AI Assisted Learning: A Tool or a Threat?

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ABSTRACT

Both Web 4.0 and EDU 4.0 are malleable terms, that while difficult to define, set the basis for contemporary learning environments. Within these boundaries, AI (Artificial Intelligence) and AIEd (Artificial Intelligence in Education) have further complicated modern pedagogy with an ever-increasing list of potential benefits and pitfalls. This paper argues that to utilize AI and AIEd to its fullest potential, it must first be understood before it is implemented, and that while the increased presence of AI in our daily lives may be inevitable, the path it follows is not predetermined. This paper briefly explores the history of AI and AIEd technology and assesses not only the potential benefits of AIEd and how they may be fully realized, but also three areas of concern; privacy and data use, inherent bias, and the role of the educator in the future. Through flexible, cyclical models and careful consideration, this paper argues that AIEd will not automatically lead to a phasing out of teachers in learning environments, but, if due care is made, the potential benefits of AI technology can be forged in a way that they improve the working and learning experiences for all stakeholders.

Keywords: AI, AIEd, 4IR, Web 4.0, Edu 4.0

1. Introduction

Technology has always played an important and influential role over education, shaping what is taught, how curricula are delivered, whilst also influencing how teachers approach constructing their learning environments, and how students interact with them, in short technology can act "as a tool to enhance the overall learning process." (Shrivastava, 2023, p.7). The progression of digital technologies and their application to education can be explored through the study of EDU 4.0 and Web 4.0, which have had a symbiotic evolution, with advances in technology, and how that technology is widely adopted and applied, altering the path and impact EDU 4.0 and Web 4.0 have on our daily lives. While each step along this evolution cannot be clearly defined with an agreed terminology that distinguishes one aspect from another, there are broad explanations that can be applied to examine this progression (see Figure 1).
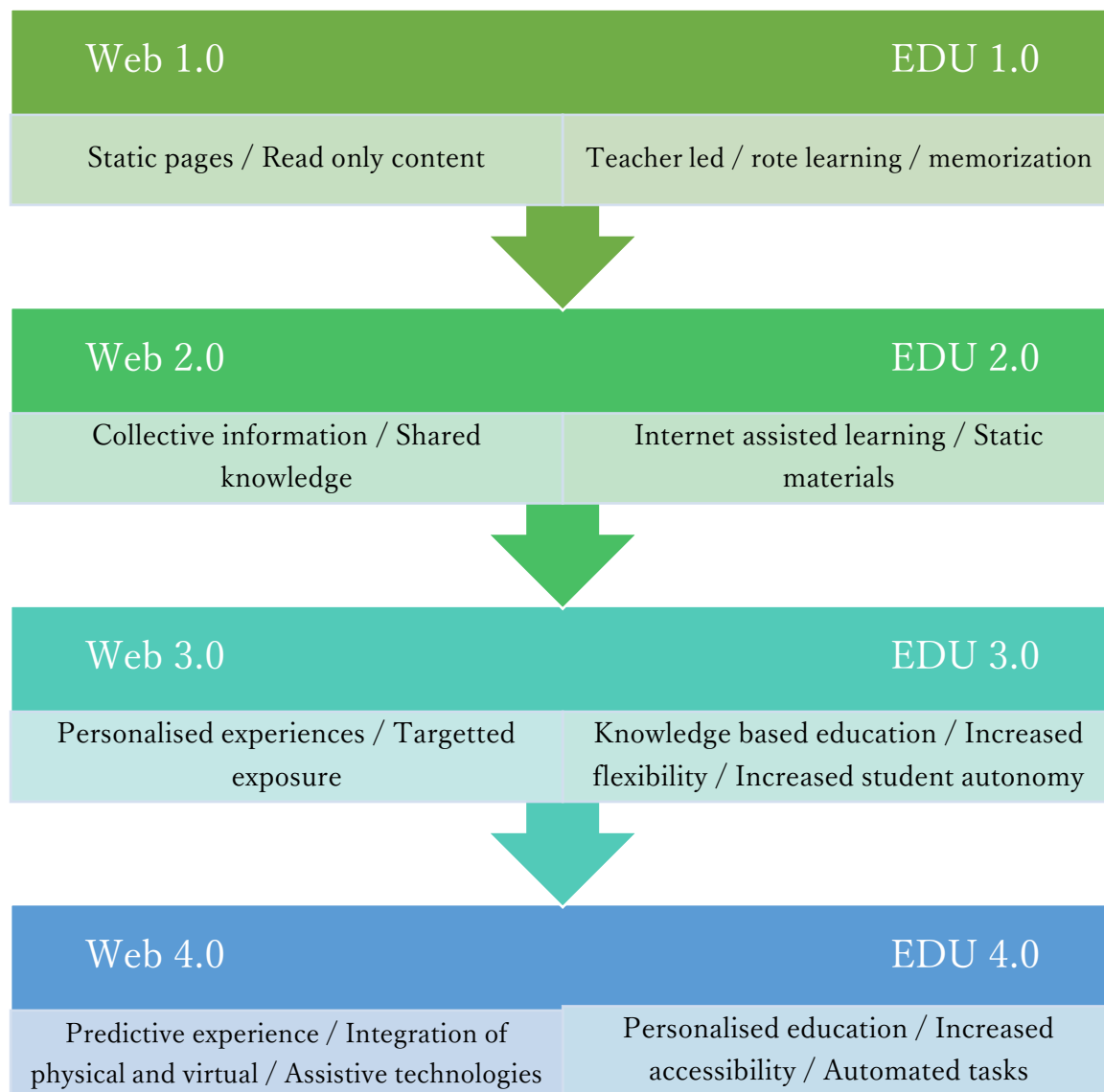
Web 1.0	EDU 1.0
Static pages / Read only content	Teacher led / rote learning / memorization

Web 2.0	EDU 2.0
Collective information / Shared knowledge	Internet assisted learning / Static materials

Web 3.0	EDU 3.0
Personalised experiences / Targetted exposure	Knowledge based education / Increased flexibility / Increased student autonomy

Web 4.0	EDU 4.0
Predictive experience / Integration of physical and virtual / Assistive technologies	Personalised education / Increased accessibility / Automated tasks

Figure 1. Web/EDU 1.0 - 4.0

While these changes did not occur truly independent of each other or in a strictly chronological manner, the increased complexity and technologically enhanced nature of Web 4.0, EDU 4.0, and each of their respective predecessors do have a number of similarities. For both EDU 1.0 and Web 1.0, the user/student was exposed to a passive experience in which they were given static materials, which they could not add to, edit, or construct; instead, they could merely access the information. While EDU 2.0 was infused with the internet and eLearning, it still relied on static materials, and the rather traditional roles of a teacher acting as an expert transferring knowledge to their student(s). Web 2.0 saw the beginnings of communal information, in which people could upload their own materials, to websites such as YouTube, or edit or compliment a growing library of data on websites such as Wikipedia. Learners also became a more active participant in the learning experience with EDU 3.0, which offered them more flexibility and autonomy, as they could not only have more input regarding the parameters of their learning (such as when and where it would take place), but also an active role in steering the direction of their learning experience; students were no longer simply relying on teachers or static materials, but were given an opportunity to contribute to the shared learning experience. An example of this can be seen in George Siemens Connectivism model, which was designed to give students more autonomy and input in their learning experience, making the

contributions of students equally as important as that of the teacher(s). This not only gives students the opportunity to optimize their learning environment, but also the responsibility to assess and actively contribute to it, meaning they "must be active agents engaging with a digital information system and utilizing this to co-construct a knowledge base for themselves and their community" (Al-Maawali, 2022, p.4).

Web 3.0 saw a further progression in which vast quantities of data was collected from users, and this had the dual effect of offering users a more personalized online experience, and allowing for third parties to apply this data to targeted advertising or algorithmically fueled suggestions. While the boundaries of Web 4.0 may not yet be fully understood or known, the increased pool of data that users are constantly updating allows for a more acute predictive experience, in which time online can be curated to an individual's interests, and Web 4.0 can predict what a user needs or wants to see and can steer them in the (assumed) right direction. The increased technological presence could also lead to a blurring of the lines between the digital and physical worlds. EDU 4.0 exists within this technologically driven environment, and its success is dependent on stakeholders not only understanding what Web 4.0 and EDU 4.0 are, but how they can be utilized.

This paper aims to examine the social and pedagogical concerns that relate to contemporary technology, and how this can be applied in contemporary education. There will be a particular focus on Artificial Intelligence (hereon referred to as AI) and how its role within EDU 4.0 will become ever more important. The paper will begin by briefly exploring AI's history within the realm of education, as well as any concerns that have arisen through its increased presence. The study does not aim to demonize or celebrate AI, instead it will argue that the process of understanding the potential of AI, and highlighting any potential pitfalls it may present, can ensure it is used in an efficient and ethical way. As AI's use is increasingly inevitable, it is therefore vital that approaches to education match the needs of modern society and take into account the full scope and potential of EDU 4.0 and AI tools, as any "educational system unable to adapt to the speed of innovation in society is obsolete" (Soskil, 2018, p.10).

Once these social and pedagogical concerns have been highlighted and explored, this paper will move on to compile a sample implementation strategy for the realm of tertiary education and explain how best to utilize the technology that is readily available to us today, while also being flexible enough to incorporate potential advances said technology may take in the future.

2. Brief History of AI

While AI is a central feature of EDU 4.0, it is not a new phenonium, as it "has a history that dates back to the 1940s when computer science and cybernetics were born" (Shrivastava, 2023, p.3). Since then, there have been a number of important milestones that have seen the sophistication and application of AI progress over the past 80 years (see Figure 2).
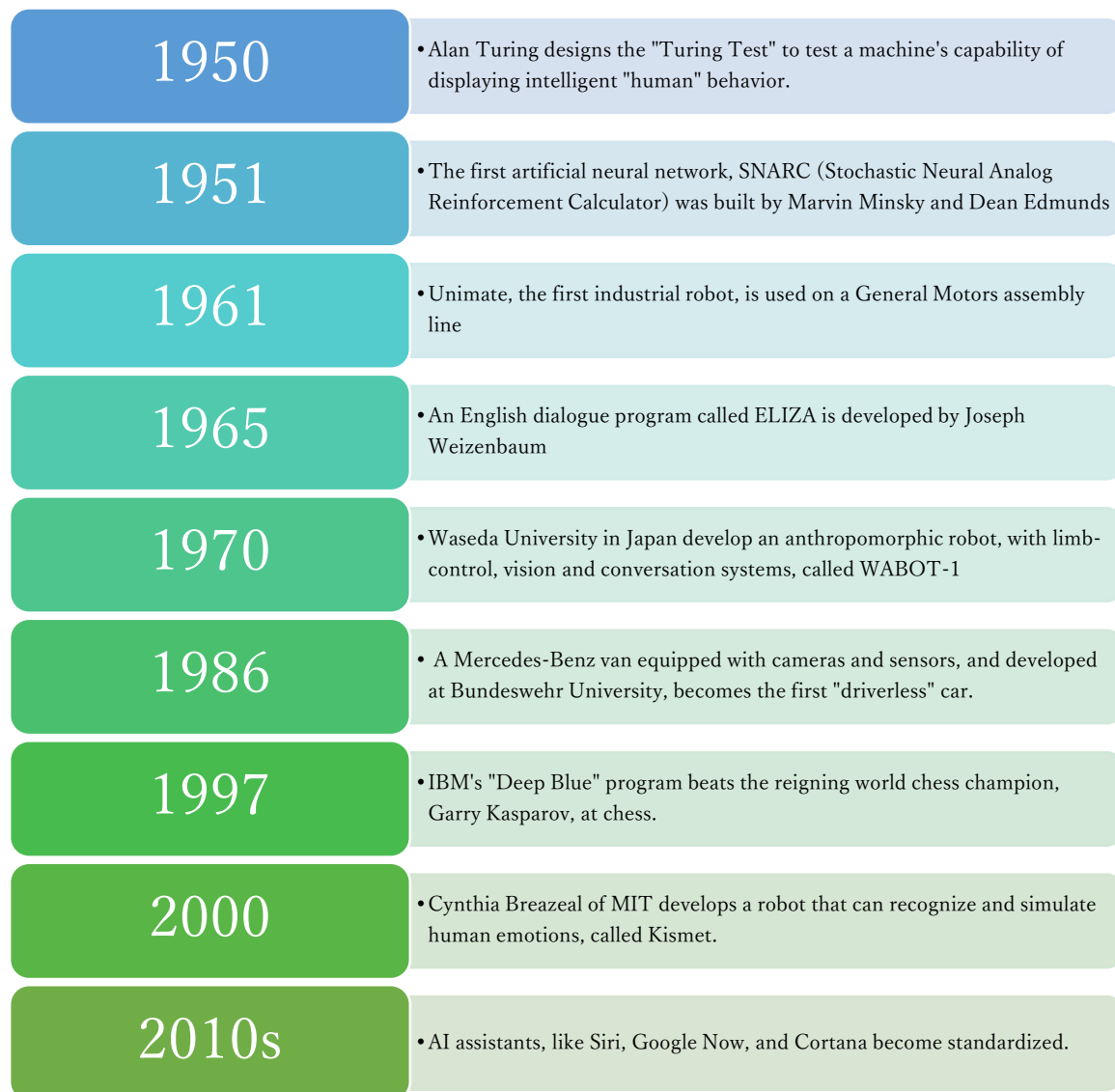
1950	• Alan Turing designs the "Turing Test" to test a machine's capability of displaying intelligent "human" behavior.
1951	• The first artificial neural network, SNARC (Stochastic Neural Analog Reinforcement Calculator) was built by Marvin Minsky and Dean Edmunds
1961	• Unimate, the first industrial robot, is used on a General Motors assembly line
1965	• An English dialogue program called ELIZA is developed by Joseph Weizenbaum
1970	• Waseda University in Japan develop an anthropomorphic robot, with limb-control, vision and conversation systems, called WABOT-1
1986	• A Mercedes-Benz van equipped with cameras and sensors, and developed at Bundeswehr University, becomes the first "driverless" car.
1997	• IBM's "Deep Blue" program beats the reigning world chess champion, Garry Kasparov, at chess.
2000	• Cynthia Breazeal of MIT develops a robot that can recognize and simulate human emotions, called Kismet.
2010s	• AI assistants, like Siri, Google Now, and Cortana become standardized.

Figure 2. AI milestones

While not an exhaustive record of AI milestones, the above list demonstrates how AI has been tested and applied in different fields, from attempting to imitate human speech patterns or emotions, to beating experts in specialized fields, or tackling manual tasks. AI is now no longer a mere curiosity, but a tool that most people can access, through the AI assistants available on their smart-phones, smart-speakers, or computers for example. But AI being more present in our daily lives does not necessarily mean we are any closer to fully understanding its potential, in fact each of the milestones above show that AI often exceeds expectations, which brings about the juxtaposition of it being a tool that could potentially better the lives of countless people, or a threat to livelihoods.

> After 2010, AI progressively resurfaced under a new paradigm, not as simulated human bits of intelligence or programmable expert systems, but as data-processing systems capable of learning and making predictions from massive amounts of 'big data' classification and correlation (Shrivastava, 2023, p.3).

Today, AI is only limited by the data from which it can draw from, and contemporary programs such as ChatGPT have "the power to pass legal exams, write entire feature-length articles, and even code full websites" (Hughes, 2023). It is therefore vital that educators (and other

stakeholders) can come to grips with the full potential of AI and how it will influence the direction of EDU 4.0. By exploring the potential benefits and dangers of artificial intelligence, it will be possible to demonstrate an optimal delivery platform for AIEd (Artificial Intelligence in Education), and what impact that will have on the online learning ecosystem of EDU 4.0.

3. Benefits of AI

As previously mentioned, AI has now become an integral and near-invisible feature of our everyday lives, being a tool that people casually call upon for a variety of tasks.

> AIs have the potential to direct you with precise turns to and from works or provide suggestions for eating out in an unfamiliar area based on past visits to restaurants (Govender, 2021, p.31).

AI can tap into the data it has collected from us, and make predictions or recommendations based upon the information it has available to it; as in the above example, the AI is aware of the user's location and past dining experiences and can suggest a restaurant that is both geographically close and suitable to perceived preferences of the user. Outside of this, AI can also be used in far more specific ways within the framework of EDU 4.0, which can allow teachers to not only rely on AI to accurately and effectively undertake menial tasks, but also afford them more time to spend with their students.

> Recently, there has been the development of educational tools that focus on teachers to help them either *orchestrate* the use of classroom technology or reflect on that organization. They also (i) help teachers allocate their precise time effectively to those students who need it most and (ii) analyze students' work to determine which are the common issues within a class. We can see this as an evolution of the learner model to emcompass both the individuals within a group and the group itself" (du Boulay, 2023, p.98).

AI has the potential to alleviate the workload for both teachers and academic administrators, as it has the ability to take on a variety of tasks, including the ability "to record academic achievements, develop personalized learning materials, provide reviews and analyse data" (Tapalova & Zhiyenbayeva, 2022, p.643). This could potentially give teachers more time to focus on teaching and create a more optimal learning environment for the students.

These benefits are not exclusive to the educators however, and students can also enjoy tangible and noticeable advantages, as "AI allows the use of different teaching methods effective for each student, taking into account the strengths, weaknesses, talents and academic problems of each learner" (Tapalova & Zhiyenbayeva, , p.643), the learning environment can therefore be adaptive enough to suit the needs of individual students, as it "can potentially be used to help identify the most effective teaching methods based on students' contexts and learning background" (Chaudry & Kazim, 2022, p.157). As will be explored in subsequent sections of this paper, this observant and adaptive nature, as well as its potential to "automate monotonous operational tasks" (Chaudry & Kazim, 2022, p.157) could potentially mean that teachers are better equipped to construct more personalized and effective learning environments. Not only this, the adoption of AIEd could also lead to improved equity levels within education, as AIEd "offers students of different age groups, academic levels and socioeconomic backgrounds opportunities to enhance learning experiences and improve academic achievements" (Tapalova & Zhiyenbayeva, 2022, p.643).

4. Concerns Regarding AI

While there is a plethora of ethical and technical concerns regarding AI, this paper will look at just three central examples:

1. Privacy and data use
2. Ethical implications (including bias)
3. The role of the educator moving forward

To further improve the clarity of this study, these three aspects will be further divided into two sub-sections, one regarding the implications of AI on teachers, and the other on students.

4.1.   Concerns for Teachers

AI and automation can be seen as a threat to job security in a number of industries and sectors, a problem that was compounded with the COVID-19 pandemic, which saw a sudden investment in this technology to circumvent the restrictions put in place on working environments:

> In the pre-pandemic era, new artificial intelligence (AI)-based technologies were being gradually introduced to automate some of the tasks performed by human employees. The COVID-19 crisis, and its accompanying measures of social distancing, has suddenly accelerated this process of innovation and technological change […] These innovations provoked by necessity […] will soon result in hundreds of thousands, and potentially millions, of job losses (Schwab & Malleret, 2020, p.55).

While the pandemic proved that this technology can be successfully implemented on huge scales, and that more and more sectors of the working public could be in danger of losing their positions, there has long been the assumption that "teaching is among the professions that is least threatened. The amount of creativity and social intelligence required to teach well is simply too "human" to be done by a machine" (Soskil, 2018, pp.22-23). While this may be true at present, the goal of AI has long been to emulate and even surpass human behaviors, as can be seen in such milestones in Figure 2 as besting a world champion at chess, attempting to conduct convincing conversations, or even trying to recognize and react to human emotions. This could be seen as the programmers attempting to imbue humanity into their AI projects, whereas now, the more successful AI software recognizes and tries to address the "human" qualities of its users, as "one of the developments of AIEd since the early days has been the focus on learners as human beings with *feelings* and *aspirations* as well as knowledge and skills" (du Boulay, 2023, p.96). How AIEd achieves this will be a point of contention in the following section.

Teachers relying on their humanity and assuring themselves that they are irreplaceable by AI could well be a form of hubris, as "AI is not yet in a position to provide such a threat, but this will not always be the case" (Bates et al, 2020, p.12). Systems have already proven that they can progress beyond merely solving problems or answering commands, as one example of the application of AIEd in the study of mathematics showed that a more rounded assistance was possible:

> These interactive platforms do not only provide explanations of mathematical concepts and principles or help in problem-solving, but interact responsively to students' needs (Ramful & Patahuddin, 2021, p.17).

If utilized correctly "AIed can be a partner in helping students reconnect with teachers" (Koh et al, 2022, p.3), as it has the potential to allow teachers more interpersonal time with their students, so that they can focus on "non-academic skills such as motivating students, inspiring

them [and] broadening their horizons" (Koh et al, 2022, p.3). It is therefore vital that teachers are fully aware of AI's progression and how it may be applied in the future; which may help in ensuring teachers are utilizing AIEd, instead of being phased out by it.

4.2. Concerns for Students

As previously stated, AIEd has the potential to become better entuned with the specific and individual needs of students; it does this however by collecting and collating vast amounts of data, which could include the students' browsing history, location, demographic details etc. So, although "such an evolution helps to humanize the interaction between systems and learners, it opens up further scope for ethical issues around privacy and around the kind of data that are collected and stored" (du Boulay, 2023, p.96).

This ethical concern is further complicated by the actors who are in charge of this technology and what they use this information for. Can a privately owned, for-profit company, be trusted with using this information to improve learning environments, or will their focus be on generating revenue? It is therefore very important to ask, "who is best placed to protect and sustain the individual in a digital age: multinational corporations or a public education system?" (Bates et al, 2020, p.12). The public perspective on AIEd extends beyond the fears and concerns of potential users, and has also become a concern for those developing these technologies, as they are increasingly aware of the hesitancy from the wider community, and how these concerns must be addressed to ensure their product/service is received well:

> There is no doubt today that AIED actors (including developers/owners of subsequent solutions) are, in varying degree, aware of the fact that cultural values and ethical concerns may influence the processes of the successful implementation of AIED technologies (Kladko, 2023, p.266).

While the cynical motivations of developers addressing ethical concerns to ensure a more receptive userbase could be seen as worrying, it could well lead to solutions to this particular problem, but it should not be left to the impulses of these developers alone to determine the ethical boundaries within which this technology should be developed and implemented, and as will be discussed in subsequent sections of this paper, major international bodies have taken it upon themselves to delve into this complex dilemma.

Another concern could be bias, which could be subconsciously added to the software and become an inherent and hugely influential problem. As the operating capabilities of AIEd is dependent on the data it is fed, what the AI is told (and not told) will alter the results to any tasks it may be set.

> AI bias occurs because human beings choose the data that algorithms use, and also decide how the results of those algorithms will be applied. Without extensive testing and diverse teams, it is easy for unconscious biases to enter machine learning models. Then AI systems automate and perpetuate those biased models (Marr, 2022).

While these biases may be unintentional, their impact can be huge, and certain aspects of society, who are not accurately or completely represented by the data pools available to AI, can gain either less helpful or actively harmful outcomes from AIEd, as "algorithms lead to bias and discrimination, inequality, and disadvantages for individual users" (Tapalova & Zhiyenbayeva, 2022, p.648). As this can potentially "go unnoticed without any accountability" (Chaudry & Kazim, 2022, p.162) it is vitally important that the ethical responsibilities of AI and its current failings are clearly highlighted and addressed with due consideration.

It could be argued that as these subconscious biases are based upon the incomplete data AI is supplied with, it is therefore the fault of human error that such disadvantages are brought about. That does not mean however that AI can be excused for such mishaps, and "just because human teachers can, on occasion, be biased does not mean we should turn a blind eye to the potential biases in AI-based educational technology" (du Boulay, 2023, p.101). This again points to the importance of fully understanding the potential benefits and drawbacks of AIEd, so that these problems can be actively avoided, and users, no matter their demographic, can enjoy the benefits of AI technology.

Bodies such as UNESCO have addressed the issues of privacy/data use and ethical implications and bias, and have stated that these issues must first be identified before suitable measures can be put in place, as the *Beijing Consensus on artificial intelligence and education* states it is necessary to adopt the following measures:

> Test and adopt emerging AI technologies and tools for ensuring teachers' and learners' privacy protection and data security. Support robust and long-term study of deeper issues of ethics in AI, ensuring AI is used for good and preventing its harmful applications. Develop comprehensive data protection laws and regulatory frameworks to guarantee the ethical, non-discriminatory, equitable, transparent and auditable use and reuse of learners' data (UNESCO, 2019, p.8).

The guidelines not only call for concrete guidelines that can be referred to in order to ensure consistent vigilance, it also points to the necessity of continuously studying the "emerging AI technologies and tools" that are developed, meaning that guidelines that are suitable today, may well need to be adapted in the near-future, and that these new guidelines must place increased focus on the wellbeing of the users.

5. A learning Environment to Meet Contemporary Criteria

While the scope and potential for Web 4.0 and EDU 4.0 are both extensive, they are perhaps hampered not by restrictions in the technology, but by the ability and knowledge of those who plan to implement them, as in order "for a teacher to successfully implement technology, they must have an understanding of how the technology knowledge (TK) works and is related to technology with content (CK)" (Williams, 2020, p.66). But these benefits can only be realized if educators understand them and implement them correctly, which will lead to tangible benefits for the students, as the "appropriate integration of new technologies into education plays a pivotal role in keeping education systems relevant relative to global benchmarks" (Govinder, 2021, p.33). As technology progresses, these "global benchmarks" will progress with them, and so learning approaches and methods must remain vigilant in attempting to remain relevant and effective; they must first be aware of what technology is available to them, how it can be implemented correctly, and what may change in the future.

5.1. Responsibilities on Educators

To avoid stagnation or only relying on familiar approaches, educators must be familiarized with instructional technology early on in their career, as studies have shown that "it is critical to tune teachers to technological affordances early when they are in their training programs" (Ramful & Patahuddin, 2021, p.21). That being said, simply teaching instructors *how* to use a particular technology may not be the most fruitful approach, as any instructional technology will more than likely become obsolete at some point; instead, teachers should be taught the importance of staying abreast with instructional technology and give them the tools and support to try new technologies and approaches when they become available. This should help towards

maintaining an effective learning environment, no matter what advances are made, and can go towards keeping the role of the teacher an essential one.

However, this training can only be successful if teachers want to participate in it, as how EDU 4.0 progresses is not limited by the technology, but by rigid paradigms which may not embrace it:

> One weakness of education 4.0 is resistance to change factor occurs at a greater level. The teachers will resist to change or will not step out from their comfort zone that they have been putting into practice for many years. Many educators feel unprepared to use technology to support student learning. Most of them are comfortable teaching the traditional ways (Lawrence et al, 2019, p.516).

While the aim of this paper is not to belittle or criticize the "traditional ways" teachers may rely upon to teach their classes, it is crucial that approaches remain flexible enough to account for any progressions in the realm of instructional technology. Again, focusing on AIEd as just one example, if utilized correctly it can greatly improve a learning environment as it can "assess the transient emotional and motivational states of learners in order to boost positive frames of mind, such as engaged concentration, and counter negative states of mind, such as frustration of boredom" (du Boulay, 2023, p.96). It therefore has the potential to create a personalized and custom learning environment for students, exposing them to tasks and materials that fall squarely in their zone of proximal development (hereon referred to as ZPD); offering them learning experiences that are challenging enough to elicit growth, without being too difficult to cause frustration or demotivation.

A number of studies have shown the practical benefits of AIEd, and in Xue and Wang's 2022 paper, *Artificial Intelligence for Education and Teaching*, they explore the ways in which AI can be used to ease the workload of teachers, while simultaneously expanding the wealth of knowledge available to students. There main thesis is that AI is not necessarily a threat to teaching, but a tool that can greatly improve it:

> In the era of information education, the main link in teaching is to implement quality education, improve the quality of education and teaching, and expand the amount of information in classroom teaching [...] The use of information technology to teach can greatly change the amount of information that students receive (Xue & Wang, 2022, p.7).

Other studies have also highlighted the immediate benefits of AIEd alleviating a teacher's workload, by completing a number of "simple tasks such as assessments, digital asses classification or scheduling [which] helps teachers to save time usually spent on routine tasks and devote more time to communicate with students" (Tapalova & Zhiyenbayeva, 2022, p.643-644). So, while the cautionary writings of Schwab and Malleret are still accurate, and automation and AI have the potential to digitize entire industries, AIEd does not necessarily need to lead to a dehumanizing of educational environments; in fact, by allowing teachers more time to spend with their students, by having other responsibilities handled by AIEd, it could be argued that AIEd could lead to a more engaging and "human" learning environment. However, Xue and Wang point to the importance of destabilizing the status quo, and forcing stakeholders to venture out of their comfort zones:

> Innovation is not only a simple technology or process invention, but a nonstop mechanism. Innovation is only introduced by the discovery and invention of production and the shock effect on the original production system"(Xue & Wang, 2022, p.3).

Teachers, students, and other stakeholders must constantly be expanding their knowledge base and challenging their pre-existing approaches/methods, otherwise they could fall behind the

curve of technological advancements, which could lead to either a sub-optimal learning experience, or one that is completely obsolete and ineffective.

That is not to say that the fears surrounding AIEd are unfounded, as it could be applied in a more skeptical manner, depending on who is implementing the technology and to what ends, and simple budgetary savings may be favoured over a more nuanced application of AIEd:

> AI advocates often argue that they are not trying to replace teachers but to make their life easier or more efficient. This should be viewed cautiously. The key driver of AI applications is cost-reduction, which means reducing the number of teachers, as this is the main cost in education (Bates et al, 2020, p.7).

To ensure AIEd is applied ethically and effectively, it is vital that its role is consistently and constantly monitored, reviewed, and discussed and "[d]igital leaders must be flexible, adaptable, and hungry for intellectual curiosity and new knowledge" (Karakose et al, 2021, p.2). But it is not just the responsibility of individual teachers to bring about these changes; instead it should be an inherent concern that is central to the ethos of entire educational institutes and educational bodies, so "[m]anagers and company leaders of the future must be prepared to comprehend and intelligently embrace the opportunities and challenges given by emerging waves of technology as effective growth engines" (Shrivastava, 2023, p.7).

6. The SPICE Model

Due to the rapid evolution of AI, it is unlikely that a static model can be constructed that will be able to be utilize it. Instead, a cyclical approach, much like the "ADDIE" model (Assess, Design, Develop, Implement, Evaluate) used by instructional designers would be better suited to the successful execution of AIEd. As previously explored, the first step is to study and understand AI, which can help identify its potential and boundaries; potential problems can then be identified, and guidelines can be constructed to ensure that AI is used both effectively and ethically. Training would then be necessary to make sure stakeholders have the ability to take full advantage of this technology, and that teachers have the skillset and knowledge to construct a productive learning environment that is conducive with EDU 4.0. Lastly, this model should be evaluated; as advances in AI are both unfathomable and unavoidable, it is key that this model is constantly evaluated, altered, and improved. This will help ensure that AIEd is a tool for betterment, and not a hindrance.

Step one in the SPICE Model is to attempt to understand the role of AI as it currently stands, and what its potential may be in the future. This is vital to implementing AIEd correctly, as has been previously shown, the role of AI has morphed over time, and it will no doubt continue to do so in the future. Next, potential problems need to be identified so that they can be carefully addressed; the contemporary problems relating to AI explored in this paper include privacy, ethical implications, and biases, but new problems may well arise in the future, for which suitable solutions must be constructed.
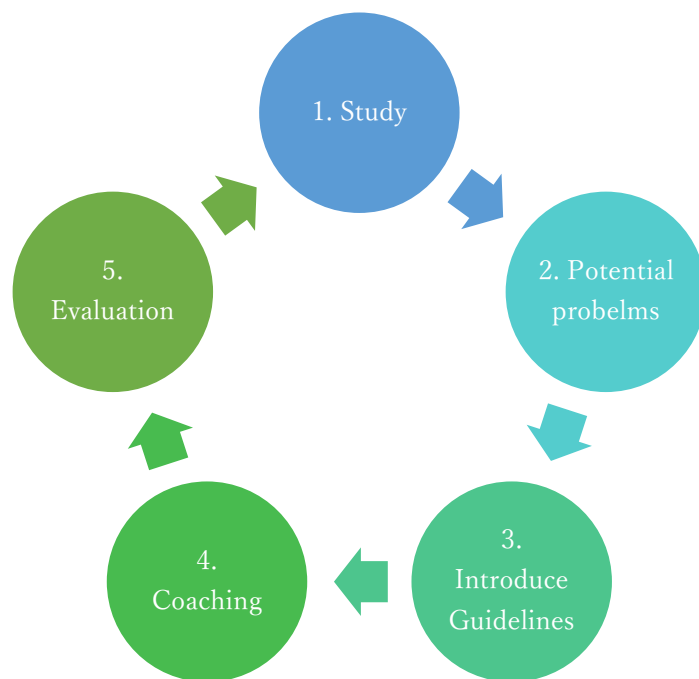
Figure 3. The SPICE Model

With the role of contemporary AI and the potential problems it may entail addressed, guidelines can then be drawn up; this could be done on a national scale, such as the *AI Governance in Japan Ver. 1.0* (see Appendix), which in 2021 was constructed with the combined knowledge of 14 experts in the field, and put forward ideas including goals, legally non-binding guidelines, legally binding regulations, international standards, monitoring and enforcement. While not an official law, the report opened the discussion surrounding AI and its usefulness in Japan (and around the world). But guidelines need not be on a national or international scale; individual educational institutes should also formally state their position on the use of AI; can students use it to help them complete projects? If so, to what extent? Can teachers rely on AI to grade said projects; if so, what projects can be graded in this way? Only if these guidelines are clearly stated can they be explained and understood by all relevant stakeholders and implemented in a uniformed and consistent manner.

With guidelines in place, coaching can begin. The first step in this process is that the guidelines (be them institutional or national) be introduced, explained, and demonstrated to the stakeholders, who must have a fully rounded understanding of how AI should be utilized. Teachers and students can then be given more focused training to tackle more specific tasks; this could include understanding how a particular program or function of a program is used, or how to detect or prevent the improper use of AI, that may otherwise go against the aforementioned guidelines. Through thorough and well-designed coaching, any problems that were formally identified can then be addressed and (hopefully) resolved, avoided, or minimized.

The final step in the SPICE model, Evaluation, is potentially the most important, as it helps maintain the usefulness and applicability of the proposed plan. It can begin by evaluating whether or not the problems that were previously identified were rectified appropriately, and whether the guidelines and training are a fair representation of contemporary demands. Moving forward, the evaluation step can also reassess the role AI plays in modern society and within the realm of EDU 4.0, and if any progressions have taken place, the SPICE process can begin again so that it is better suited to meet the updated demands. Teachers, students and other stakeholders must constantly be expanding their knowledge base and challenging their pre-existing approaches/methods; this will help ensure that AIEd is handled with due care.

While this is a very simplified approach to an extremely complex problem, it tackles the main concerns that have arisen in this study, namely the importance of understanding the technology before (not) using it, identifying any potential problems that either currently exist or could arise in the future, and how these should be reflected in clear guidelines. Stakeholders must then be given the means to use AIEd to its fullest potential and be shown that their flexibility and willingness to adopt new methods or pedagogies is essential to ensuring a lastingly beneficial learning environment, so coaching and training to ensure stakeholders know not only how to use a certain aspect of AIEd, but how that may potentially be of benefit to them, can ensure a wider adoption rate; as even if they "may not necessarily use these tools […] it is important to have an understanding of what these tools offer" (Chaudry & Kazim, 2022, p.158). Finally, the model points to the vital importance of flexibility; as AI progresses, it will not only bring up new benefits, but the potential for devastating problems is also a serious consideration. Stakeholders must constantly monitor contemporary technology and reassess their stance on its use, and only through a cyclical and perpetually moving model can such an amorphous technology even begin to be understood and utilized correctly.

This model could then be used by individual teachers, to ensure their syllabi and teaching approaches take AIEd into consideration, as even if they do not personally use the technology in their courses, there is nothing to suggest their students are not versed in its potential uses. Secondly, this model should be used by educational institutes, so that they can map out clear guidelines within which educators can operate. This does not mean they dictate the extent to which AIEd must be applied in classrooms, but allows for teachers (and students) to be aware of the boundaries within which they can operate. It also places a responsibility on all stakeholders to remain vigilant, and monitor the current state of AI, and how it should be applied to learning environments.

7. Conclusion

The aim of this paper was to explore the functionality and application of AIEd and how it applies to both Web 4.0 and EDU 4.0. It first looked at how the role of AI technology has evolved over the years, and how it can benefit both students and learners in the contemporary classroom. It then explored some potential problems that could arise from AIEd's increased presence, and although each of these problems require unique approaches to rectify them, the consistent remedy for each of them is vigilant and consistent training amongst stakeholders; this will ensure the full implications and potential dangers of AI technology are never far from mind.

In order to ensure the application of AIEd is constantly under surveillance, the SPICE model was constructed, which allows for an approach that can be flexible enough to constantly shift and adapt to the evolution of this technology. It is vital that educators know how to use the technology correctly, so that they can be aware of any potential problems, and therefore (hopefully) avoid them. It could be argued that contemporary AI cannot replace teachers, but nor should it; it should be used as a tool, one which must be understood in order to be utilized correctly. There will always be potential problems or complications with AI, be that ethical, privacy concerns, or inherent biases. Teachers must recognize these complications in order to avoid them, as AI has become so inherent in professional and daily lives, removing it from the educational environment is no longer a viable option. While the future of AIEd is unknown, its progression is a shared responsibility, and we must all ensure it is applied efficiently and ethically.

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Appendix

A link to *AI Governance in Japan Ver. 1.0:*
https://www.meti.go.jp/press/2020/01/20210115003/20210115003-3.pdf