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PAPER

Generative AI and Mobile Learning in Higher Education: Comparing Student and Faculty Perspectives on Employability Impact

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ABSTRACT

Globally, the production of moral citizens and professionals depends heavily on higher education. The advent of ChatGPT and other generative artificial intelligence (GenAI) tools has presented both opportunities and problems for the established educational model. The future of higher education, however, is a topic of little inquiry; instead, discussions these days are mostly focused on policy creation and evaluation. The purpose of this paper is to examine how AI is affecting international students' education. It uses a research approach, as opposed to a standard literature review, to look at possible applications of AI and talk about related issues. The paper examines several AI applications, including chatbots for research and learning, adaptive testing, personalized learning, and statistical analysis. This study clarifies how AI may enhance learning effectiveness and offer tailored educational support by examining its role in education for international students. It also points out important dangers and constraints that must be properly addressed, such as privacy issues, cultural differences, language barriers, and ethical considerations. Predicting future advancements in AI, however, will be exceedingly challenging.

KEYWORDS

generative artificial intelligence (GenAI), higher education, customized instruction, international students

1 INTRODUCTION

One kind of artificial intelligence (AI) technology that produces original and novel results is called generative AI, or GenAI. The results can include text, pictures, audio files, films, and 3D models, to name a few. Education, entertainment, and product design are just a few areas that can benefit from GenAI's ability to create realistic, complex material that mimics human creativity. In particular, its application can benefit several industries [1]. Technological advances, such as the generative

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pre-trained transformer (GPT), have led to notable improvements in these capacities. The employment of GenAI in higher education now has more opportunities thanks to these recent advancements. GitHub Copilot, ChatGPT, and Mid-journey are a few of these applications. These programs can be used to construct individualized instruction, write or edit lesson plans, develop research codes, and compose email responses to student questions. GenAI hence has a wide range of possible uses in the sphere of higher learning. What effects will GenAI have on colleges in the future? The seriousness of this question is demonstrated by the volume of prompt comments that college teachers have given to it.

With over five million foreign pupils enrolled in universities globally over the last three decades, international student migration (ISM) has become a major trend in higher education. That being said [2], not much research has been done on how new technologies, including AI, might affect overseas students' educational experiences. To close this gap, this paper investigates how AI might enhance curriculum creation, instruction, and educational procedures for students from around the world.

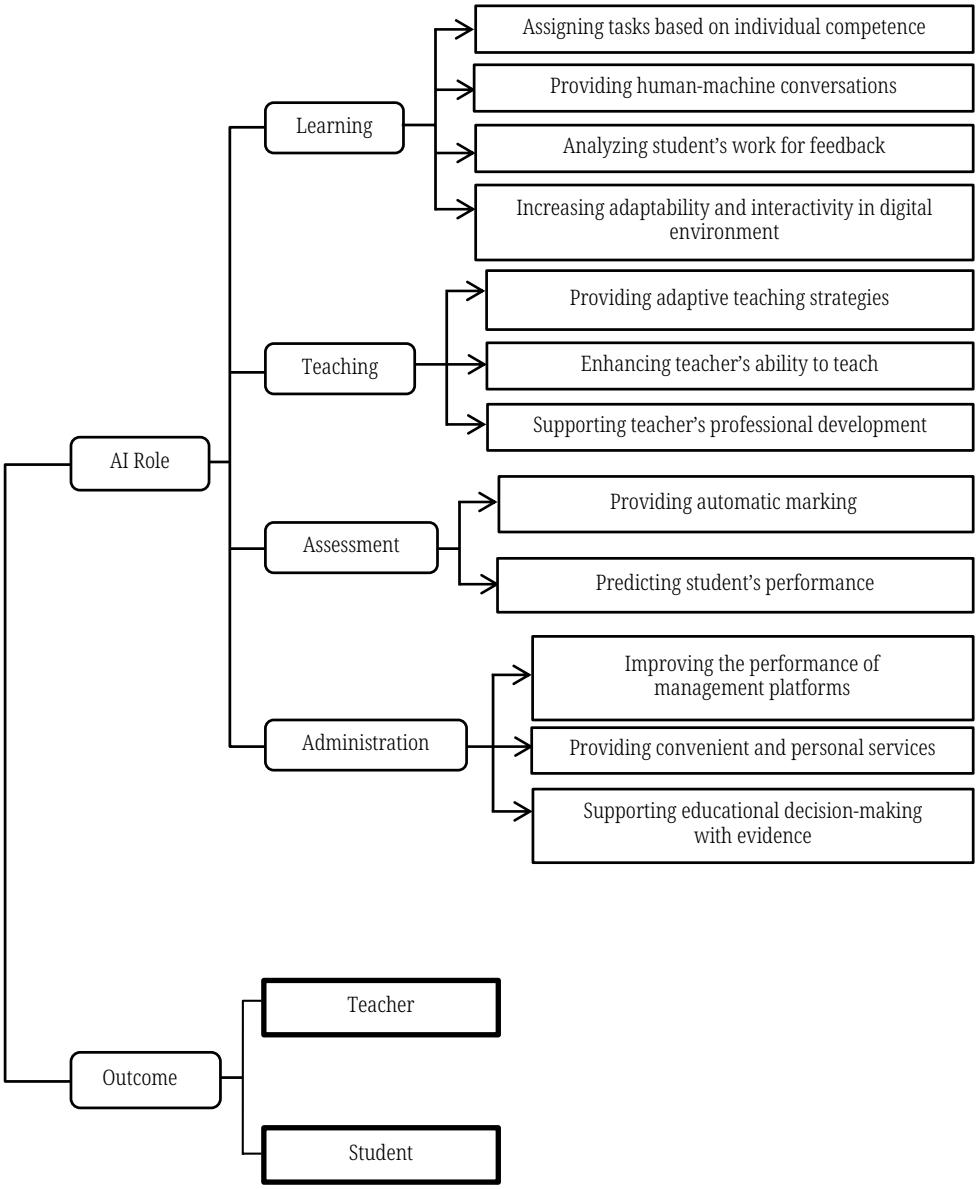

Fig. 1. The first intellectual framework: The functions and results of AI applications in the classroom

The study employed matrix coding and content analysis to examine the potential benefits and drawbacks of AI in an educational context. Figure 1 illustrates the thirteen functions that AI has been recognized for in education throughout the four core domains of education, instruction, assessment, and administration. It also highlighted seven key learning objectives for teachers and students. This framework is meant to serve as a starting point for data gathering and analysis.

The fact that this talent isn't being used in teaching is inexplicable. In addition to the benefits of mobile learning, there are a number of limitations and concerns to take into account, such as the design principles that ought to be applied in these kinds of settings. What needs to be modified, how curriculum approaches for mobile classrooms differ significantly, what features a mobile educational system should have, and which framework will be employed are all things to consider. A significant amount of educational preparation or learning path creation goes into learning. Effective curricula assist students in staying on course throughout the whole educational process [3]. A substantial emphasis on curricula is required for personalized adaptive learning. In alongside course planning, many contemporary personalized educational settings consider the learner's interests, pastimes, and online activities. However, these systems don't take into account the abilities of the student.

The rest of the paper will follow this format. Section 2 presents the goal, scope, systematic review, and meta-analysis methods of this paper. The definition and results of AI applications are provided in the Section 3 illustration, together with the relevant mobile applications. Section 4 delves into the specifics of how using mobile in performance assessment measures applied to mobile technologies enhances student and faculty perspectives on employability impact outcomes. Section 5 concludes the discussion and outlines future developments.

2 RELATED WORKS

The category of AI technology known as "GenAI" is responsible for creating new content, solutions, or data that bear similarities to human-like outputs [4]. With the help of a variety of prompts, users can create new material that includes text, photographs, videos, audio, code, 3D models, and other media forms thanks to GenAI. GenAI has the ability to produce content on its own that has comparable features, proving its versatility as a content creator. While traditional AI concentrates on using information already in the public domain to guide decisions, GenAI goes one step further by producing new content—images, writings, codes, and more—while "education" and "instruction" on freely accessible papers and artifacts.

Academic institutions bear the obligation of furnishing their pupils with modern, effective, and pertinent educational resources. AI is becoming a more and more important aspect of technology, and universities need to adapt to this quickly changing environment. It is necessary to teach students the fundamental concepts and vocabulary of AI in order to equip them for the industry, which will unavoidably use AI [5]. AI is thought to be able to help universities fulfill their duty to offer all students an equal education. In view of the recent "AI paradigmatic shift," university curricula and instructional approaches need to be changed.

In AI, the generative adversarial network (GAN) is one of the most potent generative models. Two neural networks, such as a filter and a generator, play an arcade game together to form a GAN. While the discriminator's goal is to distinguish between the created samples and actual data, the generator gains the ability to produce realistic data examples [6]. The interaction of the two networks causes the generator to produce sample data that are more and more compelling. Within the field

of processing natural languages, generative models, such as the transformers construction, have proven to be quite effective in producing text that is both cohesive and pertinent to the environment.

Since the field of generative AI is developing at an astounding rate, the suggestions that follow regarding the advantages of generative AI for instructors will need to be updated on a regular basis. But it should be clear that significant productivity increases are achievable if educators understand how to apply generative AI critically. Such as other academic workers, college instructors can employ generative AI for ideation [7]. Prompts can be improved and repeated based on how well the results suit the teacher's needs, producing a variety of ideas in a short amount of time. Notably, GPT-4 especially outperformed humans on a variety of creativity tests, scoring higher than 81% on the Alternate Uses Test and 89% on the Hawthorne Tests of Innovative Thought.

Using a systemic method, this article examines how AI is changing higher education. We create a diagram of the causal loop (CLD) framework that encapsulates the key elements influencing AI change at an HIE [8], the advancements in AI that propel the transformation, and shifts in the labor markets that have an impact on students who graduate. The CLD illustrates the structure of the feedback loop that establishes how value is created in a HEI and how AI reorganizes value production in an HIE. This enables us to comprehend the underlying causal process of a number of HEI-relevant AI effects, including effects on employment, learning, and academic integrity. Our method combines rewards and economic concepts with systems theory.

Three common needs—autonomy, ability, and relatedness—that support the motivational transition from external to intrinsic motivation are identified by several researchers in their seminal contributions to the field of self-determination theory, which is a well-established theory of human drive and well-being [9]. The expectancy-value hypothesis, on the other hand, contends that people's behavior is determined by their value judgments and beliefs about their capacity for success. In light of this, task motivational theory explains how values and beliefs influence an individual's drive to perform a task, which is essential to this knowledge. The substantial impact of task motivation on pupil achievement, participation, and educational results is supported by a large body of literature.

The findings indicated that from 1998 to 2004, there were no papers on AI-supported e-learning or similar topics. Beginning in 2007, there was a noticeable increase in the number of articles on AI-supported e-learning. The majority of these papers discussed intelligent educational platforms that provide feedback regarding students' learning progress. Additionally [10], their study revealed that the number of published articles about education and behavioral theories incorporating AI uses in online higher education was quite small. The overwhelming majority of research articles concerning AI and higher education or online learning comes from the fields of computer science and engineering, with an emphasis on the technological applications of AI in higher education.

3 METHODS AND MATERIALS

3.1 AI's place in higher education

By evaluating data on behavior and performance, identifying potential problem areas, and offering tailored suggestions for development, AI can help educators with personalized learning and educational support. AI tools are used in the development

of adaptive learning systems, which modify the degree of difficulty of tasks and evaluations according to the unique needs and abilities of each student. This allows teachers to accurately assess the educational accomplishments of each student and creates a customized educational environment [11]. In addition, AI offers focused feedback, identifying areas for development and suggesting tactics, assisting students in understanding their abilities and shortcomings, and creating productive study habits. This customized educational experience and specific instruction foster independence, skill, and connection, greatly boosting student support and creating a more productive learning environment.

Through prompt feedback and direction, NLP promotes the growth of mental process skills in students by teaching them time management techniques and learning strategies that will enhance their schooling. AI also aids in the creation of customized lesson plans that take into account the goals, interests, and learning preferences of each student. This keeps students interested and involved, improving academic outcomes. Furthermore, because educational research is changing, AI can stay current with the newest and most efficient teaching and learning tactics and methodologies. As a result, students can use a tailored and successful approach for the best possible learning and performance. In the end, AI has the power to change the way teachers provide individualized instruction and support, enhancing student performance across the board.

In addition, traditional tutoring frequently encounters challenges because of a lack of certified teachers and the need for hourly payments to offer adequate academic support. For example, GPT-4 tackles these challenges by providing timely, thorough explanations and exact responses [12]. NLP-powered chatbots can swiftly respond to simple inquiries about many topics or subjects, increasing accessibility to basic information. But it's crucial to strike a balance between the use of AI technology and human participation in education. Although AI can assist students, the importance of human interaction shouldn't ever be undervalued. Think about the significant effects that empathy and healthy emotional behavior have on students' achievement.

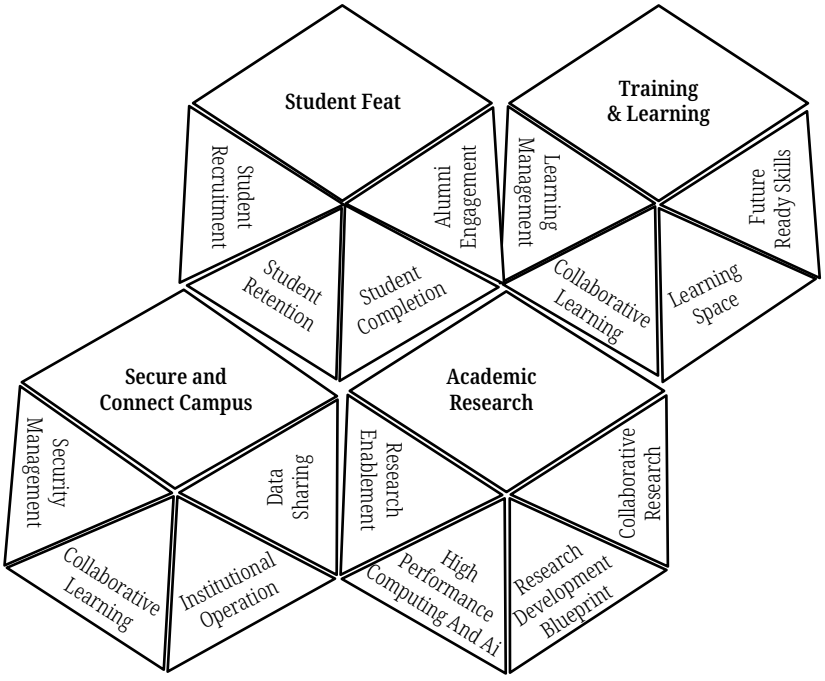

Fig. 2. Higher education using Microsoft's education transformation framework (ETF)

Therefore, when using AI in the classroom, the ideal level of human interaction needs to be identified and included in the lesson design. Teachers can increase pupil retention and overall academic achievement by carefully integrating innovations such as chatbots into classroom environments. This helps students feel connected and at home [13]. Education in general, as well as pharmacy education, is predicted to be significantly impacted by AI technology. Shortly, individualized educational opportunities catered to the requirements, passions, and preferences of every student may become the norm. To fully benefit from this paradigm change in education, teachers need to be open to experimenting with new ideas and accepting technology as a necessary instrument for advancement.

3.2 Higher education using Microsoft's education transformation framework

The traditional method of education has been greatly impacted by mobile learning. It is significant in a broad sense. It not only addressed the serious shortcomings of the time- and space-limited traditional educational model, but it also made learning engaging, allowed students to become more active, and attracted a sizable number of participants to mobile learning. Anyone, anywhere, at any time, can access the world of mobile learning. However, mobile learning is still only at the beginning of its growth. It still has a lot of issues with real-world applications.

- In mobile learning, the system for learning support services is inadequate. The methods are incredibly archaic. Services are subject to numerous restrictions. It isn't proactive, strategic, or focused.
- How to implement test open in mobile education. How to guarantee timely completion, objectivity, impartiality, authority, and science of the assessment.
- There is still more to be desired in terms of the Mobile Learning Network platform and network data query capabilities.
- The fundamental component of mobile learning, mobile learning assets, has not been completely adjusted to its unique features.
- Students don't engage in person; engaged learning in mobile education. One typical issue among students is that data analysis, the company Lenovo, etc., cannot be done manually.

The use of AI technology in mobile learning is imperative given the current circumstances. It is a crucial method for enhancing mobile education.

Intelligent teaching system on a mobile device. An intelligent learning environment can be offered by MITES. It produces an open interactive education system by simulating the cognitive operations of experts and professors and utilizing cutting-edge pedagogies such as AI and mobile media. Through mobile devices, students can access the system's knowledge. The system may adapt its instruction to the expertise, abilities, and preferred learning style of each learner. It can truly realize individualized adaptive instruction and attain the greatest teaching effect. The new educational technology known as MITES is founded on the understanding of educational psychology, integrated AI technology, cognitive science, and thinking science, among other fields. The purpose of MITES is to find a cognitive model of learning, provide individualized adaptive learning to students, and accelerate and improve learning via investigation of the features and procedures of study [14].

Typically, MITES systems possess the following intelligence:

- Has the ability to produce a wide range of workouts and problems automatically.
- Choose the right course material and modify the pace of instruction in accordance with the various learning levels of your students.
- Capable of automatically resolving issues and producing solutions based on comprehension of the lesson's material.
- Possess the ability to generate and comprehend natural language in order to improve the initiative of human-computer interaction and to obtain reasonably free answers and questions regarding the system.
- Possesses the ability to clarify the material being taught.
- Able to identify mistakes made by students, analyze the reasons behind them, and implement remedial actions.
- Can assess how students behave.
- Is it possible to consistently enhance the methods of instruction?

4 IMPLEMENTATION AND EXPERIMENTAL RESULTS

We undertake a thorough bibliometric analysis exploring the area of GAI in the context of schooling in this part. In order to give a more comprehensive picture of the present status of research and development in this developing sector, we will be looking at a sizable collection of previously published papers and publications that have been pulled from the Scopus database. Our goal is to find important patterns, insights, and implications about the integration of GAI and its effects on learning and instruction in educational contexts through a methodical screening of the research and data analysis. This investigation will clarify a number of issues, including the multidisciplinary nature of GAI research, the primary AI tools used, the geographical spread of contributions, and the variety of educational domains in which GAI is applied. By navigating through the results and visualizations, we are able to determine the common uses of GAI tools, such as ChatGPT, in educational contexts, as well as the development path of GAI research and trends in co-occurrence between terms.

We created five different kinds of visualization maps using VOS viewer in order to present a thorough overview of the condition of GAI in educational institutions today. These maps are intended to offer a thorough examination of the subject. The circles on each map stand in for various objects, including terms, researchers [15, 16], and publications. The amount of activity linked with that item is indicated by the dimension of the ring and the typeface used within it. Greater activity is indicated by a bigger circle and a larger letter size, whilst lower activity is suggested by a smaller circle and lesser font size. The diagram's distance between any two items indicates how closely related they are to one another. Stronger correlations are shown by shorter distances, while weaker correlations are indicated by greater distances.

4.1 Data analysis by documents type, fields, GAI tools employed, and investigation types

Further investigation into the field reveals 21 different disciplines in the data set, with Figure 2 displaying the top 10 most common fields. It is important to note that publications belonging to different groups (e.g., academia and colleges and universities) were counted separately.

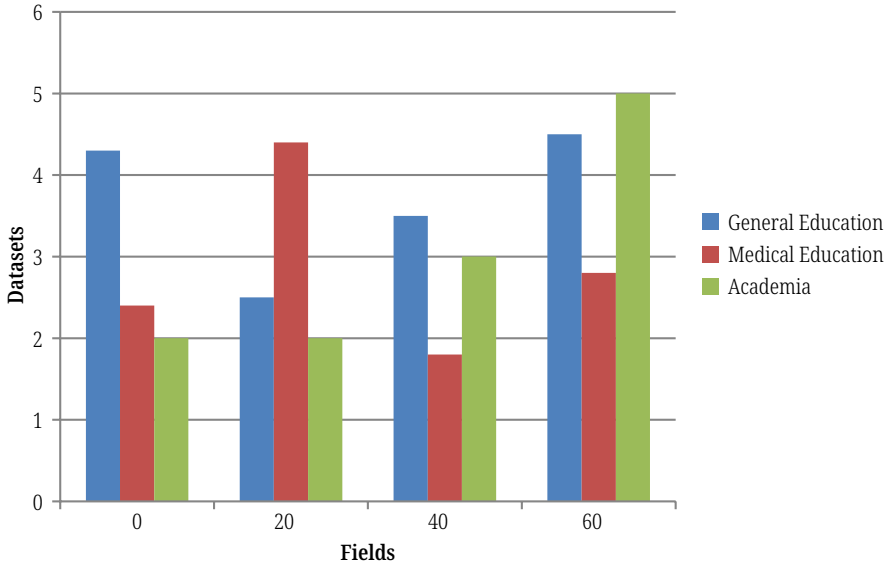

Fig. 3. Events of distinct educational fields

As illustrated in Figure 3, almost all of the articles cover a wide range of subjects and are classified as "general education," with 106 instances. Furthermore, our analysis shows how GAI is incorporated into a variety of academic frameworks in diverse domains. Of particular significance is the large number of papers coming from the medical domain (63 instances), suggesting that GAI is increasingly being used in healthcare and educational environments. Thirteen occurrences are associated with papers relevant to academia, underscoring the significance of GAI in educational studies. Furthermore, in 13, nine, and nine instances, respectively, we saw the intersection of GAI with particular fields, including information technology education, nursing instruction, and education for engineers. The incorporation of GAI in other domains—higher learning and interpersonal education, for example—is also noteworthy. With eight and six instances, respectively, these disciplines demonstrate the technology's versatility and potential across a range of educational contexts.

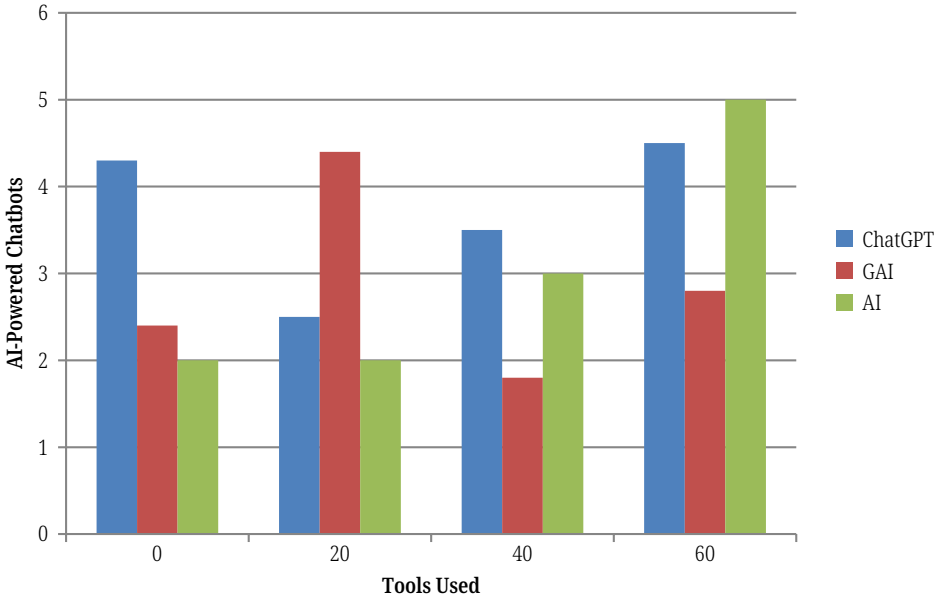

Fig. 4. Events involving tools for artificial intelligence

Next, we carried out an analysis of the AI tools used in every study, which gave us important information about the tool ecosystem in the context of GAI in education (see Figure 4). It is noteworthy that certain articles make use of several AI tools, each of which is logged as a separate event. One particularly notable observation is the prevalence of ChatGPT, which appears 151 times in as many journals. This astounding ubiquity demonstrates how widely accepted and used ChatGPT is in educational settings, demonstrating its effectiveness in producing well-reasoned and contextually appropriate answers for educational purposes.

Although they are less common, AI-powered chatbots such as Blender Bot and LaMDA, as well as AI text generating (AITG), can be found in the collection. A small number of papers discuss tools that convert natural language to code, including GitHub Copilot and Codex. A few times in the data set are BERT, a technique for pre-training language depictions, and Dependent GAN, a kind of GAN that includes the conditional production of images by inference model. Other uncommon tools with few instances are Dehut (AI), an AI-powered academic augmented setting; MACHE—bot, an AI dialogue system; and EDU-AI, a methodology for creating flexible and useful classroom layouts. Additionally, a number of publications describe the methods they used using more broad terminology such as "GAI" and "AI" rather than naming a specific tool.

Next, in order to obtain important insights into the character and scope of the academic research carried out in this area, we described the different kinds of research being conducted in the setting of GAI in education (see Figure 5).

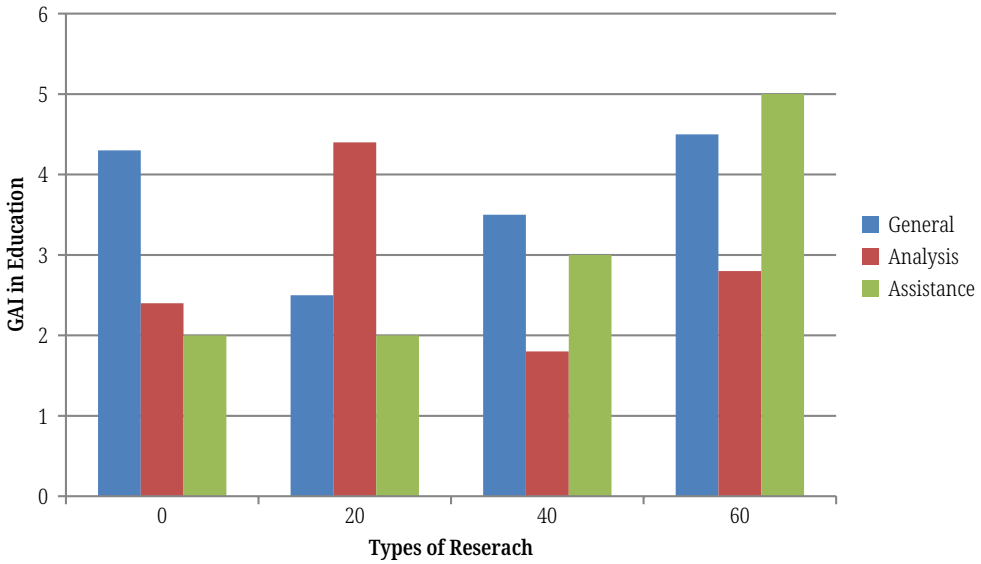

Fig. 5. Types of investigations that are conducted in education

There are 60 examples of the most common research type, "General." This indicates that there are many articles in the field of GAI for education that address a variety of subjects, approaches, and viewpoints. "Analysis" comes in second as the most frequently occurring type behind general papers, with 57 occurrences. As a result, a deeper comprehension of the consequences and uses of GAI is made possible by highlighting the importance of using analytical lenses to examine and evaluate data, designs, or educational circumstances.

With 47 papers, "support" is the third most common type. This emphasizes the importance of research into creating AI systems that assist and direct teachers

or students. It indicates a keen interest in learning more about how GAI can function as an intelligent aide in educational environments [17]. The articles titled "understanding," "educating," and "evaluating" come next, with 31, 28, and 27 instances, respectively. These kinds emphasize the need to look into the ways that GAI may improve and maximize many facets of the processes of instruction and evaluation in educational settings. Furthermore, fewer studies mention the "GAI threats," "tutoring," "discovery," and "communication" categories. These events draw attention to certain areas of interest, such as researching the application of AI systems in tutoring settings, addressing potential concerns related to GAI in schooling, performing research, and evaluating relationship patterns.

5 CONCLUSIONS

The world is changing unevenly. Organizations are expanding logarithmically, education is expanding incrementally, and technology—particularly AI—is expanding at an exponential rate. As a result, there are growing gaps in competence and organization. Technology produces new occupations while eliminating old ones. Universities should give students the ability to swiftly upgrade and acquire new skills because they will not be able to prepare them in preparation for new occupations. By predicting how their work setting and required skills will change and supporting them in the necessary development, AI can help workers keep up with changes. Working with capable and informed individuals whose knowledge base should stay at the institution will be essential due to potential hallucinations and doubts about the accuracy of the information provided by AI. Scholars ought to be the primary source of information.

Furthermore, fewer studies mention the "GAI threats," "tutoring," "discovery," and "communication" categories. These events draw attention to certain areas of interest, such as researching the application of AI systems in tutoring settings, addressing potential concerns related to GAI in schooling, performing research, and evaluating relationship patterns. The incorporation of GAI has a significant positive impact on engineering education as well, enabling students to create creative solutions using sophisticated chatbots and text-generation systems. Social robots and cloud-based frameworks provide interactive learning opportunities, resulting in an efficient and cutting-edge environment for engineering education. Promising uses of GAI are being observed in medical schooling, including public health education, dentistry, medicine, and pharmacy. ChatGPT improves patient care and develops critical thinking abilities in nursing students, which is beneficial for nursing education. The potential of GAI models in reporting, media training, and medical communication is demonstrated in the field of communication education.

The findings highlight the value of teaching students about the ethical and responsible usage of AI and show how successful GAI is at improving translation accuracy. GAI has the potential to be advantageous in several academic domains, including studies utilizing LLMs, AI technology, and natural language processing methods. Moreover, an extensive overview of GAI's broader applicability in the field of education was given in the paragraph on "General Education." The adoption of technology, class design, assessment procedures, language teaching, ethics, subject-specific learning results, student involvement, difficulties integrating AI, and creative pedagogical techniques were all covered in a variety of research publications.

The researchers used ChatGPT and Open Assistant, two generative AI tools, to help generate ideas for this study. They also incorporated pertinent references from

earlier research. According to the authors, this is a morally sound application and edited and refined the content. By employing carefully constructed questions, a systematic examination of the answers, and a rigorous content verification process, the writers can guarantee that every remark in this piece reflects their thoughts and viewpoints. The preparation of the essay has been completed more quickly and efficiently thanks to the use of GenAI techniques.

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