Designing a science curriculum in a presentation and employing technological application in teaching it

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Abstract

Effective teaching for science curriculum plays a vital role in enhancing students' learning experiences. This research deals with the concept of designing the science curriculum in a presentation manner and employing technological applications in teaching it. The main objective is to turn the textbook into a flexible electronic book to make education more effective, enhance students' interaction with scientific materials, deepen their understanding of difficult concepts, stimulate curiosity, and enhance critical and creative thinking skills. We chose a sample of 4th–grade students in the primary stage to prove the positive impact of implying technology in science curricula. The result was better than we expected, as the learning process developed to a new level after we explained to the students using our presentation. The students interacted very well with the animated images, educational videos, exciting educational games, puzzles, and simulation methods used to explain their syllabus. In addition, they loved to learn science more than before, and the competitive evaluation among the students was attractive. We concluded that using technology in teaching science curricula is essential as it solves the difficulties faced by the students in learning science curricula.

Key Words: **Presentation**, **Videos**, **Technology**, **Educational Games**, **Primary School Students**

1. Introduction: In the contemporary educational landscape, technological integration has emerged as a cornerstone in modernizing educational curricula, enriching teaching methodologies, and enhancing student participation in various disciplines. Among these areas, science education stands out as an area particularly ripe for innovation, as educators search for new ways to instill curiosity, critical thinking, and a deep understanding of scientific principles in learners. Traditional methods of science education, which often rely on rote memorization and theoretical presentation, often struggle to capture students' interest and fail to promote the comprehensive understanding necessary for real-world application. (Mogheith, Alaa Afdal, 2019, 74)

In recognition of this educational challenge, the main objective of our research is to turn the solid textbook into a flexible electronic book (e-book) to solve these problems and make education more attractive, effective, and fun. The difficulty of the science curriculum for a lot of students, especially the units related to physics part, encouraged us to think about using technology. We designed an e-book in a presentation form to be effective and interesting for children. It contains different methods for learning, such as images, animated images (gifs), videos, educational songs for children, simulation experiments, puzzles in their syllabus, riddles, audio, and educational electronic games. We tried to use different technological methods as much as possible. Therefore, it is not an ordinary e-book, but rather a presentation that attempts to address most, if not all, of the problems facing students and teachers.

Instead of the student being forced to memorize abstract information from the textbook and feeling alienated and bored by it, he can now study the same information but in a way that includes interaction between the student and the book. This increases the student's understanding of the information and makes his results better, whether through animated images to imagine, understand and enjoy it instead of static images in the textbook. Simple explanation videos can facilitate complex information (David Wilkinson, 2020), but not only that. Even if the student feels bored, despite the presence of all these animations and videos that make the presentation fun, the student will find interactive educational games that will take him out of boredom and make his grades much higher. Children also gain information through these games, which has a much better effect, as research has proven (Mohamed, H. (2015).

After all the effort expended, we are pleased to give you this treasure called the electronic book for the fourth grade of primary school which facilitates the following:

- Study and imagine scientific experiments through moving images and videos, instead of just reading fixed words.

- Simulating stories and journeys of reaching the treasure by testing the information they obtained in the shape of games that treat the boredom of studying.

- The student will not have to carry heavy books on his back and walk with them from

home to school and from school to home every day.

- Save class time: instead of the teacher trying to satisfy all brains by explaining the same information in several ways, our e-book delivers the same information in more than one way, which satisfies all brains.

- Children learn independently and more quickly with the help of technology.

- Supporting kids to build the abilities of communication, critical thinking, problem-solving, and logical reasoning.

- Students explore the world more deeply when they are urged to appreciate science.

- Saving money by printing new books every new year.

2. **The Theoretical Framework**

The world changes every day, as well as the methods used to educate students. It's a mere fact that technological progress has been coming at a blitzing pace in the past few years, and because of that, educational technology has changed and is still changing.

Applying technology to the classroom can assist and reinforce learning and teaching processes. But what makes it so important to the learning process? How can teachers include technology in their syllabus? This study shows the answers to these questions.

Our paper is concerned with the integration of technology in the science curriculum in Egypt, but we investigated more than one study to identify the evolution of integrating technology in education. We investigated previous studies and checked the

methods implied in them. After that, we tried to improve the implied applications as we practiced the project in the school and made enhancements needed to the project.

Before we investigated the studies made in this field, we examined some PowerPoints that were made for science curricula in different educational stages, including primary and preparatory stages, to get a whole vision of how we want our project to be different and creative. As we analysed these PowerPoints, we innovated our project with the advantages that were in them, discarded their weaknesses, and added new novel ideas.

Mogheith, Alaa Afdal; Wahb, Aya Ahmed; and Yassin, Lobna Abdallah study (2019): "Technology Integration in Education in Egypt".

This study dealt with one of the Ministry of Education's giant projects which is integrating technology in education. It involves improving the teaching and learning processes to boost educational outcomes and increase student engagement. The paper investigates the Ministry's new project of integrating technology in the secondary stage.

EL-Deghaidy, Heba study (2015): "Science Education in Egypt Based on Integrating Ecological Needs and STEAM Education".

This study reviews and highlights some recent efforts to reform science education. The paper's focus is to present science education in ways that are meaningful and reflective of the needs and interests of learners and their societies. Two main initiatives are presented that have picked up momentum and both emphasize interdisciplinary learning and a focus on developing 21st-century skills as a global requirement. One of them is Education for

Sustainable Development (ESD) while the other is Science, Technology, Engineering and Math (STEM) education.

Badran, Alaa; Eid, Lamiaa; Abozaied, Hanan; Nagy, Noha study (2021): "Egypt's ICT Reform: Adoption Decisions and Perspectives of Secondary School Teachers During COVID-19".
This descriptive quantitative survey study explored the perspectives of 221 secondary school teachers from 19 Egyptian governorates on the ICT (information and communications technology) component of the 2017 education reform. Data were collected during the novel context and mandates dictated by the widespread COVID-19.

Moustafa, N., Elghamrawy, E., King, K., Hao, Y. study (2022): "Education 2.0: A Vision for Educational Transformation in Egypt".
This chapter presents a comprehensive description and analysis of Egypt's Education 2.0 (EDU. 2.0) reform plan for grades K-2. The reform's five key components are described including the new multidisciplinary curriculum, technology integration, school management Continuous Professional Development (CPD), access and infrastructure, and reformed assessment.

Zaghloul, Hisham & Rabeh, Mohamed study (2020): "Educational media and educational technology within specific education in Egypt and KSA: Challenges and prospects for development. The Education and Science Journal".
This analytical study aims to diagnose the problems of carrying out professional activities and to study the needs of teachers, specializing in educational media and working in specific pre-university education systems in Egypt and Saudi Arabia. Data collection was carried out using a survey questionnaire that was administered to a sample consisting of 100 teachers (50 from Egypt and 50 from KSA) working at various pre-university education levels in both countries. All the participants reported the pivotal need to offer continuing professional in-service training opportunities for educational media and educational technology specialists.

As presented, all the previous studies correlate with our study and the title as education in Egypt needs a lot of reforming by including new strategies and specifically by integrating technology into curriculums.

From here we came up with the idea of selecting a specific science concept as a sample for applying technology in teaching it, as this area hasn't been taken seriously in recent years, since the primary science curriculum was still being developed and the efforts done to make some assistant presentations weren't including research papers or methods of implications or even reference-based data as well as no project theme to be developed afterward, but now all of this has changed as we came up with a unique project theme that will be Marvelous when applied in schools, Our work is not considered a novelty as we said there were some efforts done in this area but not deep and creative enough as our work, or maybe it was only applied in the secondary stage.

3. Methods of Research and the tools used

As a first step, for building up our presentation e-book, we have searched deeply online through different websites, YouTube, and kids' channels.

Peekaboo Kids, MightyOwl, and Smile and Learn are examples of fourth-grade primary educational channels. Also, we used the PhET program for simulation experiments. Different sites were used for animated images like the GIPHY site. We have recorded some audio by our team to explain difficult parts of the curriculum. Furthermore, our team has designed some exciting educational games for kids.

The target population in this study was fourth-grade primary school students, aged between 9 and 10 years. The sample consisted of 52 primary school students enrolled in experimental government schools in Cairo, Egypt. The pupils were divided into two groups, there were 26 children in each group (18 girls and 8 boys), (13 girls and 13 boys).

For gathering and analysing data about the effect of using our e-book presentation in teaching, we used notes, remarks, experiments, qualitative analysis, and field studies in the classes during our practical training period in school.

4. Results of Research

We started to use our e-book presentation in teaching the lessons by using a display screen in the media room of the school. The school tools were simple, but we tried to overcome this by including more original simple designs. The first version of our e-book presentation contained an explanation of some lessons using animated images and videos. This version was presented for the first time as a preliminary form, but it did not receive good feedback to meet the student's need to understand the information. Therefore, it was developed further by adding more videos, audio, and educational songs for the difficult information to gain the students' approval to understand as many

of the parts of the lesson as possible. In recent experiments, some electronic games, puzzles, and simulation experiments were developed that improved greatly our project to achieve the aim of the research. We observed the extent of the student's understanding through some electronic games and competitive evaluation among the students. In addition, the children were very happy and excited to learn more and keep the class going for a longer time.

At the end of the experiment, we conducted an oral systematic evaluation of the various parts of the curriculum, the results proved the extent to which the information reached the student's mind in the greatest possible way. To find out the students' opinions, some questions were posed after the end of the presentation section, which confirmed their approval of the idea and how to deliver the information in a simplified manner, which also motivated them to learn due to the use of educational technology in it.

The results of designing a science curriculum in presentation and employing technological applications in teaching it can be summarized in the following:

1. Attract students' attention and increase their concentration.
2. Students love the experience.
3. Increase self-confidence.
4. A better way to memorize and understand.
5. Increase the effectiveness of the class.
6. Improving student performance
7. Increase student engagement.
8. Reducing the time to deliver information.
9. Presenting information in a more organized manner that is easy to understand.

10. Enhancing students' understanding of scientific concepts and phenomena.
11. Making science curricula more attractive, interactive, and fun for students.
12. Providing opportunities for students to conduct experiments remotely through electronic platforms.
13. Developing skills such as problem-solving and creative thinking
14. Help students visualize abstract ideas and reinforce their understanding.
15. Make connections between different scientific principles.

5. Interpretation of Results

When we speak about science teaching, technology has truly transformed (revolution)the learning experience. By incorporating interactive elements like simulation, virtual experiments, GIFs, educational games, and more interactive activities we can capture students' attention and make complex concepts more accessible and enjoyable. These visual and interactive tools help students visualize abstract ideas, reinforce their understanding, and make connections between different scientific principles. Plus, they add an element of fun and excitement to the learning process, making science lessons more engaging and memorable. It's amazing how technology can enhance student comprehension and create a dynamic and interactive classroom environment.

Now, we will talk about the positive impact of technology on science teaching, with a particular focus on how to enhance student understanding, promote active learning, and enhance creativity. Let's dig deeper and discover the exciting world where technology and science education intersect.

In our graduation project, we use technological elements as much as possible like:

GIF Pictures can have a positive impact on children's learning. They provide visual representations that help children understand and remember complex concepts more easily. GIFs can bring static information to life by showing dynamic processes or illustrating step-by-step procedures. This visual stimulation helped us attract children's attention, enhance their understanding, and retain information in a fun and interactive way.

Puzzles are a fantastic educational tool; they offer a fun and interactive way for children to learn and reinforce various concepts. Puzzles are an effective way that help children memorize scientific words and concepts. By engaging in puzzle-solving activities, children used their problem-solving skills, critical thinking abilities, and memory recall, and improved spatial awareness, hand-eye coordination, and cognitive skills. puzzles promoted their patience, perseverance, and a sense of accomplishment when children complete them successfully.

Education Videos have a positive impact on children, as they combine visual and audio elements to enable us to present information in a way that attracts children's attention and makes learning more enjoyable. We have used videos that include storytelling and animation which allow kids to understand complex concepts, add life to the concepts, make them more relevant, and enhance retention of information. Indeed, we have noticed that it has led to increasing their participation, enhancing their curiosity, improving their understanding, and enthusiasm for knowledge, it

also caters to different learning styles and provides a multi-sensory experience.

Educational Games have a significant impact on students' achievement in science by combining learning and play. We saw when applying these games that they created an attractive and interactive environment that motivates students to actively participate and explore scientific concepts. Through play, students were able to apply their knowledge, which also strengthened their critical thinking and analytical skills. We saw that some students had immediate feedback, allowing them to learn from their mistakes and improve their understanding. It also provided us with opportunities for cooperation and competition among students, enhanced social Interaction and teamwork. The children loved the games and played them more than once (Ziyan Li, 2024, 27-31).

Educational Songs had a strong impact on the children. When we played the song, we noticed that it helped the children connect with the content on a deeper level. When scientific concepts were presented in an attractive and memorable tone, it helped the students simplify complex ideas and make them easier to understand and remember. The melodies and rhythm attracted the students' auditory senses. The children enjoyed the song and sang it together. It also promoted social interaction among students.

Simulation: from my point of view, I believe that simulation is a wonderful tool in learning, and teachers can integrate it into science lessons as scientific activities. We used it in our project to allow students to explore scientific phenomena and interact with them in a virtual environment.

Students can use variables and conduct experiments at any time they like. It also provides a safe space for students to make mistakes, learn from them, and refine their understanding of scientific concepts. It had great results in providing opportunities for students to develop critical thinking and problem-solving skills and immersing students in realistic scenarios. Simulations make learning science engaging, interactive, and memorable (Michail Giannakos 2013, 429-439).

Riddles *are* a fun and effective way to integrate critical thinking and problem-solving skills into science education. We use scientific-themed puzzles to attract students and encourage them to think creatively. For example, we presented a puzzle that relates to a scientific concept and fact and requires students to work together to solve it. This not only challenges their knowledge but also promotes teamwork and collaboration to find the solution. It was a great addition to science lessons, helping to develop students' analytical skills while having fun (Shaham Hait, 2013, 388-395).

A study was undertaken in 2010 by the Massachusetts Institute of Technology (MIT) wherein a 19-year-old student's brain behavior was monitored for one week. They found that when he was in an ordinary training classroom, his brain activity was almost the same as that of a television viewer. Education for youth does not occur in classrooms. It makes sense that new trends in learning, such as gamified learning, are emerging for today's workforce.

According to Tracy Sitzmann's research, games are the best way to learn. The following advantages of game-based learning (GBL) over traditional learning are as follows:

- It allows for up to 90% learning retention.

- 20% increase in learner confidence.
- 11% increase in conceptual understanding.
- 300% increase in completed tasks.

In the present study, students had a better learning process due to using the e-book presentation which includes animated images, internet links, audio, teaching videos, different games, and puzzles. That is more interactive learning than the traditional method. If we compare, there is a limitation in explaining any chapter in the textbook or even by the teacher. In our e-book, the kids can use all their senses during learning. The kids can be very enjoyed and motivated to learn.

This e-book presentation is a two-way process as it is useful for both learning and teaching. In the time of effective learning for kids, the teachers can give more information in less time, easier, and with less effort using the different technological methods included in our e-book. Kids also can keep concentration in the classroom in this way using the presentation.

6. Conclusion

Designing the science curriculum in a presentation manner and employing technological applications made a great impact on the sample of 4th-grade students in the primary stage as shown in the results and for sure it will have positive impacts on other samples. It is not just a means of presenting information, but rather a platform to stimulate curiosity and promote effective interaction between students and the curriculum. Thanks to technological tools, teachers can present educational materials in innovative and interesting ways, which enhance students' understanding and deepen their knowledge of scientific concepts. As

for recommendations for future research that resembles this one and has the same goals it would be better to design a platform for the games instead of making each one in the PowerPoint as this will save much time and space, also there should be a designed channel by the team to create more specific educational videos that work perfectly with the data included in the presentation, these guidelines will improve the future practices as the games and videos come from one place this will enhance the correlation of the presentation.

Acknowledgement

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