.

Identify learning goals and project goals

The main goal of computer maintenance curriculum is to make a full awareness of computer maintenance and to recognize its initial parts and be able to install them and diagnose its crashes, This goal will be met by using the printed material and the simulation program that indicates each computer initial part and how to install it, learning objectives and learning strategies were defined to accomplish this goal. *Goal Statement:* The student is able to install and unpack the computer parts and maintain them.

Goal Steps:

- 1- Install the power supply.
- 2- Install motherboard.
- 3- Install processor.
- 4- Install RAM.
- 5- Install an expansion card.
- 6- Install hard disk.
- 7- Install CD-ROM.
- 8- Plug in the cables.

Teaching tools: Computers, computer parts, simulation program, printed content. *The goal is going to be measured by:* Performance check card and satisfaction survey.

Project Goals:

- 1- Decrease the time needed for explanation.
- 2- Increase training time.
- 3- Decrease the financial cost.

Expected results:

- 1- Acquiring computer maintenance skills.
- 2- Being able to apply them in real world.
- 3- Being able to apply them at work in the future.

Methods to reach expected results:

- 1- A preparation lecture at the beginning of the curriculum.
- 2- Included Activities that motivate learners to participate in the virtual environment or in the lab.

- 3- An animated video that shows how to install computer initial parts will be added to the simulation.
- 4- More time will be provided for learners to practice at the lecture time or after it.

After that the learning objectives were specified with the learning strategies that are suitable to be applied with them, the following table shows the strategies and the evaluation way for each objective.

The course also has been divided into clusters where each group of skills will be evaluated in one lecture, because it's impossible to evaluate all learners in all skills at one day.

Table 1. Applying learning objectives

Objective	What learner need	Criteria's for evaluating	Evaluation type
Install power supply	Computer case, power supply, tacks	Without using book or any learning sources	Performance checklist
Install motherboard	Computer case, motherboard, tacks	Without using book or any learning sources	
Install processor	Motherboard, processor.	Without using book or any learning sources	
Install RAM	Motherboard, RAM	Without using book or any learning sources	
Install expansion cards	Computer case, motherboard, expansion card	Without using book or any learning sources	
Install hard disk	Computer case, power supply, hard disk, tacks	Without using book or any learning sources	
Install DVD-ROM	Computer case, DVD-ROM, power supply, tacks	Without using book or any learning sources	
Plug cables to computer	Computer case, monitor cables, keyboard cable, mouse cable, printer cable	Without using book or any learning sources And the computer should work.	

Define current formal learning processes and short comings

From her observation as a computer science teacher and from her interview with her colleges who teaches computer science; the author has found that; there was a problem in the approaches that Computer Maintenance course is presented to learners, because the objectives of the course and the desired outcomes did not match. The learners at the end of the course are not able to maintain their own computers; so the problem lies in the learners inability to apply what they have learned due to the lake of time and the difficulty to watch the teachers explanation while other learners are crowded around her to watch the practical explanation which increases the time taken for explanation and decreases the time should be taken in applying and practicing the taught skills. Also providing only one or two devices to learners to apply the skill on will decrease the probability of learning as well as his chance to apply these skills at the lecture time. This problem affect the course goal directly and therefore its outcomes.

Table 2. Clustering skills into practical lessons

Cluster	Objective
1	Open & close computer case. Install power supply
2	Install motherboard
3	Install processor Install RAM
4	Install expansion cards
5	Install hard disk Install DVD-ROM
6	Plug computer cables
7	Evaluating learners
8	Post test

A learners in computer maintenance course need enough time to watch the explanation and apply it, and they need prepared laboratories and computer devices to apply on the skill and to be evaluated, they also need computer simulation programs to decrease the time needed to watch and apply the skill and to increase the time needed for real practicing on a computer device, and they also need work books.

To provide the adequate time for learners to practice, many theories that talked about skills in general and about practical skills precisely were reviewed, in his theory Model of School Learning John Carol indicated that a learner needs enough time to reach mastery, and he produced the equation that says:

$$\text{The amount of learning} = \frac{\text{time taken}}{\text{time needed}}$$

This means that when the time taken to practice a skill is increased then mastering the skill will be increased (Gentile & Lalley, 2003). And because the lecture time is not enough to explain and practice the new skills the repeated practical explanation was replaced with videos for installing computer parts that were added to the educational program where each learner can watch and repeat the installation video as many times as she wants without effecting other learner's progress, so the explanation time was decreased and more time has been saved for learners to practice what they learned whether in class or home. Simulation activities were added to the program to enable learners to practice installing computer parts until they master them; Gange also talked about psychomotor domain and how to teach practical skills, he summarized that into three steps: observation, practicing and feedback which means that the learner will watch the skill being applied by the teacher or video first, then he or she will try to imitate it and experiment it by herself this is followed by many attempts to master the skill with directions from the teacher (Gange, 1987). This theory has been used in designing the educational program where the learner go through these three steps named explore, practice and test, in the explore part the learner can see many samples of a computer part and read about it and how it works, she also can watch an animated video for the process of installing the computer part, after that she can go to practice and start practicing with simulation activities where she will be asked to install the computer part with instructions from the program and feedback. After that she can go to test part which will evaluate the mastery level of each skill and if she didn't master enough skills she is going to be headed back to explore part to revise what she couldn't master and that is what Bloom pointed to in his theory (Mastery for Learning) which stated that; if some learner doesn't master all required

skills; a corrective activities should be given to them at the same time so they can use it to correct their way of learning and it should contain the skills they didn't master yet, this correction could contain pointing to a certain page in a book or to a source that could help them to learn in a better way, and this will be repeated until the student masters all skills (Guskey, 2005).

Create assessment

Prior knowledge was evaluated by a diagnostic performance pretest at the beginning of the course to measure how much learners know about computer maintenance before the research and comparing this with the performance posttest at the end of learning. A control group was also created to compare its performance with the experimental group.

Identify best practice and subject-matter expert

A diagnostic test (performance checklist) was applied to measure learner's prior knowledge at the beginning of the course and to know how much they already know about computer maintenance before starting the experiment to compare its results with the posttest (performance checklist) that will be held at the end of the course, also a control group was created to compare it with the experimental group and realize the different between them, the evaluation in both groups was measured according to learners behavior and not her success in the course, that is why each skill was evaluated at the beginning of the next lab lecture using the performance checklist, after that learners satisfaction was measured by the survey.

Interview subject-matter expert

By watching many people who are interested in computer maintenance and reading many books and tutorials about it, the steps of doing the required tasks was written and revised with the subject matter expert and a specialist in information technology department in Arabian Gulf University those steps were written in the easiest way with pointing to the existence of another complicated ways.

Assess participants current access to technology and knowledge

The program has been made in exe format that is compatible with both windows and Macintosh operating systems where most of the learners uses these OS, The program also needs a plug-in to work on windows 7 this plug-in was provided in the program CD to make sure all learners can use the simulation program.

The course was a self-study where the learner has to use the program and printed material to learn, and she can ask the teacher when she needs any help, she also can practice on the skill in the lab lecture every week.

Staff the game development effort

The searcher did the simulation herself, as her previous major was computer science and she has the skills to draw and design which helped her to design the characters and backgrounds and to produce the program without any external help.

Identifying Simulation Elements

Computer simulation has a number of missions that learner has to accomplish in order to master the required skills. These missions consist of many actions learner should do to accomplish the mission, some of the actions learner might be asked for: installing a computer parts, plugging a peripheral device, choosing an instrument, clinching a computer part, and some of the missions learner might be asked for: installing a new RAM to a computer device or replacing the old power supply with a new one, or diagnose a problem in the screen.

Simulation Elements. Simulation Name: Computer Damages. Users: learners who are enrolled in the computer maintenance course in Dammam University at the first term of school year 2010- 2011.

Content Structure: The learner moves between three levels in the simulation, first level is identifying internal computer parts, second level is training on installing internal computer parts, and third level is diagnosing computer damages, learner cannot move from a level to another without succeeding the previous level test, where each level has a demonstration for the skills learner should master before moving to next level.

Story: the story revolves around a maintenance expert who wants to hire a new trainee and train him, where the user's role is the role of the new trainee who is trying to reach a good level in the computer maintenance to be employed.

Level of Design: the simulation program was designed in 2 Dimensions, and Director MX 2004 program was used to include the drag and drop techniques, and choosing and parts matching.



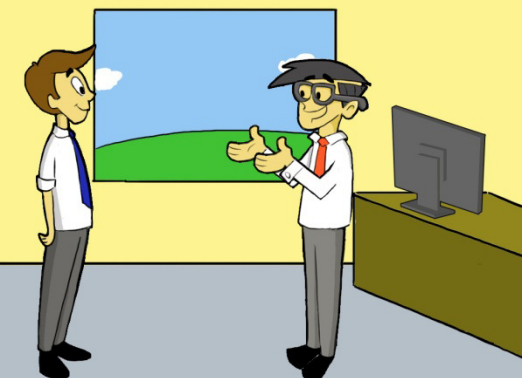
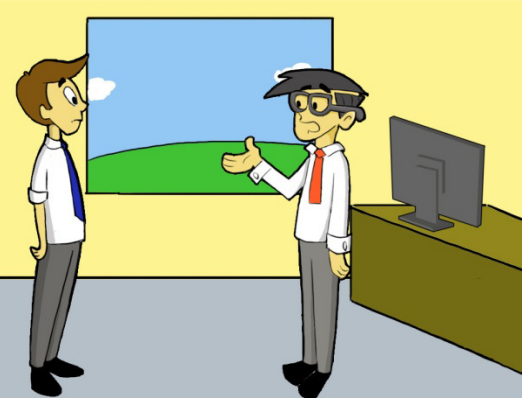
Simulation Design Document

The design document is a detailed explanation of all elements of the simulation, which contains footage of the simulation, the user interface, graphics used, animations, charts, characters description, storyboard, level designs and the requirements of the system that the simulation will be installed on, that is, it explains what the simulation director thinks and it can transfer his perception to the animators and designers and programmers (Quinn, 2005).

The simulation subject is about computer maintenance and its objective is to help participants learn about internal computer parts and how to install them and diagnose their damages, that is why the simulation is consist of three levels: identifying computer parts and training on installing computer parts and diagnosing computer damages.

Description of story characters: Maintenance expert: social, active, has specific instructions, encourage staff to show their best through a comfortable working environment.

Trainee: shows a willingness and desire to train and do his best to get the job he wants, a good listener, trying to carry out the instructions accurately from his Director.

<p><i>The expert welcomes the trainee:</i> Welcome to your first training day you can use this desk until you pass training successfully after that you will be employed in this company.</p>	
<p><i>The expert explains the task to the trainee:</i> Your first task is to pass the "Identifying internal computer part test" you can move to the test directly or click on "explore" to know more about computer internal parts and their jobs first.</p>	
<p><i>The expert congrats the trainee on accomplishing his task:</i> Well done, you passed the test successfully! You can now move to the next task which is getting ready to the "computer initial parts installation test" by clicking "train" or move to the test directly by clicking "next"</p>	
<p><i>The expert tells the trainee that he didn't pass the test:</i> Unfortunately! It seems like you didn't pass the test you can go back to explore computer initial parts using "explore" button.</p>	

Play test and pilot test

This comprised of two levels, the play test and the pilot test; in the play test as Kaner (2006) mentioned some people tried the program and judge it when it still in the implementation phase, the simulation program and virtual learning environment were judged by experts in instructional design and computer maintenance according to the following elements:

- Quality of simulating reality in activities.
- Program usability.
- The ease of navigating the program.
- Feedback context.
- The extent of meeting course goals.

Many useful notes were received like the suggestion of adding a part for dealing with computer common crashes in the program and some modifications on evaluation way.

The pilot test was applied by experimenting the program on a small group of learners in Dammam University about 18 female participants who are enrolled in computer maintenance course on the first semester of year 2010-2011 this experiment showed that the program needs a plug in to work on some operation systems and the explanation and evaluation way were modified to fit the lecture time and the study requirements.

Preparing Teacher's Guide

There was a meeting before the course where the teaching and evaluation way has been discussed, after that the teachers were meeting with the searcher after each class to revise and correct the way of teaching.

Patching the Simulation

After taking reviewers notes and experiencing the program on a small group of learners some mini-modifications were made to the simulation, a section about dealing with computer common crashes has been added, characters and story were added also to direct the learning process, the evaluation way was changed and more knowledge parts were added to the simulation program.

Results

In order to verify that the use of computer simulation has led to the acquisition of computer maintenance skills, mean and standard deviation has been calculated for both control and experimental groups in the pretest and posttest (a performance check list), As noted in table (3) that the two groups has started the experiment in an approximate level, This appears in the two groups mean in the pretest, while there is a simple improvement in both groups with a difference in the average of the two groups in favor of experimental group, and to determine the level of significance of this change analysis of variance correlative has been used, see Table 4.

Table 3. Descriptive Characteristics for the performance chick list

Group	Sample Size	Test	Mean (M)	Standard deviation (STD)
Experimental	36	Pretest	3.61	2.128
		Posttest	38.22	0.866
Control	39	Pretest	3.31	2.054
		Posttest	35.18	3.590

It is noted from table (4) that there was no statistically significant differences at a level less than 0.05 in the two groups pretest, namely, that the two groups had begun in a close level as the significance level for the pretest was 0.755 and this means there are no significant differences between groups in the pretest, but it appears from the results of the posttest that the experimental group (computer simulation) has surpassed the control group (conventional) and therefore the results are a significant at the level of 0.05 as the significance level 0.000 indicates that there is a significant difference between the two groups, the sensitivity of the dependent variable can be measured by the effect size in the previous table is 0.249 and it is noticed from the value that there is little effect among the variables.

Table 4. The results of correlative analysis of variance for comparison between the experimental group and control group in the acquisition of computer maintenance skill

	Squares Sum	Freedom Degree	Fixed Squares Mean	F	Significance Level	Power Size
Pretest	0.702	1	0.702	0.098	0.755	0.001
Between groups	170.774	1	170.774	23.863	0.000	0.249
In groups	515.264	72	7.156			
Total Variation	101367.0	75				

Because the experimental and control groups are containing more than 30 learners, the distribution is normal without the need for a distribution test, and because that the distribution is normal T test for independent samples was used to calculate the mean and standard deviation of the degree of satisfaction towards learning for both groups, a T test for independent samples for each dimension in a measure of satisfaction was also conducted for the two control and experimental groups also the level of significance and the value of T were calculated.

Table (5) shows the mean values (M) and standard deviations (STD) for the satisfaction towards learning measurement in general for each of the experimental and control groups; can be seen that there is a difference in the averages for the experimental group; also shows a clear difference in standard deviations for the experimental group means that the rate of dispersion of values around the average was lower in the experimental group than in the control group; It is clear from the table that there are also significant difference at 0.05, where the significance level came at 0.000 which means that there is significant differences between the two groups, as seen from the effect size 0.523 that there may be influenced by the average size between the independent variable (the use of computer simulation style to learn computer maintenance) and the dependent variable (satisfaction towards learning).

Table 5. T test for independent samples on satisfaction toward learning measurement

Variable	Group				T test	Significance Level	power
	Experimental N=36		Control N=39				
	M	STD	M	STD			
Satisfaction towards learning	4.3256	0.3143	3.9756	0.6682	2.862	0.000	0.523

The table (6) shows the values of averages and standard deviations for each dimension in the measurement of satisfaction towards learning in the experimental and control groups; The table shows the presence of minor differences in the standard deviation when compared between the experimental and control groups in all dimensions, as can be seen differences also between the dimensions in the two groups in the averages for the experimental group and shows the significance level for each of the offline method of teaching and the course instructor 0.000 there is a difference D (0.05) between the two groups in the degree of satisfaction, and the content of the article which did not show any statistically significant differences in the degree of satisfaction which came in at 0.079 level of significance

The results of statistical analysis has shown significant differences between the experimental and control groups in the acquisition of computer maintenance skills in favor of the experimental group, which means that using computer simulation has a positive impact on the acquisition of computer maintenance skills The researcher attributes this result to several factors that helped to acquire computer maintenance skills, including: that the animated simulation of installing computer parts has helped in reducing the time needed for explanation; which increased the time needed for practicing manually in the laboratory, also the interactive simulation has given the learner the courage to experiment on the real device in the laboratory manually without fear; The safe interactive simulation environment has also encouraged learners to try more than once until they reach the correct way which encouraged learners to install and disassemble computers in the lab without fear and the availability of the program outside the official working hours has helped learners to practice on the program in case they do not have a computer at home, or if they missed the lecture, where the simulation has contributed to simulate the lab environment and to train the learner on the installation of computer parts without the need to provide tools, although the practical application is indispensable, but this is better than missing the explanation and training, if the learner in the experimental group missed the lecture she will understand the skill and train on it by the simulation program at home and she can apply manually in the lecture that follows; while if learners in the control group were absent from the lecture they will miss a lot of important information and the opportunity to apply on the computer and it will be hard to re-explain the skill for her in the next lecture.

Table 6. T test for independent samples on satisfaction toward learning measurement dimensions

Variable	Group				T test	Significance Level
	Experimental N=36		Control N=39			
	M	STD	M	STD		
Teaching style	4.2322	0.36162	3.9749	0.72420	1.922	0.000
Curriculum content	4.2583	0.39306	3.9564	0.59462	2.571	0.079
Curriculum teacher	4.4389	0.29883	4.0641	0.75550	2.781	0.000

Also the results of statistical analysis showed the imposition of significant differences and between experimental and control groups in the two dimensions of satisfaction towards learning (method of teaching and curriculum teacher) for the benefit of the experimental group, which means that there is a positive impact for the use of computer simulations in the teaching of computer maintenance on the degree of satisfaction towards learning in these two dimensions, but there was no significant difference between experimental and control groups in the degree of satisfaction in the course content dimension, and the researcher attributes there is no difference because there is no difference in course content between the two groups, which led to a similar result in the level of satisfaction towards learning.

Discussion

This paper presented an experiment of developing a computer simulation to enhance learning outputs in computer maintenance curriculum which was being educated for a long time in a way that doesn't lead to the required outputs because of the lack of time and the difficulty to explain the skills to all learners at the same time and following their training, therefore it was proposed to use computer simulation as a method that reduces the time needed for explanation and following learners application by explaining the skill for each learner alone and providing a virtual computer to her to train on until she masters the skill.

And by using this method the university will not be forced to provide more computer devices to learners to train on, and the teacher will not have to re-explain the skill for the learners who could not see because of the throng around her, and each learner will be able to rewind the explanation more than once without effecting other learners pace, she will also be able to apply on the program with no fear from destroying any tool or computer part because she is applying on a virtual environment, and there will be enough time for her to practice on a real device, because the time that used to be wasted on re-explaining and training has been reduced by the self study in the program, All of this was observed while working on the sample consisting of 75 learners at the University of Dammam where there was enough time for learners to practice the skill and for a teacher to assess the performance of the learners.

The paper was also keen on designing the program in an appropriate educational way by using Aldrich's simulation creation model so that the program meets all learner and curriculum and virtual environment needs.

Summary

Computer simulation might be an appropriate solution to save time in teaching computer maintenance but it is also important to design simulation in an educational suitable way by using instructional design models that helps to complete curriculum parts and it's coherent and helps the designer to remember important elements, Aldrich simulation creation model has been used in this paper because _from searchers point of view_ it meets all learning parts and elements starting from the problem, objectives, learner rules and ending with evaluating curriculum and presenting it to experts to be judged and trying it on a small sample, therefore designing the curriculum using Aldrich's simulation creation model gives a coherent course that takes into account the teacher and learner and designer of the course and specifies the rule of each one of them, this intelligibility was the reason to use Aldrich's model to design the computer simulation.

References

- ALDRICH, C. (2009). *Simulation & Serious Games*. San Francisco: Pfeiffer.
- ALFAR, I. (2002). *Using Computer in teaching edition 1*. Amman: Dar alfekeer.
- ALSOM, A. (2009). *The effect of using computer simulation in developing solving physics questions skills for secondary students and their attitudes toward physics*. [Unpublished doctoral dissertation.] University of Sana'a. Retrieved from <http://www.yemen-nic.info/contents/studies/detail.php?ID=23659> [30.10.2011]
- DICK, W., & CARRY, L. (1985). *The Systematic Design of Instruction* (6th ed.). Boston: Pearson.
- FREUND, E. (2002). Multimedia Robot Teachware Based On 3D Workcell Simulation System COSIMI. In *Information technology & applications; ICITA* (pp. 133-137).
- GAGNE, R. (1987). *Instructional Technology: Foundations*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- GENTILE, J., & LALLEY, J. (2003). *Standards and Mastery Learning: Aligning Teaching and Assessment So All Children Can Learn*. New York: Corwin Press.
- GUSKEY, T. (2005). *Formative classroom assessment and Benjamin S. Bloom: Theory, Research, and Implications*. A paper presented at the Annual Meeting of the American Educational Research Association, April, Montreal, Canada.
- KANER, C. (2006). *Exploratory testing*. A paper presented at the quality assurance institute annual software testing, November, Orlando, America.
- MAHFOODH, M. (2000). *The Effect of Using Computer Simulation on the achievement of second year college students on electric continuous current circuits experiments*. [Unpublished master dissertation.] Jordan: Jordan University.
- MECHING, Linda, & O'BRIEN, Eileen (2010). Computer-Based Video Instruction to Teach Students with Intellectual Disabilities to Use Public Bus Transportation. *Developmental Disabilities*, 45 (2), 230-241.
- QUINN, C. (2005). *Engaging learning: designing e-learning Simulation Games*. San Francisco: Pfeiffer.