education sciences

MDPI

Review

Shaping the Future of Education: Exploring the Potential and Consequences of AI and ChatGPT in Educational Settings

Simone Grassini

Department of Psychosocial Science, University of Bergen, 5020 Bergen, Norway; simone.grassini@uib.no

Abstract: Over the last decade, technological advancements, especially artificial intelligence (AI), have significantly transformed educational practices. Recently, the development and adoption of Generative Pre-trained Transformers (GPT), particularly OpenAI's ChatGPT, has sparked considerable interest. The unprecedented capabilities of these models, such as generating humanlike text and facilitating automated conversations, have broad implications in various sectors, including education and health. Despite their immense potential, concerns regarding their widespread use and opacity have been raised within the scientific community. ChatGPT, the latest version of the GPT series, has displayed remarkable proficiency, passed the US bar law exam, and amassed over a million subscribers shortly after its launch. However, its impact on the education sector has elicited mixed reactions, with some educators heralding it as a progressive step and others raising alarms over its potential to reduce analytical skills and promote misconduct. This paper aims to delve into these discussions, exploring the potential and problems associated with applying advanced AI models in education. It builds on extant literature and contributes to understanding how these technologies reshape educational norms in the "new AI gold rush" era.

Keywords: artificial intelligence (AI); ChatGPT; educational technology; university education

Citation: Grassini, S. Shaping the Future of Education: Exploring the Potential and Consequences of AI and ChatGPT in Educational Settings. *Educ. Sci.* **2023**, *13*, 692. https://doi.org/10.3390/educsci13070692

Academic Editors: Lishan Zhang, Dongbo Zhou and Sannvya Liu

Received: 28 May 2023
Revised: 21 June 2023
Accepted: 28 June 2023
Published: 7 July 2023

1. Introduction

Over the last decade, the world has experienced a rapidly changing landscape in educational practices, primarily due to technological advancements. Among these technologies, arguably the most impactful has been artificial intelligence (AI) [1] Recent progress and expansion in machine learning have led to the generation of sophisticated digital content, like generative artificial intelligence (GAI), capable of assisting education [2,3]. GAI is an unsupervised or partially supervised machine learning framework that generates outputs using statistics and probabilities [4,5] Through advances in deep learning (DL), the generative AI creates artificial relics using existing digital content, such as, but not limited to, video, images/graphics, text, and audio, by examining training examples and learning their patterns and distribution [6]. The extant literature has identified two major types of generative AI—Generative Adversarial Networks (GAN) and Generative Pre-trained Transformer (GPT) [6].

Generative Pre-trained Transformer (GPT) models have mainly been discussed during the past six months due to the advent of OpenAI ChatGPT, a technology often defined as a world changer [7]. GPT technology uses a large amount of publicly available digital content data (natural language processing) to process and produce humanlike text and can exhibit creativity in writing texts convincingly on most topics. GPT models can even engage customers in humanlike conversation and have been successfully implemented to perform several work tasks as customer service chatbots [8]. The latest technology development, Chat GPT, developed by OpenAI, is a versatile tool designed to streamline automated conversations and potentially make human operators redundant [9].

The ChatGPT technology has been through several iterations [10]. GPT-3 has 175 billion parameters, which is 10 times more than any previously developed language model. GPT-3

has become the basic NLP engine that runs the recently developed language model ChatGPT, which has attracted the attention of various fields, including, but not limited to, education [11,12] and health [13–15].

Following its launch on 30 November 2022, ChatGPT amassed over one million subscribers in just a week [16]. More recently, an even newer and more powerful model, GPT-4, was released on 14 March [17], featuring a staggering 170 trillion parameters, representing a staggering increase in computational processing capacity compared to the earlier model [18]. Moreover, as a demonstration of its language prowess, OpenAI declared that its LLM can pass the US bar exam in the legal profession with results in the ninetieth centile, compared with the 10th centile for the previous version of ChatGPT [19]. However, the technology remains limited in its accessibility, requiring users to pay a subscription fee and adhere to quantitative usage restrictions. While the achievements of this technology have been remarkable, the scientific community has expressed frustration due to OpenAI's lack of transparency regarding the training methods and data sources employed for the model, as well as the inner workings of GPT-4 beyond its user interface [20]. This new era of AI-driven revolutions has been defined by some authors as "the new AI gold rush" [21], emphasizing how all the most prominent players in IT are currently rushing to develop better and better models to beat the competition, in a freshly created fast-phased market.

These AI models' impact, especially ChatGPT's remarkable possibilities of use in the education sector, has led to a mix of emotions among educators [12]. This breakthrough in AI technology seems to be overhauling current educational norms, leading to debates. Some educators see ChatGPT and similar AI as a progressive step toward the future of education and research. In contrast, others are doubtful and view it as a potential danger, with a risk of leading to a decrease in educational activities and fostering laziness among teachers and students due to reduced analytical skills [22,23]. Recently, as the topic has gained attention in the media, several scientific authors have attempted to evaluate possible possibilities and problems related to the advent of AI technologies in the sphere of education [11,12,23–25], and the UNESCO has also published a report attempting to discuss the main challenges and the emerging ethical implications of AI in higher education [26].

The Present Study

The research question of the present study is "What are the current opinions and evidence about the opportunities and the challenges represented by the development and implementation of AI systems in educational settings?" The stated research question is challenged with a narrative review article that analyzes the current research, opinions, and published literature on AI and ChatGPT (and, by extension, AI and LLMs) and the impact of these technologies in the educational sector. The existing literature was screened non systematically, searching for the keywords "ChatGPT AND education" and "AI AND education" in Google Scholar and Scopus for articles published after December 2022 until May 2023. Further articles were added using the snowball method, selecting articles perceived as particularly relevant starting points. The present article aims to build on recently published scientific works, explicitly targeting the discussion on how these advanced AI models can be used in education and especially in university settings.

2. AI and ChatGPT for Advancing Teaching and Learning Activities

The published scientific literature broadly suggests that AI technology possesses the potential to serve as a significant asset in education, occupying various roles that enrich both learning and pedagogical experiences. Authors have suggested that AI technology is an instrumental tool in essay grading [27,28], although the value and the efficacy of these AI-based grading tools remain largely unclear within the confines of the existing scientific literature. The literature has reported that ChatGPT exhibits the potential to automatize and improve the grading system and has suggested that ChatGPT could be utilized to semi automate the grading process for students' work by discerning both the strengths and weaknesses within a given task in a broad spectrum of assignments, including research

articles, academic essays, and other forms of written coursework [29]. In this context, educators can adapt the reports generated by such a model to deliver beneficial feedback to students, whether in formative or summative assessment scenarios. Furthermore, with the assistance of ChatGPT, a more precise evaluation of a student's learning challenges, and progression can be ascertained. This can aid teachers in pinpointing the areas where learners encounter difficulties, allowing them to target interventions more effectively [29].

The deployment of AI for grading short answer responses in an online learning environment has been evidenced successfully in past studies [30,31]. Furthermore, it has been argued that an AI-powered automatic grader (to be used to prepare an exam preparation) could potentially serve as a teaching aid for the students and help them achieve higher exam scores. Furthermore, AI graders may contribute to a more impartial grading process [30,31]. However, it is worth considering that it is essential to study the importance of the grading explanation and transparency of the grading process that these systems are reporting to the students, which may be a pivotal aspect considering both ethical concerns related to the technology and its acceptability [30,32].

Additionally, since AI systems rely on existing data from prior evaluations for training, they may be suited explicitly for assessing standardized tests, such as nationwide professional education examinations, where data from past tests are abundant and standardized assessment is a priority. However, these systems may be less competent when assessing individual university exams that often undergo annual format alterations and where past evaluation data might be limited.

Moreover, deploying AI for evaluating complex assignments might prove insufficient, necessitating that AI grades be calibrated or weighted by considering various variables unique to each assignment. These variables could include the student's independent work and contribution, their comprehension and representation of the existing literature on a given topic, and scenarios with limited training data. A balanced evaluation procedure that synergizes both a transparent or explainable AI system (for perspectives and definitions of explainable AI, see, for example, [33,34]) and human involvement is likely to yield the most favorable results in terms of the quality of assessments and the acceptability of using AI for evaluating student work, at least in the foreseeable future [30].

Because of future AI support, teachers could potentially lessen their workloads, redirecting their primary focus towards crafting innovative lesson plans, engaging in professional development, and offering personalized coaching and mentorship to each student. All these activities are instrumental in enhancing students' learning performance for the skills and challenges of the future.

The potential of AI tools extends beyond grading and assessment; they can also be deployed for translating educational materials and fostering interactive and adaptive learning environments. Notably, generative models, such as GPT-4, exhibit substantial promise in these domains. GPT-4 has demonstrated high proficiency in translation tasks, surpassing previous solutions in terms of quality [9,35,36]. However, the novelty of this application is partially tempered due to the preexisting success of machine translation technologies, which have delivered satisfactory results in document translation already for several years [37,38]. Although this is not an entirely new development, it underscores the continuous advancements and improvements in the AI field, specifically in the sphere of machine translation. Envisioning learning materials translated quickly and automatically into several different languages is nowadays a potential perspective in the short term. These improvements hold the potential to further enhance and revolutionize learning experiences by providing precise and efficient translations of educational content. This not only expands the accessibility of materials to a more diverse student population but also contributes to creating more responsive and adaptable learning environments.

The realm of individualized tutoring illustrates another dimension where AI demonstrates its great utility. The AI systems could adapt the instructional approach to accommodate each student's unique learning style and progress. This personalized guidance system has undergone successful testing across a variety of tutoring categories, such as

medical training [39,40]; for a review, see [41]), computer science [42], and mathematics [43]. Additionally, AI systems have seen successful deployments as tutors beyond the traditional academic disciplines, serving as personal mindset coaches [44]. In the context of Adaptive Learning—where education is tailored to accommodate individual learning styles and progress [45]—AI systems can play an instrumental role. It has been suggested [46] that AI can offer a bespoke pedagogical approach finely tuned to each student's specific abilities, interests, and requirements. Such attempts have been reported in the scientific literature, underlining the feasibility and potential of this approach in enhancing learning experiences [36,47,48]. Thus, the emergence of AI as a powerful enabler of personalized learning attests to the technology's transformative potential and underscores its capacity to redefine educational experiences. As technology continues to evolve, the integration of AI within education is expected to become more sophisticated and effective.

The advanced features offered by ChatGPT present compelling opportunities for educators to enhance pedagogical practices by conceiving and integrating interactive classroom activities. According to [49], with the support of ChatGPT, educators are empowered to devise innovative teaching techniques. A case in point is the adoption of the flipped classroom approach, where learning opportunities are not confined to the classroom but extend to remote environments, thus fostering an atmosphere of independent study among students.

Atlas (2023) [50] claims that the capabilities of ChatGPT extend far beyond assisting teachers in creating quizzes, exams, and syllabuses. It is also a powerful tool for producing comprehensive lesson plans, engaging presentations, and other educational resources. This added support allows teachers to adapt and enhance these materials in more dynamic and captivating ways to meet diverse learning needs. With the burden of routine tasks lessened, teachers gain more time to reflect, innovate, and devise new teaching techniques and activities. ChatGPT also serves as a platform for interactive communication, allowing teachers to orchestrate more engaging classroom activities. Teachers can utilize ChatGPT to help generate teaching aids, such as slides that present the expected learning outcomes and the criteria needed to complete coursework [51]. Moreover, the AI tool's ability to quickly generate a more significant number of questions and prompts based on the course materials may serve to stimulate the students' problem-solving and critical-thinking abilities [29], parts of the learning process that are crucial in the context of modern education.

3. Challenges and Threats Posed by ChatGPT in Education

While ChatGPT's potential is vast, some concerns regarding the accuracy of its generated content must be addressed. Topsakal and Topsakal (2022) [52] proposed using ChatGPT to generate raw dialogue materials for training course-specific chatbots. Upon verification of the content's accuracy, these materials could then be translated by ChatGPT into a format compatible with AI chatbots such as Google Dialogflow, thus providing students with a personalized and interactive learning environment.

While, as discussed earlier, AI tools may help lecturers to decrease their current workload and therefore promote more research and lifelong learning activities (e.g., to improve the overall quality of the teaching and to implement new teaching methods in the classroom), they could also lead to job cuts [53] or outsourcing to the machines of a large portion of paid employment [54].

The use of ChatGPT in education poses challenges related to its accuracy and reliability [13]. Because ChatGPT is trained on a large corpus of unpolished, raw data, it may not be objective and critical inaccuracies have been reported. The efficacy of generative models hinges on the quality and diversity of the data used in their training. If these training datasets encompass biases, these biases invariably seep into the model. Consider an illustrative scenario where a model is trained using a dataset predominantly composed of essays from students belonging to a specific demographic. This lack of diverse representation may compromise the model's ability to evaluate essays written by students outside of that demographic. The origin of these biases can be traced back to factors such as overreliance on research data sourced from affluent nations or the use of textbooks that

fail to address a global perspective [55]. As evidenced by the work of Pavlik (2023) [56], ChatGPT is not familiar with crucial information relevant to evaluating media sources' quality and eventual biases. It has also been found that, in some cases, the information delivered by ChatGPT may be biased politically [57,58]; as well on religion, race, gender, and fairness (for a review see [59]). However, these biases seem to have decreased in the latest version of the AI tool [60]. In addition, ChatGPT's knowledge is by now limited to data before 2021 [61,62]. Taking into consideration the time required for AI systems to collect data and be updated, some level of delay between when the information is created (e.g., over the internet) and included in the model is also to be expected in the future (although this can be mitigated, e.g., by allowing the model to access information live on the internet, as in the implementation of ChatGPT into Bing or the recently released ChatGPT browsing beta). Therefore, its responses may not always be accurate or reliable, particularly for specialized subjects and recent events. Furthermore, ChatGPT may generate incorrect or even fabricated information, as often reported by both users and the scientific literature [13,63,64], and such issue can be problematic for students who rely on ChatGPT to inform their learning. However, the problems regarding the false information provided by AI models (often referred to as "AI Hallucinations," see [65]) are probably going to be mitigated in the future, and GPT4 already shows fewer of these hallucinations compared to the previous version of ChatGPT [66].

The complex issue of student plagiarism has become a significant worry within educational institutions due to the widespread use of AI writing tools. The rampant misuse of intellectual property without appropriate citation raises ethical concerns and undermines the academic integrity of the educational process. To combat this, plagiarism-detection applications routinely uncover plagiarized content in student submissions. These software solutions use various methods, from similarity checking to advanced linguistic pattern analysis, to identify plagiarized material (for an in-depth analysis of these tools and their application, refer to [67]).

Despite these precautionary measures, recent studies have highlighted an alarming trend where sophisticated AI models like ChatGPT can successfully circumvent these plagiarism detectors. It appears that ChatGPT, due to its ability to generate seemingly original text, can produce content that appears to be genuinely novel, thereby evading detection by traditional plagiarism software [68]. Exacerbating this issue are findings that even plagiarism detectors designed to flag text generated by AI models might not be entirely trustworthy. Although these specific detectors have shown some promise, they are not infallible and occasionally cannot identify AI-generated content [19,69]. This inconsistency undermines the efficacy of these tools, contributing to the increasing complexity of plagiarism detection.

This challenge is expected to escalate further as advancements in AI technology accelerate at an unprecedented rate. As artificial intelligence continues to evolve and improve, the capabilities of next-generation models are likely to increase correspondingly, making detecting AI-generated content even more intricate. The emerging sophistication of these models will require developing even more advanced detection tools capable of distinguishing between human-written and AI-generated text. The ongoing arms race between plagiarism detectors and AI technology underlines the importance of cultivating academic honesty and reinforcing the value of original work within educational settings.

Further heightening the problem, it has been revealed that students utilizing ChatGPT for their assignments are more likely to engage in plagiaristic behavior than their counterparts who do not use the tool [69]. The ease with which ChatGPT can produce relatively good-quality text can incentivize students to employ it as a shortcut, thereby contributing to a culture of academic dishonesty. This may compromise the academic integrity of institutions and challenge the fundamental objective of assessments, which is to gauge and reflect student learning accurately and equitably. However, it is worth noting that students may want to use AI tools such as ChatGPT not to cheat on an assessment but as a learning tool to learn how to write better essays. Furthermore, they may use the tool to improve

the text they have previously written without external aids. For such cases, guidelines and regulations from national authorities are still unclear, and future efforts should be put into establishing what is to be considered a "fair use" of AI tools. A case-by-case evaluation might be more accurate and informative rather than automatically presuming that students use these AI tools to cheat on their academic tasks. One could argue that many students turn to these LLMs not for academic dishonesty but as a platform to acquire better skills and improve their grades. In the rapidly evolving educational landscape where technology has become deeply integrated, students continuously seek efficient methods to enhance their learning outcomes. Furthermore, students might be utilizing AI tools to observe how ideas can be expressed differently or to understand how to structure their thoughts coherently.

A notable consequence of ChatGPT's misuse is creating an unfair academic playing field. Students who use ChatGPT to generate unique content could gain an unfair advantage over their peers who do not have access to it or choose not to use it due to ethical considerations [70]. This disparity can skew grades and academic recognition, undermining the value of hard work and personal effort. Furthermore, there are potential future implications for students unaware of the full capabilities of AI tools like ChatGPT. Such students might inadvertently misuse the tool, leading to unintentional plagiarism. This highlights the need for comprehensive education on the ethical use of AI in academic settings.

Perhaps the most alarming aspect of this issue is the impact on educators' ability to evaluate student performance accurately. When students use AI tools, it becomes challenging for instructors to discern the student's proper understanding and mastery of the learning material. This can mask learning deficiencies, making it difficult for educators to provide targeted feedback and develop necessary intervention strategies. Consequently, the educational process becomes less effective, and the true purpose of teaching and learning is compromised.

Generative models like ChatGPT, while demonstrating remarkable capabilities in text generation, do fall short in certain vital aspects when compared to human teachers or tutors. One such area is the lack of humanlike interaction, empathy, and emotional intelligence in these models, which are often crucial in a learning environment [71]. Human teachers can understand and respond to students' emotional states, which can significantly impact a student's motivation and learning outcomes. The absence of this nuanced interaction in AI models can disadvantage students who thrive in unique, empathetic learning environments.

Studies have demonstrated that virtual tutors equipped with features enabling a higher level of empathy led to improved learning outcomes compared to tutors lacking such features [72]. This suggests that future AI tutoring systems must exhibit humanlike behavior, including imitating human empathy, to be effectively utilized in teaching tasks.

Generative models, like ChatGPT, only rely on statistical patterns learned from the data they were trained on [73,74]. As a result, these models lack a genuine understanding of the concepts they are helping students to learn. Such limitations can hinder their ability to provide explanations or feedback tailored to students' unique needs or misconceptions. Such tailored feedback is critical to practical education, allowing educators to directly address and correct students' misunderstandings.

Generative models operate by mimicking patterns observed in the data they were trained on, which traditionally placed limitations on the originality and creativity of their output. However, a recent shift in the AI landscape has seen the development of models demonstrating behaviors that resemble human creativity [75,76]. Moreover, emerging research indicates that AI has begun to transcend mere emulation of existing artistic styles and has started demonstrating genuinely creative artistic capabilities [77–80]. AI tools have been shown to be able to reproduce the styles of iconic artists [81] as well as propose unique and novel artistic expressions [82]. AI's creative reach is not confined to one medium but has spread across various artistic domains, such as music composition [83] and poetry writing [84]. AI-created work has become so sophisticated that it often poses a challenge to differentiate it from human-created counterparts [84,85]. Furthermore, blind evaluations have revealed that AI-generated artwork can garner high artistic appreciation

and value [86]. Therefore, due to its design, the lack of genuine creativity in AI has been shown to imitate human creativity to a higher degree already at the current state of the technology. However, how well such creativity could be adapted and implemented in teaching has yet to be comprehensively investigated.

As these advancements continue and the integration of large language models into educational spheres becomes more prevalent, there is an emergent need to address data privacy and security concerns. Student data's sensitivity and personal nature elevate the risk of data breaches, unauthorized access, and potential misuse of data for noneducational purposes [29]. Tlili and colleagues (2023) [87] highlight the confusion that arises from such concerns, citing the example of OpenAI's ChatGPT. According to OpenAI's official webpage, conversations with ChatGPT are recorded and analyzed to improve the model's performance, yet the specifics of storage and use of these conversations are unclear. Interestingly, when the researchers posed these concerns directly to ChatGPT, it contradicted the information on the official page, stating that it does not retain any conversation data [87]. This discrepancy could lead to uncertainty and risk for users, who might unintentionally disclose sensitive information in their interactions with AI models like ChatGPT.

4. Possible Actions and Mitigation Strategies in Response to the Impact of ChatGPT

The urgent need to address the impact of ChatGPT on the educational sector cannot be overstated, and the need for immediate action has been proposed [88]. There is a pressing demand to adapt assessment practices and institutional protocols to manage the issues brought to the fore by the proliferation of AI-generated content in academic work [89]. Before the rollout of GPT-4 in March 2023, educators could carefully alter their exam designs by introducing multimedia resources (e.g., images and charts) to mitigate the possibility of the assignments being performed entirely by AI, as ChatGPT 3.5 was not able to process visual or video content, thereby forming a challenge to students who attempted to utilize it to cheat [13,90,91]. However, this has changed with the latest iteration of the technology (GPT-4), as the AI system is now designed to process visual inputs as well (the developers have announced such a feature, but it was still not implemented for regular users as of 28 May 2023; https://openai.com/product/gpt-4, accessed on 28 May 2023). This necessitates the exploration of alternate strategies by educators involving the integration of digital-free components into their evaluation tasks, for instance, oral presentations, interviews, and written exams performed without the use of digital aids [49,87,88,92]. Such nondigital components of an evaluation will require students to demonstrate their competencies live and directly without external tools. At the broader institutional level, there is a call for AI-based plagiarism detection tools to be provided to educators, and definitive guidelines need to be put forth on the acceptable use of ChatGPT in the academic setting.

Investing in training educators and informing students may be a strategy, given the actual state of things, for managing the implications of ChatGPT [93]. A critical area of focus is equipping instructors with the ability to discern the use of ChatGPT in student work, a skill that can be developed with the help of AI detection tools. However, even training educators to recognize AI-generated content may be impossible. AI tools are improving at imitating human writing styles, and they will probably soon generate text that is totally indistinguishable from human writing. Therefore, such mitigation strategies may become quickly obsolete. Addressing this complex issue may require a multifaceted approach, incorporating improved plagiarism detection tools, enhanced education around academic integrity, and perhaps reconsidering assessment methods to ensure fairness and accuracy in evaluating student learning.

On the other hand, educators should be educated in how to maximize the potential of ChatGPT in lesson preparation and evaluation [29,88], and students should be enlightened about the inherent limitations of ChatGPT [94,95], including its dependency on partial data [96], its circumscribed access to current knowledge [97], and its propensity to generate misleading or false information [63]. Consequently, educators should guide students to confirm the reliability of the information sourced from ChatGPT with reliable, authoritative

references like textbooks and scientific articles [23,98]. More emphasis should also be placed on informing students about the university's academic integrity policies and the repercussions of academic malpractice [99,100]. To achieve this, educators should proactively engage students in discussions about ChatGPT and underscore the significance of academic honesty in their courses.

Despite its limitations, AI tutoring systems can still be valuable educational tools. For instance, it has been suggested that these systems could assist educators by identifying areas where students struggle, thereby helping educators to target their instruction better [95]. Despite their current shortcomings, the potential of AI systems to enhance education is significant, provided they are used in a manner that complements, rather than replaces, human educators.

5. Pioneering the AI Evolution in Education: Adapting, Advancing, and Innovating

Artificial intelligence, with its transformative potential, will substantially influence modern education. This is especially evident in the case of generative models like ChatGPT, which could quickly become widespread among the general population. Even though there exist various debates surrounding its application and certain technological limitations, the foothold of AI in the educational sphere is here to stay, and it could quickly push extensive transformations of our teaching and learning methodologies [101].

At the heart of the ongoing discourse around AI in education is the concern for its potential misuse, particularly in academic assignments. Many have proposed severe measures, such as a complete ban on AI tools like ChatGPT in school and university environments [102]. This approach has been criticized as it may disadvantage students in schools where these tools are forbidden compared to students attending schools where they are allowed [103]. Concurrently, there is a push for developing and utilizing technologies capable of discerning AI-produced content [104,105]. However, an arms race between ChatGPT and detector software could be expensive and ineffective [68], and these preventive measures might offer a temporary respite at best. The relentless advancement in AI technology, as evidenced by the evolution of the Open AI ChatGPT model, presents a challenge to the effectiveness of these safeguards.

To further address the issue, guidelines have been proposed to help educators mitigate the risk of student dependency on AI for academic work. Taking a drastic step in this direction, the New York City Education Department (NYC) has imposed a ban on access to ChatGPT across all school-owned devices and networks [106], and other schools and colleges have also issued bans against ChatGPT and other AI tools [107,108].

At the moment, it seems more practical to accept and integrate these technological tools into our educational structures [3,109] instead of trying to hopelessly suppress their growth, which could do more harm than good to the students, according to several journalist reports (see, e.g., [110]). It has also been noted that banning ChatGPT use for students should be considered equal to banning calculators in math class [111] or banning Google [112]. With giants like Microsoft planning to incorporate ChatGPT across their product range [21,113], it is only a matter of time before AI tools become a commonplace fixture in our lives. When this transformation comes to fruition, educational institutions might face considerable challenges in retrospectively implementing policies that foster the safe and effective use of AI tools like ChatGPT.

The development of AI also brings forth the question of rethinking assessment strategies in education. While it is premature to draw concrete conclusions, it is clear that the current assessment methods might need an overhaul to keep pace with AI's influence. Existing research illustrates that many educators struggle to design effective assessment practices that promote learning [114,115]. Therefore, there is a critical need for professional development in this area, enabling teachers to harness the capabilities of AI tools like ChatGPT to enhance learning outcomes.

As artificial intelligence becomes increasingly embedded in the professional realm following a university education, preparing students with the requisite skills to thrive in an

AI-dominated future is essential. To this end, integrating AI applications, such as ChatGPT, in educational settings can be a significant step. By offering students a hands-on experience with these tools, we can foster their understanding and application meaningfully while outlining their limitations and keeping pace with technological advances.

Negotiating the swift transformations prompted by AI involves navigating several intricate dimensions. Foremost among these is ascertaining effective strategies to employ ChatGPT and analogous AI tools to enrich educational experiences and designing customized training modules that accommodate both teachers and students, aiming to maximize the benefits of AI tools in amplifying teaching and learning. Furthermore, incorporating these AI tools within teacher training programs can equip the next generation of educators with the knowledge and skills to utilize these technologies optimally in their classrooms. It is plausible that in the future, students without training in AI tools could find themselves at a competitive disadvantage in the job market compared to their peers with extensive exposure and practical experience with these tools. Therefore, it becomes paramount to promptly establish an educational framework that both employs and scrutinizes these tools for the benefit of students.

Beyond the confines of the classroom, it is crucial to confront and address the potential impact of AI on the digital divide. AI tools could either narrow this chasm by facilitating universal access to learning resources or intensify the divide by disproportionately benefiting those with superior access to technology. We need a cooperative, cross-disciplinary approach to navigate these potential challenges and capitalize on AI's opportunities. Forming a mutually beneficial alliance between policymakers, researchers, educators, and technology experts—including private companies developing AI tools—can be pivotal in steering the future of education. The collective endeavor of these groups is crucial in guaranteeing the secure and productive deployment of continually evolving AI tools. This collaboration can foster innovative pedagogical strategies, improve students' learning outcomes, and create a well-prepared educational system to meet future demands in the job market.

Funding: This research received no external funding, and the APC was funded by the University of Bergen.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Makridakis, S. The forthcoming Artificial Intelligence (AI) revolution: Its impact on society and firms. *Futures* **2017**, *90*, 46–60. [CrossRef]
2. Bozkurt, A.; Xiao, J.; Lambert, S.; Pazurek, A.; Crompton, H.; Koseoglu, S.; Farrow, R.; Bond, M.; Nerantzi, C.; Honeychurch, S. Speculative Futures on ChatGPT and Generative Artificial Intelligence (AI): A collective reflection from the educational landscape. *Asian J. Distance Educ* **2023**, *18*, 50–130.
3. Bozkurt, A. Generative artificial intelligence (AI) powered conversational educational agents: The inevitable paradigm shift. *Asian J. Distance Educ.* **2023**, *18*. Available online: http://www.asianjde.com/ojs/index.php/AsianJDE/article/view/718 (accessed on 15 April 2023).
4. Mondal, S.; Das, S.; Vrana, V.G. How to bell the cat? A theoretical review of generative artificial intelligence towards digital disruption in all walks of life. *Technologies* **2023**, *11*, 44. [CrossRef]
5. Zhang, C.; Zhang, C.; Li, C.; Qiao, Y.; Zheng, S.; Dam, S.K.; Zhang, M.; Kim, J.U.; Kim, S.T.; Choi, J. One small step for generative ai, one giant leap for agi: A complete survey on chatgpt in aigc era. *arXiv* **2023**, arXiv:2304.06488.
6. Jovanovic, M.; Campbell, M. Generative Artificial Intelligence: Trends and Prospects. *Computer* **2022**, *55*, 107–112. [CrossRef]
7. Mathew, A. Is Artificial Intelligence a World Changer? A Case Study of OpenAI's Chat GPT. *Recent Prog. Sci. Technol.* **2023**, *5*, 35–42.
8. Rivas, P.; Zhao, L. Marketing with chatgpt: Navigating the ethical terrain of gpt-based chatbot technology. *AI* **2023**, *4*, 375–384. [CrossRef]

9. Kalla, D.; Smith, N. Study and Analysis of Chat GPT and its Impact on Different Fields of Study. *Int. J. Innov. Sci. Res. Technol.* **2023**, *8*.
10. Brown, T.B.; Mann, B.; Ryder, N.; Subbiah, M.; Kaplan, J.; Dhariwal, P.; Amodei, D. Language models are few-shot learners. *Adv. Neural Inf. Process. Syst.* **2020**, *33*, 1877–1901. Available online: https://proceedings.neurips.cc/paper/2020/file/1457c0d6bfcb4967418bfb8ac142f64a-Paper.pdf (accessed on 15 April 2023).
11. Baidoo-Anu, D.; Owusu Ansah, L. Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. *Soc. Sci. Res. Netw.* **2023**. [CrossRef]
12. Lo, C.K. What is the impact of ChatGPT on education? A rapid review of the literature. *Educ. Sci.* **2023**, *13*, 410. [CrossRef]
13. Sallam, M. ChatGPT utility in healthcare education, research, and practice: Systematic review on the promising perspectives and valid concerns. *Healthcare* **2023**, *11*, 887. [CrossRef] [PubMed]
14. Biswas, S.S. Role of chat gpt in public health. *Ann. Biomed. Eng.* **2023**, *51*, 868–869. [CrossRef] [PubMed]
15. Biswas, S. ChatGPT and the future of medical writing. *Radiology* **2023**, *307*, e223312. [CrossRef] [PubMed]
16. Rahimi, F.; Abadi, A.T.B. ChatGPT and publication ethics. *Arch. Med. Res.* **2023**, *54*, 272–274. [CrossRef] [PubMed]
17. Hassani, H.; Silva, E.S. The role of ChatGPT in data science: How ai-assisted conversational interfaces are revolutionizing the field. *Big Data Cogn. Comput.* **2023**, *7*, 62. [CrossRef]
18. Koubaa, A. GPT-4 vs. GPT-3.5: A Concise Showdown. 2023. Available online: https://www.techrxiv.org/articles/preprint/GPT-4_vs_GPT-3_5_A_Concise_Showdown/22312330 (accessed on 15 April 2023).
19. Katz, D.M.; Bommarito, M.J.; Gao, S.; Arredondo, P. Gpt-4 passes the bar exam. *Available at SSRN* **2023**, 4389233. [CrossRef]
20. Sanderson, K. GPT-4 is here: What scientists think. *Nature* **2023**, *615*, 773. [CrossRef]
21. Rudolph, J.; Tan, S.; Tan, S. War of the chatbots: Bard, Bing Chat, ChatGPT, Ernie and beyond. The new AI gold rush and its impact on higher education. *J. Appl. Learn. Teach.* **2023**, *6*. [CrossRef]
22. Skavronskaya, L.; Hadinejad, A.; Cotterell, D. Reversing the threat of artificial intelligence to opportunity: A discussion of ChatGPT in tourism education. *J. Teach. Travel Tour.* **2023**, *23*, 253–258. [CrossRef]
23. Halaweh, M. *ChatGPT in Education: Strategies for Responsible Implementation*; Bastas: Tokyo, Japan, 2023.
24. Sok, S.; Heng, K. ChatGPT for education and research: A review of benefits and risks. *SSRN Electron. J.* **2023**. [CrossRef]
25. Rahman, M.M.; Watanobe, Y. Chatgpt for education and research: Opportunities, threats, and strategies. *Appl. Sci.* **2023**, *13*, 5783. [CrossRef]
26. Sabzalieva, E.; Valentini, A. ChatGPT and Artificial Intelligence in Higher Education: Quick Start Guide. 2023. Available online: https://eduq.info/xmlui/handle/11515/38828 (accessed on 15 April 2023).
27. Babitha, M.M.; Sushma, C. Trends of Artificial Intelligence for online exams in education. *Int. J. Early Child. Spec. Educ.* **2022**, *14*, 2457–2463.
28. AlAfnan, M.A.; Dishari, S.; Jovic, M.; Lomidze, K. Chatgpt as an educational tool: Opportunities, challenges, and recommendations for communication, business writing, and composition courses. *J. Artif. Intell. Technol.* **2023**, *3*, 60–68. [CrossRef]
29. Kasneci, E.; Seßler, K.; Küchemann, S.; Bannert, M.; Dementieva, D.; Fischer, F.; Gasser, U.; Groh, G.; Günnemann, S.; Hüllermeier, E. ChatGPT for good? On opportunities and challenges of large language models for education. *Learn. Individ. Differ.* **2023**, *103*, 102274. [CrossRef]
30. Schlippe, T.; Stierstorfer, Q.; Koppel, M.T.; Libbrecht, P. Explainability in Automatic Short Answer Grading. In *Artificial Intelligence in Education Technologies: New Development and Innovative Practices: Proceedings of 2022 3rd International Conference on Artificial Intelligence in Education Technology*; Springer: Berlin, Germany, 2023; pp. 69–87.
31. Schlippe, T.; Sawatzki, J. *Cross-lingual automatic short answer grading. Artificial Intelligence in Education: Emerging Technologies, Models and Applications: Proceedings of 2021 2nd International Conference on Artificial Intelligence in Education Technology*; Springer: Berlin, Germany, 2021; pp. 117–129.
32. Conijn, R.; Kahr, P.; Snijders, C. The Effects of Explanations in Automated Essay Scoring Systems on Student Trust and Motivation. *J. Learn. Anal.* **2023**, *10*, 37–53. [CrossRef]
33. Hagras, H. Toward human-understandable, explainable AI. *Computer* **2018**, *51*, 28–36. [CrossRef]
34. Langer, M.; Oster, D.; Speith, T.; Hermanns, H.; Kästner, L.; Schmidt, E.; Sesing, A.; Baum, K. What do we want from Explainable Artificial Intelligence (XAI)?–A stakeholder perspective on XAI and a conceptual model guiding interdisciplinary XAI research. *Artif. Intell.* **2021**, *296*, 103473. [CrossRef]
35. Jiao, W.X.; Wang, W.X.; Huang, J.T.; Wang, X.; Tu, Z.P. Is ChatGPT a good translator? Yes with GPT-4 as the engine. *arXiv* **2023**, arXiv:2301.08745.
36. Wang, L.; Lyu, C.; Ji, T.; Zhang, Z.; Yu, D.; Shi, S.; Tu, Z. Document-level machine translation with large language models. *arXiv* **2023**, arXiv:2304.02210.
37. Deng, X.; Yu, Z. A systematic review of machine-translation-assisted language learning for sustainable education. *Sustainability* **2022**, *14*, 7598. [CrossRef]
38. Tsai, S.C. Using google translate in EFL drafts: A preliminary investigation. *Comput. Assist. Lang. Learn.* **2019**, *32*, 510–526. [CrossRef]
39. Fazlollahi, A.M.; Bakhaidar, M.; Alsayegh, A.; Yilmaz, R.; Winkler-Schwartz, A.; Mirchi, N.; Langleben, I.; Ledwos, N.; Sabbagh, A.J.; Bajunaid, K. Effect of artificial intelligence tutoring vs expert instruction on learning simulated surgical skills among medical students: A randomized clinical trial. *JAMA Netw. Open* **2022**, *5*, 2149008. [CrossRef]

40. Afzal, S.; Dhamecha, T.I.; Gagnon, P.; Nayak, A.; Shah, A.; Carlstedt-Duke, J.; Pathak, S.; Mondal, S.; Gugnani, A.; Zary, N.; et al. AI medical school tutor: Modelling and implementation. In *Proceedings of the Artificial Intelligence in Medicine: 18th International Conference on Artificial Intelligence in Medicine, AIME 2020, Proceedings*; Springer: Berlin, Germany, 2020; Volume 18, pp. 133–145.
41. Chan, K.S.; Zary, N. Applications and challenges of implementing artificial intelligence in medical education: Integrative review. *JMIR Med. Educ.* **2019**, *5*, 13930. [CrossRef]
42. Francisco, R.E.; Oliveira Silva, F. Intelligent Tutoring System for Computer Science Education and the Use of Artificial Intelligence: A Literature Review. 2022. Available online: http://repositorio.grial.eu/handle/grial/2566 (accessed on 15 April 2023).
43. Grossman, J.; Lin, Z.; Sheng, H.; Wei, J.T.Z.; Williams, J.J.; Goel, S.M. Transforming Online Resources for Learning Math into Conversational Interactions. *AAAI*. 2019. Available online: http://logical.ai/story/papers/mathbot.pdf (accessed on 15 April 2023).
44. Abduljabbar, A.; Gupta, N.; Healy, L.; Kumar, Y.; Li, J.J.; Morreale, P. A Self-Served AI Tutor for Growth Mindset Teaching. In Proceedings of the 2022 5th International Conference on Information and Computer Technologies (ICICT), New York, NY, USA, 4–6 March 2022; pp. 55–59.
45. Kerr, P. Adaptive learning. *Elt J.* **2016**, *70*, 88–93. [CrossRef]
46. Zhai, X. Chatgpt and ai: The game changer for education. *Available at SSRN* **2023**. *in preprint*.
47. Furini, M.; Gaggi, O.; Mirri, S.; Montangero, M.; Pelle, E.; Poggi, F.; Prandi, C. Digital twins and artificial intelligence: As pillars of personalized learning models. *Commun. ACM* **2022**, *65*, 98–104. [CrossRef]
48. Trojer, L.; Ambele, R.M.; Kaijage, S.F.; Dida, M.A. A review of the Development Trend of Personalized learning Technologies and its Applications. *Int. J. Adv. Sci. Res. Eng.* **2022**, *8*, 75–91.
49. Rudolph, J.; Tan, S.; Tan, S.C. Bullshit spewer or the end of traditional assessments in higher education? *J. Appl. Learn. Teach.* **2023**, *6*. [CrossRef]
50. Atlas, S. ChatGPT for Higher Education and Professional Development: A Guide to Conversational AI. 2023. Available online: https://digitalcommons.uri.edu/cba_facpubs/548 (accessed on 15 April 2023).
51. Whalen, J.; Mouza, C. ChatGPT: Challenges, Opportunities, and Implications for Teacher Education. *Contemp. Issues Technol. Teach. Educ.* **2023**, *23*, 1–23.
52. Topsakal, O.; Topsakal, E. Framework for a Foreign Language Teaching Software for Children Utilizing AR, Voicebots and ChatGPT (Large Language Models. *J. Cogn. Syst.* **2022**, *7*, 33–38. [CrossRef]
53. Howard, J. Artificial intelligence: Implications for the future of work. *Am. J. Ind. Med.* **2019**, *62*, 917–926. [CrossRef] [PubMed]
54. De Cremer, D.; Kasparov, G. AI should augment human intelligence, not replace it. *Harv. Bus. Rev.* **2021**, *18*. Available online: https://www.daviddecremer.com/wp-content/uploads/HBR2021_AI-Should-Augment-Human-Intelligence-Not-Replace-It.pdf (accessed on 15 April 2023).
55. Mbakwe, A.B.; Lourentzou, I.; Celi, L.A.; Mechanic, O.J.; Dagan, A. ChatGPT Passing USMLE Shines a Spotlight on the Flaws of Medical Education. *PLoS Digit. Health* **2023**, *2*, 0000205. [CrossRef] [PubMed]
56. Pavlik, J.V. Collaborating with ChatGPT: Considering the Implications of Generative Artificial Intelligence for Journalism and Media Education. *J. Mass Commun. Educ.* **2023**, *78*, 10776958221149577. [CrossRef]
57. McGee, R.W. Is chat gpt biased against conservatives? an empirical study. *SSRN Electron. J.* **2023**, *2023*. [CrossRef]
58. Rozado, D. The political biases of chatgpt. *Soc. Sci.* **2023**, *12*, 148. [CrossRef]
59. Singh, S. Is ChatGPT Biased? *A Rev.* **2023**. Available online: http://osf.io/9xkbu/download (accessed on 15 April 2023).
60. Abramski, K.; Citraro, S.; Lombardi, L.; Rossetti, G.; Stella, M. Cognitive network science reveals bias in GPT-3, ChatGPT, and GPT-4 mirroring math anxiety in high-school students. *arXiv* **2023**, arXiv:2305.18320.
61. Gilson, A.; Safranek, C.W.; Huang, T.; Socrates, V.; Chi, L.; Taylor, R.A.; Chartash, D. How does CHATGPT perform on the United States Medical Licensing Examination? the implications of large language models for medical education and knowledge assessment. *JMIR Med. Educ.* **2023**, *9*, 45312. [CrossRef]
62. Grünebaum, A.; Chervenak, J.; Pollet, S.L.; Katz, A.; Chervenak, F.A. The exciting potential for ChatGPT in obstetrics and gynecology. *Am. J. Obstet. Gynecol.* **2023**, *228*, 696–705. [CrossRef] [PubMed]
63. Gravel, J.; D'Amours-Gravel, M.; Osmanlliu, E. Learning to fake it: Limited responses and fabricated references provided by ChatGPT for medical questions. *Mayo Clin. Proc. Digit. Health* **2023**, *1*, 226–234. [CrossRef]
64. Wen, J.; Wang, W. The future of ChatGPT in academic research and publishing: A commentary for clinical and translational medicine. *Clin. Transl. Med.* **2023**, *13*, 1207. [CrossRef] [PubMed]
65. Alkaissi, H.; McFarlane, S.I. Artificial hallucinations in ChatGPT: Implications in scientific writing. *Cureus* **2023**, *15*, e35179. [CrossRef]
66. Ali, R.; Tang, O.Y.; Connolly, I.D.; Fridley, J.S.; Shin, J.H.; Sullivan, P.L.Z.; Cielo, D.; Oyelese, A.A.; Doberstein, C.E.; Telfeian, A.E.; et al. Performance of ChatGPT, GPT-4, and Google Bard on a Neurosurgery Oral Boards Preparation Question Bank. *Neurosurgery* **2023**. [CrossRef]
67. Naik, R.R.; Landge, M.B.; Mahender, C.N. A review on plagiarism detection tools. *Int. J. Comput. Appl.* **2015**, *125*, 16–22.
68. Khalil, M.; Er, E. Will ChatGPT get you caught? Rethinking of plagiarism detection. *arXiv* **2023**, arXiv:2302.04335.
69. Bašić, Ž.; Banovac, A.; Kružić, I.; Jerković, I. Better by you, better than me, chatgpt3 as writing assistance in students essays. *arXiv* **2023**, arXiv:2302.04536.

70. Cotton, D.R.; Cotton, P.A.; Shipway, J.R. Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innov. Educ. Teach. Int.* **2023**, 1–12. [CrossRef]
71. Chan, C.K.Y.; Tsi, L.H. The AI Revolution in Education: Will AI Replace or Assist Teachers in Higher Education? *arXiv* **2023**, arXiv:2305.01185.
72. Oker, A.; Pecune, F.; Declercq, C. Virtual tutor and pupil interaction: A study of empathic feedback as extrinsic motivation for learning. *Educ. Inf. Technol.* **2020**, *25*, 3643–3658. [CrossRef]
73. Chomsky, N.; Roberts, I.; Watumull, J.N.C. The False Promise of ChatGPT. *The New York Times*. 2023, p. 8. Available online: www.nytimes.com/2023/03/08/opinion/noam-chomsky-chatgpt-ai.html (accessed on 20 April 2023).
74. Pegoraro, A.; Kumari, K.; Fereidooni, H.; Sadeghi, A.R. To ChatGPT, or not to ChatGPT. *arXiv* **2023**, arXiv:2304.01487.
75. Miller, A.I. *The Artist in the Machine: The World of AI-Powered Creativity*; Mit Press: Cambridge, MA, USA, 2019.
76. Anantrasirichai, N.; Bull, D. Artificial intelligence in the creative industries: A review. *Artif. Intell. Rev* **2022**, *55*, 589–656. [CrossRef]
77. Arriagada, L. CG-Art: Demystifying the anthropocentric bias of artistic creativity. *Connect. Sci.* **2020**, *32*, 398–405. [CrossRef]
78. Carnovalini, F.; Rodà, A. Computational creativity and music generation systems: An introduction to the state of the art. *Front. Artif. Intell.* **2020**, *3*, 14. [CrossRef]
79. Colton, S.; Wiggins, G.A. Computational creativity: The final frontier? *Front. Artif. Intell. Appl.* **2012**, *242*, 21–26.
80. Toivanen, J.M.; Järvisalo, M.; Alm, O.; Ventura, D.; Vainio, M.; Toivonen, H. Towards transformational creation of novel songs. *Connect. Sci.* **2019**, *31*, 4–32. [CrossRef]
81. Iansiti, M.; Lakhani, K.R. *Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World*; Harvard Business Press: Brighton, MA, USA, 2020.
82. Schwab, K. *The Fourth Industrial Revolution*; Currency: Redfern, Australia, 2017.
83. Rubinstein, Y. Uneasy Listening: Towards a Hauntology of AI-Generated 835 Music. *Reson. J. Sound Cult.* **2020**, *1*, 77–93.
84. Köbis, N.; Mossink, L.D. Artificial intelligence versus Maya Angelou: Experimental evidence that people cannot differentiate AI-generated from human-written poetry. *Comput. Hum. Behav.* **2021**, *114*, 106553. [CrossRef]
85. Gangadharbatla, H. The role of AI attribution knowledge in the evaluation of artwork. *Empir. Stud. Arts* **2022**, *40*, 125–142. [CrossRef]
86. Elgammal, A.; Liu, B.; Elhoseiny, M.; Mazzone, M. Can: Creative adversarial networks, generating "art" by learning about styles and deviating from style norms. *arXiv* **2017**, arXiv:1706.07068.
87. Tlili, A.; Shehata, B.; Adarkwah, M.A.; Bozkurt, A.; Hickey, D.T.; Huang, R.; Agyemang, B. What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learn. Environ.* **2023**, *10*, 15. [CrossRef]
88. Farrokhnia, M.; Banihashem, S.K.; Noroozi, O.; Wals, A. A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innov. Educ. Teach. Int.* **2023**, 1–15. [CrossRef]
89. Sullivan, M.; Kelly, A.; McLaughlan, P. ChatGPT in higher education: Considerations for academic integrity and student learning. *J. Appl. Learn. Teach.* **2023**, *6*. [CrossRef]
90. Susnjak, T. ChatGPT: The End of Online Exam Integrity? *arXiv* **2022**, arXiv:2212.09292.
91. Newton, P.M. ChatGPT Performance on MCQ-Based Exams. 2023. Available online: https://edarxiv.org/sytu3 (accessed on 15 April 2023).
92. King, M.R.; ChatGpt. A conversation on artificial intelligence, chatbots, and plagiarism in higher education. *Cell. Mol. Bioeng.* **2023**, *16*, 1–2. [CrossRef]
93. García-Peñalvo, F.J. *The Perception of Artificial Intelligence in Educational Contexts after the Launch of ChatGPT: Disruption or Panic?* Ediciones Universidad de Salamanca: Salamanca, Spain, 2023.
94. Azaria, A. ChatGPT Usage and Limitations. 2022. Available online: https://hal.science/hal-03913837v1/preview/ChatGPT.pdf (accessed on 15 April 2023).
95. Yang, K.B.; Echeverria, V.; Lu, Z.; Mao, H.; Holstein, K.; Rummel, N.; Aleven, V. Pair-Up: Prototyping Human-AI Co-orchestration of Dynamic Transitions between Individual and Collaborative Learning in the Classroom. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems, Hamburg, Germany, 23–28 April 2023*; Association for Computing Machinery: New York, NY, USA, 2023; pp. 1–17.
96. Ray, P.P. ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope. *Internet Things Cyber-Phys. Syst.* **2023**, *3*, 121–154. [CrossRef]
97. Eggmann, F.; Weiger, R.; Zitzmann, N.U.; Blatz, M.B. Implications of large language models such as ChatGPT for dental medicine. *J. Esthet. Restor. Dent.* **2023**. [CrossRef]
98. Szabo, A. ChatGPT a Breakthrough in Science and Education: Can it Fail a Test? OSF Prepr. 2023. Available online: https://journals.lsu.lt/baltic-journal-of-sport-health/article/view/1341 (accessed on 15 April 2023).
99. Ventayen, R.J.M. ChatGPT by OpenAI: Students' Viewpoint on Cheating Using Artificial Intelligence-Based Application. *SSRN* **2023**. 4361548 %U. Available online: https://ssrn.com/abstract=4361548 (accessed on 15 April 2023).
100. Perkins, M. Academic Integrity considerations of AI Large Language Models in the post-pandemic era: ChatGPT and beyond. *J. Univ. Teach. Learn. Pract.* **2023**, *20*, 7. [CrossRef]
101. Adiguzel, T.; Kaya, M.H.; Cansu, F.K. Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. *Contemp. Educ. Technol.* **2023**, *15*, 429. [CrossRef]

102. Huang, K. Alarmed by AI chatbots, universities start revamping how they teach. *The New York Times*, 16 January 2023.
103. Duffy, C. Public school bans on AI tools like ChatGPT raise fears private school kids are gaining an unfair edge and widening a digital divide. *ABC News Australia*, 26 May; 2023.
104. Sun, Y.; Zheng, Y.; Hao, C.; Qiu, H. NSP-BERT: A Prompt-based Zero-Shot Learner Through an Original Pre-training Task—Next Sentence Prediction. *arXiv* **2021**, arXiv:2109.03564.
105. Verma, V.; Fleisig, E.; Tomlin, N.; Klein, D. Ghostbuster: Detecting Text Ghostwritten by Large Language Models. *arXiv* **2023**, arXiv:2305.15047.
106. Elsen-Rooney, M. NYC Education Department Blocks ChatGPT on School Devices, Networks %U. *Chalkbeat New York*. 2023. Available online: https://ny.chalkbeat.org/2023/1/3/23537987/nyc-schools-ban-chatgpt-writing-artificial-intelligence (accessed on 15 April 2023).
107. Castillo, E. These Schools and Colleges Have Banned Chat GPT and Similar AI Tools. 2023. Available online: https://www.Bestcolleges.com (accessed on 15 April 2023).
108. Myklebust, J.P. Universities adjust to ChatGPT, but the 'real AI' Lies Ahead. 2023. Available online: www.universityworldnews.com (accessed on 15 April 2023).
109. Al-Worafi, Y.M.; Hermansyah, A.; Goh, K.W.; Ming, L.C. Artificial Intelligence Use in University: Should We Ban ChatGPT? Preprints. *Preprints.org* **2023**, 2023020400. [CrossRef]
110. Roose, K. Don't Ban ChatGPT in Schools %U. *Teach with It*. 2023. Available online: https://www.nytimes.com/2023/01/12/technology/chatgpt-schools-teachers.html (accessed on 15 April 2023).
111. Toscano, J. Banning ChatGPT in Schools Is Like Banning Calculators in Math Class. *forbes.com*. 2023. Available online: http://www.forbes.com/sites/joetoscano1/2023/04/20/banning-chatgpt-in-schools-is-like-banning-calculators-in-math-class/?sh=adff58812131 (accessed on 20 April 2023).
112. Anthony, P.; Eager, B.; Glendinning, I.; Webb, M.; Maris, S.C. *To Ban or Not to Ban*; QAA: Gloucester, UK, 2023.
113. Yu, H. Reflection on whether Chat GPT should be banned by academia from the perspective of education and teaching. *Front. Psychol.* **2023**, *14*, 2156. [CrossRef]
114. Earl, L.M. *Assessment as Learning: Using Classroom Assessment to Maximize Student Learning*; Corwin Press: Thousand Oaks, CA, USA, 2012.
115. Willis, J.; Adie, L.; Klenowski, V. Conceptualising teachers' assessment literacies in an era of curriculum and assessment reform. *Aust. Educ. Res.* **2013**, *40*, 241–256. [CrossRef]