Technium Vol. 26, pp.84-101 (2025)
ISSN: 2668-778X
www.techniumscience.com

The effectiveness of a newly developed smart learning environment for developing Smart Devices Apps Design Skills

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Abstract

The research aimed at examining the impact of a newly developed Smart Learning Environment (SLE) based on two AI-based chatbot modes (text - voice) to develop the design skills of smart mobile apps by using appmachine platform. The developed SLE uses smart tools from the field of Artificial Intelligence for interactive experience, support, and guide for graduate learners to effectively learn smart mobile apps design and development skills. The research sample consisted of 40 randomly selected male and female graduate learners specializing in educational technology at the Faculty of Education, Mansoura University, Egypt. The learners were classified in two equal groups. The content is implemented by two chatbot modes that help the learners to deal with SLE to register, get the learning content, execute the tasks and build the app. The research tools included a list of skills for designing smart mobile applications, and a performance aspects observation card for evaluating the learner design skills. After implementation of the research experiment, the results indicated that there is a positive impact of the two chatbot modes (text - voice) in developing the design skills of smart mobile applications among graduate learners. The environment was designed and developed using the latest available technology standards, approaches, and tools. The environment was tested with a random group of learners as new developers, and showed impressive results with positive impacts. Finally, the main result is the success of all learners to build a complete educational app after the full execution of this research experiment.

Keywords: Smart Learning Environment (SLE) ; Chatbots (Voice-Text); Smart Mobile Apps.

1 Introduction

The modern teaching and learning processes heavily rely on the latest advancements in technology. They are rapidly evolving, especially during COVID-19 pandemic, which has forced the world to resort to online learning and develop new programs and applications to adapt to the COVID-19 situation. Most countries have sought to harness technology capabilities to facilitate learners' access to knowledge and continue to learn, using the latest technological means, leading to an increased need of using modern educational technologies. These educational technologies have evolved to be key and integral part of the modern educational process. Among these latest technologies used in the modern educational process are SLE using AI-based Chatbots, videos, documents, and social media. SLEs as

learning or activity workspaces can determine different learning scenarios, identify learner characteristics, provide needed resources and interactive tools, automatically record the learning process, and assess learning outcomes for enhancement of effective learning (Huang et al.,2013). The goal of intelligent learning is to improve the continuous learning quality of learners by focusing on smooth personal learning according to contextual needs to stimulate learners' intelligence and facilitate their problem-solving abilities in smart environments (Zhu et al. ,2016). Various Artificial Intelligence (AI) technologies became the cutting-edge technologies on the top list of technologies to be used in SLE design and implementation. It was predicted that AI-based Chatbots would be among the most widely used technologies, alongside AI-based Virtual Reality (VR) applications (Laurinavicius, 2016). Chatbots are artificial intelligence applications that learn through engaging in conversation on machines (e.g., computers, smartphones) used for dialogue with humans. They can connect to social networks such as Facebook and Gtalk and automatically respond to chat conversations. Chatbots can be programmed to respond in different ways based on who is speaking to them, what the person is saying, and what was the previous conversation topic (Benotti et al., 2014). Marino (2014) views chatbots as programs that simulate conversation with humans and considers them as key products of artificial intelligence research. A study by Pavel and Petra (2020) indicates the effectiveness of using chatbots in achieving learning outcomes, as they are one of the most flourishing innovations in e-learning and can serve as a helping hand to facilitate the learning. However, though the many benefits of using AI-chatbots in education, there are still only few academic research studying their use in the SLEs enabled education processes (Li & Wong, 2022). Moreover, Smartphone applications are now essential requirements due to the development of diverse learning resources, which is no longer optional for experts in educational technology. They are becoming important in facilitating our access to resources and services in all aspects of life from business, health, education, to entertainments, especially they exceeded 8 million apps for the well-known platforms. This placed higher demands on training more learners as app developers in a short period and to a decent professional level.

Kelly and Mangis (2012) regard the smartphones apps as intelligent programs stored in smartphones memory, to perform specific functions such as accessing websites, learning new material, performing different transactions or even reporting the smartphone location. The use of available applications on smartphones has increased, especially in terms of educational services, due to the growing number of users of modern smartphones and tablets among educational institution learners. Modern app stores are filled with thousands of educational applications useful for learners in various educational stages, developed to allow learners to interact with them easily and engagingly, in an easy manner. Consequently, there are growing and urgent need to learn and master the skills of design and implementing of these applications for learners. They have many and important benefits in making learners keep pace with the latest scientific advancements.

Examining the latest literature reveals that there are not recently research studies carried out on smart apps design skills using SLE enabled education process employing AI-based Chatbot modes (text-voice). So, it is thought that this research will be helpful in covering this research gap.

2 Literature review

Smart learning environment (SLE)

Many studies have emphasized the urgent need for the use of SLEs in education and training. Koper (2014) pointed out that SLEs are those environments that achieve some initial structures and consciously and strategically include technologies that influence learners, enabling them to consider the learning space smartly. Therefore, enriching SLEs with digital and adaptive devices and environmental awareness is essential to enhance faster and better learning. Similarly, (Kinshuk et al. ,2016) emphasized customization as a key feature of smart environments, allowing adaptation to learners' needs. (Liu, Huang, & Wosinski, 2017) spoke about adapting learning content to provide what learners want and need to learn according to their personalities. Consequently, in a smart learning environment,

curricula and courses should be transformed from traditional to intelligent, as stated by (Segredo, Miranda, & León, 2017).

Ha and Kim, (2014) noted that smart learning environments provide learners with suitable communication environments and rich resources, a concept echoed in other studies. Through SLEs, teachers can effectively use various digital learning materials for clarification (Jayahari et al., 2017), while Liu, Huang, & Wosinski (2017) added that SLE supports self-directed learning "without teachers, but with predetermined learning content, objectives, and assessment methods."

Smart learning can be seen as a self-directed learning method that focuses on the individual (Durán-Sánchez et al., 2018). The use of the Internet of Things (IoT) is linked to wearable technologies, as proposed by (Freigang, Schlenker, & Köhler, 2018), who suggested designing SLEs using the concept of IoT for learning purposes. Platforms like HiljaNet rely on the Internet of Things, as noted by (Isaksson et al., 2017). When using SLEs, learners aspire to set higher personal goals, such as innovation (Learn Better Things, LBT), or to develop self-organizational skills (Learn Things Better, LTB).

Several studies have specialized in the use of AI in education and training as tools for SLEs, with one of its effective tools being chatbots. (Ho Thao et al., 2018) emphasized the importance of chatbots as intelligent assistants that provide solutions for educational institutions and contribute to improving their current services, reducing costs, and creating innovative new services.

The study presented a smart chatbot that classifies text and automatically responds to learners' inquiries on behalf of faculty members. (Farkash, 2018) highlighted the benefits of using chatbots in the educational process, including facilitating access to information, simplifying administrative procedures, answering frequently asked questions, providing training content, offering technical support, and assisting in error exploration and correction.

Chatbots excel in reinforcing the learning and training process through various methods, such as using data analysis to cater to individual differences among learners, enriching content, considering learners' individual differences, and providing necessary support during the learning process.(Benotti et al., 2014) demonstrated that designing a smart chatbot and testing its capabilities helped attract learners' attention, stimulate their participation in topics related to computing concepts, and increase task completion, participation, enthusiasm, and interest compared to other learning platforms and environments. (Fryer & Carpenter, 2006) affirmed that chatbots provide knowledge to recipients in an enjoyable manner while also playing a supportive role in activating learner engagement. They facilitate higher participation rates and a greater sense of comfort among learners when interacting with a neutral entity. Additionally, numerous studies have confirmed the effectiveness of using chatbots in education, skill mastery, retaining learning effects, and achieving educational goals, such as (Abbasi and Kazi, 2014), (Sofie & Roos, 2018), (Kowalski et al., 2013), (Bii et al., 2018), (Jia & Ruan, 2017), and (Benotti et al., 2014).

Designing Smart devices Applications & Its Need in Education

The study of Mtega et al. (2012) also indicated that despite the use of smart phone applications in the teaching and learning processes, some learners have no idea how to design and use these applications, especially interactive multimodal applications. The study of Huang et al. (2010) emphasized the need to pay attention to training learners in designing applications on smart phones. This is for the purpose of improving learning outcomes because these applications are of great importance in interacting with others and cooperative learning. They also represent an important cognitive tool for providing modern information and guidance by the teacher at any time and in any place.

3 Research Problem

Many studies have confirmed the urgent need to use SLEs in education and training. Koper (2014) indicated that SLEs are those that achieve some initial structures, and include in a conscious and strategic manner technologies that allow for influence. For the learner, to be able to consider the learning

space as smart, the SLE must be enriched with digital and adaptive devices and awareness of the environment in order to promote faster and better learning. (Kumar & Graf, 2011), Kinshuk et al (2016) also pointed out that personalization is an essential feature of the smart environment.

SLE research has grown over time, particularly during the COVID-19 pandemic in 2020–2021, which fundamentally altered the "landscape" of technology use in education. The availability of technology and the existence of digital transformation have changed behavior, habits, and teaching and learning processes to encourage the transformation of the learning environment into a SLE. Digital transformation is a continuous adoption process, resulting in the transformation towards SLE (Maulidiya et al, 2024).

By evaluating learners' perceived preferences for the learning environment, we can understand the important characteristics and better improve the learning environment, ultimately to provide great potential for the optimization of teaching practice (Dai et al., 2023). The concept of SLE is closely related to the concept of Future Classroom [FC] which rely on heavy use of Artificial Intelligence tools such as Chatbots (García-Tudela, & Marín-Marín, 2023).

At the same time a lot of studies approved for the existence problem in design skills of smart mobile apps between learners such as the study by (Yassin, 2013) indicated a lack of sufficient training among individuals who use smartphone applications on how to use these applications in their different specializations. Therefore, the study recommended the need for effective training programs in the field of designing smartphone applications and using them in education and other related fields. A study by Al-Huli (2011) indicated that there is little interest in faculties of education in the field of developing skills related to the design of educational applications and software for learners, with a focus on cognitive aspects at the expense of practical and operational aspects. This led to a weak level of graduates, in addition to the scarcity of specialized training programs in the design of educational programs for modern technologies. The study recommended the need to focus on smart device applications. A study by AdelSadeq (2014) concluded that there is a need to train learners in the College of Education on the skills of designing electronic achievement files using smartphones. Training programs are distinguished by their ability to provide learners with the information, skills, and attitudes necessary to keep pace with any development in institutions and open new horizons for professional development. These studies highlight the need for more training and education on how to design and use smartphone applications in education.

The researchers conducted an exploratory study on a sample graduate learner in the Department of Educational Technology, Faculty of Education, Mansoura University, to explore their use of AI programs and their need for training in the design of smart devices applications. The results of the exploratory study indicated that the learners had taken many training courses in computers, information technology, electronic programs, and the English language. The duration of the training courses ranged from one month to one year. As indicated by (90%) of the sample, they received training electronically. The training programs they received training through varied, including Zoom, Office 365, Teams, Edmodo, Google Meeting, and Co-Space.

Additionally, (80%) of the sample did not receive any training in the field of AI. (90%) of the exploratory sample indicated that they had not received any training in smart device application design. Finally, (100%) of the sample members expressed a need to develop smart device application design skills in their field of work, in order to keep up with scientific progress, design programs that keep pace with modern curricula, and because smart devices and their programs are the tools of the future, and due to the strong impact of artificial intelligence programs.

This highlights the need for universities to develop and offer training programs in modern AI tools to prepare learners for the future and the importance of smart device application design skills for future educators.

According to literatures, there is a lack of skills for graduate learners in education colleges in designing applications for smart mobiles, necessitating the development of a SLE based on chatbot

modes (text - voice) to address this deficiency. So, the researchers proposed a new design of SLE using interactive Chatbots modes (Text and Voice) to be developed in this research.

The newly designed and developed SLE is used to answer the following research questions:

1. What are the skills for designing smart devices applications that graduate learners at the College of Education must have?
2. What are the criteria for designing a smart learning environment based on two modes of chatbots (text - voice) to develop smart device application design skills among graduate learners in colleges of education?
3. What is the effect of two modes of chatbots (text - voice) in a SLE in developing the learners' skills of smart devices application design among graduate learners in faculty of education?

4 Methods

4.1 participants

The research sample consisted of 40 randomly selected male and female graduate learners specializing in educational technology at the Faculty of Education, Mansoura University, Egypt. The learners were assigned in two equal groups, each consisting of 20 learners. this first experimental group utilized voice chatbot-based AI whereas the second experimental group utilized text chatbot-based AI. Most of the learners are of a homogeneous age, specifically around 24 years old. These learners are instructed in subjects in education technology. According to the result of exploratory study with the learners which asked them about smart devices apps design skills, the researchers found that they never built smart app before. Moreover, personal experiences of the researchers through their work in the field of information technology and e-learning in Egypt and the United Arab Emirates for university learners, shows that there is a weakness in the cognitive and performance aspects of university learners in smart device applications. This can be attributed to lack of special courses on designing smart device applications. Consequently, they are not adequately trained in it and thus do not keep pace with scientific and technological progress in the field of designing educational programs. Therefore, it is confirmed that there is a weakness in learners' smart devices apps design skills.

4.2 Study instrument

A developed list of skills is used to design an observation card which is a tool to evaluate the performance aspects of the learners' design skills of smart devices apps, The researchers developed a list of smart device design skills for graduate learners by reviewing relevant studies, consulting experts in educational technology, and analyzing modern operating systems and educational trends. Initially, they created a list of seven main skills and 54 sub-skills, which was refined based on feedback from experts in the field. The final observation card was designed for clarity and accuracy, and its validity was confirmed through expert review and adjustments. To ensure reliability, the researchers used the Cooper equation to calculate the coefficient of agreement among multiple raters, achieving a high reliability score of 91.79%, demonstrating the tool's suitability for practical application.

4.3 Procedures of testing

The learners were evaluated twice prior to and after during testing phase according to the observation card to track their progress to execute and success in designing skills and built educational app. It is applied one time before learning across SLE and the second time after finishing learning across SLE. The learners started to watch videos and pdf files that introduced by chatbot (voice or text) which explain the designing skills for building an educational app. Then the learner took turns to execute the skills according to the task that required after each video. The researchers evaluated the learner performance and their progress according to their work to execute the skills and build the app according to observation card and its list of (7) main skills and (54) sub-skills.

4.4 SLE application design.

The researchers developed detailed criteria for designing effective smart learning environments, focusing on integrating modern technologies such as chatbots (text and voice), fingerprint recognition, and face recognition. The process started by defining the main goal of creating a smart learning environment based on clear and precise standards. They reviewed prior Arab and international research, including studies by Al-Mohammadi (2016) and Costello (2012), to extract applicable standards from fields related to smart learning and artificial intelligence. An initial framework was created with seven standards and 65 indicators, divided into educational and technological domains. After expert reviews, feedback led to adjustments, including adding two standards (teaching, learning, and support for use), merging content, and removing five redundant indicators. The final list consisted of six standards and 60 indicators: (1) controls, ethics, and legality (8 indicators); (2) teaching, learning, and support (15 indicators); (3) smart environment structure and multimedia design (8 indicators); (4) production of resources (5 indicators); (5) intelligent support for applications (9 indicators); and (6) chatbot design (15 indicators). The validated standards will be used to track learners' progress in designing smart educational applications.

4.5 application procedures

The researchers designed a comprehensive, multi-source smart learning environment (SLE) that included educational software, multimedia videos (created using Camtasia23 to explain how to design educational applications via the Appmachine platform), images (using Adobe Photoshop and Paint), and PDF files. AI technologies, such as chatbots (text and voice) and facial recognition, were also incorporated, reflecting the researchers' qualifications in e-learning technology and experience in designing e-courses and activities. After making necessary modifications, the researchers rented hosting space to develop the SLE and uploaded the smart environment as a webpage with the domain www.dalia-appmachineai.com. The environment utilized Microsoft Azure for chatbot deployment and various programming languages and technologies (Json, JavaScript, SQL, Python, API, Microsoft SQL Server, NLU, STT, Microsoft Adaptive Cards, WordPress), including AI applications for facial verification. It also featured 26 instructional videos, PDF files, and two activities designed on the Kahoot platform, all of which covered the skills needed to design smart device applications.

Before implementation, the researcher met the learners via Zoom to explain how to use the SLE, ensuring they could easily access it from their locations and answering any questions. The SLE allowed learners to register through the chatbot, giving them access to learning materials such as videos, PDF files, activities, and tasks via both text and voice chatbot modes. After watching each video, learners were prompted by the chatbot to complete a task related to smart device app design using the Appmachine platform. During the application of the SLE, the researchers tracked learner progress, interacting with them through WhatsApp for further support. Upon completion, the researcher evaluated the educational apps created by the learners using the observation card.
The research instruments:

5 Research Findings

5.1 Homogeneity between groups

The equality of the research groups in skills of designing applications for smart devices was confirmed before applying the two experimental treatment materials by conducting independent sample t-test for the scores of the learners of the two groups in the pre-measurement of observation card, and the results are represented in the following table: Where the equality of the experimental groups was verified in the pre-measurement to test the smart device application design skills, as the following:

Table 1 The results of the independent sample t-test between the research groups on pre-implementation grades of the observation card

Group	Mean	Std. Deviation	t	df	Sig.*
Text_chatbot	76.00	4.267	0.223	38	0.825
Voice_chatbot	76.30	4.231			

*** Note**: $p > 0.05$ for Smart Devices Apps Design Skills

It is evident from Table (1) that there are no statistically significant differences at the 0.05 level between the means of the research groups in the pre-implementation application of the observation card. The calculated value of t equals 0.223 with a significance level of 0.825, which is greater than 0.05. This indicates the equivalence of the groups before the experiment began, and any differences observed after the experiment can be attributed to the experimental treatment.

5.2 answer the research questions

To answer the first research questions, which states: "What skills for designing smart device applications must be available to graduate learners at the College of Education?" It was answered within the research procedures, as the researcher prepared a list of skills for designing smart device applications that must be available to graduate learners at the College of Education. The list, in its final form, included (7) main skills and (54) sub-skills.

To answer the second research question, which states: "What are the criteria for designing a smart learning environment based on two types of chatbots (text - voice) to develop the skills of designing smart device applications for graduate learners in colleges of education?" It was answered within the research procedures, as the researcher prepared a list of criteria for designing a smart learning environment based on two types of chatbots (text - voice) to develop smart device application design skills for graduate learners in colleges of education, and it included The list in its final form consists of (6) standards and (60) indicators.

To answer the fourth question: What is the effect of two types of chatbots (text - voice) in a smart learning environment in developing the performance aspects of smart device application design skills for graduate learners in colleges of education? To answer this question: the researcher tested the validity of the fallowing hypotheses to provide an answer to this question, using the Statistical Program Package for the Social Sciences (SPSS), and using statistical methods and equations.

First Hypothesis:

There is a statistically significant difference at a level of ≤ (0.05) between the mean scores of the pre- and post-applications of the observation card for smart devices designing skills for learners in the first experimental group who study through a smart learning environment based on text chatbot in favor the post-application.

To verify the research hypothesis, paired sample t-tests were used to calculate if there are differences between the mean scores of pre- and post-applications of the observation card for smart devices designing skills among learners in the first experimental group who study through a smart learning environment based on text chatbot, also used Eta2 to measure the impact size of using smart learning environment of smart devices designing skills

Table 2 Results of paired sample t-tests to calculate if there are differences between the mean scores of pre- and post-applications of the observation card for smart devices designing skills among learners in the first experimental group who study through a smart learning environment based on text chatbot

Skills	test	N	Mean	SD	t	Sig.*	Eta^2	impact
smart devices designing skills	pre	20	76.00	4.267	48.968	.000	0.992	Large
	post		139.50	2.626				

*** Note**: $p > 0.05$ for Smart Devices Apps Design Skills

The first Experimental group who study through a smart learning environment based on text chatbot achieved in smart devices designing skills post-test mean scores (139.50) with *SD* (2.626) while the control group achieved a mean (76.00) with *SD* (4.267), the value of T-test for differences between the pre and post-test mean scores were (48.968) with significance (.000) which is lower than (0.05), which means that there are significant differences between pre- and post-application of the observation card for smart devices designing skills in favour of the post test, also to measure the effect size of the smart learning environment based on text chatbot on developing smart devices designing skills, the researchers used Eta^2 which achieved (0.99-), and this value is large.

Second Hypothesis:

There is a statistically significant difference at a level of ≤ (0.05) between the mean scores of the pre- and post-applications of the observation card for smart devices designing skills among learners in the second experimental group who study through a smart learning environment based on voice chatbot in favor the post-application.

To verify the research hypothesis, paired sample t-tests were used to calculate if there are differences between the mean scores of pre- and post-applications of the observation card for smart devices designing skills among learners in the second experimental group who study through a smart learning environment based on voice chatbot, also used Eta2 to measure the impact size of using smart learning environment of smart devices designing skills

Table 3 Results of paired sample t-tests to calculate if there are differences between the mean scores of pre- and post-applications of the observation card for smart devices designing skills among learners in the second experimental group who study through a smart learning environment based on voice chatbot

Skills	test	N	Mean	SD	t	Sig.*	Eta^2	impact
smart devices designing skills	pre	20	76.30	4.231	52.152	.000	0.993	Large
	post		131.70	3.213				

*** Note**: $p > 0.05$ for Smart Devices Apps Design Skills

The second Experimental group who study through a smart learning environment based on voice chatbot achieved in smart devices designing skills post-test mean scores (131.70) with *SD* (3.213) while the control group achieved a mean (76.30) with *SD* (4.231), the value of T-test for differences between the pre and post-test mean scores were (52.152) with significance (.000) which is lower than (0.05), which means that there are significant differences between pre- and post-application of the observation card for smart devices designing skills in favour of the post test, also to measure the effect size of the smart learning environment based on voice chatbot on developing smart devices designing skills, the researchers used Eta^2 which achieved (0.993), and this value is large.

Third Hypothesis:

There is no statistically significant difference at a level of ≤ (0.05) between the mean scores of learners (who study through a smart learning environment based on text chatbots) and learners (who study through a smart learning environment based on voice chatbots) in the post-application of the observation card.

Table 4 Results of independent sample t-test for ensuring the equivalence between the 2 experimental groups in pre-test of observation card for smart devices designing skills

Skills	test	N	Mean	SD	t	Sig.*
smart devices designing skills	Experimental1	20	139.50	2.626	8.406	.000
	Experimental2	20	131.70	3.213		

* **Note**: $p > 0.05$ for Smart Devices Apps Design Skills

The first Experimental group (text chatbot) achieved in smart devices designing skills observation card mean scores (139.50) with *SD* (2.626) while the second Experimental group (voice chatbot) achieved a mean (131.70) with SD (3.213), the value of T-test for differences between the two experimental groups in Smart Devices Apps Design Skills observation card mean scores were (8.406) with significance (.000) which is lower than (0.05), which means that there are significant differences between groups in Smart Devices Apps Design Skills in favour of the first experimental group who study through a smart learning environment based on text chatbots-based AI.

5. 3 Discussion:

The researcher explains this by saying that learning through a smart learning environment based on the style of text chat bots in general has helped to better develop the skills of designing smart device applications and their performance aspects, as many learners prefer to use text chat bots over voice chat bots for various reasons. They see text chat as more available and convenient, and it helps memorize the practical steps for designing smart device applications. They can communicate with the robot in text at any time without having to take care of external factors such as noise, which may lead to errors in obtaining skills from the chat robot, and it's not recognizing some skills due to external sounds.

Learners believe that text chat provides a higher level of accuracy and clarity in communication as text chatbot enable the presentation of skills in an organized, sequential, and integrated manner, without exposure to misunderstanding. Learners can also keep records of text chat sessions and the steps of their skills, which makes it easier for them to review the practical steps to apply the skills of designing smart device applications later and benefit from them.

A smart learning environment employing AppMachine software offers a dynamic platform for developing skills in designing device applications. Through AppMachine's intuitive interface and comprehensive features, learners can engage in hands-on learning experiences that simulate real-world app development scenarios. The software's user-friendly design enables learners to create custom applications without extensive programming knowledge, empowering them to explore concepts such as user interface design, functionality implementation, and app deployment. By immersing themselves in the app development process within a controlled digital environment, learners can experiment with different design elements, test functionalities, and iterate on their projects, fostering a deep understanding of the principles and practices involved in designing device applications.

Furthermore, the smart learning environment facilitated by AppMachine software offers collaborative opportunities and feedback mechanisms that enhance the learning experience. Learners can collaborate on projects, share insights, and provide peer feedback, fostering a sense of community and collective learning. Additionally, instructors can monitor learners' progress, provide targeted guidance, and assess learning outcomes effectively through the software's analytics and tracking features. By leveraging the capabilities of AppMachine within a smart learning environment, learners can develop practical skills in designing device applications while benefiting from a supportive and interactive educational experience that prepares them for success in the rapidly evolving field of app development.

Text chatbots outperform voice chatbots in the realm of learning device application design skills within smart learning environments due to their inherent advantages. Firstly, the accessibility and convenience of text-based communication allow learners to engage with the material at their own pace and in diverse settings, free from constraints like noise or privacy concerns. This unrestricted access

fosters a more flexible learning experience, enabling learners to interact with the chatbot whenever they desire, leading to improved retention and understanding of the subject matter. Additionally, the clarity and organization offered by text chatbots facilitate effective communication of skills in a sequential and integrated manner. Unlike voice chatbots, which may struggle with accents or pronunciation, text-based interactions minimize misunderstandings, ensuring that learners receive accurate and coherent information consistently.

Moreover, the ability to review previous chat sessions and easily reference the steps of their skills enhances the learning process. By providing a record of conversations, text chatbots enable learners to reinforce their understanding through repetition and revision, ultimately strengthening their mastery of device application design concepts. Furthermore, text-based communication eliminates language proficiency barriers often encountered with voice chatbots, as it does not rely on speech recognition technology. This inclusivity ensures that learners of varying linguistic backgrounds can fully engage with the material without hindrance, promoting a more equitable learning environment. Overall, the preference for text-based communication, coupled with its inherent advantages in clarity, accessibility, and language proficiency, solidifies the effectiveness of text chatbots in facilitating the acquisition of device application design skills within smart learning environments.

Despite the possibility of dealing with voice chatbot, learners find some difficulties in learning some of the skills related to designing device applications. Smartphones in English, which the chatbot may not recognize correctly and thus a deficiency in learning some of the targeted skills, which later negatively affects learning the skills in an integrated and formative manner. This result agreed with the results of the study of: Al-Najjar and Habib (2021), Hassan, and Al-Zalan (2021), Shukla and Verma (2019), Al-Far and Shaheen (2019), Roos (2018), Fares and Ismail (2017).

6. Conclusions and Suggestions for Future Research

6. 1 Conclusions

This study results are consistent with the principles of information processing theory through the mental processes that learners perform during learning. Learners interacting with the smart learning environment based on the two types of chatbots (text - voice) provides a rich and realistic input for learners, and they can interact with the environment and chatbots as if it was realistic, interacting with it, and talking to it in order to deepen its understanding, and then mentally processing the information presented and available through the smart learning environment, and thus activating the learners' mental processes in terms of attention, concentration, memory, and thinking in order to develop the learners' biology concepts, and This confirms the previous studies by (Mayer). , 2005; Johnson-Glenberg, et al., 2014), and it also agrees with the communication theory, which relies heavily on electronic media communication, which is primarily present in the smart learning environment based on the two types of chatbots (text - voice), so the learner can wander inside the smart environment, interaction with the chatbot, and learning about the skills of designing applications for smart devices, which helps to interact better and thus understand and master these skills, and this is reflected in the production of integrated applications. It also encourages learners to continue learning and mastering the skills of designing applications for smart devices and enables them to imagine the structure of applications, and this is confirming all previous studies by (Martin e al., 2019; Park et al., 2020).

It is also consistent with behavioral theory, where the learner can interact with smart learning environments and chatbots in both types, and then observe and simulate, so the learner watches, practices, interacts, and then learns and trains to perform the skills and integrate them to produce a complete application. Practice helps to master the skills and leads to the learner's involvement in learning and mastering the skills of designing applications for smart devices in a deeper way. Thus, the learner can link the various skills and highlight the relationships between them and their various functions through his behavioral practices, and then integrate them to produce an integrated application, and this is what was confirmed by the Lent study, Brown, & Hackett, 2000; Bandura, 2001)

Finally, it agrees with constructivist theory in that the learner performs a set of practices and interactions with skills and links between them in order to produce applications for smart devices, which requires the learner to use and employ his/her previous experiences in the topics of interactive applications and their components.

As a teacher, the learner goes through a group of similar skills in less depth and then uses and employs what has been learned as a guide and guide for dealing with the new skills he aims to learn and master. This confirms the studies by (Duffy, & Jonassen, 2013; Piaget, 2013; Hmelo-Silver, 2004).

6. 2 Suggestions for Future Research

In light of the results of this research, the researcher proposes the following research topics:

1. Study the effect of the interaction of the chatbot style (text - audio) in the smart learning environment with different learning styles, such as the learning style (holistic - analytical), the learning style (simplification - complexity), and learners' scientific thinking skills.
2. Studying the effect of the interaction of the chatbot style (text-audio) in a smart learning environment, with the learning style (sensory-intuitive), on developing systemic thinking skills among graduate learners at the College of Education.
3. Study the effect of using the chatbot style (text-voice) in a smart learning environment in developing self-learning skills and raising the level of learners' knowledge need.
4. Studying the effect of using a chatbot (text-audio) in a smart learning environment to develop motivation for achievement and the level of mastery among graduate learners at the College of Education.
5. Study the attitudes of both teachers and learner teachers towards the use of smart device applications in education.

Statements and Declarations

Ethics approval and consent to participate

* All experimental protocols were approved by Faculty of Education- Mansoura University in Egypt"

Consent for publication

* All authors agreed to provide their consent to publish the article.

Availability of data and materials

* All data generated or analyzed during this study are included in this published article (and its supplementary information files).

Competing interests

* The author stated that he has no competing interests

Funding

* No Funding was provided by any entities, self-funded by the researcher

Authors' contributions

* All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [First Author], [Second Author] and [Third Author]. The first draft of the manuscript was written by [First Author] and [Third Author] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Acknowledgements

* I would like to acknowledge the contributions of previous scholars whose work has informed and enriched this research, and I express my gratitude for their insights and innovations, which have provided the foundation and inspiration for this study.

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