APPLICATION OF ARTIFICIAL INTELLIGENCE IN EDUCATION FOR IMPROVED LEARNING AND THE SUBJECT OF ETHICS

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ABSTRACT

This article explored the complex and sophisticated realm of Artificial Intelligence (AI) applications in education, exploring their potentials to provide solutions for improving teaching and learning experiences for teachers and students, as well as the ethical concerns they raise within the educational sphere. This study reviewed complementary approaches that AI uses to improve academic activities, intelligent content distribution, through AI enabled adaptive learning platforms such as: ChatGPT, Grammarly Google Bard, Quillbot, etc. In addition, the study highlighted some skills necessary for the up-skilling of teachers and learners in readiness for the adoption of AI in education and delved into topical concerns about the ethical complexities surrounding the use of AI in education, including issues of data privacy, biases in AI algorithms and the potential attrition of teachers' roles. The study provided roadmaps and guidelines to safe adoption of AI in education Institutions and suggested approaches to striking a balance between safely harnessing the power of AI for improved learning and protecting ethical principles for the use of AI in the field of education.

Keywords: *Artificial Intelligence (AI), Generative AI, Technological Advancement, AI Inclusion, AI Applications for Education, Disruptive technology, Improved Learning, Ethics in AI.*

INTRODUCTION

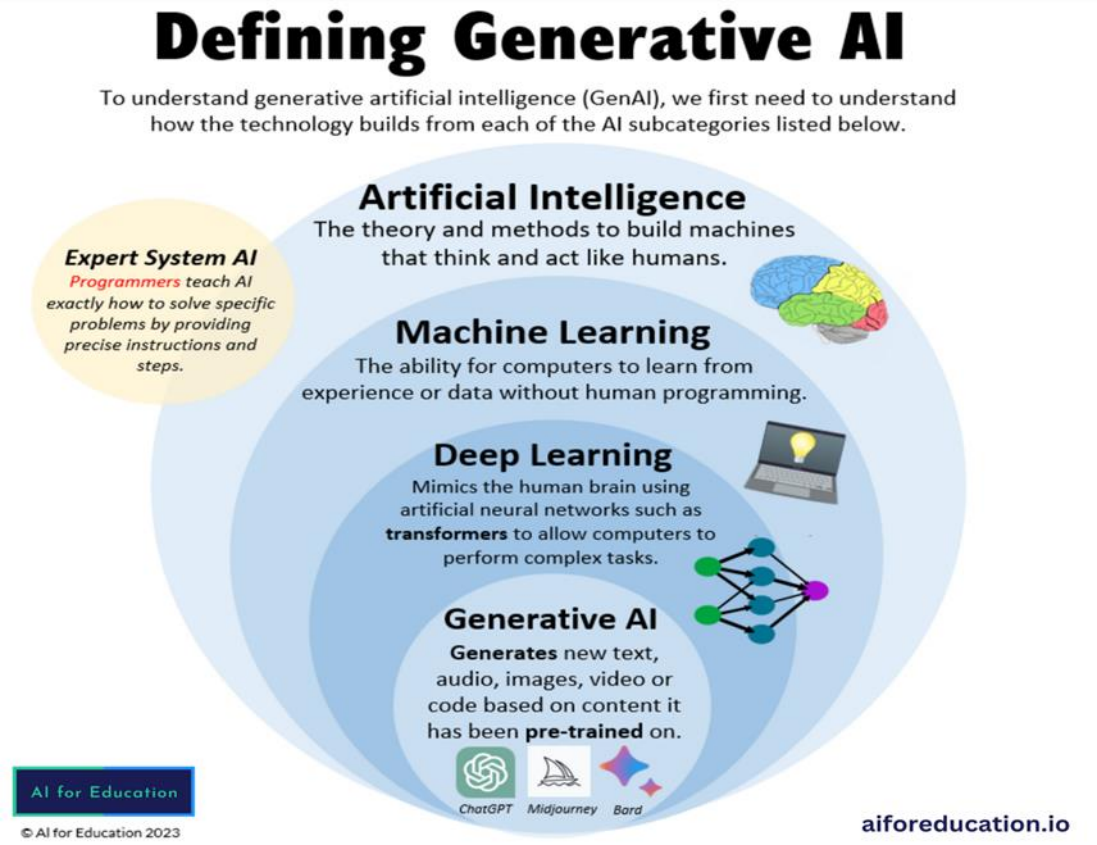
Traditional teaching methods as mentioned by Beder (2022) may cause students nowadays to lose focus, and disengage from learning activities, rather the use of Artificial Intelligence AI and other digital realities present learners with a more holistic learning experience since students can engage and interact with these technologies in a seemingly realistic way. More so, AI helps to personalize the experience for each unique user by analyzing users' preferences, behavior, biometrics personalized environments that adapt to users' needs and preferences. By using AI-powered tools and strategies, educators can improve management of administrative tasks, streamline work activities, personalize learning, improve student outcomes, and better prepare students for success in the digital era.

Artificial Intelligence (AI) is a locus where people in diverse fields of work and learning draw the potential to enhance work and learning. AI belongs to the type of technology commonly described as disruptive technology, although Obe, Higton, Beard, Birkin, Corley & Milner (2019) consider technologies generally to be broadly expected to have disruptive consequences for workers. Hardman (2023) thinks of AI as a process where humans teach computers to do things that normally require human intelligence: things such as recognizing images, understanding speech, responding to instructions or making decisions. They do this by training machines to identify and reproduce structural patterns. Simply put, Artificial Intelligence is the replication of human intelligence in machines to make them think and act like humans. They are artificial in the sense that they are made by man.

AI however, has long been around us in the world, even in the field of education but had not been explored as much as it is today. According to Hardman (2023) AI-powered educational technologies and designs have existed for well over 60 years. Hardman wrote that though it is not unforgiveable to think that AI in education is an uncharted path, she recognized that the same Machine Learning technology and expertise that enabled computer scientists to train computers to understand differential characteristics has been used and continues to be used to design and deliver education for over 60 years. Modern day Adoption of AI for teaching is what Beck, Stern, Haugsjaa (1996) as far back as the late 90s described as the use of Intelligent Tutoring systems (ITSs) to offer considerable flexibility in presenting materials and a better response to peculiar students' needs by representing pedagogical decisions about how to teach as well as information about the learner. The authors wrote that ITSs have proven to be highly effective at increasing students' performance and motivation.

To provide a clear and concise insight on the concepts of VR, AR, MR and AI, the following infographic called Generative AI Explainer by AI for Education (2023) will attempt to define Generative AI in the larger context of the field of Artificial Intelligence.

Figure 1: Generative AI Explainer



Source: AI for Education (2023) https://www.aiforeducation.io/ai-resources/generative-ai-explainer

Artificial Intelligence in Education

This section attempts to provide insights and answer the question of what teaching and learning problems can be solved using AI. Abounding research has treated the subject of teacher burnouts due to overwhelming work pressures and an incessant demand to integrate new materials and an exhaustive attempt to meet the needs of a wide range of students over a protracted cycle.

To this end, D'Orio (2018) reported that one in ten teachers leave the profession after their first year and to him, it is not surprising. Limna, Jakwatanatham, Siripipattanakul, Kaewpuang and Sriboonruang (2022) asserted that Artificial Intelligence is a strategic and critical factor in educational development and is increasingly being accepted as a digital assistant for teaching and learning, to assist teachers, learners and researchers by providing access to a wide range of learning materials based on their specific learning needs and subjects of interest. Among the opportunities obtainable in educational AI technologies are innovation, collaboration, and transformation, including new pedagogies, models, platforms, and ecosystems (Linkedin, (2023). Srivastava, (2023) on the other hand highlighted the problems that educational AI technology can solve by expanding the possibilities of AI and classifying them into what he described as ten most popular AI in education. Examples where AI technology is transforming learning and education are:

1. Personalized Learning

Every student adapts to knowledge differently; therefore, conventional learning styles have proved inadequate in achieving the concept of customized learning for every individual student. AI in education on the other hand, ensures that educational software is personalized for every individual, with supporting technologies that back up how each student perceives various lessons and adapts to that process to minimize the burden.

2. Task Automation

AI creates an automated and productive environment along with creating a tailored teaching process, AI solutions for education can take up the task of student assessment by grading tests, organizing research papers, keeping records, making presentations and notes, and managing other administrative tasks.

3. Smart Content Creation

AI helps teachers and researchers create innovative content and are convenient for use in complex subjects and learning. Some examples of AI smart content creation include:

Information visualization

Apart from laboratory practicals, traditional teaching methods, hardly provide visual features that could enhance comprehension, whereas, AI smart content creation increases real-life experience through graphical web-based learning environments.

Digital lesson generation

AI applications generate bit-size and low-storage study materials in digital format which teachers and students can leverage on, without taking up much space in the device. More so, these materials can be accessed from any device, so you do not have to worry about remote learning. To quote a real-life example, Appinventiv (2023) developed an online learning platform, Gurushala, that educates millions of students by providing free study material and other interactive forms of instruction.

Frequent content updates

AI allows users to create and update information frequently to keep lessons up-to-date with time. The users also get notified whenever new information is added, which helps prepare them for upcoming tasks.

4. Adaptable Access

AI is adaptive and provides personalized content and recommendations for users, based on each unique user's progress rate and support features like multilingual support which is; translating information into different languages, making it convenient for different natives to teach and learn. AI also plays a vital role in teaching visually or hearing-impaired users.

5. Determining Classroom Vulnerabilities

AI supports the experts by improvising the teaching-learning process for individuals. The belief that AI will soon replace the human touch in learning might be the case for other industries but not the education sector. AI and education go hand-in-hand complementing manual and virtual teaching.

6. Closing the Skill Gap

Up-skilling students are a valuable solution for businesses struggling with gaps in technology. AI powered software and application development solutions deliver widely available and affordable opportunities for not only students but teachers and school administrators to up-skill.

7. Customized Data-Based Feedback

Feedback is a crucial ingredient when it comes to designing learning experiences, whether in a workplace or classroom. The fundamental difference between effective teaching and merely giving out content is that effective teaching includes giving continuous feedback. It's essential that feedback comes from a trusted source; therefore, AI in education analyzes and determines work reports based on everyday data.

8. 24*7 Assistance with Conversational AI.

Chatbots are an increasingly familiar example of how AI in education consumes data to inform and provide assistance accordingly. This benefits both business professionals and teachers for user engagement in customized learning. Conversational AI in education delivers intelligent tutoring by closely observing the content consumption pattern and catering to their needs accordingly.

9. Secure and Decentralized Learning Systems

The education industry is delivering rapid innovations with AI but is often held back by issues like data protection, alterable data accessibility, outdated certification processes, etc. Amidst all these challenges, AI-based decentralized solutions can bring a positive technical revolution to the education sector.

10. AI in Examinations

AI software systems can be actively used in examinations and interviews to help detect suspicious behavior and alert the supervisor. The AI programs keep track of each individual through web cameras, microphones, and web browsers and perform a keystroke analysis where any movement alerts the system. An AI-based software and application solution can be beneficial in more ways than one can imagine. This is why Educational Technology startups and enterprises are attracted to AI technology solutions that successfully address the wide range of users' pain points. Therefore, if you are a part of the professional education sector, it's officially time to integrate AI solutions into your education business.

Adaptation to AI in Education

As the capabilities of AI continue to expand in the world of education, the technology will continue also to influence how students learn, how teachers work, and eventually how the education system is structured (Bailey, 2023). Concerns have been raised about the potential of AI to infringe on privacy and personal data. As AI algorithms become more advanced at analyzing and interpreting data, there is a risk that they could collect and use users' personal data in ways that users may not be aware of or consent to.

Predictions about the emergence of new technologies which have the potential to act as humans, disrupt human activities, strip humans of their jobs and is in-fact feared to have the capacity in the future to depend greatly on humanoids; a term used to refer to inanimate entities with either human forms or characteristics programmed to learn and think like humans. Artificial Intelligence and Immersive Technologies such as Deep Learning (DL), Machine Learning (ML), Virtual Realities (VR), Augmented Realities (AR), Mixed Realities (MR), Extended Realities (XR) and Big Data Analytics according to Patil and Pradhan (2020) and in agreement with Oktra (2020), are poised for continued adoption in businesses and will become increasingly optimized for a wide range of utilities across the globe and may greatly affect business decisions, lifestyle and education.

Another subtle risk factor is the capacity of AI to replace human creativity if the algorithms become well advanced and automated; there is a risk that they could replace human workers, potentially leading to job displacement and other economic and social consequences (AIContentfy Team, 2023). This, in my opinion is a contributory reason teachers tend to be draggy towards the subject of adoption of AI in the education system.

Although problems such as fear of technology, unavailability of technological gadgets and paucity of funds for subscriptions to run software that support technology and AI inclusion in the education process have been severally revealed, Ben-George (2021) believed that employees are likely to adapt to developing technologies as the adoption of one technology type may lead to the desire or an intention to use its coexistent sub technology. This likelihood is explained in Coccia's (2019) theory of Technological Parasitism. This is because most technologies are either complementary, interconnected, more advanced, substitutes others, solves the lacunas of previous technologies, is required by policy or regulatory authorities, peer pressure, upgraded versions, or sheer consumerism. For instance, a chatbot like ChatGPT can create text on any subject you ask of it but lacks the capacity to generate graphic content. Therefore, text and ideas generated from such chatbots may be used to create graphic content; Images or videos on a separate application like wave.video or Google Bard. Another example is that of interconnectivity: take Apple, Samsung, or Huawei phones and tablets for example; ownership of one these may lead one to the desire to own a smart watch from same company.

However, the fear of loss of one's job is the most terrifying, judging by the pace at which technological evolutions are rolling out. This fear no doubt is valid and does not only exist in the realm of education, but fields of Science, Technology, Engineering, Agriculture, Management, GeoScience, Human Resources Management, etc., will all bear the brunt because whether teachers want to use AI technologies or not, students are using them and would soon outsmart their teachers. Adepoju (2023) however made an attempt to ease this threatening reality by stating that although AI would change the role of teachers, take away knowledge base and assessment, smart teachers will maintain their jobs if they perceive AI as an instrument to augment their capabilities. They will become facilitators of the social and emotional aspects of learning using AI, which is why teachers must up-skill to stay relevant in the not so far future. The assertion of University of San Diego (2023), an AI industry thought leader and education partner summarizes the question about whether or not AI in education is sustainable: Despite the continuous and extensive debate over the pros and cons of deploying AI technology in the field of education, including the concerns about depersonalization and the ethical concerns of stakeholders, there is an emerging consensus that the exciting range of current and future benefits will carry the day.

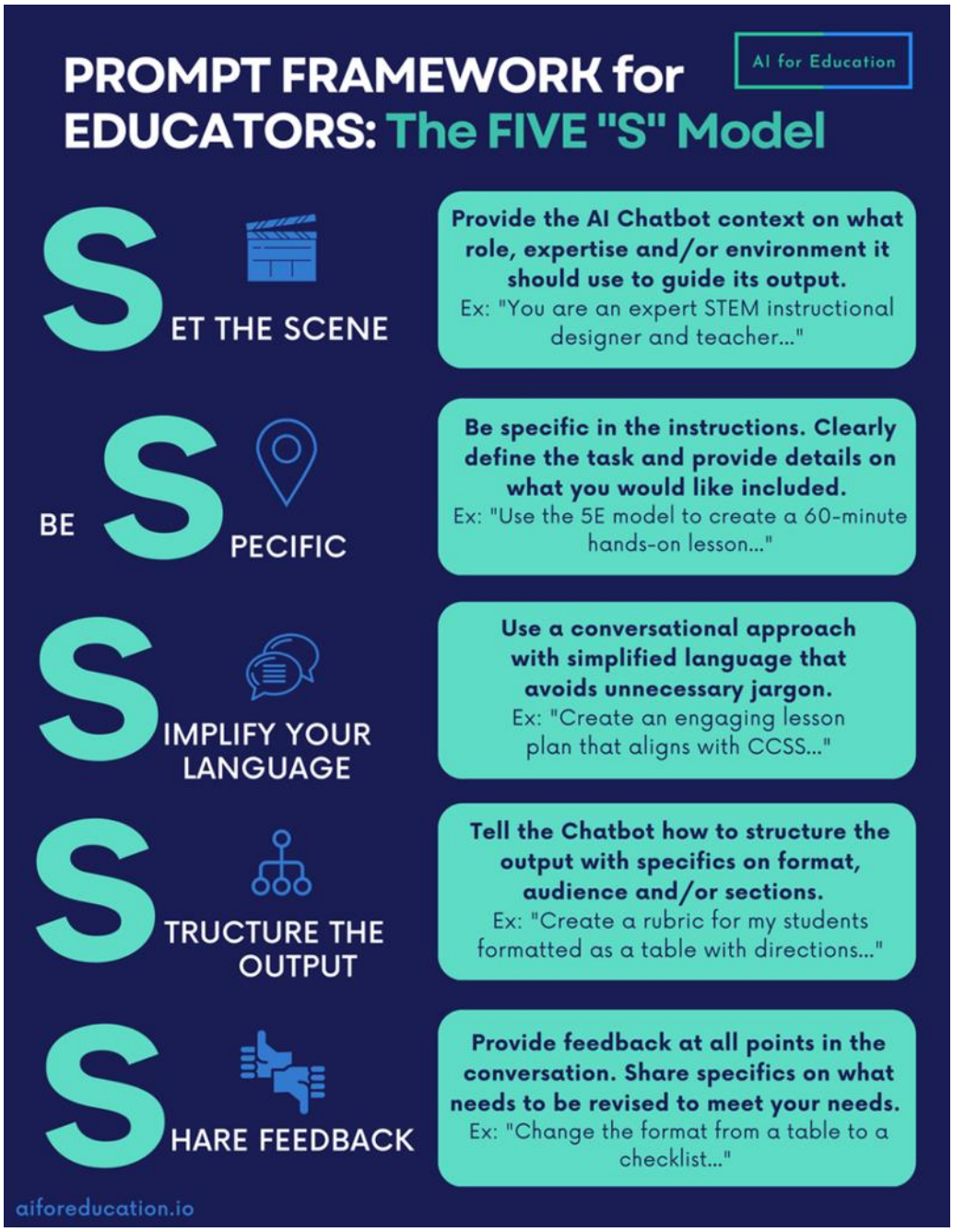
To make this overwhelming AI adoption pathway smooth, the study adopts the following models and guides and roadmaps created by AI For Education (2023): a 4-step AI Adoption Roadmap for Education Institutions, a Prompt Framework for Educators which is a Five "S" Model for Educators, a Prompt Framework for Students, also a Five "S" Model for students, a Guide to Developing an AI Policy for Schools and a Student Guide for AI Use. The roadmap and models and guides are as shown below:

Figure2: AI Adoption Roadmap for Education Institutions

Source: AI for Education (2023) https://www.aiforeducation.io/ai-resources/ai-adoption-roadmap-for-education-institutions

The AI Adoption Roadmap for Education Institutions focuses on how to establish a strong foundation for developing an AI policy, develop workers, update educational materials, train students and the larger school community, and continuously review implementation plan and progress.

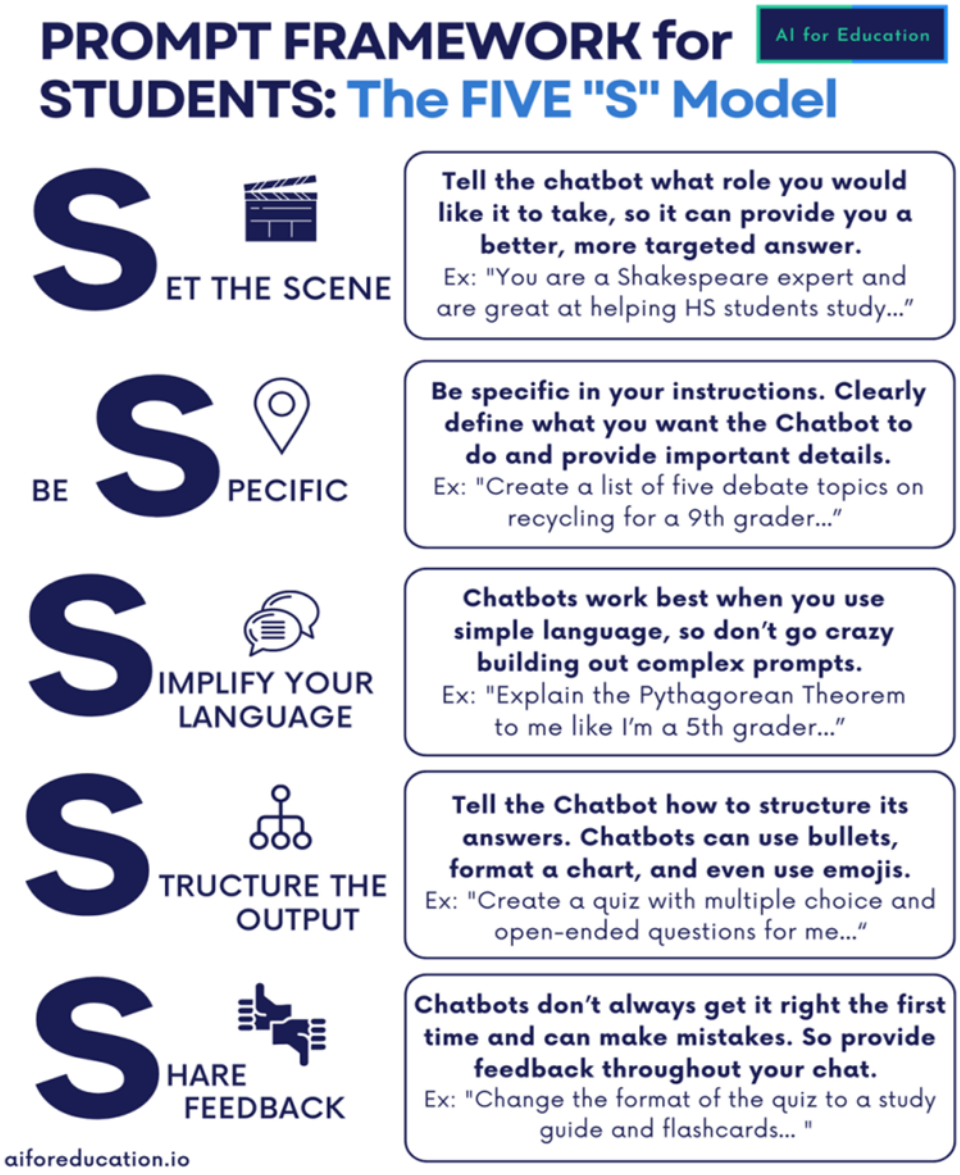
Figure 3: Prompt Framework for Educators: Five "S" Model for Educators



Source: AI for Education (2023) https://www.aiforeducation.io/ai-resources/the-five-s-model

The Five "S" Model for Educators can help educators develop skills required to prompt AI applications to prepare lesson plans, saving hours on administrative tasks, or brainstorming ideas for personalized learning. This framework will help educators to get the most out of search prompts.

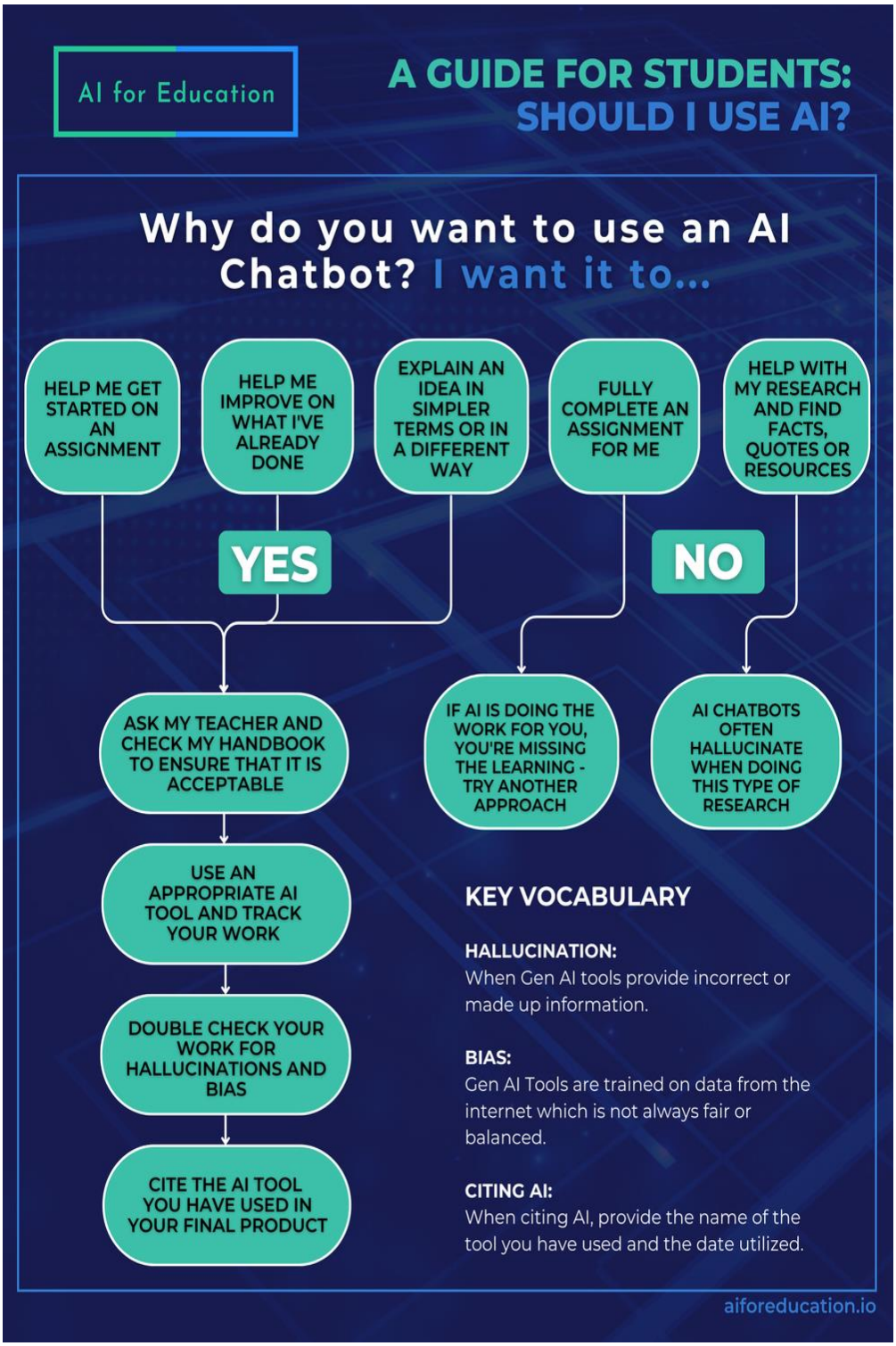
4: Prompt Framework for Students: Five "S" Model for Students



Source: AI for Education (2023) https://www.aiforeducation.io/ai-resources/the-five-s-model-students

The Five "S" Model for students can help students can help students engage with AI responsibly, to help them study, brainstorm, query ideas, or have concepts explained in ways that are personalized to them and work best for them. AI for Education further provided a self-check guide for students which provides a direction for students on when to and when not to use AI for academic purposes.

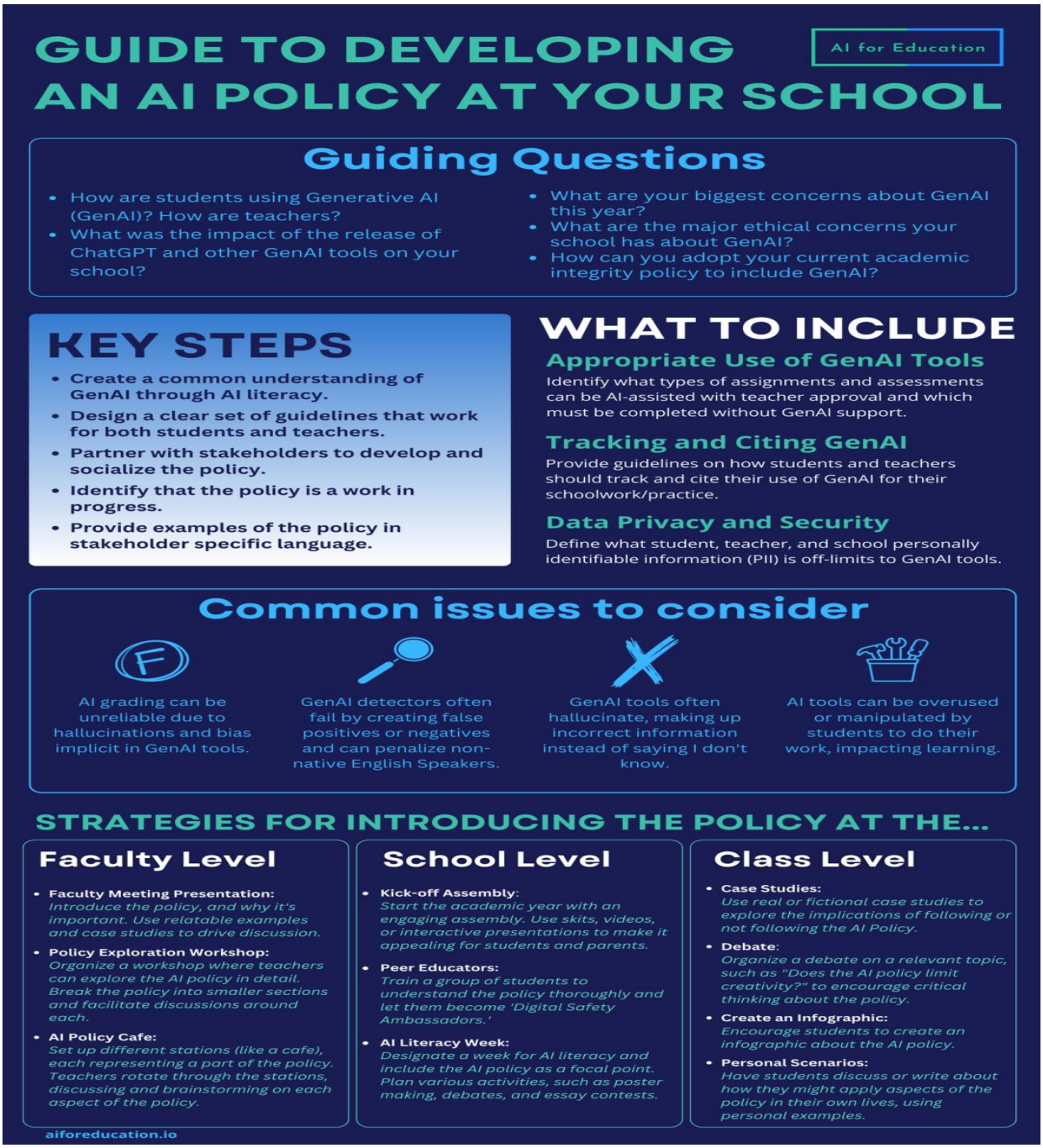
Figure 5: A Guide for Students



Source: AI for Education (2023) https://www.aiforeducation.io/ai-resources/student-guide-ai-use

AI for Education warns that although AI-powered tools promise to enhance learning, they do not come without risks but this quick guide infographic promises to help students understand how and when to use these tools wisely and responsibly.

Figure 6: A Guide to Developing an AI Policy for Schools



Source: AI for Education (2023) https://www.aiforeducation.io/ai-resources/ai-policy-guide-school

The AI Policy Guide for Schools reveals the most important steps to take while considering AI adoption in schools. These approaches help to develop a practical AI academic integrity policy which aims to provide guidance to school leaders looking to start this critical work.

What skills are recommended to help teachers prepare for AI application in teaching?

As forecasted by Adepoju (2023), AI will see the end of thousands of jobs but will create new jobs which will demand up-skilling from individuals to remain gainfully employed. Adepoju in fact mentioned that jobs that would be available in 2029 have not yet been invented. To get a full grasp of what skills would be needed for role playing either as teacher or student using AI, it is best to highlight some of the most popular AI applications useable in the education sector especially at a personal level and what they can do. They include:

ChatGPT

ChatGPT is a high speed generative text-based openAI tool which provides answers to human prompts in real time. The acronym GPT stands for Generative Pre-trained Transformer, while the word chat typically defines its design to engage in conversations with users by text. Two versions are available: ChatGPT3.5 is a free version trained according to Bailey (2023) up to 2021, while ChatGPT4.0 is a latest version of the AI tool said to be faster and more accurate than version 3.5. It evidently has advanced capabilities to analyze data, create charts, perform mathematical functions, interpret codes, and of course it is not free. Both versions can be accessed at https://chat.openai.com/.

Grammarly

Grammarly is also a generative AI tool that provides real time communication and writing assistance to its users. It has the capacity to write, rewrite, paraphrase content. Grammarly have features which can change the tone of your text depending on whether you want to sound official academic, legalese or plain simple. More so, it also has features for referencing, plagiarism and similarity index tests. This grammarly (2023) feature will highlight passages that have not been cited properly and even provide the materials to help you provide the right credits for sources. Grammarly may be accessed at https://www.grammarly.com/.

Google Bard

Bard, as it is called for short is a conversational generative artificial intelligence chatbot developed by Google that helps you imagine more possibilities in less time (Google, 2023). In the case of Bard, it has features that support images and infographic materials. This means that one could simply upload an image to bard and get all the information desired about that image. Bard could also generate images when concerning any subject when prompted to do so. This AI tool can be accessed at https://bard.google.com/.

Quillbot

QuillBot is an artificial intelligence-powered writing and paraphrasing application that aimed at assisting users to enhance quality of written work. It includes a number of features to help users write clear, well-structured content with primary features and attributes that help users to select their word choice through their pool of synonyms, paraphrase, check grammar style: academic, formal, creative, etc. it allows users to achieve fluency, customize and summarize contents to suit their purposes.

In fact, host of other AI enabled applications abound and cannot be exhausted in a single piece of article such as this. Other applications which may be used by teachers and students to enhance learning include: Canva.com, Scribber, Socratic.org, GeoGebra, wave.video, Animaker, Doodly, Copy.ai, Conversation.ai,

Writesonic, Duolingo, Turnitin, etc

Chat GPT, Grammarly Google bard, Spinbot, and other generative AI tools with chat features have amazing conversations like a human, responding to your prompts with feedbacks suggestive of an understanding friend. While writing this paper, an experiment was carried out with ChatGPT about a person who had been betrayed by a friend and was feeling depressed. ChatGPT provided a feedback that sounded like a real person was speaking. It provided steps on how to overcome depression and gave advice.

Further prompts presented feedbacks like a listening friend. Here's why many people are now talking to chatbots about their personal concerns like a friend would do leaving digital footprints that worries experts, leading to advocacies against the ethical problems that may protract from high dependency and trust of AI tools. They warn that AI sometimes hallucinates if it cannot provide answers to prompts and instead assumes other things may be the answers that you need.

Skills required for Adoption of AI

For players in the education sector to adopt and adapt to the inclusion of AI in education campaign, there is need for a continuous advocacy for open hearing and training and understanding of AI systems through free and accessible data literacy, digital skills & AI ethics training and media literacy. Some major but not so complicated skills required for adption of AI include:

1. Ability to sign-up on AI applications using Google, Linkedin, Facebook, etc.
2. Ability to develop popular and attractive keywords and phrases
3. Ability to prompt AI systems to provide personalized feedbacks
4. Familiarity with ethical considerations associated with the use of AI
5. Ability to maintain creativity while applying support from AI systems

The Subject of Ethics on the Use of Artificial Intelligence in Education

The possibilities of AI when critically thought about scares nearly everyone. Lynch (2018) asserts that the future of AI scares him just as much as it scares even Elon Musk, the CEO of Tesla Incorporated, a man who talks about self-driving cars and is well versed on the subject of AI; and one whom we ought to give hearing. Musk according to Lynch had begun a billion-dollar campaign against the advancement of AI, especially in education. Edgerton and Wasson (2023) on the other hand revealed that Musk, at a closed door meeting with US Senators and World Technology Leaders warned of the risks of deeper AI and called for a regulatory structure for AI. Musk's reference to the term “Deeper AI” was understood to be referring to Deep AI: a category of artificial intelligence which teaches computers to process data in a way that imitates the human brain. This type of learning is otherwise referred to as deep learning.

Rapid technological advancements in Artificial Intelligence according to UNESCO (2023a) are transforming disciplines, economies, and industries, and challenging ideas about what it means to be human. Suffice it to say that advancements in AI are shaking, reshaping and shifting the landscape of not only fields of science, medicine and entertainment but also education in nations. Adepoju (2023) mentioned in a virtual classroom on Microsoft Teams that AI has been identified as the 4th digital revolution of the world and foretold a time in the future when humans would become partly human and partly machine: a situation where chips would be implanted in humans, which could help the blind to see and the deaf to hear. UNESCO (2023b) has however raised concerns about the rapid technological developments inevitably springing multiple risks and challenges, which have so far overtaken policy debates and regulatory frameworks. UNESCO therefore affirmed its inherent commitment to see a human-centred approach to AI, in addressing current inequalities regarding access to knowledge, research and the diversity of cultural expressions and to ensure AI does not widen the technological divides within and between countries while supporting Member States in harnessing the potential of AI technologies for achieving the Education 2030 Agenda. It is ensuring that the application of AI in educational contexts is guided by the core principles of inclusion and equity. Bailey's (2023) also attempted to provide a respite to the situation when he said that technology does not revolutionize education, rather humans do. It is humans who create education systems and institutions and it is the leaders of those systems who decide which tools to use and how to use them.

Educational efforts highlighting the risks of malicious interruptions to AI might, according to Borenstein and Howard (2021) be beneficial for AI integration in education and could foster a professional mindset for the next generations of AI developers. Guided by the aim of nurturing a professional mindset of future tech developers in the AI community, Borenstein and Howard proposed three elements that could help familiarize students with the emerging ethical challenges of AI.

They are:

1. Teaching the ethical design of AI algorithms; this should include but not be limited to Fairness, Ethics, Accountability, and Transparency (FEAT) considerations. Learning about the importance of participatory design could also be an important lesson.

2. Incorporating fundamental concepts of data science and the ethics of data acquisition; using real-world data sets that require students to address privacy, fairness, and legal issues while developing AI solutions.

3. Offering ethics-related lessons in multiple ways and at multiple times. Including ethics across the curriculum as a model for putting this into practice.

Conclusion

Inclusion of Artificial intelligence technologies in education undoubtedly has enormous benefits which cannot be overstated but also has its attendant negative effects on the education system as well. Therefore, it is critical for education stakeholders to prioritize artificial intelligence in education but develop and implement deliberate strategies to leverage on the opportunities and expectations of teachers and students, through AI technologies, while addressing the challenges embedded.

Suggestions

The following are made based on the matters discussed in this paper:

1. For education institutions to become key players rather than spectators in a fast advancing world of technological evolutions, models and roadmaps based on the peculiarities of each education institution leading to the adoption of IA technologies should be developed and implemented to improve teaching and learning in schools.
2. Every possible AI technology in education cannot be adopted. Therefore, institutions are encouraged to consider developing AI integration policies on what and how AI can be used depending on their needs.
3. Teachers are by all means encouraged to begin exploring AI applications suitable for teaching different subjects, to improve information base and provide guidance for students on the use of such applications.
4. While applying AI to the teaching and learning process, usage of AI systems must not exceed what is required to achieve the main objective of its use, which is primarily to improve learning.

REFERENCES

Adepoju, F. (2023). Application of artificial intelligence in teaching and learning. [Master class on Microsoft Teams e-classroom for academics, proprietors and school administrators 01].

AIContentfy Team. (2023). The role of AI in content creation for immersive technologies. Retrieved September 11, 2023, from https://aicontentfy.com/en/blog/role-of-ai-in-content-creation-for-immersive-technologies#:~:text=AI%20can%20also%20be%20used, the%20user's%20needs%20and%20preferences.

Appinventiv. (2023). How Appinventiv helped Gurushala in its mission? Retrieved September 30, 2023, https://appinventiv.com/portfolio/gurushala-online-learning-platform/.

Bailey, J. (2023). AI in Education: The leap into a new era of machine intelligence carries risks and challenges, but also plenty of promise. Education Next, 23(4), 28-35.

Beck, J. Stern, M. & Haugsjaa, E. (1996). Applications of AI in Education. Retrieved September 3, 2023, from https://dl.acm.org/doi/fullHtml/10. 1145/332148.332153.

Beder, C. (2022). Digital realities future potentials and use cases. Retrieved September 28, 2023, from https://www.isaca.org/resources/news-and-trends/industry-news/2022/digital-realities-future-potentials-and-use-cases.

Ben-George, I. (2021). Business Education graduates' adaptability to evolving office technologies in Rivers State universities. Unpublished PH.D thesis: Department of Business Education, Rivers State University, Port Harcourt.

Borenstein, J. & Howard, A. (2021). Emerging challenges in AI and the need for AI ethics education. AI and Ethics, 1, 61–65.

D'Orio, W. (2018). What's the difference between burnout and demoralization, and what can teachers do about it? Retrieved September 2, 2023, from https://www.edweek.org/education/opinion-whats-the-difference-between-burnout-and-demoralization-and-what-can-teachers-do-about-it/2018/09.

Edgerton, A. & Wasson, E. (2023). Musk alls for AI 'regulatory structure,' warns Congress of risk. Retrieved September 28, 2023, from https://www.bloomberg.com/news/articles/2023-09-13/musk-calls-ai-double-edged-sword-in-tech-ceo-summit-at-us-senate. Google. (2023). Getting started with Bard – Google's conversational AI. Retrieved September 30, 2023, from https://www.google.com/search?q=google+bard&sca_esv=572136157&ei=TxglZYTiKZ6zhbIPqtqUmAk&ved=

Grammarly. (2023). Retrieved October 4, 2023, from https://www.grammarly.com/?transaction_id=102bd220cd1cddcbe561b9697fa451&affiliateNetwork=ho&affiliateID=124135

Hardman, P. (2023). A brief history of AI in education. Retrieved September 14, 2023, from https://drphilippahardman.substack.com/p/a-brief-history-of-ai-in-education#:~:text=In%20fact%2C%20Artificial%20Intelligence%20in,researched%20nuclear%20physics%20and%20DNA.

Limna, p., Jakwatanatham, S., Siripipattanakul, S., Kaewpuang, P., & Sriboonruang, P. (2022). A Review of artificial intelligence (AI) in Education during the Digital Era. Advance Knowledge for Executives, 1(1), (3), 1-9.

Linkedin. (2023). Challenges and opportunities of AI in education. Retrieved September 20, 2023, from https://www.linkedin.com/advice/0/how-can-ai-help-address-global-challenges#:~:text=For%20example%2C%20AI%20can%20help,chatbots%2C%20simulations%2C%20and%20gamification.

Lynch, M. (2018). My vision for the future of Artificial intelligence in education. Retrieved September 2, 2023, from https://www.theedadvocate.org/vision-future-artificial-intelligence-education/.

Obe, D. H., Highton, J., Beard, A., Birkin, G., Corley, A. & Milner, C. (2019). What motivates adults to learn? A rapid evidence review of what drives learning new skills in the workplace. United Kingdom: Nesta.

Oktra. (2020). Office futures: Our top 5 tech trends 2020. Retrieved April 18, 2020, from https://www.oktra.co.uk/insights/office-futures-our-top-5-tech-trends-2020/.

Patil, P. R. & Mudholkar, R. R. (2012). Utilizing cloud computing for modernizing universities IT retrieved May 1, 2021, from https://www.academia.edu/25274804/Utilizing_Cloud_Computing_For_Modernizing_Universities_IT.

Srivastava, S. (2023). 10 Ways AI in education is transforming the industry. Retrieved October 2, 2023, from https://appinventiv.com/blog/10-ways-artificial-intelligence-transforming-the-education-industry/.

UNESCO. (2023a). Artificial intelligence. Retrieved October 2, 2023, from https://www.unesco.org/en/artificial-intelligence.

UNESCO. (2023b). Digital learning and transformation of education: Artificial intelligence in education. Retrieved October 2, 2023, from https://www.unesco.org/en/digital-education/artificial-intelligence?hub=32618.

University of San Diego, (2023). The future of AI in education. Retrieved October 2, 2023, from https://onlinedegrees.sandiego.edu/artificial-intelligence-education/#h-the-future-of-ai-in-education.