Exploring the Role of Chatbots in Education Systems

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Artificial Intelligence is taking over the education system. Over the past few weeks, Michigan State Students, along with many other students across America have heard of or have used Artificial Intelligence (AI) in the classroom. Artificial intelligence is the use of computerized machines used to simulate human-like responses by receiving information and outputting information. Recently, AI has been integrated into platforms such as ChatGPT, Grammarly, and Google which has, in turn, created a new annex in monitoring education and research organizations. Furthermore, the use of AI in education is fairly new but has spread through the nation like wildfire.

In this research essay, I will dive deeper into how AI has positively and negatively impacted the education system. I would like to touch on topics such as Integration: how to use AI effectively to further your research, Regulation: If we use AI in our learning, how can we monitor and regulate using computer-generated ideas, and finally Boundaries: Is AI limitless? Does AI know right from wrong ethically and subjectively? I can use relevant literature to gain an understanding of how AI is currently used in education systems and I can do my own research integrating AI into my studies. This year, ⅘ of my classes have put information about AI in their syllabus, and there has already been an informational email sent out to the student body. Artificial Intelligence not only presents challenges but also boundless opportunities for making a more innovative, responsible, and ethical education.

Literature Review

Introduction

Today, Artificial Intelligence (AI) is extremely common in most web-based platforms. Over the past couple of years, many students, and educators across America have heard of or

have used Artificial Intelligence (AI) implementation in the classroom. Artificial intelligence is the use of computerized machines used to simulate human-like responses by receiving information and outputting information (Eguchi et al. 2021). Recently, AI has been integrated into platforms such as ChatGPT, which has, in turn, created a new annex in monitoring education and research organizations. It is good to note that the use of AI in education is fairly new, but has spread through the nation like wildfire. This literature review will dive deep into how AI positively and negatively impacts the education system and how it will lay the framework for future curricula. Hence, this literature review will further the understanding of how AI is currently used in education systems and how Artificial Intelligence not only presents challenges but also boundless opportunities for making a more innovative, responsible, and ethical education.

Summary

To many, Artificial Intelligence is thought of as ‘smart’ generative technology. While AI can be a very useful tool, it is not considered ‘smart’; but simply, extremely good at being told what to do. This idea immediately establishes a role of hierarchy, creating a reliance of humans onto AI. Thus, education systems and workplaces are now faced with a pivotal choice: implement this advanced technology into their work or ban its use. In the study conducted by Rosario et al., both qualitative and secondary research methods were performed using ChatGPT, pointing out the benefits and challenges of using this artificial intelligence. These methods were beneficial because Rosario et al. (2023) was able to devise their research questions specifically for AI and allow the technology to present its ‘own’ response, and use the information gathered from that experiment and relate it to what was already known in earlier studies.

Many positive opportunities for education have been revealed through AI, for example, platforms such as ChatGPT have broken down language barriers that stand between some international students and educators by providing grammar and spelling assistance (Rosario et al. 2023). This secondary research was gathered through several studies, and continues to suggest how AI can help with communication as a whole and not only put a focus on international education, but also students with reading disabilities such as dyslexia. Likewise, this remote accessibility allows for fully interactive assistance at any time of day. After analysis of this study, research showed that there are many opportunities for implementing AI into education systems. However, many challenges such as plagiarism and misuse of information could possibly follow; ChatGPT was able to provide new insights for this through the Q/A qualitative research (Rosario et al. 2023). Despite these challenges, future studies are needed to gain insight on how to use and regulate AI before its integration into schools and universities.

Common Research Methods

Most research on Artificial Intelligence in the education system uses qualitative research methods; for example, several recent studies used this method through the form of surveys to identify personal concerns about the integration of AI in education by asking loose-ended questions (Cecilia 2023). In the study, both students and teachers were unsure of the definition of ‘cheating’ when it comes to AI; although inefficient, the collective thought after the survey was to place students in a controlled environment or give a written/oral exam to try and lower the opportunity for academic misconduct until future policies are established (Cecilia 2023).

Relying primarily on qualitative research design may create bias in the conclusions drawn from the study, so this academic journal conducts quantitative research as well. The study addresses both the strengths and weaknesses that future students and teachers might face.

Additionally, the quantitative research provided feedback on the preexisting knowledge of AI was very low for students and educators (Cecilia 2023). This means that there is a lot of information out there that is still yet to have been unpacked that could potentially provide optimal benefits for them.

Through the collection of cross-sectional design while using quantitative research, studies show that the implementation of emerging technologies within the K-12 system are exponentially growing (Van Mechelen 2023). The study took record of existing schools qualifying in the K-12 group and tracked their introduction of new technology curricula throughout 10 years. The jump was astonishing, clearly showing that in the years 2019-2020 new technological learning objectives were introduced related to the creation of AI. The societal implications of Artificial Intelligence show the rate of growth within the education system is not equivalent to the rate of growth within policy and regulation; leaving room for the previously mentioned challenges such as plagiarism and academic misconduct without regulation.

Common Findings

There are many ways to approach the research question, can ChatGPT be used to benefit research opportunities, and are education systems prepared to incorporate AI into their teachings? One key concept that will be discussed include the reliability of the research. Huh et al. (2023) suggested that researchers must be prepared to face false information given by generative AI because of its inability to obtain information without being ‘told what to do’. The use of this AI within an academic context cannot be used as a source because it is not an author, leaving a gray area in the ethics of using AI for informational writing (Huh et al. 2023).

Another concept that would be incorporated in the research study is bias. In today’s world politics are on the forefront of most people's minds, and with the topic of Artificial Intelligence

on the rise, keeping this proposal unbiased will be a challenge. Furthermore, due to the increasing implementations of AI in education systems, debates have arised that disapprove of the possible automation of teachers practices (Bergviken Rensfeldt & Rham 2022). This concern has not only made an impact on the educational labor, but workforces as a whole because of the inevitable growth of Artificial Intelligence in everyday jobs.

Summary

To summarize the analysis of the empirical articles many advantages and disadvantages regarding the use of AI in education have been discovered. Studies show that Generative AI can suggest that AI will take over more simple tasks and leave the more complex tasks for the human researcher (Rosario et al. 2023). For example, one study found that AI is capable of sifting through an extensive amount of research information and in turn, suggest possible research directions from the given data set (Rosario et al. 2023). Therefore, educators and students should consider how the use of generative AI may be useful, but keep in mind that there could potentially be challenges faced along the way.

Another study adds that AI has revealed high concern and risks of harmful social impacts through the spread of misinformation originating from AI. The use of fake images/news articles can be made by ChatGPT “hallucination” (Jisu et al. 2023). Furthermore, the use of AI in an educational system must be highly monitored and regulated in order to prevent the spread of false information in an academic space. Although many challenges have been introduced with the use of Artificial Intelligence, researchers are just scraping the surface compared to what is to come if we continue to use emerging technologies at the rate we are.

In conclusion, this literature review covers many topics regarding advantages AI can bring to education systems, such as efficiency and thought mapping, but also touches on harmful

challenges such as academic misconduct along with social and ethical concerns. This review continues to emphasize the importance of continuing research and regulation of generative AI. In further research a beneficial aspect to cover could be the use of focus groups as a research method to further an understanding of AI and the baggage that comes with using it.

Research Design

Method Introduction

Effective, efficient, and easy to use. These are the words many university students are using to describe Artificial Intelligence (AI) in the context of a support system for coursework. AI has been defined in many different ways, but simply put, Artificial Intelligence is the use of computerized machines to simulate human-like responses by receiving information and outputting information (Eguchi et al. 2021). Therefore, this proposal will break down the research method of surveys to solve the question: What impact does ChatGPT have on a student's education, and what are the long-term effects associated with its implementation?

The implementation of surveys in this research enables direct feedback from the people affected, students and teachers, and can plainly reflect the behaviors of the respondents (Cozby, 2019, p. 127). Although surveys will be very helpful in solving this question, it is important to note the advantages and disadvantages of them. Some advantages of surveys may include well-organized/unbiased answers to questions, being structured in many different ways, and being a great way to implement sample generalizability (Campos, 2023). Even though the advantages of surveys are very strong, being able to understand the disadvantages can create a better form of research. Some disadvantages of this research method include unresponsiveness to surveys, poor measurement, and sampling errors (Campos, 2023). In order to mitigate these

disadvantages, this research proposal will identify the procedures and measurement techniques to allow for an adequate conclusion to be made regarding the use of AI in education systems.

Method Comparison

Both experiments and surveys are powerful methods used when gathering research. In a recent study by Kamarudin et al. (2022), an experiment was conducted to monitor the mental health of students who took a coding course and learned AI versus students who just took the coding course. According to the textbook, by Cozby (2019) surveys can open up issues such as double-barreled and loaded questions that can hold one or more answers or bias, whereas in the experiment previously mentioned, the quantitative data is clear and concise. Aside from the drawbacks, the benefits of using surveys to conduct research allow for both quantitative and qualitative responses. For example, when using close-ended questions there is a limited number of responses available for a respondent to select. In this case, a quantitative distinction is provided to help further a more analytical response (Cozby, 2019).

Modality

When conducting a survey, it is good to note that there is more than one way to go about collecting the data presented. In this particular study regarding the impact of generative AI on students, the data will be collected online. The first reason supporting the decision to administer online surveys is that the data collection and design will be much easier to organize. The survey could be made through Google Forms and the responses then could easily be exported to an Excel sheet for further examination. Another reason to support the use of online surveys is the capability to reach such a vast group of respondents to combat the unresponsiveness of some participants. However, this benefit may also lead to the drawbacks of online use; according to Cosby (2019), many online survey databases are so large that it can be hard to find suitable

samples. To prevent this issue, the surveys will be given to select groups of people that fit within the sample population, possibly using the research tool Prime Panels to filter the niche characteristics of participants.

Sampling Introduction

The research that will be conducted is based on the effects artificial intelligence has on students and education systems. In order to get an accurate representation of students in a diverse population stratified random sampling will be used. Therefore, students will be broken up into stratum (subgroups) based on age, race, gender identity, and education level. Then, the random selection will occur by placing representatives of each group into a proportionate sample - providing dependencies based on the size of the population.

Many advantages are associated with the use of stratified sampling. For example, examining a stratified sample allows for the inclusivity of diverse respondents to relieve biases, gives the opportunity to compare and contrast differing subgroups, and creates a visualization of the target population with minimal error (Cosby, 2019). These advantages will create a smooth data analysis at the end of the collection. Unfortunately, Cosby (2019) also states that time and money can sometimes outweigh the benefits of dividing these subgroups. However, due to the highly diverse population, the use of stratified sampling will offer an easier format to analyze the data at the end of the study.

Sampling Comparison

It is likely that Artificial Intelligence will continue to grow causing questions of its limits. The Human-Centric Intelligent Systems conducted a survey regarding the overview use of explainable Artificial Intelligence (XAI) across different specific areas of expertise nation-wide, while utilizing the cluster sample technique (Yang et al., 2023, p. 163). Due to the vastness of

this survey, this research was broken down based on job categories nation-wide. The research of Yang et al. (2023) compared the different approaches to AI through questionnaires and case studies. Additionally, a Cluster Sample is beneficial in this sense because it represents the behaviors and opinions of the respondents at large scales (Campos, 2023). However, some drawbacks are related to the use of such a large sample population, such as Random and Systematic Errors that may occur due to random selection techniques within a population and non-random factors that may be aligned with the structure of the survey (Campos, 2023). The research conducted in this study, regarding the impact of AI on students and education systems will minimize this error by having a smaller stratified sample population.

Procedures

Sampling and Recruitment

Artificial Intelligence specifically at Michigan State University is growing, and conversations that include AI in coursework between students and staff are overwhelming. In order to maximize the number of respondents to this survey, the research team will develop promotional materials online that advertise the research. In the effort to maximize participation, the use of incentives will be necessary. For example, the research team could work with willing universities to offer extra credit or volunteer hours through SONA for participating in the online survey. This will be helpful because the target population includes very busy students and teachers who may not have the time in their day to fill out a survey on their own time without an incentive.

The stratified sample technique will separate the participants into subgroups starting with students and teachers. Then, the participants would be organized even further regarding age, race, gender identity, and education level. This separation will be part of the questionnaire at the

beginning of the survey. Finally, the online survey will compile the information collected and organize it into a readable format. The responses will be gathered over 16 weeks, which is about a semester length. To reduce this, each participant will be able to respond to the survey only once. After 16 weeks, the research will be reviewed and updates will take place on how to lessen any errors before conducting another survey using the Test-Retest Method.

Measures

To effectively consider the reliability and validity of this survey, the research will utilize four specific measures. The first measure used will be the implementation of the Test-Retest Method. Therefore, the respondents will be asked to complete the survey on two separate occasions. In efforts to limit respondents' remembering the survey, alternate forms will be used to avoid the possible high correlation (Cosby, 2019. P. 101). This will be beneficial to watch the change in behavior while using AI over time.

In addition to the test-retest reliability, multiple variable scales will be introduced to define the given data from the survey. When complying with the stratified sample technique the use of nominal scales will help divide up the subgroups. These scales will determine, race, major, and gender identity.

Understanding the amount of AI used within their coursework already will be beneficial to monitor across groups. When identifying the use of AI in the classroom the respondent would be asked to rate how often they incorporate AI programs, such as ChatGPT, into their learning. Additionally, this Ratio scale would have questions like, “How often would you describe your use of AI when completing an assignment?” Then, the survey would have the following response options: never, sometimes, often, always.

It will be beneficial to also include Interval scales to measure the population's education level. Due to the fact that this survey will be conducted only on students and educators, there will be no undefined response. According to Cosby (2019), without the lowest value of zero, creating a ratio will not be satisfactory in this context.

Many positive opportunities for education have been revealed through AI, for example, platforms such as ChatGPT have broken down language barriers that stand between some international students and educators by providing grammar and spelling assistance (Michel-Villarreal et al. 2023). This research was gathered through several qualitative interview studies and continues to suggest how AI can help with communication as a whole and not only put a focus on international education but also on students with reading disabilities such as dyslexia. Although this information was useful in understanding the uses of AI, the disadvantages associated with just quantitative work make it difficult to compare and contrast its impacts on a numerical scale.

Ethical Considerations

While conducting this research two ethical concerns need to be monitored, privacy and transparency. When conducting this research some information gathered may be personal to the respondent. The research will try to combat privacy breaches by using secure local-based machines that can be contained in a controlled environment instead of allowing remote surveys from a cloud-based platform. Additionally, transparency and consent are at the forefront of this design setup. The respondent will be given a clear explanation of the survey and questions that may be involved. Finally, the participant will have the opportunity to continue to participate after receiving informed consent, or the opportunity to back out of the study.

Expected Findings

In today's world, Artificial Intelligence is a fast-growing technology, because of this it is important to answer the question: What impact does ChatGPT have on a student's education, and what are the long-term effects associated with its implementation? This proposal suggests that due to students' regular use of AI, education systems will have to shift their attention to ethical issues and implementation of this inevitable tool. I believe this to be true because of my personal experience using AI and my observations made by interacting with my peers. Additionally, I feel that the use of AI on assignments can be very beneficial, but for many reasons, it may bring up concerns. I have already witnessed my own professors talking about ChatGPT in their syllabus and how to cite it on an assignment. My question will help me gain an understanding of what our future with this technology will look like.

Possible Data

In my previous proposal, I mentioned that I want to conduct surveys using many different measures. In this proposal, I will focus on the use of ordinal, nominal and ratio scales. Additionally, I will analyze the ordinal scale questions using the mode central tendency. Median will be useful to help measure the nominal scale value because it will help find the most common answer value. For example, I can use median to help "Rank the following classroom AI technology integrations, with 1 being the most preferred and 4 being the least preferred" and use that to find the answer that half or the population sample agrees with. In addition to ordinal scales, I will use nominal to help categorize the sample group. For example, I could ask the question "Which race or ethnicity best describes you" and use the central tendency mode to identify the most common response. Finally, I will use mode to help me navigate the responses in the ratio scale central tendencies. For example, the survey may contain the question, "How

many hours a week do you currently spend using AI as an educational tool," and in order to analyze this question the value I will use the Mean to help find the average amount of hours spent using AI. Ultimately, these questions will be very helpful in understanding the reasoning behind student use of AI and further contribute to answering my research question.

Visualization Plan

In my opinion, Artificial Intelligence has already made its way into the education system and while the data has not yet been collected, I believe that it would amount to a growth in the use of Chatbots and allow for a clearer direction of how it is used. Therefore, I believe that most students would say that they do use some form of Chatbot in their studies compared to non-students. I also believe that teachers may have a different opinion on how it is used, and bring up more concerns regarding its long-term effects.

In order to analyze the use of AI in the classroom and its effects I will have to evaluate the responses from the survey and make the data readable. First I would use a bar graph in order to distinguish the use of AI in a student group, teacher group, and non-teacher group, and compare the responses over time. This will allow me to see how often it is used and who is using it, and if there has been growth in the past 5 years. In order to evaluate how respondents use Chatbot AI, I will use a histogram to find the most frequent preferred use of AI. Overall, this would aid my use of the mode central tendency and aid me in finding an answer to my research question.

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Appendix: Measurement Instrument

1. **Nominal Scales -**
    a. Which race or ethnicity best describes you?
        i. Caucasian, Black or African-American, Hispanic, Native American, Asian, Other/Prefer not to say.

2. **Ordinal Scale -**
    a. Rank the following classroom AI technology integrations, with 1 being the most preferred and 4 being the least preferred.
        i. The use of AI for translation or disability purposes
        ii. The use of AI for creative thinking help
        iii. The use of AI to correct grammatical errors/critiques on essay writing
        iv. The use of AI as a search engine

3. **Interval Scale -**
    a. On a scale from 1-5, rate your level of confidence in navigating a Chatbot where 1 is not confident and 5 is extremely confident.
        i. Not confident
        ii. Somewhat confident
        iii. Confident
        iv. Very confident
        v. Extremely confident

4. **Ratio Scale -**
    a. How many hours a week do you currently spend using AI as an educational tool?
        i. 0 hours per week
        ii. 1-2 hours per week
        iii. 3-5 hours per week
        iv. 6 or more hours per week