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(REVIEW ARTICLE)

A paradigm shift in education: Prospects and recommendations for schools in 2030

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Abstract

The interest of this study is borne out of an attempt to investigate the drastic change that technology has brought to the instructional core. The future of schools is exponentially upgrading through the integration of sophisticated educational systems that appear to create a whole new trajectory for all education stakeholders. Instruction will be adaptive and assessment will be real-time. In this profound and complex scenario, current schools will no longer be the epicenters of knowledge as AI-powered educational tools will hegemonize and remarkably offer extraordinarily enticing adaptive learning opportunities through smart classrooms and other technological trends and patterns, such as Cloud Computing (connectivity and data security) and the Internet of Things (IoT) (intelligent whiteboards). Needless to say, technology enhanced learning will unequivocally become the pinnacle of education. Therefore, many educators will have to expand their instructional technology to rise to the occasion.

Keywords: Educational technology; Instructional core; Technology enhanced learning; Pedagogy-driven design; Artificial intelligence; Types of reality; Schools in 2030; Research

1. Introduction

With the rapid development of Artificial Intelligence (AI), Big Data, Machine Learning, Cloud Computing, Geographic Information System (GIS), 3D Printing and the IoT, the human civilization has entered a new era of technological advances far more complex than one can imagine (robot teachers, self-driven cars, drones, 5G, quantum computing, and so forth. Education has tremendously been impacted by such a technological revolution.

Industry 4.0 was initially proposed in 2011 at the world's largest industrial technology expo: Hannover Messe in Germany, which has sparked a vision of a new Industrial Revolution (Pfeiffer 2017). Joshi (2022) explains that "education 4.0 is a technique of learning that is connected with the fourth industrial revolution and focuses on transforming the future of education through advanced technology and automation". In the same vein, the core value of Industry 4.0 is to advance and modernize different industries (agriculture, car manufacturing, etc.) through the use of AI and other forms of automation, and thus changing traditional production methods. This change has become inextricably interwoven with the integration of technology into various educational domains. Hence, education has transformed from relying on passive learning methods (focusing on direct teaching and memorization) to promoting critical and personalized thinking. For instance, "fictional universes, i.e. metaverses, are best accessible and interesting to learners through video games. The development of educational games will be increased to boost learners' interest, as the entire course syllabi become gamified" (ElanWave 2022). In this regard, through gamification, Kahoot can be an excellent example where students use electronic gadgets to create a connected and interactive classroom environment so as to answer questions in the form of quizzes. Questions are timed and students need to respond within the time given to them. This online learning game changes the classroom dynamics for the better as it gives students a sense of competition and achievement. Further, it is visually appealing and captivating. In effect, technology-enhanced learning can be conducive to successful learning if it is strategically and appropriately implemented (Ougoulakis et al., 2020).

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It must be noted that Morocco, a developing country, has made a quantum leap in Education 4.0 through a plethora of online platforms and applications, such as Telmid-TICE (INWI), e-madrassa, MUN, ALLO SCHOOL, Kezakoo, FLDM, J'offer Gratuitement, eDorous, Al IMANE, and NOON Kids. Whalen et al., (2019) stresses the significance of continuous mentorship and professional development for teachers in order to better deal with the challenges of technology integration into their classrooms. Bachiri (2020) believes that "positive attitudes often encourage less technologically skilled teachers to learn the skills necessary for the implementation of technology-based activities in the classroom." It is important to encourage teachers to learn more about technology integration through exposure and training. There should be bold and consistent attempts of direct and indirect stakeholders (teachers, administrators, students and parents) so as to educate and disseminate the culture and practice of educational technology. It is the future, and we cannot avoid it.

2. Literature Review

Drawing on recent research, "the role of the teacher in 2030 will change drastically from today" (Yates 2019). Learning, in this context, is no longer perceived as simply absorbing and retaining information in the classroom. Rather, it is about the ability to access information, contextualize it, and then use it within a network of colleagues (Brown & Duguid, 2000; Ito et al., 2009; Jenkins et al., 2006).

Moore III states "for more than 30 years, NSF has both led and invested in AI research projects to support, reimagine, and transform learning and teaching with the use of emerging technologies," (Willmore 2023). This necessitates a rapid shift toward educational technology and technology enhanced learning. In this same vein, Willmore (2023) believes that "AI in education doesn't just help students improve computational thinking skills in the classroom. It can also create new ways to connect learners with their local environments".

The U.S. Department of Education Office of Educational Technology has urged the necessity to refine technology plans and policies for artificial intelligence. In their report, it describes "AI as a rapidly-advancing set of technologies for recognizing patterns in data and automating actions, and guides educators in understanding what these emerging technologies can do to advance educational goals—while evaluating and limiting key risks." (Office of Educational Technology, 2023).
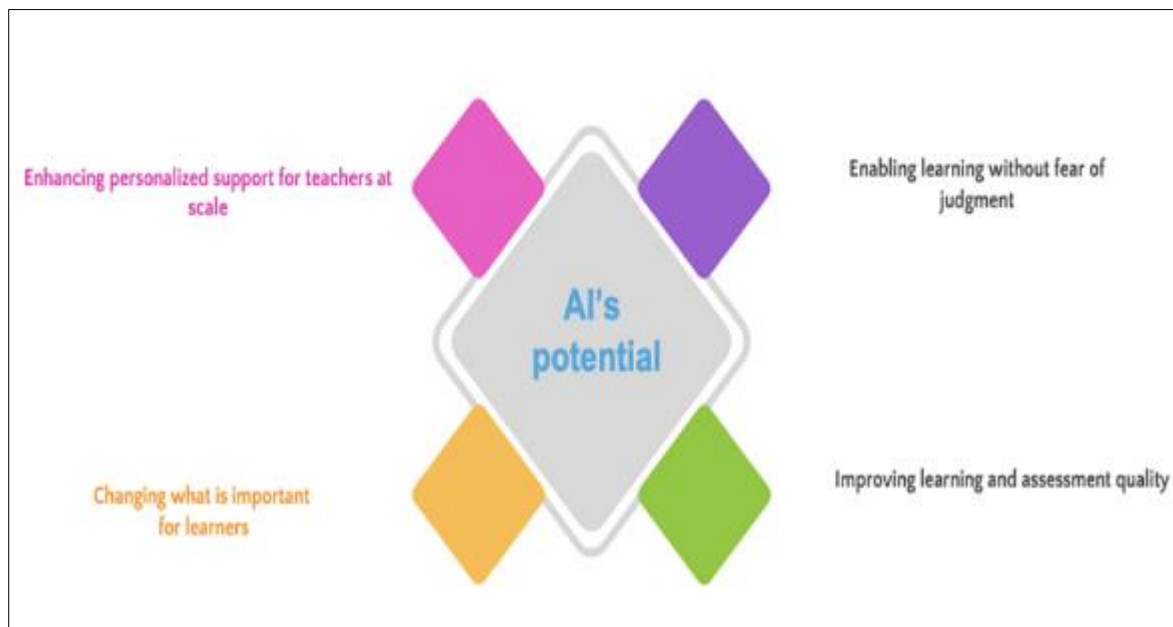

Figure 1 The Potential of Artificial Intelligence (AI) (Al Matari 2023)

The Office of Educational Technology (OET) strives to encourage the use of education technology through scientific research to enhance learning outcomes. Such an initiative was conducive to the creation of the National Education Technology Plan (NETP) 2024, a forward-thinking approach, which continuously seeks to create collaborations and partnerships with different stakeholders in order to reduce achievement gaps and promote the teaching-learning process (Office of Educational Technology 2024). Such a plan is premised upon 3 main divides: **1-**The Digital Use Divide,

2- The Digital Design Divide, **3-**The Digital Access Divide. The emphasis on these divides will aspire to mitigate a number of obstacles previously encountered in the implementation of educational technology in the state of K–12 education since the initial release of the NETP in 2000. The action-oriented recommendations provided with exemplified models from different schools across the US will certainly help establish the bedrock of educational technology in the instructional core (Torchia 2024).

Furthermore, the UNESCO has constantly strived to encourage education policy-makers to adopt AI through the creation of seamless comprehension of both opportunities and challenges. According to the UNESCO, "the rapid development of Artificial Intelligence (AI) is having a major impact on education" (Education 2023). In fact, this can be possible with augmented reality (AR), virtual reality (VR), and mixed/merged reality (MR). They have the potency to drastically transform and buttress education.
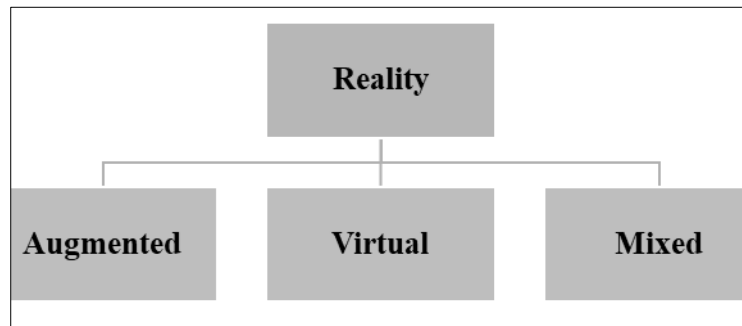

Figure 2 Types of reality

There is no doubt that AI can bring about a great deal of gains to education through enhanced technology learning. Teachers will have to make a choice of either keeping up with the current technological trends or they will be left behind. The world is swiftly shifting towards AI, and "some experts anticipate that instructors will be replaced by robots by 2027, which is less than a decade away" (Inamdar 2021). As shocking as it may seem, it is already happening in China. Nowadays, kindergartens in Beijing use a robot teacher named Keeko that tells stories and enable children to solve logic problems. In this specific context, Xie Yi, principal of the kindergarten, where 'Keeko' was experimented stated that "the best thing about robots is that they're more stable" (NDV 2018). This portrays one of the innumerable advantages that AI can offer. According to Kozma "… when teachers use technology to plan and prepare lessons and collaborate with external stakeholders, and when conducting student research projects and analyzing data, they are also using technology to solve problems and design products" (2003, p. 13). Likewise. advancements in computer technology have made 3D graphic production and representation more reachable and applicable in education (Portalés et al., 2009).

According to Yates (2019), "in 2030, adaptive learning software will replace direct instruction. Adaptive learning software is computer software that uses AI to move students up and down through a grade level's content based on student performance and assessment questions." This remarkable and futuristic representation consistently predisposes education stakeholders to an unprecedented instruction experience where "schools will be filled with new technologies like XR/AR, voice-controlled devices and the 2030 version of a personal computing device for each student to engage with" (Yates 2019). These enhanced technology learning trends are unquestionably fascinating, powerful and tempting. They have the potency to transform the systems thinking models of schools across the globe. They are already inevitable technological truths. It is something that schools have to follow and get used to. The sooner they start, the longer they exist.

Radcliffe (2008) proposed a heuristic Pedagogy-Space-Technology (PST) framework to design physical learning spaces in a pedagogy-driven manner. In lieu of defining a set of rigid design principles, the PST framework is grounded upon a collection of guiding questions. "What type(s) of learning and teaching are we trying to foster and why? Why is this likely to make a difference to learning? What is the theory & evidence? What plans will be made to modify programs or courses to take advantage of the new facilities?"

Leinonen (2010) worked on the Pedagogy-Driven Design model where he studied online language learning programs in order to increase their efficiency and success from a pedagogical standpoint both in theory and application. The study encapsulated 5 main elements: Contextual inquiry, participatory design, product design, software as hypothesis, and finally co-evaluation of DLE. The primary motive behind the pedagogy-drive design is to come up with a viable and sound pedagogical methodology and implementation so as to bolster and enrich technology-enhanced learning systems.
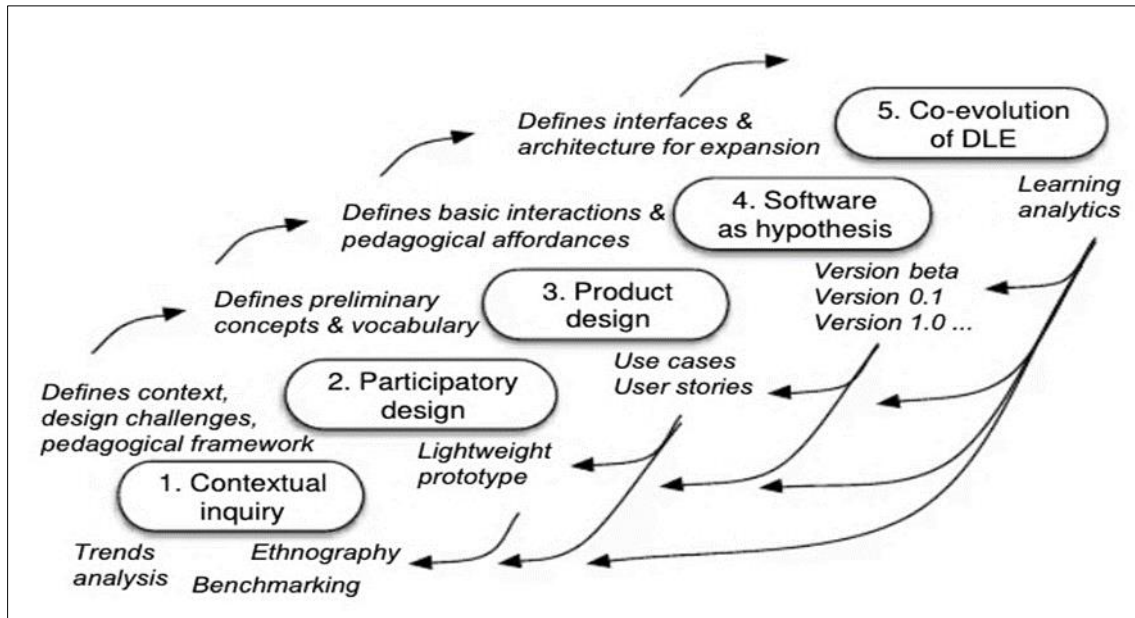
Figure 3 The Structural Representation of the Pedagogy-Driven Design (Leinonen, 2010)

2.1. Instruction and Research

Teaching and research must be intimately intertwined in any school organization. Schools that deliberately detach or rather are devoid of research activities from their structural foundation are the ones that are stagnant, insignificant, and hence produce the most unsuccessful students, and perhaps are ranked at the bottom of the list. The nature of their thinking system is fragile, monotonous, and may unexpectedly collapse over time. Schools of this sort are resistant to change and despise new perspectives and ideas and feel threatened when innovation is called upon. They find satisfaction in cherishing extracurricular activities and speak with pride about how grandiose their athletic competitions are. It is not the researcher's intention to diminish the value of school sports. However, learning should be given more importance in the most comprehensive sense of the term. A school is where students learn, experiment and blossom. Learning must be the dynamo of school activities. Faculty members need to consistently focus on instruction and research. These two elements will dramatically change the status quo of any educational institution, and will eventually catalyze local, regional, and national development.

It must be noted that research enables instruction to be up-to-date, progressive, valid and reliable. Teachers need to be mindful of the paramount importance of research in their daily professional tasks (curriculum design, lesson planning, instruction, evaluation, mentoring, coaching, and so forth.). There must be an independent research laboratory that exists within the school organization where units are created under specific themes. A group of 3 or 4 teachers can join a research team according to their specialty or preference (For example, instruction and/or assessment). Each department should work and coordinate collaboratively. Similarly, each research unit should at least meet twice a month to review, discuss and generate research topics that are pioneering in nature. Such research topics should preferably be context-based and data-generating. This will create an abundance of data that matters to the educational institution with which they are affiliated. It will both create a bank of information that is hybrid and traceable, and at the same time provide alternatives to the increasingly rising issues in academia. Please, see the examples below:

2.2. Examples of Research Topics

2.2.1. Academic Writing, Communication & Literature

Suggestions

- Effective Strategies in Teaching Academic Writing
- The Fundamentals of Communication in a Digitalized World
- Politics and Tyranny in Shakespeare's *Macbeth*: An Analytical Study

2.2.2. Information and Communication Technology (ICT) in Education

Suggestions

- The Use of Blended Learning with ESL Students: Focus on Receptive Skills
- The Significance of Gamification in the Teaching of Vocabulary: Kahoot as a Case Study

2.2.3. Women's & Gender Studies

Suggestions

- The Representation of Women in Abstract Arts
- Sociology of Gender: Discussion of Class and Status in America

2.2.4. Translation, Migration, and Culture

Suggestions

- Translation of Idioms and Jokes: Linguistic and Cultural Nuances
- Migration and Mobility Factors
- The Effects of Stereotypes on Minorities

Recommendations

- To organize workshops and seminars banked upon the findings of research studies and projects carried out in the Research Laboratory.
- To organize and host conferences (online and face-to-face) periodically.
- To create community-oriented projects that can lead to seamless local and national development.
- To establish a regional consortium for research so as to attract outstanding scientific talents.
- To develop a vibrant and solid platform for research and collaboration among researchers and scholars that will eventually lead to scientific production and proliferation.
- To seek other sources of funding from research centers national and international to help finance projects and research studies.
- To participate in national and international educational and cultural events.
- To encourage innovation in research in order to do pioneering research on educational, societal, cultural, economic, and technological topics.
- To involve students in the Lab's activities (organization of conferences, participation in seminars, leading presentations, etc.).
- To promote study abroad and cultural exchange programs among students and teachers through research collaboration with schools, NGOs, associations, and research centers.

3. Conclusion

In this study, there has been an attempt to examine and demystify the integration of AI into education. As has ever been true, educational technology is rapidly growing worldwide. It has the potentiality to transform many aspects of the teaching and learning process through the creation of immersive virtual learning environments, as well as bridging the gap between the instructional core components (student-teacher-content-instructional task). Nevertheless, rapidly-advancing technologies may engender ethical and legal concerns, such as creativity, academic integrity, data privacy, and most importantly fairness among learners, despite their economic differences.

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