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Implication of E-learning and AI Individualized Pedagogical Perspectives

Abstract: - Over the past few years, multiple e-learning programs have been created. Technology-enabled learning possibilities are now commonplace in educational settings, and a lot of people use online resources to further their knowledge for private, professional, or academic purposes. The results show that while newly created e-learning programs are based on contemporary digital tools, require content that is more strategic and has a distinct emphasis than classic learning situations. These findings make one wonder if the elements of virtual education are the best additions to conventional face-to-face instruction. This paper focuses on identifying an e-learning program using Artificial Intelligence (AI) that effectively incorporates pedagogical learning approaches by using the expertise of pedagogical specialists. To help develop theoretical ideas for instruction, several categories encompassing conventional and e-learning learning theories, such as behaviorism, cognitivism, constructivism, and connectivism, were examined.

Keywords: AI, E-learning, Online Learning, Machine Learning.

I. INTRODUCTION

Online instruction is now a crucial component of education. The concept revolves around an interface between humans and computers comprising two separate components: "human" and "machine". One side involves the user benefiting from automated operations performed by machines, while the alternative side focuses on data-processing software as the technological instrument [1]. The central link refers to human-machine interaction which is the connection involving these two components [2, 3]. One instance of this interaction between technological advances and human beings is educational technology, which frequently follows conventional learning models. Contrary to traditional learning principles and scenarios, digital learning is more intricate yet provides unparalleled possibilities for teaching and learning simultaneously. Technology enhances learning efficiency by providing instant access to pertinent knowledge, irrespective of location or time constraints. It develops more engagement for the individual using it when the communication between human beings and technology becomes autonomous [4].

Machine learning and AI are commonly used in educational settings, particularly in systems that aim to enhance users' skills and evaluate systems [5, 6]. Educational programs utilize AI and its component ML to enhance educational and instructional contexts, allowing educators and instructors to leverage contemporary technology. AI can improve efficiency, personalization, and automate administrative tasks, enabling teachers to focus on providing recognition and responsiveness [7].

The COVID-19 epidemic significantly contributed to a substantial growth in the market size [8, 9]. Safety concerns prompted the implementation of a work-from-home strategy to ensure the completion of daily operating responsibilities. Subsequently, there was a rise in the need for educational platforms by both companies and small businesses. To meet the growing need, many organizations choose to create a customized learning platform. The eLearning sector has had a rise in notable users, resulting in a growing interest from entrepreneurs and companies aiming to establish themselves as significant contributors [10]. A rise in the marketing of technological devices, such as mobile phones and notebook computers, is predicted to drive the accessibility and convenience of eLearning. Figure 1 displays the insights of the E-learning market.

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Figure 1. E-learning Market [Source: https://www.gminsights.com/industry]

Online learning systems play a crucial role in establishing the framework of schools and universities by facilitating knowledge development [11]. Advancing into unknown prospective domains, the transformation of these networks goes beyond supposition and is the outcome of thorough investigation and evaluation. The present study explores new possibilities in eLearning, using extensive research to provide four innovative forecasts that are expected to transform educational platforms in 2024 as well as beyond. Based on a combination of factual information and creativity, these discoveries offer insight into the transformative power of digital education, shaping the future of teaching and learning.

II. ELEARNING IN EDUCATION

E-learning is now a crucial component of our learning processes. Various web-based Learning Management Systems (LMS) have been created to assist learners in their learning journey. Previous techniques for learning were limited to acquiring and integrating knowledge. An online system is a beneficial tool for in-person communication and for delivering educational content to aid students in their studies [12]. Effective pedagogical strategies for e-learning involve leveraging learner associations to create and update instructional content with high-quality appearance methods, incorporating themes and equivalents to convey key knowledge and notions, and using video games to convey information and address challenging problems [13]. Creating and organizing the material based on learners' demands and needs is one of the major aspects of E-learning.

The development and advancement of e-learning in the realm of education, along with cooperation with the instructional sector, have led to a growing interest in personalized content delivery, the use of digital media for e-learning, and raised accessibility to high-speed networks, Wi-Fi, and 5G cellphone networks [14]. These factors have attracted attention to the concept of omnipresent learning. This has culminated in the development of an inventive online educational setting called PEACOCK (Performance-based E-learning Adaptive Cost-efficient Open Corpus framework). It caters to a variety of intellectual needs and content while considering consumer demands within cost, device, and system limitations [2, 9, 15]. The e-learning framework facilitates intelligent context and semantic e-learning by recognizing the semantic context in multimedia information processing related to learning and educational practices. Furthermore, it will enhance knowledge of the student's temperament to assist in personalized learning growth.

The intelligent learning model design must be carried out in three stages to establish a model for e-learning scenarios based on semantics [16, 17]. This model can be utilized regardless of the trainer, allowing the learner to lead the learning experience. The initial step involves pre-learning activities that focus on preparing both learners and trainers. The second phase involves learning through multiple tasks such as selecting instructive and literary resources, writing down ideas to enhance learning, engaging in joint debates to promote comprehension and the sharing of experiences, and finally self-evaluation and review. The last phase involves reporting and assessing the learning results for students as well as instructors following the process of learning. Figure 2 displays the AI-Based E-Learning modes.

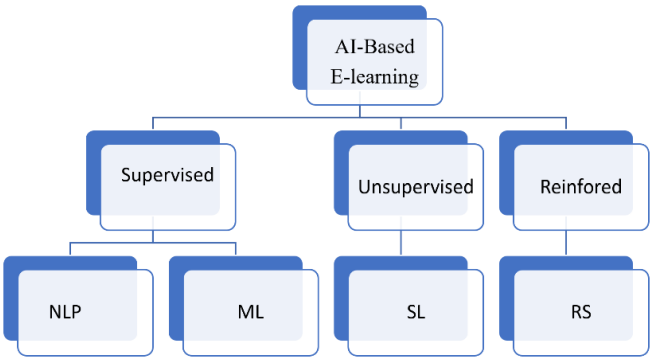

Figure 2. AI-Based E-Learning modes

NLP Natural Language Process, ML; Machine Learning, RS: Recommended system, DL: Deep Learning, SL: Self Learning

III. THEORIES USED IN E-LEARNING AND AI PEDAGOGY

A. Constructivism

Constructivism is a paradigm that highlights the process of active learning, in which learners build knowledge using their observations, interactions, and analyses [18, 19]. In e-learning, this might manifest as problem-solving, teamwork, and seeking out resources activities. Constructivism focuses mostly on how humans internally process information and generate knowledge through their experiences[19]. The process of learning is structured to have a stimulus that comes from the objective world create a sensory perception, which then shapes the individual's subjective experience. These insights are utilized in academic settings to encourage critical thinking, express personal perspectives in discussions, and provide critical questions. These acts demonstrate that people are capable of acquiring information [20]. The theories explain how individuals learn in conventional educational settings. Therefore, traditional learning paradigms are only partially applicable to digital information acquisition due to their emphasis on human interaction [21]. Siemens created a new instructional paradigm that includes interacting using digital media, building on the fundamental principles of classical techniques in e-learning programs [22]. Connectivism involves individuals viewing themselves as autonomous and forming connections with others based on their unique learning requirements and sources of information [23]. Learning develops the ability to navigate a "decentralized network" and expand their knowledge through content-related, technological, and collaborative networking, as well as by engaging with ideas, hypotheses, and perspectives [24]. Siemens' focus is on the educational method for developing the abilities for learning retention. Learning in the context of the world involves connecting sources of information and data to derive interpretation from the information that is provided [25].

B. Connectivism

Connectivism is an approach to learning that involves human interaction. It is especially pertinent in the age of connectivity and holds the belief that information is present in both people and the electronic devices, materials, and coalitions that they use. Learning is an activity that takes place within structures of connections. The concept of connectivity has a big impact on how courses are taught, how learning is designed, and how students engage with the material in online learning environments [26]. Connectivism throughout the digital era focuses on the notion that links and networks improve learning. To build knowledge collaboratively, learners employ technological tools to access data, work with classmates, and take part in social networks. As a framework for learning geared towards the digital age, connectivism emphasizes the role that networks and connections play in learning [27]. Connectivism holds that knowledge is dispersed among networks of individuals, resources, and technological advancements. This theory is applied to e-learning via the use of social media platforms, virtual communities, and personalized educational settings, which allow students to connect with and access a wide variety of information and resources [28]. To promote connectivism principles, LMS frequently includes features like social media, curation of content, and personalized learning approaches. In the data management process, LNS and PLNS are involved.

C. Behaviorism

This theory emphasizes linkages between stimuli and responses as well as observable behaviors [29]. Behaviorist principles are used in e-learning to support the development of skills and accumulation of knowledge

using techniques including feedback, reassurance, and organized instruction sequences [30]. Originally developed as a theory of psychology, behaviorism was later included in the curriculum. According to the idea, learning occurs in humans through an externally focused process. Students are individuals whose behavior and educational processes can be regulated by various stimuli or circumstances, according to a behavioral perspective. Either a beneficial or detrimental feedback system can be used to ingrain the reaction to the stimulus. These results have led to the widespread adoption of the behavioral concept of "stimulus-response" in adult education settings, where inputs can be appropriately programmed to achieve the intended outcome [31].

D. Cognitivism

Cognitivist ideas focus on mental processes including memory, problem-solving, and decision-making. The instructional designers in e-learning use techniques such as chunking material, scaffolding, and offering multimedia tools to improve cognitive functions [32]. Cognitivism focuses on elucidating how information is received and processed [33]. The concept is that pupils must engage in learning and problem-solving while digesting individual information. Unlike behaviorism, this theory posits that people are rational beings who need to actively engage in learning and thinking, involving input, processing, and output components [34]. Cognitivism influences e-learning design by focusing on the mental procedures involved in instruction and offering solutions to enhance learning results. E-learning experts can create stimulating and efficient educational materials that support student cognitive growth and mastery of complicated skills and concepts by utilizing fundamentals such as the processing of information, schema advancement, troubleshooting, metacognition, and attention management.

IV. MULTIPLE INTELLIGENCE THEORY

The concept of multiple intelligences theory, put out by Howard Gardner, contends that intelligence is a collection of multiple skills or cognitive abilities that people possess to differing degrees rather than a single, fixed entity [35, 36]. MI can be utilized in e-learning to accommodate various styles of learning and strengths. Individuals with mathematical and logical intelligence excel in logical thinking, problem-solving, and numerical analysis. E-learning modules can captivate these learners with interactive simulations, logic puzzles, arithmetic exercises, data analysis activities, and algorithmic challenges. Spatially intelligent individuals excel at perceiving, visualizing, and manipulating spatial connections. E-learning programs can utilize visual aids such as schematics, maps, data visualizations, visuals, virtual reality (VR) modeling, and creative endeavors to engage learners who are spatially orientated [37, 38]. Furthermore, bodily-kinesthetic learners excel through exercise, hands-on experiences, and movement. E-learning platforms in this context may employ movies, demonstrations, virtual modeling, physical activity, and virtual labs to stimulate students with bodily-kinesthetic intelligence. Machine learning can help socially adept learners excel in social environments and appreciate cooperative tasks, conversations, and team assignments. E-learning systems facilitate interpersonal connections via discussion boards, assignments for groups, peer feedback mechanisms, collaboration document modification, and asynchronous communication tools [38, 39]. E-learning specialists can enhance enthusiasm, involvement, and learning achievements in distance education by designing inclusive and personalized educational environments that recognize and accommodate the varied intelligences of learners, leveraging their abilities and preferences [16]. Figure 3 describes some of the theories related to and involved with E-learning.

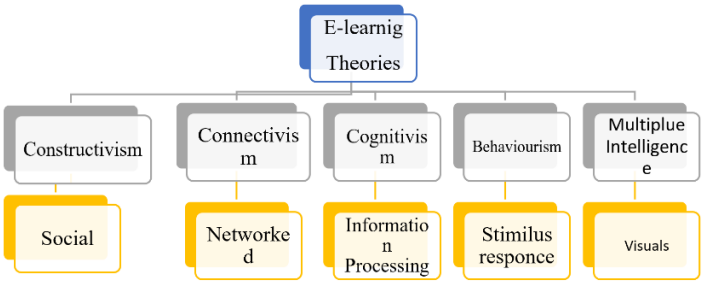

Figure 3. E-Learning Theories.

V. CONCLUSION

In the context of online education, AI has a big potential to improve pedagogical concepts, offer individualized learning adventures, and support better learning results. The goal of e-learning is to customize educational opportunities to each learner's requirements, interests, and skill level [40]. AI systems can continually change the

content, tempo, and degree of complexity of learning exercises by analyzing the performances, preferences, and instructional styles of students. This guarantees that every student gets customized guidance and assistance. AI and online education offer interactive, tailored education, providing students with suggestions, advice, and comments as they work through the course material [41]. NLP and machine learning algorithms are used by AI-powered instructional systems to comprehend student responses, identify incorrect assumptions, and offer customized feedback and clarifications. This facilitates the simulation of one-on-one tutoring sessions in virtual learning settings.

Additionally, NLP enables interactive discourse and knowledge sharing by facilitating natural language interaction among people and machines. Artificial intelligence (AI)-driven avatars and digital assistants with NLP skills can converse with students in natural language, responding to inquiries, giving clarifications, and extending support instantly [42]. This encourages active learning and helps students get past the challenges they face in their academic careers. AI-driven recommender systems examine information regarding performance, learner behavior, and preferences using machine learning techniques [43]. Subsequently, they produce tailored suggestions for classes, papers, films, and additional learning materials, assisting students in finding and using materials that complement their unique learning objectives. These pedagogical structures can be improved to offer more flexible, interesting, and successful instructional opportunities for students across a range of subjects and academic backgrounds by incorporating AI technology into online classrooms.

AI in e-learning is transforming pedagogical concepts and improving learning using information-driven conclusions, personalized experiences, and adaptable training. This is a succinct synopsis: All things considered, AI improves e-learning pedagogical frameworks by offering data-driven, personalized, and adaptive educational experiences that meet the various requirements and interests of learners individually, hence increasing learning results and engagement among pupils in online instructional settings.

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