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STUDYING THE IMPACT OF USING MULTIMEDIA INTERACTIVE PROGRAMS AT CHILDREN ABILITY TO LEARN BASIC MATH SKILLS

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Abstract: The continuous inventions and evolutions in all information technology fields open new channels and opportunities to enhance teaching and educational methods. In one side, those may improve the abilities of educators to present information in an interactive and media enhanced formats relative to traditional methods. This may help students or learners through offering them the information in channels and methods that can be easier to understand, deal with, and retrieve. On the other hand, offering those alternative methods of teaching can be helpful particularly for children, people with special needs, or students in rural areas where they can have virtual or remote instructors especially for majors that have shortages. The purpose of this study is to investigate the impact of utilizing multimedia technologies on enhancing, or not, the effectiveness of teaching students at early stages in Jordanian primary schools. To achieve this objective a program is developed to test the students' abilities to understand mathematical basic knowledge and skills. Two groups are selected from a local school based on their own class distribution where one group was taught the subject in basic math using a program developed for this purpose. The second class was taught the same subject using traditional methods of teaching (i.e. direct student to child instruction, board, etc.). Results showed that in such math skills at this age, using programs or multimedia enhanced methods of teaching can be effective in getting students attention especially when cartoon characters are used. Results also showed that there is no significant difference in learning and knowledge skills and information absorption based on gender distribution where results comparison between little boys and girls showed no significant difference in their learning skills.

Keywords: Component; Multimedia, interactive learning, ICT education, animation, teaching through programs

1 Introduction

There are many parameters that can define and impact students' abilities in learning. Typically papers focus on parameters or factors that are related to the school and the educational methods as other methods such as self or family oriented factors can't be controlled by educators or educational systems. Students who have access in their home to new methods and tools of education through computers, interactive learning, etc. may have also different and more potential to absorb those technologies while used in the school educational system.

Teaching methods is the subject of many research papers in this field in trying to evaluate methods to improve students' ability to be interactively be involved in the class. This seems to be particularly necessary in the current Internet, wireless, etc connectivity environment where students can be distracted through having or using those tools. Through providing the ability for students to use those tools in their education besides using them for entertainment or social activities, this may have positive impact on education.

The availability of Information and Communication Technology (ICT) tools and programs spread all over the world. Those tools emerged to be part of not only high class well educated people; rather, Internet, cell phones, etc. are used to help people in their daily life activities: shopping, maps, information about restaurants, land, knowledge, science, etc. They are provided not only through personal computers, rather most of those services can be provided through wireless, GPS, PDA, etc.

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The government of Jordan has been concerned about developing and reforming the education system. Similar to education systems around the world, the current education system in Jordan is facing many challenges. Probably one of the most important challenges is the quality of education.

Over the past four decades, Jordan has invested heavily in education and allocated an average of 5% of its gross domestic product on education. Furthermore, an impressive improvement has been made in terms of number of students enrolled in different levels of education. Unfortunately, recent reports indicate that there are several improvements to be done regarding the quality control and assurance of education. Such problem is widely recognized by many circles. For instance, in a recent report by the World Bank (2008) it is made clear that the Jordanian educational system, like other educational systems in the Middle East and North Africa (MENA region), depends heavily on memorization, definition, knowledge of facts and concepts. It fails to concentrate on learning and the usage of new approaches or techniques that reinforce creative and critical thinking among students.

Another indicator about the poor quality of education is the results of the well known international test of eight graders in mathematics. The average math score for 21 countries in the MENA is 401. Though Jordan score is above the regional average but significantly below that of East Asia (466). It is also below the international average of 489.Over the past two decades or so, technology has a significant impact on the educational system. Drucker stressed the idea that new technologies will force us to shift from teaching to learning (Drucker, 1999). Research into teaching and learning with new technologies is currently a very dynamic, high-profile and relevant area of educational enquiry (Muller et al., 2006).

Multimedia technology is probably one of the most exciting innovations in the information age. The rapid growth of multimedia technologies over the last decade has brought about fundamental changes to computing, entertainment, and education (Norhayati & Siew 2004).

Multimedia technologies and applications are probably one of the most exciting innovations in the age of information evolution. They helped and got help from the Internet and other communication and computer inventions. Multimedia has the potential to create high quality learning environments, with the capability of creating a more realistic learning context through its different media. It also helps allowing a learner to take better control of the classroom especially when the class size is large.

Multimedia has the potential to create high quality learning environments. With the capability of creating a more realistic learning context through its different media and allowing a learner to take control, interactive multimedia can provide an effective learning environment to different kinds of learners (Margie & Liu, 1996).

While many may argue against or with such studies of evaluating the impact of a technology on learning compared to traditional education. In all cases, multimedia education offers an alternative to traditional education that can enhance the current methods and provide an alternative especially in some cases where teaching in educational methods is not applicable.

Definitions

1. Multimedia

Multimedia refers to computer-mediated information that is presented concurrently in more than one medium. It consists of some, but not necessarily all, of the following elements: text; still graphic images; motion graphics; animations; hypermedia; photographs; video; and audio, i.e., sounds, music, and narration. Multimedia can support multiple representations of the same piece of information in a variety of formats. This has several implications for learning. (Ke, 2008)

2. Interactive Multimedia

By Interactive multimedia, educators unusually refer to the use of multimedia and ICT equipments to offer an effective dialog between the instructor and the students in comparison with traditional methods of teaching which may lack such interactivity. However, supporters of traditional methods of teaching argue that the face to face communications can be more interactive.

3. Multimedia and education

The advancement of technology has made a significant impact on the evolvement of teaching methods from traditional face-to-face teaching to Computer-Based Learning (CBL) or- e-learning systems in all levels of education. Modern education and communication environments can offer alternative ways in the learning process.

Multimedia has been widely used in educational technologies. It is also expected that future will see more of the utilization of such tools in education. Some argue that multimedia and e-learning tools can be used as a supplement to traditional classes (and not as a replacement). Using interactive multimedia in the teaching process is a growing phenomenon. It plays a very important role in assisting students in learning processes. Therefore, it can be concluded that the Multimedia enhance and enable students to learn in a more effective way.

More efforts are needed to create new programs using multimedia elements and multimedia authoring tools to fulfill a content-rich learning software and courseware to different students. By multimedia, here we don't mean only animation, or image and video related products. Those maybe incorporated with programming and other methods to provide a portal, an application, etc. in which data, video, and images are mixed.

A theoretical background

The roles of interactive multimedia and its effectiveness have been the subject of many studies. This section intends to shed light on the main works in this area.

User Interactivity is a major feature of well-designed multimedia courseware. In fact, researchers have shown that an interactive learning environment can generate effective instruction and learning system (Harper & Hedberg, 1997; Sims, 1998; Shinde, 2003).

In different researches by Mayer, results indicate that using multi-modal instruction is more effective than using any single mode (Norhayati & Siew; 2004; Mayer, 1997). In other words, this finding demonstrates that media do impact learning, through the instructional possibilities that they enable. For example, based on Mayer's research, one could state that when used appropriately, the video medium should be more effective than radio, since the latter cannot provide visual information. The presentation of ideas in visual form has proven to be particularly important as it critically helps the educational process.

In a review by various researchers of studies that have investigated the effectiveness of multimedia in learning suggested that the people who used computer-based multimedia instruction performed better in terms of test scores, compared to those who received instruction through traditional classroom lectures.

Bayhan et al. explored the use of computers at home to develop mathematical ideas and reported that there were considerable potential for computer games to support such learning (Bayhan et al. 2002). Similar research papers showed that kids who are exposed or have and use the computer and Internet at home for education can have better chances understanding basic learning skills such as the basics of Math and Alphabets. This early exposal to technology may offer new potentials for both children and the pedagogy in early childhood settings. Special terms used to describe this new generation can be seen in different papers. For example: "Generation Y" (Zabel, 1999; Charp, 2003), "Digital natives" (Prensky, 2001), and "Millennials" (Zemke, 2001; Howe & Strauss, 2000). Children homes have computer technology in all facets of gadgets: TV remote control, the programmable microwave, wireless phones, computers, digital games (such as Play-station, Xbox, etc). These offer significantly different ways of playing from what had been possible in non-digital worlds (Zevenbergen, 2007). In trying to keep up and compete with those kids, educators may have to continuously update their knowledge and skills and should always include those methods in their education (at least in preparation and presentation) no matter what is their major.

Stitch (2003) study shows that the use of animation in teaching cell biology and all fields of biology are beneficial. It was found that scalable interactive animation with hot keys and rollover help to

enhance the learning in effective way. Animated illustration accompanied with audio, video, and kinetic are much better to the cell biology learners than static illustrations (Stith, 2004).

Cronje et al. investigated the differences of mental models of learners and designers. The study was based on six high school students (3 males & 3 females) attempting to learn principles of electricity (Cronje & Fouche, 2008). The students were selected in a way that reflects three levels (i.e. weak, middle, and good) for each gender. The results revealed considerable differences between the mental models of learners and designers. The free navigation of the multimedia learning program helps good students to accelerate their learning, while weak students are lost (Clements, 2002).

Holzinger et al. (2009) addressed the effects of using simulation to teach complex physiological models to 96 students of college of medicine. They also found that the effectiveness of the designed simulator and the conventional text lessons are equivalent. Using additional guidance to the designed simulator helps to improve the learning process (Holzinger et al, 2009).

The Kamat et al.'s (2009) project was based on the results of a test on a number of interactive multimedia packages for grade I to IV. These multimedia packages are usually used for subjects like science, mathematics, geography, history, etc. It was concluded that interactive multimedia is much better than traditional educational methods, which depends on classrooms and lecturers using chalk and talk (Kamat & Shinde, 2009).

Kay aimed at finding whether gender affects the use of an interactive classroom communication system (ICCS). The study examined student involvement, assessment, and perceived learning of a sample of 659 secondary school students, which were equally divided between males and females. The comparison revealed that male students are more significantly positive than their counterpart's female students (Kay, 2009).

Computer games can be used as a teaching and learning tool. Ke's study aimed to find the effect of educational computer games on the 4th and 5th graders' to learn mathematics. To achieve this goal the study tested the effect of educational games on cognitive math achievement, meta-cognitive awareness, and positive attitudes toward math learning. Results revealed that educational computer games help to attract students towards learning math during the first five weeks, but it has no effects on cognitive math achievement, and meta-cognitive awareness (Ke, 2008).

Liu et al.'s study confirmed previous findings on the positive effect of media richness within e-learning educational systems on the user's intention to use such systems. E-learning systems that present its materials using text, audio, and video stimulating a higher perceived usefulness (PU) and concentration than their counterparts which used text only, text and audio, or text and video, or audio and video (Clements, 2002).

E-learning should not be a replacement to the traditional learning, but an improvement to the efficiency of learning process. Academic institutions adopt a number of learning strategies to enrich learning process, and this is called blended learning. The experimental research shows a high retention rate of improvement for learning by reading and practicing.

Many studies have found that the effectiveness of online teaching modules is equivalent to traditional way of teaching. Moneta et al. explored the effectiveness of interactive multimedia online courses versus the traditional lecture based on studying an introductory computing course. It was concluded that well designed e-learning modules have its pros, but could not prevent the cons found in traditional modules (Kamat & Shinde, 2009).

Evans et al. tried to find the effects of adding interactivity to computer-based learning packages of business and management on a small sample of undergraduate students (22 males, and 11 females). The sample was randomly divided into two groups, in order to test the effect of interactivity versus the non-interactive modules. The results reassert the positive effects of using visualization to improve the depth of learning and understanding. Also the results show that gender has no effect on learning (Evans & Gibbons, 2007). Kamal et al (2000) found that the dynamic nature of multimedia seemed to help children to create mental models more effectively and improved comprehension.

(Rochelle et al., 2000) have suggested that such research has indicated that learning is most effective when characterized by:

Active engagement, participation in groups; frequent interaction and feedback is provided; and connections to real world contexts are made. Traditional teaching methods are quite poor at providing such contexts and in fact, the characteristics of innovative uses of computers are conducive to learning that is all of those listed.

Due to the lack of sufficient proficient English language teachers in Philippines public schools, alternative ways are used to bridge this need. Atienza et al. and the department of education at the University of the Philippines created handheld electronic reader that helps students to pronounce English words correctly, and to supplement English materials for third grade students at Philippines elementary schools. The electronic reader was used to monitor, test and evaluate the performance of 300 students. Results show that the electronic reader improved significantly the learning process (Kleen & Shell, 1994).

Recent studies attempted to evaluate the cognitive load (CL) to learn and understand online, multimedia curriculum. These studies concluded that as the interactivity of the presented materials increase, the CL decrease. For instance, Chang et al. evaluated CL during four weeks to learn Web-based materials about global warming by 105 (24 males, and 81 females) 11th grade students from an academic senior high school in Taiwan (Chang & Yang, 2010). Gender differences were statistically significant, where males are overloaded with reading scientific articles, while females are engaged with chat rooms and search activities. Scientific articles, online notebooks, flash animations and online tests, might need high mental effort, while chat rooms, videos, and interactivity need low mental effort.

Most of the E-Learning materials designed linearly forcing its users to sequential learning, so that all users are forced into same path pedagogy regardless of their experience and their needs. Because of that Robberecht asserts the need for designing interactive nonlinear e-learning educational systems. Those are intelligent enough to dialogue with the learners according to their actions and responses. Also the e-learning educational systems should attract different learners regardless of their experience (Robberecht, 2007). Educators should incorporate entertainment through education and should get students involved actively in classes. This can be achieved through showing them that the things they use and appreciate such as : games, social websites, etc, can be used and utilized in the class as well for educational purposes.

Well designed Interactive multimedia e-learning systems can attract the learners to posses more information. Active engagement is important factor towards improving learning process. Said attempts to lay down a foundation of a design model of interactive multimedia e-learning system which offers active engagement (Said, 2007).

Design and development

Designing an interactive educational multimedia needs to present the learning material in an adequate form and needs to provide the facilities to enable and process learner activities. In designing new technologies for children, researchers of Human-Computer Interfaces (HCI) have discovered that children have unique likes, dislikes, and needs that are often different from those of adults. In addition to that it is important to know how interactive multimedia elements are used in teaching and learning math.

One of the most important issues in designing a course material is how to transfer the course contents to students via a combination of text, graphics, sound and animation. The use of multi-sensing communication can lead to better learning results, increasing the motivation for students to learn, achieving larger volumes of knowledge transfer and more attractive ways in presenting educational content.

Stemler mentioned that “Educators should have access to appropriate ways to design software packages that will take advantage of multimedia capabilities without losing the focus on the user's needs or the content being presented” (Bailey & Milheim, 1991).

A multi-billion dollar industry exists all around the world from kids video games (Herz, 1997; Jones, 2003). Kids at early ages spend a significant amount of their daily time on those video games. Providing educational games through those games can then be very effective and useful. Educators and possibly game developers need to find smart ways of mixing entertainment with education where students at early ages usually see education methods as "boring" in comparison with those video games. Researchers who worked in this area tried to see the factors that make video games important and interesting to kids. Of course, features, tools and gadgets are important elements. However, kids also pointed to the social factors that make those games popular whether through playing those games together or sharing their experience with those games in their social activities at school or outside. Similar to the recognition, researchers can get for significant publications, players can get for good scores; kids are looking to be recognized by their friends on their exceptional games achievements. They use this to trigger most of their dialogs at meetings.

In other reports, kids seem to be "hiding" or "running" away spending time on those games lacking family activities or avoiding their families.

Some researchers summarize the "skills" that some rich video games may provide for children. Those includes: possible complex learning, thinking, social practice, achievement, communication, collaboration and fantasy. Of course, this is not to say that those games provide all benefits. Most agree that many games promote violence, addiction and consume considerable amount of kids' time and cause them possible health problems related to sight and body.

Many research papers had also different definition of the word "game" given the rich and wide spectrum they can currently include. They argue also whether entertainment and fun are core elements in this definition and hence how can this be applied to educational games. According to (Salen & Zimmerman, 2004): "a game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome." This definition gave four major features as comprising a game: system, rules, artificial conflict, and quantifiable outcome. Several research papers discussed the benefits of using "academic games" in education. Learning should occur as a part of participation in rich contexts through which the science information and content takes on meaning. As such, it is this sort of engaged participation that also makes learning through games an attractive pedagogical shift. Barab et. al proposed an ontology for the core tensions to consider in the academic play space (Barab et al., 2009). The percentage of each core participant may vary from one game to another based on the flavors of audience, the goals of the game and its people target age, level of knowledge, etc.

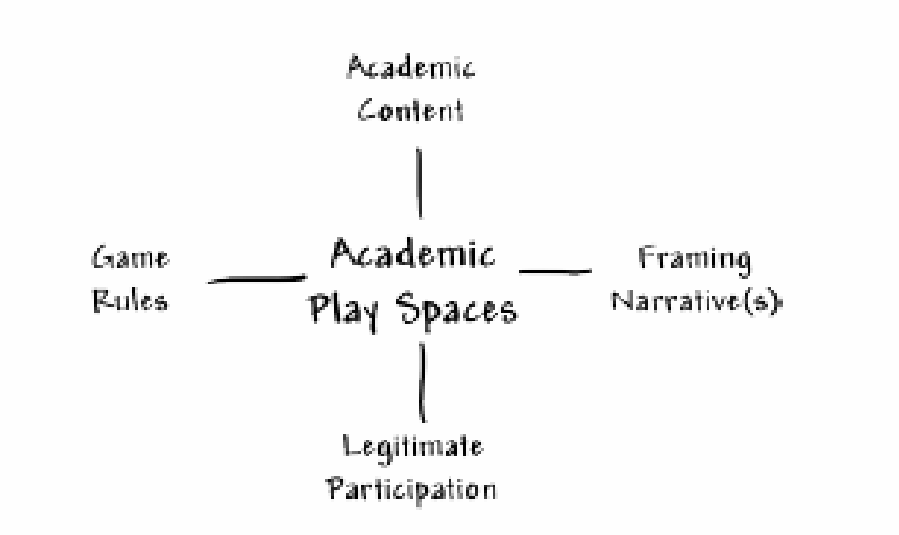

Figure 1. Core tensions in an Academic play space (Barab et al, 2009).

Purpose of the study

This study aims at:

1. Finding the differences (if any) in achievements of first grade children in arithmetic, between those students who use the traditional learning approach and those who use the interactive multimedia approach.

2. Find the association (if any) between gender of first grade children and their levels of achievement in arithmetic mathematics by using the traditional learning approach and the interactive multimedia approach.

3. Identifying the strengths and weaknesses in the traditional and newly proposed system.

Problems with traditional education system

This section discusses some problems with the current traditional educational system in Jordan. Those problems may not be always true. Those problems are also related to the proposed enhancements and do not focus on other issues such as the international quality standards for educational systems.

Enhanced methods of learning extend the learning experience beyond the traditional physical boundaries of the school. Teachers and students can securely access the system from any Internet-enabled location. This can be achieved using a range of different devices such as desktops, laptops, handhelds, wireless phones, etc. Elimination of physical boundaries has many benefits. For example: the student learning experience can be achieved from home and is no longer limited by physical or actual presence in the school. This means that parents can be actively involved in the educational process through online visibility of student accomplishment and greater involvement in the support of specific educational needs. External educators or experts can be invited to deliver talks and presentations using web-conferencing technologies; and teachers can share learning resources and build upon other external resources to enrich the process of creating educational content.

A major problem with the current educational system in Jordan and many other countries in the region is the large number of students per classes. This problem arises as a large percentage of population in these countries is usually young or in the age of schools and universities, Most people in this age category prefer joining higher education institutions which is likely to increase the pressure on class size and instructors. Large classes may cause several problems for instructors. They are usually harder to control. It is not easy for the instructor to ensure that all students are concentrating on the course material. It is not easy also for students of large classes to focus especially where teaching traditional using the board or through directly listening to the instructor. It will take more time from instructors to monitor attendance. Instructors will also have a hard time dealing with students on the individual basis and interact with them, answer their queries, or evaluate their understanding.

Large classes imposed a further headache on the instructor to manage his/her exams. Another problem with the large size is the instructor problem ability to write and correct exams. It may decrease chances to give quizzes, assignments, and any extra works. Instructors will hardly have time to grade main exams.

Current traditional educational systems are also incapable of dealing with students of special needs and disabilities. Students who have visual, or hearing problems may not be able to see or hear well the class material especially when class size is large.

In the age of information evolutions, students are equipped with cell phones, laptops with wireless internet and probably some other high tech gadgets. It is sometime boring and uninteresting to present to them the course material on a board or direct rehearsal. The educational system may need to utilize and compete with the new Information and communication technologies and benefit from them. There are lots of possibilities of such utilization such as: using simulation and animation to present some of the complex boring problems in a more appealing format. Such techniques are particularly useful for teaching kids within primary schools in early ages.

Rural areas usually face the problem of shortages in the number of teachers in their schools. Usually teachers may not be willing to teach in rural areas. Traditional educational systems may not provide a solution to this problem, but new technologies be helpful by recording different teacher courses or through an e-learning system.

Acknowledging and dealing with those new technologies can help educators develop children skills for a future that is different from the present. Educators, especially for children at young ages, should be proactive in their teaching methods and should help prepare those youngsters to a different future. In Australia for example, the department of education focused on such elements in their periodic publications. In one of those in 2003, they mentioned that educators should prepare children to “think flexibly and creatively and to manage their learning throughout life”. They should also help them improve “the ability to apply knowledge to new situations and make informed choices and decisions will be of paramount importance”.

Methodology and case study

The population of the study consists of all first grade children enrolled at Yarmouk University Model School. First grade students are divided randomly into two sections (e.g. groups). The researchers designed and developed a multimedia program that covered two topics from the class math curriculum (according to the ministry of education curriculum and guidelines). Table 1 shows the research procedures adopted in this experiment.

Table 1: Experiment implementation procedure

Study sample and activities		**Traditional**	**Multimedia**	**No. of students / group**
Day 1	Topic 1 (Half)	Group 1 60 students	Group 2 62 students	122
Day 2	Topic 2 (Quarter)	Group 2 62 students	Group 1 61 students	123
		122	123	

As can be noticed from Table 1, the research consists of two steps. In the first step, the first group was taught by using traditional approach, whereas the second group was taught the same materials of the first group by using the newly developed multimedia program. Each group was given a test. The first was subjected to a traditional text-based quiz, while the second group was given a computer-based quiz. In the second step of the research procedure the two approaches were reversed.

Methods and procedures

In designing the tool used in the present research the following procedure were utilized:

1. An interactive multimedia program was built to cover one of the main topics (fractions principles) in mathematics for Grade 1 students that are usually covered in the textbook adopted by the Ministry of Education. This program was developed by using Adobe Flash CS3 as an authoring tool.
2. Different multimedia elements were used to deliver the needed information (text, images, sound, and animation) with interactive and retroactive (feedback) features implemented within a user- friendly interface.
3. The students were allowed to interact with the interactive multimedia lesson for a maximum of 30 minutes followed by a computerized short test. A traditional test is executed before using the multimedia program. Before both tests, students learn the basic math skills through traditional methods of teaching.

Screen design feature

The Interactive Multimedia program was designed and implemented by integrating different multimedia elements. Special attention was given to the interactivity "user control", vivid colors, animation, and using a common cartoon characters usually kids like to make it more attractive and different than traditional way.

- **Main Screen**

It can be seen in Figure 2 that the main screen contains buttons that are linked to the basic components of the selected material. These buttons were designed by using a combination of different elements. Figure 2 shows the main user interface for the program developed.

- **Text**: a clear and easy to read font size and style was utilized. (Bailey et al., 1991) suggested that no more than two or three types and sizes of fonts be used per screen. Garner adds that one font per screen be used unless certain material needs to be emphasized. In this case, varying the size and font of text can be used to attract attention (Gamer 1991).

- **Graphics**: As shown in Figure 2 one of the most cartoon characters that kids know and admire (i.e. Tom & Jerry) is associated with simple drawings to represent the topic.

- Sound: A kid's voice to the main buttons was attached. When the child rollover any of these buttons he/she will hear the title of the button.

- Animation: in addition to the sound attached to each button the button will be little bet larger when the child rollover the button.

Figure 2: The main user interface for the developed program

Results and analysis

In order to evaluate the impact of using multimedia interactive educational tools on education, a case student is designed and executed on two classes from Yarmouk University model school. Each group is further divided into two groups. The same educational material which was about teaching basic math skills is taught through the traditional educational methods along with the multimedia interactive one. In order to reduce possible biases in the study, classes were selected as they are without any rearrangement or reordering of the students in the 4 classes selected for the studies (two classes for each method). At the end of the educational session, a simple math exam is conducted on the two teams. Table 2 shows the summary of the results for the average student grade (out of 10) in comparison between multimedia and traditional exam. The correlation between the student results from both tests for the students who took the two exams is calculated and came out to be +0.29.

Table 2: Comparison of average scores between multimedia and traditional

	Multimedia	Traditional
No. of Students	123	122
Mean	8.47	8.05
Std. Deviation	2.06	1.41

As shown in Table 2, in the computer-based group using Interactive multimedia, the team significantly outperformed traditional group as measured by the test scores.

Table 3: Results after applying t-test

Paired Samples Test			
	N	Correlation	Sig.
Text-based test & computer-based test	114	0.292	0.019

Results show a positive impact of using multimedia interactive tool for teaching elementary education. This is noticed through both averages of multimedia relative to traditional teaching. Table 4 shows gender based distribution of results that indicates an insignificant difference of results based on gender.

Table 4. Gender based results distribution _using Traditional approach

Traditional approach			
Gender	N	Mean	Sig.
Male	68	8.132	0.512
Female	54	7.963	

Table 5: Gender based results distribution using Multimedia approach

Interactive multimedia approach			
Gender	N	Mean	Sig.
Male	72	8.375	0.557
Female	51	8.600	

Tables 4 and 5 show that there are no significant differences between the means of male and female in the two approaches.

There are several papers that tried to evaluate the effect of using multimedia interactive tools on enhancing kids learning, particularly, math skills. Rauscher has done a review of meta analyses showing that studying music has positive effects on math and reading skills (Rauscher 2003). These students were also compared to students who studied English on the computer and did the math puzzles. Results showed that students who actually studied the piano scored better than did students who merely listened to music or did not have music training.

Johannes et al (2009) showed that the use of the self-instruction programs is usually better than general instruction program. Furthermore, results of children with learning disabilities were more significantly improved in the experimental group when they used effective problem-solving strategies on non-trained tasks.

Olga (2009) evaluated the effect of a program on improving math skills for students in the 4th grade. Results showed improvement on some math skills such as multiplication and division over other math skills such as learning fractions.

This is a clear indication is that interactive learning is not a silver bullet solution for all possible education weaknesses. Results showed in paper (Math Whizz 2009) on using Math Whizz software in UK on a class of 26 children showing improvement in math skills after using this interactive program. The study is applied over a period of one and a half school terms.

Ainley and Pratt (2005) evaluated students at different graders ability to solve proportional word problems. Results showed that only acquire skills to calculate proportions and solve proportional problems. The proportionality scheme becomes so prominent in students' minds that they also begin to transfer it to settings where it is neither relevant nor valid. (Adamo-Villani et al, 2008) proposed a methodology to help students with disabilities in learning math skills. Results showed that deaf children generally took longer time to accomplish various tasks in comparison to hearing children. Results showed that, on average, girls took more time on performing tasks relative to boys.

Table 6 shows summary evaluation of a similar research project from (Joenathan et al, 2005). Results showed somewhat similar improvements to those demonstrated in this paper. The paper presented a unified geometrical and mathematical presentation of spectrometers that facilitate the learning process and the retention of the physics behind spectrometry.

Table 6. Results summary from paper (Joenathan et al 2005)

Score Above This Percentile	Pre-Class Questionnaire Number of Students (Total = 8)	Post-Class Questionnaire Number of Students (Total = 7)
90 %	0	0
80 %	0	0
70 %	1	2
60 %	0	3
< 60 %	7	2

	Pre-Class	Post-Class
Average	40.6 %	60.7 %
Standard Deviation	18 %	10.4 %

Study risks and assumptions

In traditional methods of teaching, the computer, games, programs, and multimedia has little or no role tom play. These days, those are elements that exist in the environment around us everywhere. Those elements enable students to experience new range of skills and ideas that were not possible to experience using traditional methods of teaching. They can also facilitates project-based working, enabling students to collaborate in the exploration of related learning content to complete assignments whilst communicating with teachers or other students.

While this intention in this research is not to propaganda against traditional methods of teaching, of course new techniques and applications in the ICT should be used as enhancers and facilitators for improving traditional methods of teaching. Many may also argue that the evaluation process may not be fair and that introducers of this different method of teaching may focus intentionally or unintentionally on the group that was taught using this enhanced method relative to students who were taught the subject using the traditional method. The general approach adopted in this paper, similar to many research projects and papers who promote enhance methods of education, is that the use of those enhanced methods needed to occur within the context of continued use of traditional early childhood educational methods.

In addition, several educators appear to have major concerns regarding the amount of time that children spend using computers with the fear that once children start to use them they will not want to experience traditional play materials, and will only want to play computer games in some sort of

addiction. In reality, without introducing educational games, many kids are already spending a significant amount of their time on playing games on computers or other ICT equipment such as play-station, Xbox, WII, etc.

Many opponents of enhanced methods of teaching argue that using those interactive methods of teaching may transiently improve children knowledge or skills and that such skills may not be mature or stable in comparison with those of traditional methods of teaching. Opponents also argue that supporters of new methods ignore the serious drawbacks of those methods particularly games in promoting violence or addiction and time consuming. Further, if the Internet is involved in those methods, the risks that those children may be accidently exposed to pornography or in-proper websites can be serious and catastrophic.

Opponents of new methods may also argue that comparison and competition is not fair and balanced specially when it comes to little kids where graphics and animation can be overwhelmingly attractive relative to white and black colors in traditional boards (even colored markers may not be as much impressive compared to flashy pictures and animation). This may come at the risk that anything below "mind-blowing" on a graphical scale has the chance of being ignored or written off by some students. In such way, it may be helpful to use those methods as supplements to traditional methods rather than alternatives.

Educators will be concerned with the time and difficulty it might take to integrate games into their curricula. However, we believe that it is possible to use interactive and enhanced methods such as gaming technology in the classroom and they will have positive impact on students' ability to acquire knowledge.

Experiment and study implications

In this experiment, we started based on an assumption that video games, multimedia and animation pedagogies and technologies produce a considerable potential for science education. In particular, they can help giving a considerate embodiment specially in complex systems that can facilitate understandability of such systems. The work described here suggests that it is possible to develop games or programs that are both entertaining and educationally useful. In general, schools and the educational system have had difficulty engaging children in the process of learning for reasons beyond scoring highly on tests, with research revealing a significant decline in academic motivation specially for children at young ages. Despite the fact that some of the reasons that cause such lack of motivation for children at middle age are external and may not be controlled by the educational system, however, a failure in the educational system to inject motivators for those young children may expand if educators insisted that traditional methods of education should never be replaced or enhanced by new methods and techniques. It is important to find methods and programs to produce a significant percentage of information to students using programs, games, media flash, etc. In this simple demonstration, we tried to prove that it is possible to mix education with entertainment.

As educators, we have a responsibility to support students in understanding particular facts, concepts, and principles as those are core responsibilities for educators. However, balancing gaming or entertainment elements with educational or pedagogical goals is a challenging task where those programs or games designers need to compromise between those two elements; a process that is not always simple and straightforward. While it is not our direct intention and goal to capture the interests and passions of our students, however, "swallowing" information without those motivators may not be always possible. Therefore, we need to make sure that any structure we give them allows the students to learn and reflect without being a too prearranged experience. We should try to accomplish this fragile balance by using some recent developments in ICT and e-learning technology, as well as referencing more traditional learning techniques and theory.

Conclusion and future work

The usage of games and enhanced methods of education has been the focus of many recent education related research papers and studies. In this study, a small math program is developed for students at young ages to evaluate the impact of interactive learning on students' abilities to improve their learning skills. In synchronization with several similar studies, results showed that those methods can be

effective especially for youngsters where they can be motivated by graphics and animation particularly when known cartoon characters are used in those educational games.

As explained in the paper, and despite the fact that results showed improvements in students learning skills, however, this is not a proposal for replacement of traditional education. Rather, interactive enhanced learning can provide a very useful alternative for traditional education especially in cases where it is not applicable to teach through traditional methods.

In future, a field study will be conducted on students of schools in Jordan to assess the effectiveness of using multimedia interacting systems with larger study or experimental groups. In order to be able to generalize the outcome results, different game applications will be used and apply them to different subjects or fields of knowledge. In order also to reduce possible bias in the results, groups of both students and educators will be selected randomly. Future studies should also include studying some other factors, particularly possible drawbacks, of using those educational games on students.

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