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To Explore Sora's Potential Influence on Future Education

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ABSTRACT : In February 2024, OpenAI first publicly presented Sora (even though it still not accessible to common people), the world's preeminent representative of state-of-the-art Generative Artificial Intelligence (GAI), which immediately received widespread attention. As a leading-edge GAI, Sora has demonstrated excellent capabilities in Text-to Video (T2V), generating long-form videos, scene rendering, understanding natural language, maintaining narrative continuity and other aspects. This study mainly employs literature studies and function analysis method. After analyzing, this study believes that Sora has a great potential influence on the following aspects in the future. For teachers, Sora has the potential to enrich teaching materials, accelerate the visualization of pedagogical contents, improve teachers' effectiveness and role changes, upgrade teaching methods and others in the future. For learners, Sora has the potential impact in visualizing learning contents, interacting with learning processes, highlighting learners' personalized needs, owning intelligent virtual instructors, elevating experiential and participatory feelings, reducing one-to-one homework tutoring troubles, developing self-directed learning abilities and more in the future. For different disciplines, Sora has the potential to influence mathematical disciplines, geographical disciplines, physical disciplines, chemical disciplines, biological disciplines, history disciplines, astronomy, computer disciplines, film or media, English language disciplines, etc. Beyond that, Sora also appears to have the potential to influence transforming temporal space, home education, and traditional education models. Sora and other GAIs may have a relatively significant impact on employment. As one of first studies to explore Sora's potential influence on education, especially its potential influence on different disciplines and transforming temporal space, this study will provide an important reference on future integration between Sora and education.

KEYWORDS – Education; Generative Artificial Intelligence (GAI); Potential; Sora; Visualization

I. INTRODUCTION

In February 2024, OpenAI first publicly presented Sora (even though it still not accessible to common people), the world's preeminent representative of state-of-the-art Generative Artificial Intelligence (GAI), which immediately received widespread attention [1-3]. Sora can generate vivid, realistic, imaginative videos based on textual clues and maintain narrative consistency [2], [3]. It has several advantages in generating long videos, rendering frames, understanding natural language, and preserving the story's coherence [1], [4]. Sora is one of the most outstanding masterpieces of GAI at the highest level nowadays, with potentially far-reaching implications for many fields in the future. For education, Sora may have benefits in educational materials, teaching strategies, immersive educational content, learning experience and many more [1], [3], [5], [6]. However, there is still minimal research on Sora's potential influence on education, especially with regard to Sora's potential influence in transforming temporal space, geography-related course teaching and learning, visualizing instructional materials, home education, tutoring homework, self-directed learning, simulating experiments, film and media majors, intelligent virtual tutors and so on. The current study aims to fill these gaps.

II. LITERATURE REVIEW

Information and Communication Technology: Over the past few decades, Information and communication technology (ICT) has progressed at a rapid pace and achieved remarkable achievements, which have profoundly impacted the economic structure, social advancement and people's lifestyles around the world [7-10]. The impact of ICT has spread throughout education, healthcare, management, business partnerships, entertainment and many other industries [7-10]. Mohd Faiz et al. thought that the implications of ICTs were inevitable, specifically with respect to their motivational and cost-saving role in Technical and Vocational Education and Training (TVET) implementations in the current digital age [10]. ICT provided a wealth of resources for improving the quality of educational information services and was an inseparable part of enhancing the effectiveness of teaching and learning [7], [8], [11]. According to Sharma et al., ICT has the potential to enhance teacher-student connection and facilitate self-paced learning through various means such as emails, chalk sessions, and other channels [12].

Furthermore, Sharma argued that using educational ICTs (e.g., teleconferences, video-chatting software, and current social media sites) helped connect rural and urban stakeholders [7]. Therefore, ICT offers numerous benefits in transforming teaching and learning styles, bridging the gap in educational resources, enhancing service levels and others, which are worthy of further in-depth study.

Generative Artificial Intelligence: As an important branch of ICT. GAI usually draws on a variety of models and algorithms with stronger understanding and generative and deductive capabilities [8], [13], [14]. GAI has already received a great deal of attention from different industries such as healthcare, tourism, finance, art, education, and more [15-20]. Aldoseri et al. (2024) highlighted the assessment of AI and the crucial evaluation elements of enterprises [21]. Zhou and Lee examined the consequences of integrating text-to-image GAI into the creative process of humans [22]. Drawing on ethnographic research methodology, Salinas-Navarro et al. investigated combining GenAI tools with authentic evaluation. From the perspectives of AI and art designing, Wang and Zhang verified the key factors affecting users' acceptance of GAI in the unified theory of acceptance and use of technology 2 (UTAUT 2) model [16]. Previous studies concerned different aspects of GAI in education, for example, ChatGPT for personalized instruction [23], course evaluation [24], advantages [23], limitations [14], intention to use [25], incorporation between GAI and education [23], comparison of different chatbots [26] and many others. Consequently, GAI has already made a substantial and significant effect on several industries, and the potential influence of one of GAI's newest products (Sora) needs to be further explored.

Sora's Potential Influence on Different Industries: As a part of GAI, Research related to Sora has been carried out in many domains, for instance, the movie industry [27], medicine [28], digital resource preservation [3], mining [29], smart vehicles [30], advertising [6] and education industry [5], [31]. Within the framework of Kant's theory of productive imagination, Zhang J. highlighted the importance of Sora, especially its ability to develop a consistent world model [32]. On the foundation of a thorough examination of hallucinatory phenomena, Chu et al. presented the Sora Detector, which used cutting-edge keyframe extraction algorithms and multimodal large language models [33]. Besides, Kyrie Zhixuan Zhou et al. expressed worries about the intellectual property issues posed by Sora [34]. Therefore, different researchers have conducted preliminary studies on Sora from different angles to provide ideas for future research.

However, past research specifically addressing the potential implications of Sora for education is still minimal, particularly concerning transforming temporal space, visualizing teaching documents, geography-related courses, family education, assisting homework, student's self-directed learning, visualizing experiments and so forth are very scarce. Therefore, it is urgent to conduct further research on the gaps identified above to explore the potential influence of Sora on future education.

III. RESEARCH METHODOLOGY

Exploratory research is a study that aims to explore a field with limited knowledge or concerns the feasibility of doing a particular type of research [35], [36]. Exploratory research is a distinct type of research that is known for its exceptional degree of flexibility [36]. Exploratory research facilitates identifying initial conceptual information, eliminating impractical assumptions, increasing the researcher's familiarization with problems, establishing a foundation for hypotheses at later stage, among other significant advantages [35-37]. There are many types of exploratory research methodologies, some of the more frequent of which include literature studies, case studies, focus groups and so on [36]. As mentioned, literature studies also belong to exploratory research. At the same time, OpenAI has not released specific details about Sora, and there is very little research on it. So, to analysis Sora's internal and external functions is another suitable method for this study. Consequently, considering the benefits of exploratory research methodology and Sora's current research stage, this study mainly employs literature studies and function analysis method.

IV. TO ANALYSE SORA'S POTENTIAL INFLUENCE ON FUTHURE EDUCATION

For Teachers

Enriching Teaching Materials : Static educational resources dominated educational content [3]. The video diffusion model represented by Sora provided unparalleled chances for animated instructional materials [3]. By converting text prompts into lifelike videos, educators could create videos on various topics, making complex concepts easier to understand, thereby enriching educational materials and reducing the difficulty of production [3], [6]. Sora offers the potential to compensate for traditional educational materials' weaknesses in weak human-computer interaction, time-consuming, high economic costs, insufficient interest, and inadequate attraction, thereby improving educational materials for richness, interestingness, accessibility,

Comprehensibility, and acceptability. In addition, Sora can be used with ChatGPT or other products to generate lesson planning, design exam questions, expand knowledge beyond the classroom, etc.

Accelerating the visualization of pedagogical contents : Sora possessed the technology to quickly and precisely transfer text statements into moving video content [5]. In the past, text and image formats have dominated the contents of most classroom presentations, whereas, with the appearance and advancement of GAI (like Sora), the overall proportion of generative video usage will probably rise. According to Sora, uncountable sophisticated concepts, incomprehensible articles, abstract principles, changeable spatial shapes, and many others can be visualized, which will help learners understand and master them.

Improving teachers' effectiveness : In contrast to traditional methods, Cho et al. argued that implementing text-to-video (T2V) techniques in education has significantly improved teachers' teaching effectiveness by transferring their handouts into video formats [1]. Meanwhile, GAIs such as Sora and ChatGPT can automatically generate teaching strategies, teaching content, author's background introduction, formula explanations, etc., effectively improving teachers' work productivity.

Influencing teachers' roles changes : Sora will challenge the traditional role of the teacher [3]. Because GAIs, represented by Sora and ChatGPT, can partially substitute for part of traditional teachers' roles in teaching, evaluating, answering questions and many other aspects, the role of traditional teachers may be affected. The original roles of knowledge transmitter, educator, instructor, manager or others may be weakened. The roles of server, co-designer, co-collaborator, personalized tutor, supporter may be enhanced.

Upgrading teaching methods : The T2V technologies have the ability to significantly revolutionize educational methods by providing creative solutions and ample experiences [1]. Kustudic and Mvondo thought that educators can promote students' more profound levels of engagement and experiential learning by immersing them in dynamic, hands-on learning experiences [6]. With the onslaught of GAI, teachers might have to shift their conventional teaching approaches and learn how to acquire human-machine interaction, value personalization, differentiation, interactivity, interestingness, attractiveness, and future orientation and reinvent the teaching workflow, revamping teaching content presentation and enhancing the proportion of visualization. In the future, there are possibilities for a deeper integration of virtualization and realization.

Transforming Temporal-space : In terms of space and time, with the development of GAI technologies represented by Sora, once Sora is deeply integrated with other technologies, it will provide boundless possibilities for combining virtual and realistic space and creating flexible teaching and learning time. Scenario of simulation and rendering, generative virtual classrooms, cloud classes and so forth potentially beyond the school's physical boundaries. The acceptance of virtual temporal space among learners needs to be further investigated.

For Learners

Visualizing learning contents : Based on the learning objectives and individual learning requirements, Sora will make it easier to visualize the learning resources, turning textual learning contents into detailed explanations in the form of diagrams, animations, simulated scenes and other forms of video [2], [3]. For some learners, visualizations of learning components may be more helpful for their understanding and memorization. Additionally, with Sora, parts of learning content that would otherwise be boring, static, unintelligible or incomprehensible will become lively, engaging, dynamic and dialogue-ready.

Interacting learning processes : Horizontally, one teacher tutors one student at one time, whereas Sora can potentially tutor hundreds of millions of learners simultaneously at one time. Vertically, one teacher can tutor one class for one semester or even many years, whereas Sora represents GAI with the potential to accompany and tutor learners from childhood to adulthood. Sora's interactive coaching process allows both sides to discuss different issues. For example, students who want to know about Borneo wildlife can use Sora to generate interactive videos rather than texts or images (Fig. 1).

Figure. 1. Borneo wildlife generated by Sora. (Collection date: June 21, 2024)

Highlighting learners' personalized needs : Depending on the learner's individual learning needs, Sora is able to transfer textual elements into richly illustrated videos to support the learner's understanding and mastery. [3], [31]. As the economy and technology evolve, learners will likely develop diverse, customized and differentiated expectations. In a class-based system, it is difficult for a teacher to take care of every student's feeling or needs, and Sora can bridge this gap to a certain extent. Following an individual's learning pace and requirements, Sora can generate individually tailored videos to promote learning intentions and enhance engagement.

Owning intelligent virtual instructors : Sora can help learners solve their professional learning problems, optimize their knowledge structure, supply specialized learning resources and broaden their horizons [3], [5]. Sora, ChatGPT, Midjourney and other GAI models might work together as intelligent virtual instructors who are highly flexible, portable and environmentally adaptable to solve countless problems for learners. Learners can take intelligent virtual instructors with them to as many places as they desire, not only to combine theory and practice but also to significantly reduce the limitations of physical boundaries. The advent of intelligent virtual instructors may make the student-centered slogan one step closer to being realized.

Elevating experiential and participatory feelings : Text-to-video technology provided creative tactics to diversify the learning experience [1], [5]. Compared to textual and pictorial presentations, video explanations are intuitive, visual, and memorable, enhancing the experiential feeling. Incorporating Sora with meta-universe, virtual reality (VR), augmented reality (AR) and other technologies will have the potential to create immersive learning environments in the future, enhancing the learner's feelings of participation and experience.

Reducing one-to-one homework tutoring troubles : Sometimes, for some ordinary families, the knowledge possessed by parents may appear challenging in guiding their children, and Sora probably plays a role in this regard. Sora shows potential to accompany learners in their studies, assist with homework, provide suggestions, answer confusions, generate learning resources and others, especially for learners who lack a knowledgeable person to guide them or those who are not strong in the basics.

Developing self-directed learning abilities : At present, in some places, the central point is "teaching," while the time and space for students to learn under their control are minimal, resulting in the phenomenon of strong "passive learning" and weak "active learning." GAI, represented by Sora and ChatGPT, can somewhat attenuate this. In other words, Sora and other GAIs have the efficacy of weakening the teacher's function and strengthening self-directed learning. For students who are self-directed learners, Sora gives them new options and avenues to pursue.

Home Education : Home education is a crucial part of children's growing-up process, which directly affects their world, life, values, love, career, and money viewpoints. While teachers at school may change frequently, parents are more constant. In the age of the knowledge spurt, Sora might assist parents in many ways, such as coaching complex mathematical problems, explaining natural phenomena, providing methodological advice, explaining machine construction, knowing historical figures, generating bedtime stories, explaining English grammar, etc.

For Different Disciplines

Mathematical disciplines : In the process of mathematical formula deduction, Sora can visually show the background of the formula, the primary process, the applicable scenarios and so on. Sora has its own strengths in

unfolding, collapsing, and deforming three-dimensional geometric shapes and designing, altering, and simulating auxiliary lines in planar shapes. Sora also has the potential for dynamic presentations of function problems, engineering problems, distance problems, etc., which are common in mathematics examinations.

Geographic disciplines : Inputting a text, Sora can animatedly present the undulating mountains, running rivers, geological evolution, humanistic landscapes and so forth, which may be easier for students to understand than describing them in words. Moreover, Sora may also contribute to demonstrating surface morphogenesis, natural environmental differentiation, desertification prevention, water pollution control, renewable energy utilization, forest conservation, Geographic Information System (GIS) remote sensing detection and many others.

Physical disciplines : For example, visualizing electricity flows gives students a deeply insightful comprehension of the situation [1]. Sora offers some new ideas for understanding the principles of mechanical movements, the reflection and refraction of lights, sublimation and condensation, magnetic fields, free-fall motions, and other phenomena. Sora may deliver new solutions when exploring the laws of uniform linear motion, centripetal acceleration, electromagnetic induction phenomena, energy conservation and others.

Chemical disciplines : When responding to students' questions about chemical reaction experiments, with the help of Sora, teachers may simulate real-time changes in the colors, forms and smells of liquids under the action of different chemicals, as well as the consequences of incorrect experimental steps. Under Sora's assistance, it is easier for students to understand atomic structure, metallic chemical properties, organic compounds, inorganic non-metallic materials, polymer compounds, crystal structure and other chemical knowledge. Students may be able to communicate with Sora in real time about the stories behind each chemical element in the Periodic Table of Chemical Elements, as well as the chemical element's forms, manufacturing procedures, chemical properties, preservation methods, etc.

Biological disciplines : Based on the textbook's introductions, Sora video-enables presentations of plant and animal cells under a Microscope, the composition of the human nervous system, bacteria and fungi, mammals and amphibians, heredity and variation in organisms, the relationship between genes and chromosomes, and much more. Sora dynamically demonstrates the process of biological evolution and distinguishes its performance in saving experimental costs. In the future, Sora may also be helpful in embryo engineering, ecological engineering, infectious disease control, vaccine development and more.

History disciplines : In history classes, Sora has some ability to simulate historical scenes, allowing students to immerse themselves in specific historical events, such as the background, key characters, social environments and main sequence. By generating different historical scenarios, Sora may be able to help students access historical stories during different periods, for instance, primitive agricultural instruments, the feudal system, the Industrial Revolution, the Renaissance, economic crises in history, ancient poetry, ancient texts, and so on. For example, the OpenAI website published a video that recreated a specific scene of the Gold Rush period (Fig. 2).

Figure. 2. A specific scene of the Gold Rush period in history. (Collection date: June 20, 2024)

Astronomy : For astronomy students or enthusiasts, Sora converts static text in a book into a dynamic astronomy video, turning something previously unattainable into a reality. Examples include the distribution and characteristics of the eight planets, the trajectory and animation of the Earth's revolution around the Sun, the laws regulating the orbits of the Moon and the Earth, the formation and growth of black holes, the evolution of dark

matter, etc. Sora also allows learners to simulate observations of nebulae, gamma rays, supernovae, cosmic reionization, the magnetospheric structure of pulsars and more.

Computer disciplines : Sora's intervention allows sophisticated computer textbook knowledge to be transformed into visualized materials with human-computer interaction features. For computer beginners, Sora may help them understand the basic principles of computers, the main components of computer hardware and software, computer system architecture, and the basic knowledge of databases. As a leading-edge innovative GAI, Sora's emergence may further stimulate the advancement of Natural Language Processing, Data Visualization, Computer Graphics, Text Recognition, Human-Computer Interaction, Machine Vision, Digital Signal Processing, and other technologies.

Film or media : Sora will likely have a relatively strong impact on film or media because it provides great T2V capabilities and possesses excellent scene rendering, complex scene design, long video generation, narrative coherence, and many other capabilities. In film or media-related classes, Sora may be applied and discussed. Due to its powerful functionalities, it may affect the major choices and career planning of students in film or media-related classes.

English language disciplines : For some students who have a weak foundation in English, have no one to mentor them, or have a psychological fear of English, Sora can give them some suitable one-on-one assistance that will help them improve their grades and confidence. Similarly, Sora and other GAIs may partially undertake the work of an English teacher, generating colorful, exciting and attractive videos at a relatively low cost and maintaining continuity and interactivity. Regarding English vocabulary memorization, long and difficult sentence analysis and grammar learning, Sora can also potentially support learners through short stories, visual structural analysis, word tracing, sentence disambiguation, grammatical structure clarification and other forms.

Influencing traditional education models : Based on the existing literature and technological development trends, it is inferred that the existing traditional education model may become very difficult to adapt to technological iterations and social development trends and that a considerable proportion of students graduating from the existing model are likely to reflect knowledge lagging, technological inaptitude and powerlessness in keeping up with the fast-changing times. Sora and ChatGPT, combined with meta-universe, robotic technologies, VR, AR (Massive Open Online Courses), MOOCs and many other technologies or platforms, may significantly influence the traditional education model. As common people, we still need to explore how to adapt to the implications of GAI and other innovative technologies.

V. CHALLENGES

Based on previous publications, intellectual property issues, moral risks, misinformation, and regulation are mentioned [4], [38] [6], [34]. Notably, Sora and other GAIs may have a relatively large impact on employment.
In terms of hardware, on the one hand, Sora and other technologies have the potential to reduce large-scale spending on school fences, school buildings, dormitories, office buildings, and multitudinous ancillary hardware facilities; on the other hand, they are likely to have a strong impact on investment in many of the related infrastructures. Regarding software, Sora and other technologies have the potential to bring many benefits. Still, on the other hand, they may cause problems such as technology maladjustment, unemployment, and job replacement. According to the experience of innovative technology application in the field of education, historical literature and reference cases, it is inferred that the promotion and practice of GAI represented by Sora in the field of education may be affected by the conventional education "inertia," cultural traditions, customs, multiple pressures and others. The gap between the ideal and the reality may be significant due to many difficulties.

VI. CONCLUSION

As a leading-edge GAI, Sora has demonstrated excellent capabilities in T2V, generating long-form videos, scene rendering, understanding natural language, maintaining narrative continuity and other aspects. For teachers, Sora has the potential to enrich teaching materials, accelerate the visualization of pedagogical contents, improve teachers' effectiveness, change teachers' roles changes, upgrade teaching methods and others in the future. For learners, Sora has the potential influence in visualizing learning contents, interacting with learning processes, highlighting learners' personalized needs, owning intelligent virtual instructors, elevating experiential and participatory feelings, reducing one-to-one homework tutoring troubles, developing self-directed learning abilities and more in the future. For different disciplines, Sora has the potential to influence mathematical disciplines, Geographical disciplines, physical disciplines, chemical disciplines, biological disciplines, history disciplines,

astronomy, computer disciplines, film or media, English language disciplines, etc. Beyond that, Sora also appears to have the potential to influence transforming temporal space, home education, and traditional education models. Sora and other GAIs may have a relatively large impact on employment. The gap between the ideal and the reality may be large due to many difficulties. This study remains limited in data support, empirical validation and other aspects, and future research directions can strengthen empirical research and investigations in different contexts.

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