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COMPARISON BETWEEN SIMULATION AND TRADITIONAL PEDAGOGIES EFFICACY AT ELEMENTARY LEVEL

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ABSTRACT

This paper investigates students' performance, the difference between traditional teaching methods and simulation, and the correlation between conventional teaching methods and simulation. The experiment was done in the 7th class of Mubashir School of Excellence Taluka Qasimabad, District Hyderabad. It was an experimental study; students of the 7th class were equally divided into two groups: the experimental group and the control group. The sample consisted of 10 students. The duration of the study was two weeks. Pre and Post tests were conducted before and after the experiment. According to the findings of the study, it can be said that simulation is better than the traditional method of teaching, where students can enhance their knowledge and skills by doing practical networking in the Cisco Packet Tracer Simulator; students can find different types of switches, routers, cables and they can understand how a computer is connected with other computers, how they can send data from one computer to other on the same network. This study suggested to school teachers on behalf of this study that, as an alternative to lecture techniques, they should incorporate simulation into their teaching practice. This will significantly aid students in understanding their subjects. It is suggested to the school management on behalf of this study that you may use ICT for the students' better learning. This study suggests to the policymakers of the education department on behalf of this study if you provide ICT labs in your schools and include ICT in your curriculum as compulsory, our education system will rise and shine. According to this study, simulation is more efficient than traditional methods of teaching elementary-level students.

Keywords: Computer Simulation, Cisco Packet Tracer, Traditional Methods, Teaching, Elementary Students

INTRODUCTION

For more than 40 years, computers have been employed extensively in educational settings. Computer simulation as a teaching tool has become widespread in education (Liao & Chen, 2007). The practical component and hands-on training are crucial to science education, particularly in secondary schools when students are increasingly expected to apply their knowledge of observation, analysis, and conclusion (Ben Ouahi et al., 2021)

Simulation is used in different fields of education, like medicine, engineering, business, teaching, and other fields, as well as in training. Through simulation, the learner can understand that particular topic well because doing practical work in labs is too hard and costly. So, they can do it very efficiently and effectively through simulation.

Huppert et al. (2007) expressed that "in computer simulations, students can receive supplemental contact with the variables tested in real or dangerous experiences. Students can be active during the simulated experiments by identifying the study problem, writing in their notebooks their hypotheses planning and performing the simulated experiments, gathering results, collecting data in their notebooks, plotting these data back in the computer, and using the data for drawing tables and graphs" (p.110).

Rivers and Vockell (1987) also discovered in their research that computer simulations improved students' active participation in the learning process,

facilitated their practice, and aided in mastering ideas and principles; undoubtedly, computer simulation assisted students in achieving their learning objectives or goals. Computer simulation can provide students the chance to participate in activities that might otherwise be unachievable, improve academic success levels, and be just as effective as real-world, hands-on laboratory experiences. Students with various majors could respond to the simulation in different ways (Gill, 2015)

Students from various majors respond differently when using simulations as a teaching tool. This results from teachers using multiple teaching materials, which leads students' responses to simulations to vary (Talan, 2020). A review conducted by Dekkers and Donatti (1981) concluded that even while simulations were more successful than lectures in shaping students' attitudes, the promises of better cognitive growth and learning retention were not quickly corroborated.

Research scholar believes that students can perform very well through simulation as compared to traditional methods of teaching because, in conventional methods, students understand their topics in abstract, but in simulation, they can do it practically, which is not possible in actual situations due to lack of facilities in schools. In every school, the student is not facilitated to do practicals even if they can't do their practicals of biology and chemistry; they memorise only facts and figures and write in examinations, even though they don't know how it happens in real, because of lack of practical. In a simulation, the student is immersed in a teacher-defined "world" for educational purposes. They stand in for a world that pupils engage in. This "world" has settings the instructor sets and utilises to get the intended learning outcomes. Students engage with the event as it occurs and derive meaning from it (Bello et al., 2016). Virtual learning is becoming more and more common as technology, especially the internet and educational resources, has evolved (Alenezi, 2019)

Teachers typically employ a face-to-face technique. However, as high-tech tools like the internet, video, and voice technology advance, the virtual teaching approach is growing in acceptance. Simulations help students learn actively. Simulated learning is more engaging for students than typical lectures in the classroom (Veenman, Elshout, & Busato, 1994). Students can gain experience and consider their prior performance in a simulation-based learning environment (Nahvi, 2002). Computerised scientific simulations help pupils to address more issues than they can in a conventional laboratory environment. The computer may allow the learner to work considerably more effectively by carrying out ancillary chores (such as data tabulation) that may take time without helping them learn how to solve problems (Rivers & Vockell, 1987).

Research Questions

This study deals with the following research questions:

- Are the traditional teaching methods at the elementary school level sufficient?
- What is the role of simulation in student performance?

Literature Review

Simulations have been utilised successfully for instruction across many areas. For many years, pilots have employed sophisticated simulators. Doctors have used simulators to train for operations. Thanks to software simulations, information technology students can study hardware and software platforms in a solitary learning environment (Marquardson & Gomillion, 2019).

Information technology is utilised constantly to make our lives and work better; as a result, it should also be used to improve learning and the learning process. Visual learning through simulation is required to boost learning in science and engineering. The course is given graphically, through which ideas, concepts, facts, and other information are tied to visuals and animations. It employs techniques that encourage pupils to think creatively and broadly. As a result, the significance of using simulation to enhance teaching and learning in the computer field was considered when conducting this study. Network simulations' graphical appearance might vary considerably, unlike Packet Tracer and GNS3, which primarily target instructors and students (Marquardson & Gomillion, 2019).

Simulation

The gradual copying of a real-world process is called simulation. In an entirely interactive fashion, simulations "evoke or replicate substantial aspects of the real world" (Gaba, 2007). In educational simulations, the instructor creates a "world" in which

the student is engaged. They depict the world that students are exposed to. This "world" has limits the instructor controls and uses to get the desired learning results. Students interact with the reality of the event and take away lessons from it. A simulation is used in experiential education. This strategy aligns well with the principles of student-centred learning and teaching and constructivism (State et al., 2016). Effective teaching techniques pique students' attention, which serves as a foundation for attaining curricular goals in a classroom context. The traditional educational system greatly emphasises teaching strategies that will completely and actively engage the student rather than viewing him as a helpless, uneducated, or just receptacle of information. Teacher-centered teaching approaches are fundamentally seen as outmoded; they are a significant burden with minimal bearing on a child's learning growth.

It is believed that involving students in the teaching and learning process through inquiry-based and simulation-based methods will make learning more engaging, create a lively learning environment, pique students' interest, and maintain their interest and attention throughout the teaching and learning period (State et al., 2016). Golfers can also advance their game with the help of indoor simulations (Libkuman et al., 2002). Additionally, mine operators employ simulations to enhance safety results (van Wyk & de Villiers, 2009). Simulator games are being utilised more often for training in professional settings (Sitzmann, 2006). Simulators can undoubtedly help with training across a range of disciplines. The discussion of simulations in a computer networking setting is covered in the following section.

Simulation and Student Learning

Integrating simulation into the networking curriculum will improve students' conceptual comprehension of fundamental and advanced topics and provide them with practice resolving the kinds of networking problems they may encounter in a production setting (Perez-Hardy, 2004). Researchers have examined the general efficacy of simulations for training purposes and discovered their value in various circumstances. (Marquardson & Gomillion, 2019). Many businesses are investigating how simulations may enhance training for ongoing professional development (Bell et al., 2008). Simulations improve educational settings. Teachers may provide students with experiences that should translate directly to the real world by using virtual representations of the complicated reality (Marquardson & Gomillion, 2019).

The form and manner of providing information to users are mainly discussed during the instructional material's design and development phases. Typically, text, videos, and Packet Tracer Simulator give the topic. The Packet Tracer's significance as a simulation-aided learning tool is crucial in boosting the student's knowledge, necessitating the development of simulation-based laboratory work that can imitate the cognitive process (Elias & Ali, 2018).

Modelling and simulation tools are utilised to help teachers get beyond practical limitations while teaching networking and hardware principles, such as price and available space. Additionally, these resources let students engage in flexible learning activities. (Sasikala & Tanyong, 2016).

Cisco Packet Tracer

Packet Tracer is a visual network simulation tool created by Cisco Systems that aids networking professionals and students learn networking basics, designing networks, and troubleshooting network setups. The subject of information and instructional technology is heavily reliant on research on the teaching and learning of computer networks. Simulators are frequently used in computer network education because of their adaptability and accessibility. Computer networking topic presents a difficult teaching challenge due to its intricate and complex ideas and protocols (Gullu & Delialioglu, 2018).

Using a simulator to assist in understanding computer networks is one technique that could potentially lower the failure rate of network procedures. Students should use network simulators to assist in creating and modelling networks that will later be used in real networks. Cisco Packet Tracer is a network simulator utilised frequently during learning (Sari et al., 2018). The simulation of Packet Tracer closely resembles the natural world in many ways. Cisco Systems switches and routers are available in Packet Tracer models. In Packet Tracer, nearly all features supported by the hardware are functional. It was more difficult than anticipated to teach students using Packet Tracer and then have them practice utilising physical equipment. This prompted us to examine how the actual and simulated settings vary to see how the simulated

training may be enhanced (Marquardson & Gomillion, 2019).

Table 1

		Pretest	Posttest
N	Valid	10	10
	Missing	0	0

		N	Correlation	Sig.
Pair 1	Pretest & Posttest	10	.793	.006

Paired Samples Correlatio

Method & Procedure

This study is a component of a quantitative research project that focuses on data analysis. The quantitative data includes the numerical data. In this study, experimental research is the main priority. Since the survey was conducted in a natural setting with isolated, regulated, and changed conditions, the researcher opted for a pre-and post-test experiment design, indicating that the tasks assigned to the experimental and control groups were randomly chosen. A pre-and post-test was handed out to both groups, with the experimental group receiving treatment. The experiment lasted for two weeks. The pretest was done on the first day, the intervention began the next day, and a post-test was carried out after the second week. In this study, the researcher focused on elementary students at Mubashir School of Excellence in Qasimabad Hyderabad. The data was collected through a pretest and post-test and analysed through the Statistical Program for Social Sciences (SPSS).

RESULTS

Table 2

T-Test Results

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	16.80	10	1.932	.611
	Posttest	17.30	10	1.494	.473

Table 1 shows the T-Test (pared sample), which has two rows: one is the pretest, and the other one is the post-test.

The Pretest results are mean = 16.80, N = 10, Std. Deviation = 1.932, and Std. Error Mean = 0.611. Posttest results are, mean = 17.30, N = 10, Std. Deviation 1.494 and Std. Error Mean = 0.473.

Table 2 shows the correlation between both pretest and post-test. It also shows the correlations N = 10, correlation = 0.793 and Sig = 0.006.

Table 3

Paired Samples Test

		Paired Differences				
					95% Confidence Interval of the Difference	
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper
Pair 1	Pretest - Posttest	-.500	1.179	.373	-1.343	.343

Table 3 shows the pared differences Mean = -0.500, Std. Deviation = 1.179, Std. Error Mean = .373, it has 95% confidence interval of the difference lower = -1.343 and upper = 0.343

Table 4

Paired Samples Test

		t	Df	Sig. (2-tailed)
Pair 1	Pretest – Posttest	-1.342	9	.213

Table 4 shows the t=1.343, Difference=9 and Significance 2 tailed=0.213

Discussion

The results of this study indicate a notable benefit of utilising simulation as opposed to conventional instructional approaches in augmenting students' academic achievement and comprehension, specifically within the realm of networking education. A research investigation was conducted at Mubashir School of Excellence Taluka Qasimabad in District Hyderabad. The study aimed to assess the efficacy of simulation-based learning compared to conventional teaching techniques by splitting seventh-grade students into experimental and control groups.

Compared to the control group, which received conventional lectures, the experimental group showed significant enhancements in knowledge acquisition and skill development through the utilisation of the Cisco Packet Tracer Simulator for practical networking exercises. The simulation allowed students to engage in practical exercises, including configuring switches, routers, and cables, enhancing their comprehension of computer networking principles. Furthermore, the students demonstrated a comprehensive understanding of the complexities associated with data transmission inside a network, a critical aspect in the contemporary era of digital technology.

The ramifications of these findings have broader significance beyond this specific study's boundaries. Educators are advised to use simulation technologies in their instructional methodologies as a feasible substitute for conventional lectures. Educators can use this approach to enhance student engagement and promote a more profound content comprehension. Moreover, it is advisable to integrate Information and Communication Technology (ICT) into the curriculum to augment the entire educational experience.

This study emphasises the significance of allocating resources towards ICT infrastructure and integrating it into the regular curriculum for educational policymakers. Policymakers can enhance the education system by establishing ICT laboratories in schools and mandating ICT education. Simulation-based learning has been identified as a pedagogical approach that demonstrates enhanced efficiency and effectiveness in instructing elementary-level children. This method provides a practical and captivating means of acquiring knowledge in intricate disciplines, such as computer networking.

In summary, the research results underscore the capacity of simulation-based learning to transform conventional instructional approaches, specifically within the realm of primary education. By adopting this novel methodology, practitioners, educational administrators, and policymakers can collaboratively contribute to improving students' academic achievements and the progress of the educational framework.

Conclusion

According to the findings of the study, it can be said that simulation is better than the traditional method of teaching, where students can enhance their knowledge and skills by doing practical networking in the Cisco Packet Tracer Simulator; students can find different types of switches, routers, cables and they can understand how a computer is connected with other computers, how they can send data from one computer to other on the same network. They can appreciate how LAN and WAN work entirely, although, in the traditional teaching method, students could understand only abstract things or see only in textbook pictures how a network is designed, whereas, in Packet Tracer, they also understand IP and Subnet Masks.

Recommendations

- This study suggested to schoolteachers on behalf of this study that, as an alternative to lecture techniques, they should incorporate simulation into their teaching practice. This will significantly aid students in understanding their subjects.
- It is suggested to the school management on behalf of this study that you may use ICT for the students' better learning.
- It is suggested to the policymakers of the education department on behalf of this study if you provide ICT labs in your schools and include ICT in your curriculum as compulsory, our education system will rise and shine.

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