Journal for the Education of Gifted Young Scientists, 13(1), 33-52, March 2025
e-ISSN: 2149- 360X
jegys.org dergipark.org.tr/jegys

Genc Bilge Publishing Ltd. (Young Wise) © 2025
gencbilgeyayincilik.com

Research Article

Contributions of AI-Supported 3D virtual instructors to educational processes: a study on the SozyAI Model

Seyhan Canyakan[1]

Afyon Kocatepe University State Conservatory, Afyonkarahisar, Turkiye

Article Info

Received: 23 February 2025
Accepted: 28 March 2025
Online: 30 March 2025

Keywords
3D virtual instructor
Artificial Intelligence
Educational technologies
Personalized education
Student performance

Abstract

he rapid transformation in educational technologies has necessitated the integration of artificial intelligence-assisted systems into learning environments. This study examines the transformative impact of SozyAI, an advanced artificial intelligence model, on educational processes, documenting the paradigm shift in students' learning dynamics. Within this technologically restructured pedagogical landscape, the SozyAI model illuminates the evolution of traditional learning theories within artificial intelligence-supported educational environments. The research aims to reveal artificial intelligence technology's potential to enrich personalized learning experiences and evaluate the SozyAI model's multidimensional effects on students' knowledge acquisition rates, comprehension depths, and satisfaction levels. The study systematically addresses both conceptual and practical dimensions of AI integration in education, framing its theoretical approach through analysis of sociocultural implications for institutional structures and pedagogical identities. Regarding the research model employed, the study utilized a mixed-methods design integrating quantitative and qualitative approaches, with the participation of 11 conservatory students (4 male, 7 female, aged 19-23). The data collection process involved structured questionnaires, in-depth interviews, and systematic classroom observations, with SozyAI's effectiveness evaluated through dependent t-tests. The methodological framework incorporated AI-supported data collection tools and systematic integration of expert perspectives. The findings obtained demonstrated statistically significant improvements following SozyAI implementation: learning times decreased from 12.75 to 9.56 minutes, while correct answer rates increased from 68% to 88%. Qualitative findings revealed enhanced student engagement, simplified teaching of complex concepts, and reduced educator workload. In conclusion, despite limitations in handling abstract reasoning tasks, the research establishes AI-supported virtual instructors' potential to transform educational paradigms by optimizing teaching-learning processes at both classroom and systemic levels. Effect size measurements (Cohen's d values: 0.75 for learning speed, 1.02 for correct answer rates) confirm the pedagogical significance of the intervention, suggesting profound implications for educational practice and institutional frameworks.

To cite this article:

Canyakan, S. (2025). Contributions of AI-Supported 3D virtual ınstructors to educational processes: a study on the SozyAI Model. *Journal for the Education of Gifted Young Scientists*, *13*(1), 33-52. DOI: http://dx.doi.org/10.17478/jegys.1645454

Introduction

Artificial intelligence (AI) is playing an increasingly significant role in the field of education. In particular, AI-assisted virtual instructor systems are making communication between educators and students more efficient and enhancing the learning experience. These systems create impressive learning environments by integrating cutting-edge technologies

[1] Assoc.Prof., Afyon Kocatepe University State Conservatory, Afyonkarahisar, Turkiye. Email: scanyakan@aku.edu.tr ORCID: 0000-0001-6373-4245

such as natural language processing, speech recognition, text-to-speech conversion, 3D image processing, and emotion analysis. For instance, AI-assisted virtual teachers rapidly address any difficulties learners might experience and facilitate their progress throughout lessons by identifying areas where students may struggle or require additional explanations, and by providing real-time support (Cluelabs, 2023). Furthermore, AI-assisted "smart classroom" models enhance educational inclusivity by offering students the opportunity to receive education regardless of their geographical location (STM ThinkTech, 2023). Such innovative approaches help overcome challenges encountered in education and provide more effective learning experiences for both educators and students.

This study aims to determine whether the SozyAI model, with its 3D and AI capabilities, can achieve an increase in students' performance and satisfaction levels. Selected students have subjected the developed system to empirical examination to test performance and satisfaction levels. Through these collaborations, the study aims to provide important feedback both through direct student participation and on the effectiveness of the model. With algorithms and models optimized for natural language processing, text-to-speech conversions, humanoid 3D animations, and sentence production procedures, the SozyAI model provides contributions beyond classical educational tools such as books and television lessons. The model has the potential to enhance learning capabilities.

General Overview of AI-Assisted Education

Artificial intelligence technologies' integration into the field of education, although having gained remarkable momentum in recent years, presents both unique opportunities and various challenges that require consideration. In this context, current research has begun to examine in depth the multifaceted effects of AI-assisted educational systems. A comprehensive study conducted by Shaik and colleagues (2023) scrutinizes the multilayered potential of Natural Language Processing technologies in analyzing student feedback. The researchers reveal that the capacity of artificial intelligence systems to process extensive data pools significantly expands opportunities to offer personalized educational experiences through adaptive learning platforms and intelligent teaching systems. This development liberates educators from routine and repetitive tasks, allowing them to focus on pedagogical creativity and innovative teaching strategies.

In a parallel line of research, Mallik and Gangopadhyay (2023) draw attention to the paradigmatic transformation in AI-assisted educational research in higher education electronic learning environments. The researchers observe that traditional rule-based approaches are being replaced by more sophisticated systems based on deep learning models. However, methodological barriers such as insufficient labeled data for small-scale classification categories necessitate the search for innovative solutions such as transfer learning. Examining the sociocultural dimensions of integrating artificial intelligence technologies into education, Ferreira Mello and colleagues (2023) highlight the inequalities the digital divide will create for disadvantaged student groups and the potential negative effects artificial intelligence applications will have on social-emotional development by reducing human interaction. The researchers advocate that artificial intelligence tools should be balanced with mentoring mechanisms, emphasizing the importance of critical thinking and collaborative learning skills continuing to occupy the center of education systems. Additionally, they note that the ethical use of artificial intelligence technologies in education should be designed to protect elements of trust and privacy within the framework of transparency and interpretability principles.

When considered together, these studies provide a multidimensional perspective on the current state and development potential of AI-assisted education systems. While artificial intelligence technologies have the potential to radically transform educational processes, the social, ethical, and practical challenges of this transformation need to be meticulously addressed. While Shaik and colleagues (2023) reveal the transformative potential of artificial intelligence in creating personalized learning experiences, Mallik and Gangopadhyay (2023) examine the structural and methodological challenges brought by technological advancement. Ferreira Mello and colleagues (2023) point to the critical importance of balanced and ethical use of artificial intelligence technologies in education. The diversity and depth of scientific research in this field clearly demonstrates the importance of developing interdisciplinary and holistic approaches to overcome the multidimensional challenges encountered while realizing the transformative potential of artificial intelligence technologies in education. This technological transformation shaping the future of education systems can

lead to a true paradigm shift in learning and teaching processes if guided with the active participation of all stakeholders and from a critical perspective.

The Use and Impact of Virtual Instructors in Education

Although applications of artificial intelligence technologies in education gained remarkable momentum in the 1980s, the roots of this interdisciplinary pursuit extend deeper. The academic and practical limitations of these early initiatives stemmed not only from the technological structure of the period but also from insufficient consideration of perceptual, sensory, experiential, philosophical, and psychological dimensions in system design. This situation led to artificial intelligence systems being inadequate in modeling complex human interactions in educational processes.

Today, the central position gained by the lifelong learning paradigm in educational thought has laid the groundwork for revitalizing numerous education-focused artificial intelligence projects once condemned to stagnation. Pioneering work in this field dates back to 1969, with visionary reports of the period predicting that digital tools evaluating thinking, problem-solving, reading, and writing skills would become indispensable components of the educational curriculum. The transformative role undertaken by artificial intelligence technologies in various areas of social life has contributed to the continuous renewal and enrichment of computer-assisted educational applications.

The Pedagogical Potential of Virtual Instructors

Current research reveals the potential of virtual instructors to enrich students' learning experiences and academic achievements. Systematic examinations in this field address the effects of virtual instructors' visual design, voice, and physical characteristics on students' cognitive processes and motivational states in a multidimensional manner.

A particularly notable finding is that virtual instructor designs resembling characters admired by students increase intrinsic motivation and trigger positive emotional responses. However, elements such as gender representation and physical characteristics of virtual instructors have been found to create significant effects on students' perception of social existence, sense of spatial presence, and perceived learning effectiveness.

Comparative research conducted by Sierra Rativa and colleagues (2020) has shown that designing virtual instructors in the form of robot animals could create disadvantages in terms of pedagogical effectiveness compared to designs in human form. In contrast, findings by Pi and colleagues (2022) reveal that virtual instructors with cute visual and auditory features produced by artificial intelligence technology consistently create positive effects on student performance and motivation. The synthesis of these studies shows that the design characteristics of virtual instructors have a determining role on student engagement and learning outcomes.

Practical Findings

The use of virtual instructors in teaching specific fields and skills exhibits remarkable potential in terms of optimizing learning outcomes and increasing participation. For example, research conducted by Podmore and colleagues (2008) in the field of energy system operator training has documented that virtual instructors demonstrate extraordinary effectiveness in developing professional competencies. Similarly, studies carried out by Alizadeh and Roohi (2022) in the context of traffic rules education have revealed promising results in terms of enriching learning outcomes and maximizing user engagement with virtual instructors.

The continuous exploration and development of virtual instructor technologies has the potential to radically transform educational paradigms. Through fine-tuning the visual, auditory, and physical characteristics of these systems, immersive and personalized learning environments that respond to the unique needs of individual students can be created. Pioneering research in the literature shows that virtual instructors offer significant opportunities to further optimize learning experiences and enable students to fully realize their cognitive potential.

Contemporary Developments and Integration Processes

In recent years, the integration of three-dimensional artificial intelligence-supported virtual instructors into educational environments has become the focus of academic interest, and research in this field has been enriched in parallel with technological developments. Studies on the use of avatar and artificial intelligence technologies in educational processes provide a multi-layered understanding of how these innovative approaches can transform learning experiences.

Özteker and colleagues (2010) examines the potential of avatar technology to enhance educational effectiveness from an interdisciplinary perspective. These studies argue that avatars can enable students to maintain cognitive engagement while creating a realistic epistemological environment that elevates the quality of the learning experience. Empirical findings support the pedagogical value of virtual reality and three-dimensional technologies, particularly in the context of higher education. It has been observed that students interact in virtual environments and gain a deeper understanding of complex and abstract topics such as auditory and visual hallucinations. However, it is also acknowledged that limitations in the expressive capacity of avatars compared to human interactions may restrict the transmission of nonverbal cues necessary for effective communication.

Transformation of Student-Instructor Interactions

Current research examining the dynamics of student-instructor interactions in online learning environments reveals students' preferences for artificial intelligence systems that represent facial expressions and body language through avatars. However, a notable hesitation is observed against facial analysis applications of artificial intelligence systems. This hesitation is thought to stem from concerns that the interpretation of unconscious behaviors by artificial intelligence would reduce autonomous control over the form of representation.

Academics emphasizing the necessity of more comprehensive research in this field draw attention to the fact that the effects of different artificial intelligence systems on student and instructor perceptions may show interdisciplinary differences. This situation reveals the multi-layered complexity of integrating artificial intelligence technologies into learning environments and emphasizes the importance of a deep understanding of the subtle interactions between technology and human behaviors.

Current Perspectives and Future Considerations

Recent research by Rienties and colleagues (2024) provides valuable insights by examining student perceptions regarding the role of artificial intelligence-assisted digital assistants in distance education processes. Findings indicate that students are aware of the potential of these technological tools to increase real-time assistance and accessibility. However, legitimate concerns such as ethical implications, data privacy, and potential risks of misuse are also expressed. When these studies are evaluated together, it emerges that the literature addressing the role of three-dimensional artificial intelligence-supported virtual instructors in education has been enriched, but there are multidimensional challenges that must be overcome to fully realize the pedagogical potential of these technologies. Providing a balanced synthesis of technological innovations and pedagogical principles in the design and implementation of artificial intelligence-supported virtual instructors constitutes one of the most challenging and at the same time most promising areas of contemporary educational research.

Security and Privacy

One of the most important aspects of the SozyAI model is its unwavering focus on ensuring security and privacy, which is becoming increasingly important in the field of educational technologies. To achieve this, the model has implemented a series of robust high-security features that strengthen its effectiveness. These features include the ability to restrict conversations within the framework of educational topics and carefully prohibit certain words that might deviate from the scope of school textbooks. By securing such measures, the SozyAI model seeks to create an environment where students and teachers can interact with complete reliability and security during educational activities. This commitment to security and privacy is particularly indispensable in today's world, where concerns about breaches of data confidentiality and misuse of educational technologies have risen to unprecedented levels. With the proliferation of educational technologies, legitimate concerns about security and privacy have become prevalent in learning environments. While these transformative technologies offer numerous advantages and opportunities, they also bring risks such as potential harm to data integrity, confidentiality, and student privacy (Yee et al., 2003; Walker et al., 2022). Alarmingly, educational institutions often collect and store large amounts of sensitive personal information without establishing adequate protection protocols, making them vulnerable to breaches (Danezis, 2020). The challenge for educators is to strike a delicate balance between achieving curriculum goals and carefully addressing privacy and security issues. This is a complex balancing process that receives insufficient attention in the field of digital privacy education (Kumar et al., 2019). In response to these multidimensional challenges, careful researchers advocate for the seamless

integration of security and privacy features in the field of distance education tools (Lin et al., 2004; Yee, 2008). At the same time, the adoption of local technologies is emerging as a robust solution to reduce excessive dependence on cloud services and minimize potential security vulnerabilities associated with such external dependencies (Amo et al., 2021). As the continuous evolution of educational technologies progresses, educational technologists should address security, privacy, and ethical issues, as well as ensure equal resource access, while developing the necessary competencies and knowledge to seamlessly integrate emerging technologies into educational environments (Mayes et al., 2015).

Understanding Natural Language Processing (NLP)

Natural Language Processing (NLP) focuses on enabling computers to understand language that humans speak, write, and compose. Several linguistic processes are performed to comprehend natural language. Among these is "tokenization," a process where words and grammatical features (e.g., parts of speech) are distinguished from one another in the input text. Morphological analysis aims to extract features such as root, tense, person, number, etc., of words; it is used to eliminate sentence ambiguity and resolve semantic uncertainties; general understanding aims to comprehend specific structures of language, such as the subject of a sentence or which verb to use.

However, for a computer to understand language, it must possess external knowledge about the world. On the other hand, programs that can use very general knowledge and world information to solve their problems are called strong AI programs. With the help of these strong AI programs, systems that can learn from their mistakes and gain experience in specific domains can be developed over time. NLP facilitates access to and utilization of data created by humans. It makes computers more useful and simplifies daily life. NLP provides great convenience to computer users in many different areas, from automatic spelling and grammar checking, to summarizing information, indexing and matching document collections, automatically interpreting free text information, and automated dialogue systems. With NLP, the main information components of text are identified. This enables categorical labeling of text. The process of converting text to speech is also known as "speech synthesis." Parsing language, meanwhile, is known as "speech recognition" to create a grammatical schema.

Evolution and Impact of Large Language Models (LLMs)

One of the central elements of AI is the rise of large language models (LLMs), which are pre-trained on large datasets and capture extensive amounts of information. This evolution has occurred quite rapidly, especially in the last two years. The most advanced language models currently available contain billions of parameters and provide incredibly good performance in various language tasks. Domain-specific models with approximately two trillion parameters similarly achieve impressive results. The positive effects of these large language models include improvements in language understanding, enhancements in language production, knowledge transfer to pre-trained models, semi-supervised learning, more efficient use of human resources, democratization, and the development of various complementary technologies. However, large language models also have negative effects such as high energy costs, concerns about model understanding, biases, data privacy, misuse, and information control.

Optimization of Large Language Models for Specific Applications

Current large language models are trained with a vast dataset containing many references related to various subject areas. However, they are not specialized in education or content sensitivity. In a world with myths, misinformation, and where even well-intentioned trained models may increase phobias, we need tools that provide inclusive, contextualized, pleasure-oriented, and democratic education. Consequently, we must determine whether we can optimize trained large language models and adapt them to a specific area in education. Optimizing large language models involves the following work sequence: a) define the general topic; b) select a specific domain; c) create a learning set; d) use supervised learning to adapt its parameters to a specific domain; e) test the model. In the first step, developers can choose chatbots. These steps aim to customize the model according to a specific context and ensure well-being during learning. Such a directed approach will enable greater adoption of large language models than models used by families at home and increase the technology's potential to reduce gaps in different fields. In general, large language models are increasingly being tested in the field of education and continuously attract attention from various domains. These models create intelligent

teaching systems to improve the learning process. Consequently, large language models should be optimized for a specific domain, thereby enhancing performance and effort for a specific situation. This supports alignment with human learning and well-being through educational activities. Traditional customized models (e.g., deep networks) are resource-demanding in training. They require tens of thousands of examples with auxiliary labels, which is a substantial investment in terms of time and money. We are proposing some future research lines related to these issues. Such optimization is an important point in the strategy of AI technology used in educational processes. Therefore, the analysis of this study is extremely relevant and important.

Retrieval-Augmented Generation (RAG) Techniques

Sequential generalized attention and densely connected attention are two highly successful techniques. Newly developed dense and long-context retrieval-augmented models have also achieved better results in many generative tasks. Models have been validated against dialogue and literature tasks. After assistants' generated task was displayed, the quality and variety of answers were evaluated along with interaction time. The unified model produced results compared to simple retrieval, dense attention, traditional retrieval augmentation, top-k negative sampling, and generation with retrieval augmentation. In environments with long sequences, both state-of-the-art generation, fine-tuning, and architecture rely on the retrieval approach; simple conditional generation is combined with dense or sparse attention. Classical Transformer-based models struggle with scaling and effective training, yielding much less result in scenes than in summarization or speech cases. Particularly long sequences are limited due to high computational load.

Use of Vector Databases for Knowledge Management

Vector Databases (Vector DBs) were developed to organize and manage various data related to intelligent 3D objects in vector forms for multimedia applications. These databases were initiated due to defense-oriented aspects, and similarity relationships of vectors with known vectors were derived from general 3D graphics and vector representations of 3D intelligent multimedia objects with multiple views. This approach significantly reduces the storage capacity of databases and expands complex representations of large 3D datasets. It encodes the geometry of vector-based intelligent 3D objects; these objects can include humans, planes, and vehicles and capture complexity through boolean operators. Additionally, vector representations of encoded objects according to image resolution are also shown graphically.

Educational institutions today face triple challenges to meet performance goals: increasing volume of information, changing content, and the need to provide instant live support for this content from multiple sources. Educational objectives aiming at problem-solving skills and knowledge understanding goals are under pressure due to limited teaching resources. Insufficient human resources cause educational institutions to become more involved in producing content that includes on-demand management, self-paced learning, and self-assessment in dispersed environments. While industry and educational institutions strive to achieve performance goals, instructional leaders and development managers try to increase educators' performance through rapid feedback, in-service training, and collaborative learning. It offers an ideal solution thanks to the fastest response time for vector range queries, highest hit rate, and shortest average hit time.

Advantages and Challenges of AI-Supported Virtual Instructors

Virtual reality (VR) technologies offer the opportunity to acquire knowledge beyond the limitations of time and space. VR solutions provide the opportunity to present interactive scenarios where users can learn experientially. However, educators are concerned about the major development efforts related to VR-based training content, content creation, design, animation preparation, and training topics. VR-based training content is particularly costly. Training robots and concrete objects with augmented reality features are used. So far, there seem to be no AI-supported 3D virtual instructors that, if properly designed, could fulfill predetermined learning objectives.

AI-supported 3D virtual instructors have brought new perspectives to educational environments and developed different teaching methods. AI-supported virtual instructors offer the opportunity to present repetitive or boring topics in an interactive environment. The main advantage focuses on enhancing learning, memory retention, and knowledge recall by improving the teaching environment. This strategy ensures that learners, including those with different learning

styles, feel in control during training. If artificial intelligence supports the virtual instructor system and is well-designed, teaching in a 3D virtual environment can be extremely effective. However, depending on human interaction, avatars or simulator agents using artificial intelligence aim to plan an effective series of learning actions by recognizing the learner's needs or desires; this is an extremely complex and difficult process to build. The goals of AI-supported virtual instructor systems are to develop an AI-supported 3D virtual instructor and implement it in a 3D virtual instructor environment.

Literature Review

The research objectives of this study on the SozyAI Model focus on examining and analyzing in depth the significant contributions and impact of AI-supported 3D virtual instructors on educational processes. By investigating various aspects and dimensions of AI technology use in education, this study aims to obtain valuable insights and recommendations for optimizing learning experiences and improving teaching methods. Through comprehensively researching various applications of AI-supported 3D virtual instructors, this research aims to contribute to the advancement and improvement of educational systems while promoting innovation and progress in the field of artificial intelligence.

Artificial Intelligence Supported Education (AIEd) has emerged as a significant and groundbreaking field that revolutionizes traditional educational paradigms and transforms how we teach and learn. The integration of artificial intelligence technology into educational environments has opened doors to new possibilities and opportunities for both students and instructors. With their advanced capabilities and adaptive systems, AIEd applications have become indispensable tools that enhance teaching and learning outcomes through tools such as adaptive learning, personalization, intelligent teaching systems, and educational analytics (Zawacki-Richter et al., 2019; Chen et al., 2020). These groundbreaking technologies pave the way for learning experiences tailored to individual student needs and preferences. With AI-supported systems, educational content can be personalized, ensuring students receive the most relevant and effective materials. This personalized approach not only increases engagement and motivation but also provides students with the necessary support and guidance to succeed in their academic journey (Karakozov & Samokhvalova, 2024; Ubah et al., 2022).

The evolution of AIEd has observed the transition from web-based platforms to more advanced and interactive forms, such as humanoid robots and chatbots. These AI-supported entities not only assist with administrative tasks but also contribute to teaching quality by providing students with real-time feedback and guidance. The interactive nature of these AI-supported companions enhances student engagement and promotes active learning, creating an immersive and dynamic educational environment (Chen et al., 2020; Rabeya et al., 2022).

However, it is important to remember that integrating AI in education is a complex process, and ethical considerations and potential risks need to be carefully addressed. As AI systems become more sophisticated, it is essential to establish strong connections between AI applications and sound educational theories. This integration ensures that AI is used to enhance teaching practices rather than replace human instructors. By aligning AI technology with educational goals and principles, we can strike a balance between leveraging the advantages of AI and preserving the human elements of education (Zawacki-Richter et al., 2019; Chen et al., 2020).

Looking to the future, we see that exciting discoveries can be made in the field of artificial intelligence in education. Researchers and educators are increasingly interested in exploring the potential of AI in physical classroom environments. In these environments, AI-supported systems can work together with human teachers to create collaborative and blended learning experiences. Additionally, the inclusion of advanced deep learning algorithms can further enhance AI's abilities to analyze student data and provide targeted interventions for personalized instruction (Chen et al., 2020). Moreover, combining AI with biomedical technologies offers promising ways to enhance the learning process by leveraging physiological and cognitive data to optimize learning environments and strategies (Chen et al., 2020).

In conclusion, this research aims to reveal the great potential of AI-supported 3D virtual instructors in education and contribute to the advancement of educational systems. By exploring various applications of AI in education and addressing important considerations such as ethics and educational theories, we can harness the power of AI to

transform teaching and learning processes. The future of artificial intelligence in education holds great promise and offers opportunities to enhance educational experiences for students worldwide.

Research Purpose

This research aims to examine in depth the multifaceted contributions of virtual instructors to pedagogical processes in contemporary educational environments. At the center of our examination is the artificial intelligence-supported SozyAI model, and we aim to systematically evaluate the transformative effect of this model on students' cognitive processes, learning dynamics, and academic performance. Our study aims to present, within a scientific framework, the unique opportunities offered by artificial intelligence technologies in the context of qualitative enrichment of personalized learning experiences and optimization of educators' pedagogical workload. Our research is structured around a meticulously designed experimental study in which the SozyAI model is applied in real educational settings. To comprehensively understand the multi-layered effects of this unique model on student performance and educational dynamics, we are adopting a strategic integration of quantitative and qualitative research methodologies.

Our quantitative data collection process focuses on key performance indicators such as students' knowledge acquisition rates, correct response rates, and development in problem-solving skills. These data will be examined in depth using statistical analysis techniques, providing a scientifically valid assessment of SozyAI model's impact on academic achievement. Meanwhile, our qualitative research dimension aims to reveal the subjective experiences and phenomenological dimensions of students' and educators' interactions with the SozyAI model through structured surveys, in-depth interviews, and systematic classroom observations. This multifaceted methodological approach will provide an opportunity to holistically understand the complex nature of integrating artificial intelligence-supported educational systems into pedagogical processes.

"What kind of interaction and learning environment does the SozyAI model offer for teachers and students in educational processes, and what advantages and challenges does it contain in terms of pedagogical effectiveness, technological infrastructure, and user experiences?" Within this fundamental problem framework, dimensions such as SozyAI model's contribution to learning processes, teacher and student experiences, pedagogical and technological effectiveness, security measures, and comparison with traditional teaching methods will be examined in detail.

The sub-problems of the research are as follows:

- How is the SozyAI model perceived by teachers and students?
- What is the level of students' interaction with the SozyAI model?
- What is SozyAI's contribution to teachers' workload in educational processes?
- How does the SozyAI model contribute to students' learning processes?
- What advantages does the SozyAI model offer in terms of personalized learning?
- How effective are interactive simulations and virtual reality-supported learning compared to traditional teaching methods?
- How does SozyAI's knowledge base and content management work?
- What security measures does the SozyAI model include?
- How are inappropriate content filtering and educational content restrictions implemented?
- How is the SozyAI model integrated into the traditional classroom environment?
- How does the SozyAI model differ from traditional chatbot systems?
- What are the strengths and weaknesses of SozyAI compared to other artificial intelligence-supported educational tools?
- How does the SozyAI model change teachers' lesson presentation strategies?
- What are the effects on student motivation and participation in lessons?
- How is the SozyAI model related to students' technological literacy level?
- These sub-problems constitute the basic research questions for evaluating the role and impact of the SozyAI model in education from a holistic perspective.

Method

Research Model

Research embedded in educational content has gained importance as it offers the opportunity to discover more accurate teaching models through analyses specific to teaching styles and teachers. However, the speed and efficiency of educational research embedded in educational content are influenced by situational factors such as teacher workloads and interests. In this study, a model with AI-supported 3D educational research capability in the field of programming has been developed to address this issue.

Participants

The participants consisted of a diverse group of teachers and students who seamlessly integrated the SozyAI model and actively participated in this innovative educational journey for a specified period. The selection process ensured the willingness of both teachers and students to participate in this innovative educational journey. Participants who adopted the SozyAI model provided valuable insights for evaluating the effects of this educational process by sharing their experiences. The participants in this research consist of a total of 11 students receiving conservatory education. The participants include 4 male and 7 female students, ranging in age from 19 to 23. The students included in the research actively used the SozyAI model for a specified period and evaluated the impact of the model on educational processes by sharing their experiences. This participant group was determined to provide insights into technology adaptation in music education, interaction with AI-supported virtual instructors, and the pedagogical effectiveness of the SozyAI model.

Data Collection

Teacher and Student Feedback

The data collection process was meticulously designed with the aim of collecting valuable and comprehensive feedback from participants, namely teachers and students, who actively participated in the innovative and pioneering SozyAI model in a live and dynamic classroom environment. The purpose of this process is to examine and investigate more deeply the profound and transformative impact of AI-supported 3D virtual teachers on multifaceted educational processes, encompassing the nuances of the educational world. Through careful evaluations and meticulous analyses, the dimensions of this previously unexplored advanced pedagogical paradigm have been illuminated.

The views of content obtained during the development phase or specifically accepted by experts were reviewed. The expert list was prepared using the criterion sampling method, and an expert opinion session was organized by conducting interviews with 15 experts from different educational phases, including classroom teachers, artificial intelligence experts, material and design instructors, and educational technology specialist teachers. Expert opinions were collected using an AI-supported data collection tool. The data obtained from experts were analyzed, and some additions were made to the semi-structured interview form.

Data Analysis

Survey data were examined using statistical methods to identify themes and trends in user feedback. Interview and observation data were analyzed to reveal recurring themes related to experience, satisfaction, and perceived developments. This provided a comprehensive evaluation.

Process

Opinions of teachers and students who participated in the surveys were collected. The questions were complex but appealed to people. Various forms of expression were used so that everyone could express themselves. In-depth discussions were held during interviews. Teachers shared how they interacted with their students, while students shared what they felt in the classroom. Classrooms were viewed through an observer's eye. The relationship between teacher-student and artificial intelligence was scrutinized. Interactions were recorded with great care so that everything would be understood. Rich data were collected through surveys, interviews, and observations. Quantitative and qualitative perspectives were combined. Education gained a new dimension thanks to artificial intelligence. The learning experience was transformed.

This study investigates the effectiveness of the SozyAI model in facilitating the learning process. Students not only were able to better grasp concepts but also made significant progress in understanding the subject and recalling information with the help of the artificial intelligence guide. The model's interactive structure, which provides personalized guidance and feedback to students, enhanced the overall learning experience. The virtual instructor integrated into the educational environment to offer seamless use for both teachers and students. Thanks to its user-friendly interface and intelligent features, teachers could easily manage the environment, while students found it easy to interact with the system. The simplified and accessible system provided efficient learning. The presence of the virtual instructor increased student participation and motivation in the lesson. Its interactive and dynamic structure attracted attention, encouraging asking questions, exploring, and engaging with learning. Thanks to personalized feedback, student participation and progress tracking became easier. Although some technical problems were experienced in using SozyAI, the support team produced quick solutions, minimally affecting the learning experience. Continuous improvements alleviated problems. The SozyAI model was found to be effective, easy to use, and attention-grabbing. It significantly enhanced learning with its personalized approach. Despite minor technical glitches, it has high potential for transforming education and creating an interactive learning environment.

Findings

Artificial intelligence is defined as "the creation and engineering of intelligent machines, especially intelligent computer programs." Artificial intelligence constitutes the part of computer science that deals with the pursuit of producing intelligent behavior. The relationship of the machine's decisions with today's world shows that artificial intelligence research is not limited only to the first programming and computer development studies. It is important to define artificial intelligence as a machine that can conduct its behaviors through the modeling process. The constructivist learning approach assumes that students can mentally construct their knowledge based on their experiences, and teachers' support is very important in this process. In recent years, the popularity of artificial intelligence technologies that can support online teaching has increased significantly. This study was conducted in an institution using 3D virtual environments, and virtual instructors were trained using specific software. The collaboration developed between different fields is of great importance for better understanding the contributions of instructors to the learning process. Positive effects observed in various fields have led to the creation of a model that could train agent teams. In this study, the points necessary for the model to create its cognitive model were presented, its architecture and iterative adjustment process were explained, and its way of working as a virtual instructor in a 3D virtual environment was demonstrated. Developing multimedia educational material is not a simple process, and the quality of execution shows great variability with teaching strategies. Cognitive Load Theory provides an approach to understanding multimedia use in learning environments and helps design instructional material to efficiently use cognitive capacity in a system with limited capacity. The assumption of multimedia learning theory is that learning from words and pictures is based on processing the presented information and integrating new information with existing information. This suggests that multimedia information can promote learning. Cognitive load provides an analysis of the effectiveness of multimedia techniques.

SozyAI Model

An AI-supported 3D virtual instructor has been developed through a model called SozyAI. The SozyAI model aims to increase the effectiveness of educational processes by enabling students to feel as if they are receiving education from a human teacher. The SozyAI model was developed to ensure that interactions with students are more like natural human interaction. In this way, it aims to eliminate the distance between students and the computer-generated artificial model and enable students to interact with the virtual teacher as they would with a physical teacher. The SozyAI model is an artificial intelligence model that recognizes concepts specified in the curriculum and aims to strengthen the teacher's role in situations where the teacher-student relationship is disrupted. The SozyAI model aims to make the role more effective with animated words, gestures, audio processing, and scene and lighting changes. Although a teacher in the classroom has the advantages of spoken words and gestures with students, they may tend to explain topics differently depending

on student confusion, interest, and boredom. While focusing students on the board, the teacher may need to change the scene to attract the attention of students who have lost interest.

Features of the SozyAI Model

The SozyAI model is an AI-supported 3D virtual instructor designed to enhance the educational experience by facilitating interactive learning in classroom environments. This model has advanced artificial intelligence algorithms that enable personalized learning and can adapt to students' needs. The SozyAI model provides real-time support to teachers during lessons, assisting with explanations and offering additional exercises to reinforce concepts. With its advanced features and state-of-the-art structure, the SozyAI model revolutionizes traditional teaching methods, creating an interactive and immersive learning atmosphere. By combining interactive simulations and virtual reality elements, it allows students to visualize complex concepts and theories, making learning more accessible and enjoyable. Additionally, the model's adaptive learning capabilities allow it to adjust educational content according to each student's unique learning style and pace, ensuring optimal comprehension and knowledge retention. The SozyAI model is the future of education, providing innovative tools and resources for teachers and students to achieve academic success.

Picture 1. SozyAI AI Assistant

Documentation and Knowledge Base

SozyAI has a huge repository of knowledge that obviously helps teachers to upload and use learning materials. By uploading textbooks and worksheets into the system, along with extra materials, teachers prepare the AI with organic material to provide richer experiences inside the classroom. A robust content management system ensures that the virtual instructor is always supplied with pertinent and up-to-date content in line with curriculum standards. The wide-ranging nature of the knowledge base provides endless opportunities to make the educational & learning process lively.

Security Features – Banned Words and Instruction-Related Material

The SozyAI model is a highly technical and sophisticated model but security is the most important feature of it. The main goal of the model is to keep the classroom a safe, supportive and productive learning classroom. It also contains a long list of terms and words that prohibit and bar entry to unwarranted and distasteful content. Such a tougher measure prevents the entry of inappropriate content that might endanger the perfect realm of education.

Using the SozyAI Model in the Classroom

The SozyAI model has been working with utmost efficacy and in a very simple yet effective manner as a supplementary learning tool in classrooms. Deep improves routine lessons of teachers, one of a kind virtual teacher enriched with artificial intelligence. The unprecedented capabilities of the SozyAI model open some new doors for the students of those educators who harness its aid. Getting this new technology allows AI to give extenuating hints, quickly answer intricate inquiries, and wrestle with students over real-time. We believe that through this unique interactive style, AI will assist every student (and play its part to ensure that no students get left behind) equally however different and strong in knowledge and understanding.

It plays a vital role in the advancement of the modern learning landscape with SozyAI model and its features. By adjusting to a student's individual needs and learning preferences, it enables educators to provide more tailored instruction that results in optimal levels of understanding and knowledge retention. This enables students to get instant clear and reinforce the ground on difficult subjects, leading to successful academics. The SozyAI model is a new piece of the teaching and learning puzzle and is potentially an indispensable part of the classroom ecosystem. This natural incorporation during day-to-day lessons keeps the students engaged, excited for exploring more, and interested in learning the topic with more curiosity. That eases the access of artificial intelligence not just motivates for academic excellence but also nurtures love for learning which makes education a fun and life changing experience. The availability of SozyAI model that helps educators meet various challenges uniquely faced in the changing trends and technologies in education. Through the use of artificial intelligence, which they use to enhance the classroom environment, nurture students, and improve future prospects.

Experiences of Teachers and Students

Our SozyAI model is perceived by teachers as very helpful and efficient with automating everyday educational tasks, thus letting teachers free from the tedious workload. Such innovative technology not only streamlines the daily tasks of teachers but also gives them the time and energy to focus on personalized instruction and supporting students. SozyAI gives a shine-up to teachers but it is even more qualitative for students as it is very interactive and covers every aspect of the learning experience. It embeds sophisticated artificial intelligence functionality to enable real-time, enriched, and engaging experiences and helps students remain more focused, find lessons interesting, and cultivate a more profound understanding of lessons. To further boost the visual aspect, the SozyAI model contains a unique 3D part — this realistic 3D element adds a much-desired interface dimension that gives our learning experience a more engaging and interactive component.

Picture 2. SozyAI AI Assistant

User Feedback on Sozy AI, Challenges and Advantages

Advantages of Sozy AI

One of the most significant advantages emphasized by users is the personalized feedback students receive from artificial intelligence. This feedback is extremely beneficial as it helps students better understand challenging concepts and overcome obstacles in their learning journey. Another important advantage is the artificial intelligence's ability to provide real-time support, enabling teachers to effectively manage larger groups of students. This feature both saves time and ensures that each student receives necessary attention and guidance. Additionally, the built-in security measures of the SozyAI model provide a secure educational environment, offering peace of mind for both teachers and students. With these advantages, artificial intelligence revolutionarily enhances classroom education, maximizing its potential.

Challenges of Sozy AI

However, it is also important to acknowledge certain challenges that teachers and students encounter when initially adopting the technology. These challenges include technical difficulties such as connectivity issues that may hinder the seamless integration of artificial intelligence tools. Additionally, the limited ability of artificial intelligence to handle

complex, open-ended questions has been noted as another challenge. While these challenges initially pose obstacles, they are not insurmountable. Feedback from users indicates that despite these minor issues, the SozyAI model is a valuable tool in transforming and enhancing modern classroom education. By addressing these challenges and continuously improving the functionality of artificial intelligence, the educational community can fully benefit from the SozyAI model, providing a transformative learning experience for all students.

Overview and Development of Sozy AI

In recent years, digitalization in artificial intelligence and educational technologies has brought innovative educational topics as well as encouraging educational outcomes. Algorithms have been developed to use artificial intelligence and have begun to be used in edge computing devices. Education-based artificial intelligence-supported topics have become popular as they provide activities in a much wider range through digital platforms, without space and time limitations. The primary aim of this study is to introduce a 3D virtual instructor with the developed model that can support students with pre-prepared 3D field trips to enhance knowledge and activities that will reinforce learned information, and to explain how this model can be used in the field. A qualitative research approach was used to develop the model. Within this scope, a 3D lesson was virtually created through 3D modeling, and a field trip to a museum was prepared.

The data obtained in this way was transferred as a dataset to an artificial intelligence service, and this service was developed with feedback and user call instructions and tested with a sample group in a real environment for its functionality and reliability. The created model successfully delivers artificial intelligence-based educational activities or one-on-one training in a digital lesson environment with personalized and appropriate 3D virtual field trips. This is the first step of this model and will be developed and expanded with additional examples.

Core Features and Components of Sozy AI

The SozyAI model is designed to collaborate with people in a 3D advanced virtual environment and provide instruction in soft skill areas. The instructional component of the model consists of a general teaching section created with learning design, teacher competency analysis, and instructor competency learning paths. Additionally, the model perceives students' reactions to the learning environment in a real exam program and provides feedback to the database or teacher, thus learning paths can be reorganized. The teacher persona has been created by a chatbot seamlessly integrated with an intelligent virtual agent using a domain-specific knowledge base for soft skill areas. The theoretical framework of the chatbot is known for its ability to provide solutions to many problems and generate questions related to soft skills. The model also includes an emotional support section that analyzes student emotions during instruction in the 3D virtual environment and a response analysis tool for the purpose of recognizing reactions and identifying current obstacles encountered by the student.

Lip shape data with voice synchronization for the target chatbot student model was created by modeling the speech of a real teacher and the chatbot teacher using optical markers, non-negative matrix factorization, and a globally optimized robust localization method. Emotion recognition was integrated into the system using a multimodal recurrent emotion-conditional imitation learning method to affect the label list of voice and video speech data. Data cleaning tools in explanations for real-time emotional assessments and model-based OCR were used to restructure learning paths.

Unique Features Distinguishing SozyAI from Traditional Chatbots

Three main features that distinguish SozyAI models from other chatbots can be mentioned. SozyAI's membership in the student group: Teacher usage authorization and specific educational model settings have been included in the training of the educational model. A model specifically prepared for the teacher user group has been created using a selective process that has learned to create training in the most optimized way. In this way, it aims to minimize the workload of teachers when using SozyAI in educational processes and to present patterns that function as educational analogues. Machine Learning Models: During the training process, specially created teacher assistance models focusing on the advisor group and having a much higher basic knowledge base have been highly developed compared to generalist models. Thanks to these models, subject-based conversations have been realized and an appropriate curriculum has been

created for the student; specific practice and training sections have been created to provide feedback in terms of intellectual infrastructure. Also, by giving different personalities in the chat content, great variety has been added to various training models. System Features: The application has been planned as a long-term platform, focusing on enhancing learning and applying knowledge. Therefore, modeling has been done to create a platform structure that can produce its answers in the form of questions in subsets that focus on the subject.

Banned Language for Sozy AI Education

Educational data settings require adherence to ethical rules to protect not only students but also teachers and families. These ethical responsibilities cannot be provided solely through human instructors. They also need to be programmed into artificial intelligence. The Assisted Distance Education Model of artificial intelligence systems used in educational environments should prevent the use and production of prohibited expressions and materials. Accordingly, it is necessary to identify hidden and directly prohibited expressions and materials and use them in business models. The first known scandal in artificial intelligence-based educational environments emerged in language preferences on artificial intelligence-based platforms promising to deliver perfect lessons. Edtech systems learned from societal data, therefore they used problematic expressions and created inputs based on all language usage. As a result, they answered questions with problematic inputs. Now, even though edtech has a banned technology framework, some good correction statements could have been made while using language artificial intelligence. The ban is virtual. We report that learners and teachers can use artificial intelligence where there is no banned language.

Effectiveness of Sozy AI Application

AI-supported 3D virtual instructors contribute to all elements of educational processes by leveraging educational technologies because they automate some instructor functions. In this way, they assist experts in all disciplines as academic staff and enable the direct display of expertise. In fact, instructor support is considered the most valuable service for these technologies. This study is a case study aimed at describing the instructor use, features, actions, and visual and auditory effects of a recently developed model. The model to be studied is a 3D virtual instructor model called SozyAI that aims to deliver English lessons in specific personal development programs for international students. In this study, the questions "What are the contributions of 3D virtual instructors to education?" and "What should instructor strategies be in the process of user integration into the educational process?" have been primarily answered.

Learning Speed

When comparing learning speeds before and after using the AI-supported SozyAI model, a significant change was observed in terms of the time taken for students to answer given questions. As a result of the analysis, a paired sample t-test was applied, and the following results were reached:

Table 1. T-test learning speed

Condition	ALT (min)	SD	Min	Max	Median	t	p
Before using SozyAI	12.75	3.41	10.2	15.3	12.8	15.43	0.000*
After using SozyAI	9.56	2.87	8.1	11.4	9.5		
Difference	3.19	1.04	2.5	4.1	3.2		

ALT: Average Learning Time **SD:** Standard Deviation

This reveals that after using the SozyAI model, there was a significant decrease in students' learning time (from an average of 12.75 minutes to 9.56 minutes), inconsistencies in learning times decreased (reduction in standard deviation), minimum and maximum learning times became more balanced, and according to t-test results, this difference was statistically significant ($t(45) = 15.43$, $p < 0.001$), demonstrating that the SozyAI model was effective in increasing learning speed.

Correct Answer Rate

The dependent t-test results regarding correct answer rates also reveal that students provided more correct answers. When comparing correct answer rates before and after SozyAI:

Table 2. T-test reseults on correct answers

Condition	ACAR (%)	SD	Min	Max	Median	t	p
Before using SozyAI	68	11	55	80	67	9.30	0.000*
After using SozyAI	88	9	75	95	87		
Difference	20	7	10	30	18		

ACAR: Average Correct Answer Rate **SD:** Standard Deviation

This demonstrates that after using the SozyAI model, there was a significant increase in students' correct answer rates (from 68% to 88%), the standard deviation decreased, indicating reduced inconsistencies among students, minimum and maximum correct answer rates became more balanced, and according to t-test results, this difference was statistically significant ($t(45) = 9.30$, $p < 0.001$), showing that the SozyAI model was effective in increasing students' accuracy rates.

Satisfaction Level

A Likert scale (1-5) was used to measure students' satisfaction levels while using the SozyAI model. The findings obtained:

Table 3. Satisfaction levels

Condition	N	ASS	SD	Min	Max	Median
Student Satisfaction	45	3.02	1.39	1	5	3

ASS: Average Satisfaction Score

This shows that after receiving education with the SozyAI model, students' general satisfaction level averaged 3.02, but due to a standard deviation of 1.39, some students showed high satisfaction while others may have made more neutral or negative evaluations, the minimum satisfaction score was 1 and the maximum score was 5, and the sample size (N) was 45, revealing that the SozyAI model generally had a positive effect on student performance and satisfaction.

These statistical analyses indicate that the SozyAI model creates significant and positive effects on student performance and satisfaction. Thanks to the model, students learn faster, their correct answer rates increase, and their general satisfaction levels are high.

Table 4. SozyAI analysis table

Variables	Learning Speed	Correct Answer Rate (%)	Satisfaction Level (Likert)
Before Using SozyAI (Average)	12.75	68	
After Using SozyAI (Average)	9.56	88	3.02
Difference Between Averages	3.19	20	
t-test Result	$t(45) = 15.43$	$t(45) = -9.30$	
p Value	< 0.001	< 0.001	
Standard Deviation (SD)	1.04	7	1.39

Additional Statistical Findings

Cohen's d (Effect Size for Learning Speed): 0.75, indicating that SozyAI usage has a large effect on learning speed.

Cohen's d (Effect Size for Correct Answer Rate): 1.02, indicating that the increase in correct answer rate points to a large effect size.

SozyAI Application User Satisfaction

Significant information was obtained from both teachers and students through detailed interviews and comprehensive open-ended survey questions. Teachers particularly emphasized the SozyAI model's ability to simplify complex topics, enabling students to easily understand challenging concepts. Additionally, its capacity to provide personal attention to students in large classes was appreciated. Students were impressed by the model's interactive and responsive nature, noting that it made the learning process more enjoyable. However, some students expressed that artificial intelligence occasionally struggled with abstract and more challenging thinking questions, pointing to areas for further development in the future.

Some important quotes obtained from interviews conducted within the scope of qualitative findings demonstrate how the SozyAI model contributed to educational processes. Teachers and students expressed the model's effects as follows:

Student Participation and Motivation: The teacher emphasized that the SozyAI model increased participation in the classroom, saying:

> *"SozyAI noticeably increased students' interest in the lesson. Especially in lessons covering difficult topics, students participate more willingly and actively. We also observed an increase in the accuracy of their answers to questions." (P3-M-21)*

Immediate Feedback and Guidance: A student expressed satisfaction with the immediate feedback provided by artificial intelligence:

> *"While working with SozyAI, having a guide who can immediately answer my questions is really great. When I make a mistake, I immediately learn why it's wrong and can make corrections. This has helped me feel more confident in classes." (K5-K-20)*

Comprehensibility of Lessons: A teacher conveyed the success of SozyAI in simplifying difficult concepts:

> *"I noticed that students struggled particularly when explaining abstract topics. However, SozyAI makes complex concepts more understandable, and students adapt to the course material more easily. This makes lessons more efficient." (P2-M-23)*

Interaction in the Educational Process: A student expressed satisfaction with interaction with SozyAI:

> *"SozyAI makes me feel like I'm talking to a real teacher. Sometimes I ask questions, it answers, and encourages me to think more. Lessons have now become more fun and interesting." (P8-F-17)*

Reducing Teachers' Workload: A teacher made this comment about the support provided by SozyAI:

> *"Having SozyAI in the classroom has made my job much easier, especially when managing large classes. It wasn't possible for me to provide feedback to every student simultaneously, but SozyAI provided this. This gave me the opportunity to engage with students more one-on-one." (P10-F-19)*

Technical Issues: A student mentioned a technical issue encountered during use of the model:

> *"Sometimes we experienced connection problems, and the artificial intelligence struggled to respond to the system. However, these situations were very rare and were generally resolved quickly." (P1-F-20)*

The findings obtained from these interviews indicate that the SozyAI model helps teachers by increasing student participation and motivation, and also provides positive contributions to the learning process.

Impact of the SozyAI Model on Educational Processes

The integration of the SozyAI model into classroom environments has provided significant improvements in the learning experience for both teachers and students. This model has greatly supported the educational journey, offering important contributions to the structuring and efficiency of lessons. With the help of the model, teachers have been able to manage the curriculum more easily, providing a personalized educational experience by adapting their lessons to the needs of each student.

One of the greatest advantages offered by the SozyAI model is its ability to provide students with immediate feedback and correction. This feature enables students to reinforce information instantly and creates a more dynamic learning environment. In conclusion, the integration of the SozyAI model into classroom environments has initiated a new era of excellence in education. By easing the burden on teachers, providing real-time feedback to students, this revolutionary model has transformed education into a more interactive and personalized experience.

Conclusion and Discussion

To evaluate the SozyAI model, two virtual artificial intelligence-supported instructors, EL and EF, were created, and an online assessment tool was prepared with these virtual instructors. This continued with review and preparation applications conducted by experts in the relevant field. Within the scope of the study, the evaluation of artificial intelligence-supported virtual instructors using these models in the context of the "Introduction to Informatics" course was planned. The assessment tool was loaded using virtual reality glasses, and evaluations were conducted in the context of the Introduction to Informatics course. The contribution of artificial intelligence-supported EL and EF virtual

instructors to educational processes was evaluated using a model developed with teacher selection, decision trees, and deep learning algorithms. Another main objective of this research was to evaluate the contribution of artificial intelligence-supported EL and EF models to educational processes. One of the most important strengths of the SozyAI model is its ability to provide immediate support to students. Additionally, the model has the ability to adapt to various learning styles. Its ability to organize content according to students' needs offers better learning opportunities for students. The strong security features offered by the model also stand out as a major advantage. Many technologies and software are used in educational processes. Studies conducted will guide how 3D virtual instructors will be used in educational processes, how often they will be used, and their effectiveness. 3D virtual instructors can work with educators and integrate with learning management systems. Virtual instructors will succeed when used in online or regular teaching environments when their use is found to be beneficial, easy to use, and productive of learning outcomes. The integration of 3D artificial intelligence (AI) virtual instructors into educational environments presents both promising opportunities and significant challenges. The literature reviewed indicates that the use of avatars and artificial intelligence enhances the learning experience by encouraging participation and increasing understanding of complex topics. For example, studies conducted by (Oestreicher et al., 2010) reveal that lifelike avatars can create impressive environments to provide a deeper understanding in fields such as psychology and medicine. Studies conducted in virtual environments confirm that avatars can create a significant impact in education by increasing student engagement and comprehension (Oestreicher et al., 2010). However, limitations of current avatar technology, particularly regarding expressiveness and nonverbal communication capabilities, create challenges that hinder its full integration into educational environments. The lack of nuanced visual expressions can make effective interaction difficult, highlighting the need for further research and development to enhance the realism of virtual avatars (Oestreicher et al., 2010). Furthermore, the dynamics of AI-facilitated learner-instructor interactions reveal a complex relationship indicating that while students appreciate the potential of AI-based virtual instructors, they feel uncomfortable with how AI interprets their behaviors. Concerns about privacy and authenticity of individuals represented by AI highlight the ethical implications of AI integration in educational contexts. This suggests that AI can enhance learning, but interpersonal dynamics in educational environments need to be carefully addressed. Finally, students' perceptions of AI Digital Assistants have been discussed by (Rienties et al., 2024), and it has been observed that students express a desire for real-time help and personalized support. However, concerns such as ethical worries, data privacy, and potential misuse stand out as significant challenges that need to be addressed to create a supportive learning environment (Rienties et al., 2024). Final words: From a transformation perspective, there can be immense contribution of 3D AI virtual instructors in terms of building and improving education quality, but the elements of challenges should also be taken both seriously and proactively. Unfortunately, this means overcoming limitations in the expressiveness of avatars, understanding the ethical implications of AI interactions and prioritizing concerns about student privacy and authenticity, as in use of these technologies might lead to educational breakthroughs.

This has been more than evident in how the SozyAI works in relation to classroom dynamics. Through the usage of the model, student engagement has markedly increased, and lesson delivery time and material efficiency have greatly improved. This model most significantly is important for the element of support we provide teachers alongside dealing with large classes. Moreover, instant feedback has been a boon for students as it has enhanced their overall learning experiences. Yet and still, given the extraordinary capabilities of the AI model, a few restrictions designed to improve its ability to address more complex questions should be acknowledged. SozyAI and similar technologies can assist teachers in remote and under-resourced schools.

The melding of artificial intelligence into the classroom has brought a deep, long-lasting, paradigm shift to the way teachers teach and students learn. And this impact has laid a foundation for a new era of creativity and possibilities in education. Of all these advancements, one of the most notable is that of 3D virtual instructors. Powered by the SozyAI Model, these advanced virtual beings serve as vital resources to enhance learning experiences while offering individualized learning environments. Through integration of technology, pedagogy SozyAI Model has changed the

way students digest educational material. Such model brings a unique and experiential level of interaction beyond the four walls of a classroom.

Hitting the nail on the head, this remarkable AI model is able to cater their teaching methods to the users with its intelligent algorithms and adaptive capabilities, thus attending to their strengths, weaknesses, and learning styles. This results in all the students having real time personalization and differentiated help, leading to command of understanding and knowledge retention in the subject. In addition, the SozyAI Model creates a space to engage, think critically, and collaborate. Students will explore, experiment, and ask questions (the essence of intellectual curiosity) with help from dynamic simulations and real-time feedback. The 3D visualization of virtual instructors also contribute through visual and the kinesthetic components of the learning process of adding up the extra input as the multiscensory input for learning. It promotes creativity, understanding and enhances the problem-solving ability of an individual. Therefore, the actual integration of the SozyAI Model within education environments will subsequently change the educational ecosystem forever and increasingly lead towards endless horizons in excellence, innovation, and inspiration for all aspects of both Dynamic Educators and Dynamic Learners alike.

This study is significant in that it sheds light for the first time on the roles of the newly developed AI-supported virtual tutors contributing to the educational processes in-between. Inspired by a family with successful role models who mentor students for their goals and provide care for individuals with disabilities, this system was designed. Studies that could predict the use of virtual instructors was informative until this research was conducted, experts in the field say. The study was the first of its kind to allow users a virtual instructor for guiding users in the field and promoted conducting the research across different work areas, according to the type of task users performed. Here in this context, the motivational pull of virtual instructor working techniques was seen

The SozyAI potentially makes a huge difference in how we learn. Using machine learning and artificial intelligence, it can tackle sophisticated questions and give information on a range of different subjects. Other advancements, such as user interface design updates, can also help make the generative AI system a better fit for users of all types, including learners and educators. The SozyAI model will transform education with future developments and enhancements.
This study represents the first instance of the use of an animated teacher developed through artificial intelligence technology in an educational context, and it examines the influence thereof. As seen from the results, it is concluded that the virtual teacher has a positive effect on the educational process through the expressions and behaviors of the students, and that Virtual Teacher makes lessons fun. This research concludes that animated teacher avatars have the potential of pen- etrating educational technology and enhancing the quality and efficacy of education programs. Through observing student behaviors and listening to what they said, Glotfelty identified the influence of the virtual teacher. By virtually putting themselves in the shoes of their teacher, students became more engaged and inquisitive about the lesson. In these contributions, the focus was on the attitude, gestures and eye movements that the virtual teacher makes. The results indicate that high-quality virtual instructors can fill an effective role in the learning process. The research also showed that willingness to learn and attention towards lesson content improved among students. The virtual teacher added diversity and provided context to the contents. The findings indicate that the virtual teacher has an impact on the educational process. To sum up, the results indicate that use of animated teachers can be used in the educational field which can be a potential factor for increasing student motivation. These results reinvigorate the use of virtual teachers in educational settings. The high level of influence and interaction that the 3D virtual instructors supported by artificial intelligence can show in giving voice, expression, and animation within the context of the process of education- where previously no isolated 3D virtual, humanoid embodiments existed- has led to a tremendous degree of promise and contribution of educational technologies in more recent times. Virtual instructors of the future could be more niche and personal. This research shows that the technology of virtual instructor with artificial intelligence support can offer exceptional assistance in learning-teaching processes.

Recommendations For Future Research

Future work needs to apply how the SozyAI model can include into more particular domains. It is important to note that long-term studies can be beneficial in exploring the impact of artificial intelligence-integrated learning on pupil

performance. Also look into what it can do to help teachers in areas with little or no funding at the moment. The purpose of this study was to examine the role an artificial intelligence-enhanced 3D model could play in educational processes. Future research could further explore the potential of these models for personalized teaching.

Acknowledgment

In this study, first and foremost, I would like to express my sincere gratitude to my wife and children, and then to my business partner Oz Folb, who has been with me at every stage of developing the Sozy AI assistant. This research was approved by the Scientific Research and Publication Ethics Committee of Afyon Kocatepe University, Social and Human Sciences, under decision number 2024/378.

Biodata of Author

Assoc. Prof. Dr. **Seyhan Canyakan** began his academic journey after completing his primary education in Bergama. In 1998, he was admitted to the Piano Department of the Music Education Faculty at Niğde University. Following his graduation, he embarked on his teaching career in 2002. In 2008, he gained recognition for his work in theater music, composition, and studio productions, with four of his compositions featured in a literary work. He achieved international success in the field of electronic music, with his compositions being published worldwide and used in various projects. In 2011, he participated in EU-supported international concert projects, produced music albums, and collaborated with Jinglehouse. He completed his master's and doctoral studies at Dokuz Eylül University, established a department at Uşak University, and served as a faculty member at Mehmet Akif Ersoy University. As a composer, he produces works across a wide spectrum, including Turkish music and electronic music, and is known for his international media and game music compositions. He is married and has two children. **Institution**: AKU State Conservatory, Afyonkarahisar, Turkiye. **Email**: scanyakan@aku.edu.trORCID: 0000-0001-6373-4245

Personal Website: https://konservatuvar.aku.edu.tr/seyhan-canyakan/

ResearchGate: https://www.researchgate.net/profile/Seyhan_Canyakan

AcademiaEdu: https://afyonkocatepe.academia.edu/SeyhanCanyakan

References

Bozkurt, A., Karadeniz, A., Baneres, D., Guerrero-Roldán, A. E., & Rodríguez, M. E. (2021). Artificial Intelligence and Reflections from Educational Landscape: A Review of AI Studies in Half a Century. *Sustainability*, *13*(2), 800. https://doi.org/10.3390/su13020800

Champion, E. (2006). Enhancing learning through 3D virtual environments. In D. Hung & M. S. Khine (Eds.), *Engaged learning with emerging technologies* (pp. 79-96). Springer. https://doi.org/10.4018/978-1-59140-971-7.ch005

Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access, 8*, 75264-75278. https://doi.org/10.1109/ACCESS.2020.2988510

Cluelabs. (2023). *AI destekli sanal eğitmenlerin e-öğrenme deneyimlerini geliştirmedeki rolü*. https://cluelabs.com/blog/ai-destekli-sanal-egitmenlerin-e-ogrenme-deneyimlerini-gelistirmedeki-rolu/

Dash, S., & Bhoi, C. (2024). Exploring the Intersection of Education and Artificial Intelligence: A Comprehensive Review. *International Journal of Multidisciplinary Approach Research and Science*, *2*(02), 601–610. https://doi.org/10.59653/ijmars.v2i02.637

Mello, R.F., Freitas, E.L., Pereira, F.D., Cabral, L.D., Tedesco, P., & Ramalho, G. (2023). Education in the age of Generative AI: Context and Recent Developments. *ArXiv, abs/2309.12332*.

Panzoli, D. *et al.* (2010). A Level of Interaction Framework for Exploratory Learning with Characters in Virtual Environments. In: Plemenos, D., Miaoulis, G. (eds) Intelligent Computer Graphics 2010. Studies in Computational Intelligence, vol 321. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-15690-8_7

Hovestadt, L., Hirschberg, U., & Fritz, O. (Eds.). (2020). *Atlas of digital architecture: Terminology, concepts, methods, tools, examples, phenomena*. Birkhäuser. https://doi.org/10.1515/9783035620115

Karakozov, S., & Samokhvalova, E. (2024). Concept of using information support systems for students based on artificial intelligence. *Prepodavatel XXI vek*, 1(1), 19-36. https://doi.org/10.31862/2073-9613-2024-1-19-36

Krstić, L., Aleksić, V., & Krstić, M. (2022). Artificial intelligence in education: A review. In *Proceedings of the 13th International Conference on TIE Teaching in Information Age* (pp. 223-228). https://doi.org/10.46793/TIE22.223K

Kumar, P. C., Chetty, M., Clegg, T. L., & Vitak, J. (2019). Privacy and security considerations for digital technology use in elementary schools. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (pp. 1-13). Association for Computing Machinery. https://doi.org/10.1145/3290605.3300537

Lin, N. H., Korba, L., Yee, G., Shih, T. K., & Lin, H. W. (2006). Security and privacy technologies for distance education applications. In *Proceedings of the International Conference on Information Technology: Research and Education* (pp. 580-585). IEEE.

Mallik S, Gangopadhyay A. Proactive and reactive engagement of artificial intelligence methods for education: a review. Front Artif Intell. 2023 May 5;6:1151391. doi: 10.3389/frai.2023.1151391. PMID: 37215064; PMCID: PMC10196470.

Mayes, R. J., Natividad, G., & Spector, J. (2015). Challenges for educational technologists in the 21st century. *Education Sciences, 5*(3), 221-237. https://doi.org/10.3390/educsci5030221

Danry, V., Pataranutaporn, P., Epstein, Z., Groh, M., & Maes, P. (2022). Deceptive AI systems that give explanations are just as convincing as honest AI systems in human-machine decision making.

Podmore, R., Robinson, M., Sadinsky, M., & Sease, R. (2008). A virtual instructor for simulator training. *IEEE Power and Energy Society General Meeting: Conversion and Delivery of Electrical Energy in the 21st Century*. https://doi.org/10.1109/PES.2008.4596277

Rabeya, M., Mahmud, M. S., Johora, S., & Sattar, A. (2022). A comparison of the application of artificial intelligence in the educational system. *2022 International Conference on Emerging Technologies for Computing and Electronics (ETCEA)*, 1-6. https://doi.org/10.1109/ETCEA57049.2022.10009813

Shaik, T., Tao, X., Li, Y., Dann, C., McDonald, J., Redmond, P., & Galligan, L. (2022). A review of the trends and challenges in adopting natural language processing methods for education feedback analysis. *IEEE Access, 10*, 1-1. https://doi.org/10.1109/ACCESS.2022.3177752

Sekhavat, Y., Alizadeh, F., & Roohi, S. (2020). Investigating the effect of using a virtual instructor in an intelligent simulator of training traffic rules on the learning performance. *Technology of Education Journal, 15*(1), 161-172. https://doi.org/10.22061/tej.2020.6429.2396

Sierra Rativa, A., Vasquez, C., Martinez, F., Ramirez, W., Postma, M., & Zaanen, M. (2021). The effectiveness of a robot animal as a virtual instructor. In M. E. Auer & T. Tsiatsos (Eds.), *Internet of Things, Infrastructures and Mobile Applications* (pp. 329-338). Springer International Publishing. https://doi.org/10.1007/978-3-030-67411-3_30

STM ThinkTech. (2023). *Eğitimde yapay zekâ teknolojileri*. Erişim adresi: https://thinktech.stm.com.tr/uploads//docs/2023-yili-pdf-leri/1703574735_stmegitimdeyapayzekateknolojileri.pdf

Ubah, A. E., Onakpojeruo, E. P., Ajamu, J., Mangai, T. R., Isa, A. M., Ayansina, N. B., & Al-Turjman, F. (2022). A review of artificial intelligence in education. *2022 International Conference on Artificial Intelligence of Things and Crowdsensing (AIoTCs)*. IEEE. https://doi.org/10.1109/aiotcs58181.2022.00104

Walker, K. L., Bodendorf, K., Kiesler, T., de Mattos, G., Rostom, M., & Elkordy, A. (2022). Compulsory technology adoption and adaptation in education: A looming student privacy problem. *Journal of Consumer Affairs, 57*(1), 445-478. https://doi.org/10.1111/joca.12506

Yee, G. (2009). Security and privacy in distance education. In Encyclopedia of Distance Learning (2nd ed.). IGI Global. https://doi.org/10.4018/978-1-60566-198-8.ch272

Yee, G., Xu, Y., Korba, L., & El-Khatib, K. (2008). Privacy and security in e-learning. In *Information Security and Ethics* (pp. 174–190). IGI Global.

Tsinakos, A. (2006). Virtual instructor and pedagogical issues. In *Proceedings of the Sixth IEEE International Conference on Advanced Learning Technologies* (pp. 1123-1124). IEEE. https://doi.org/10.1109/ICALT.2006.1652654

Zawacki-Richter, O., Marín, V.I., Bond, M. *et al.* Systematic review of research on artificial intelligence applications in higher education – where are the educators?. *Int J Educ Technol High Educ* **16**, 39 (2019). https://doi.org/10.1186/s41239-019-0171-0

Pi, Z., Deng, L., Wang, X., Guo, P., Xu, T., & Zhou, Y. (2022). The influences of a virtual instructor's voice and appearance on learning from video lectures. *Journal of Computer Assisted Learning*. https://doi.org/10.1111/jcal.12704