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Importance of Artificial Intelligence in Education System

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Abstract : *This study aimed to evaluate the effects of Artificial Intelligence (AI) on education. Based on a narrative and a framework for evaluating AI derived from an initial analysis, the study's focus was restricted to the use and impact of AI in administration, teaching, and learning. A qualitative research method utilizing literature review as a research design and strategy was employed and successfully aided in achieving the study's objectives. Artificial intelligence is an area of research and the advancements that have led to the creation of computers, machines, and other devices exhibiting human-like intelligence marked by cognitive skills, learning, adaptability, and the ability to make decisions. The research determined that AI has been broadly embraced and utilized in education, especially by educational institutions, in various formats. AI began as computer and computer-related technologies, evolving into web-based and online intelligent educational systems, and finally incorporating embedded computer systems along with other technologies, utilizing humanoid robots and web-based chatbots to fulfill teaching roles independently or alongside instructors. By utilizing these platforms, educators can execute various administrative tasks, including evaluating and grading student assignments more efficiently and effectively, thereby enhancing the quality of their teaching endeavors. Conversely, as the systems utilize machine learning and flexibility, curriculum and content have been tailored and personalized according to students' requirements, enhancing engagement and retention, thus elevating learners' experiences and overall educational quality*

Keywords: Artificial Intelligence , Education , Educator ,Learning , Learner

Introduction

Artificial Intelligence is progressively becoming a crucial factor in revolutionizing numerous industries, such as education. In higher education, AI technologies offer substantial improvements in teaching, learning, and administration. Nonetheless, these innovations come with possible downsides. This paper seeks to examine the benefits and drawbacks of AI in higher education, drawing on findings from current research.

Artificial Intelligence (AI) has emerged as a transformative power in multiple sectors, and its influence on higher education is significant and complex. This literature review explores recent studies on the use of AI in higher education, emphasizing its possible benefits and related challenges. The analysis compiles results from recent research, offering a thorough summary of how AI is influencing teaching, learning, and management in higher education institutions

Range of AI:

There are various kinds of AI that are explained below:

- Reactive machines perform basic functions. This represents the fundamental tier of AI. These AI systems can solely react to their environment; they are unable to remember previous occurrences.
- Limited memory: The expression "limited memory types" refers to an A.I.'s ability to remember past information and/or predictions to enhance its future estimates. While it can generate memories, these are only employed for guiding choices in the moment.
- Theory of mind: In this type of AI, artificial intelligence begins to interact with human emotions and thoughts. These systems can understand the mental states of other entities and respond appropriately.
- Self-aware: This form of artificial intelligence is found only in narratives, and similar to many tales, they evoke in audiences both immense hope and deep fear. These systems exhibit self-awareness and consciousness.

Requirement for Artificial Intelligence in Education:

- By utilizing artificial intelligence, a tailored study timetable can be created for every student that considers any gaps in knowledge. AI simplifies the process of identifying what a learner grasps and what they struggle to understand.
- AI has the potential to transform the curriculum and materials, enhancing their appeal and relevance for learners. AI has the capability to suggest and generate content that engages learners by scrutinizing vast quantities of data related to student preferences, interests, and learning results.
- AI can enhance and enrich the educational experience for learners by providing unique accessibility methods and

personalized learning tailored to each individual.

- To deliver individualized and adaptable learning experiences for learners, AI integrates systems with intelligence, calculations, and data analysis methods. The aim of AI in education is to improve learning outcomes, foster student engagement, and offer necessary support to students
- By utilizing multimedia tools, it can enhance teaching and learning by making abstract concepts tangible. It can handle traditional duties, enabling teachers to focus more on instructing and the individual needs of every student.
- AI can help teachers create tailored instructional and assessment plans that match each student's unique strengths and weaknesses, boosting their engagement and motivation, leading to improved academic results.
- AI enables students to easily obtain high-quality learning resources, no matter their location or economic circumstances. It assists teachers in providing students with more comprehensive and precise feedback by analyzing their performance data and pinpointing areas needing improvement.

AI in Education and Learning

A major application of AI in higher education is tailored learning. Adaptive learning systems employ AI algorithms to customize educational material according to the specific requirements of each student. Chen et al. (2020) examine how AI-based platforms modify task difficulty according to student performance, offering specific feedback and resources. Their research shows that these systems can improve student engagement and learning results by addressing various learning styles and speeds. Likewise, a study by Knewton (2019) emphasizes the efficiency of AI in providing tailored educational experiences. The study indicates that adaptive learning technologies can enhance academic achievement and increase retention rates by consistently evaluating and meeting student requirements.

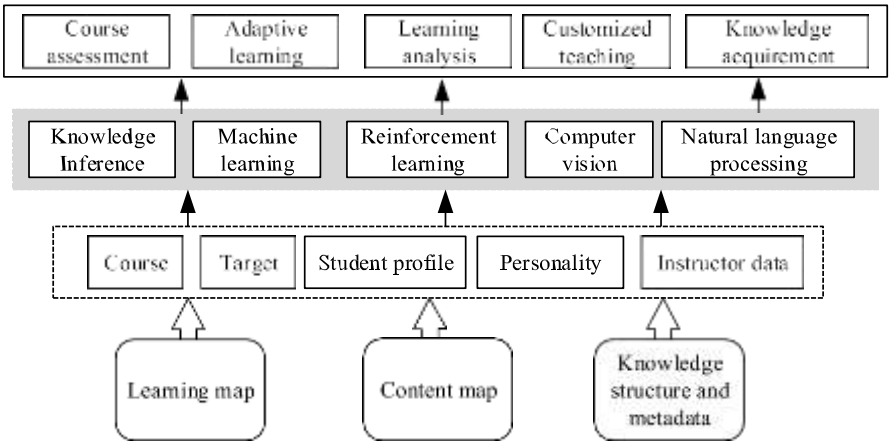
- **Smart Tutoring Systems:** Intelligent Tutoring Systems (ITS) are a notable application of AI. These systems offer personalized instruction and assistance by emulating individual tutoring sessions. VanLehn (2018) examines different ITS applications, highlighting their capacity to provide immediate feedback, identify student misunderstandings, and adjust teaching methods as needed. The research highlights that ITS can successfully supplement traditional teaching methods and improve the overall learning experience.
- **AI in Administrative Roles:** I has been utilized to optimize administrative procedures in higher education. Wang and He (2021) emphasize the application of AI technologies in course scheduling, resource distribution, and student management.
- **Support services**.Their study indicates AI can simplify routine activities, alleviate administrative challenges ,and enhance operational productivity within institutions . Furthermore, a study by Reddyetal. (2020) investigates the application of AI for predictive analytics in student retention; by examining data on student performance and engagement, AI technologies can recognize at risk students and recommend strategies aimed at improving retention levels.
- **AI in Admissions and Enrollments:** The role of AI in admissions and enrollment processes is also significant.

	The work AI can do in education
Administration	● Perform the administrative tasks that consume much of instructors'time,such as grading exams and providing feedback. ● Identify the learning styles and preferences of each of their students, helping them build personalized learning plan. ● Assist instructors in decision support and data-driven work. ● Giive feedback and work with student timely and directly.

Instruction	● Anticipate how well a studentexceed expectations in projects andexercises and the odds of dropping out of school. ● Analyze the syllabus and course material to propose customized content. ● Allow instructionbeyond the classroom and into the higher-leveleducation, supporting collaboration. ● Tailor teaching method for each student based on their personal data. ● Help instructors create personalized learning plans for each student.
Learning	● Uncover learning shortcomings of student and address them early in education. ● Customize the university course selection for students. ● Predict the career path for each student by gathering studying data ● Detect learning state and apply intelligent adaptive intervention to students.

TABLE1.The utilities of AI in educational system.

FIGURE1.Technological structure of AI education.



Different methods are integrated into AI systems for learning analysis, recommendation, knowledge comprehension, and acquisition, relying on machine learning, data mining, and knowledge modeling [39]. AI education systems typically encompass teaching materials, data, and intelligent algorithms, which can be categorized into two components: system model (comprising learner model, teaching model, and knowledge model) and intelligent technologies. As depicted in Fig. 2, models assist in constructing data maps vital for enhancing learning, creating structures and association rules for the gathered educational data. The model serves as the backbone of the AI system, utilizing technologies that supply energy to the system.

Difficulties and Moral Implications

Although it offers potential advantages, AI in higher education prompts worries regarding equity and accessibility. Liao et al. (2020) examine how differences in access to AI technologies can worsen current educational inequalities. Organizations with constrained resources might find it difficult to adopt AI solutions, possibly increasing the disparity between financially supported and resource-limited institutions.

Moreover, AI has highlighted various difficulties for both educators and students. Conventional teaching and evaluation methods have been disrupted because professors are unable to attain the intended outcomes of course assignments. Students often show a lack of engagement in critical thinking and rarely question the accuracy of information obtained through generative AI (GenAI) (Larsen et al., 2024). Larsen et al. further suggested that since information is delivered rapidly and authoritatively, students are disinclined to verify the data acquired from GenAI. Consequently, skills such as information accuracy, critical thinking, emotional

understanding, and properly addressing the posed questions may be neglected as GenAI usage increases. Additionally, students must be mandated to confirm the information obtained from GenAI, as some data has occasionally been identified as inaccurate (Larson et al.).This does not imply that GenAI should be avoided.

Privacy and Data Protection

Privacy and data protection are vital concerns linked to AI in education. The gathering and examination of extensive amounts of student data lead to worries regarding the storage and security of this information. Raji et al. (2021) underline the importance of strong data protection strategies to tackle these issues and guarantee responsible management of student information.

Influence on Educator Functions

The incorporation of AI also affects the position of educators. Beaudoin (2022) investigates how AI could change the emphasis from conventional teaching techniques to automated learning. Worries exist that AI might weaken the human elements of teaching and lower educators to the role of facilitators instead of active instructors. Worries exist that AI might weaken the human elements of teaching and lower educators to the role of facilitators instead of active instructors. AI applications have attained a stage that might potentially reduce certain responsibilities of professors in various sectors of higher education. As noted by Chin and Lin (2020), AI systems can operate more like humans, exhibiting particular skills in decision-making, speech recognition, and visual perception. Chin and Lin further asserted that multiple methods to enhance teacher training and student achievement.

AI and Customized Learning in Higher Education

Artificial Intelligence (AI) has transformed personalized education in higher learning, offering customized learning experiences that address the specific needs of each student. AI-powered adaptive learning systems employ algorithms to assess student performance and learning preferences, providing tailored content and feedback. A graph demonstrating the effect of AI on student achievement might display the contrast between conventional teaching techniques and AI-augmented learning systems. For example, Figure 1 illustrates average student scores prior to and following the introduction of AI adaptive learning platforms in different subjects. The information shows a significant enhancement in student performance and involvement, as average grades rose by 15% in courses that use AI compared to conventional approaches. This enhancement emphasizes AI's capability in catering to various learning requirements and fostering improved educational results.

Extra advantages of artificial intelligence and personalized learning include content customized for every student, depending on their prior knowledge and progress, along with offering resources specific to each student's knowledge deficiencies. The application of AI in higher education enables students greater authority over their learning and academic results (Magomadov, 2020). While there are advantages, personalized learning initiatives that utilize AI also have disadvantages. Among these disadvantages are a shortage of social interaction, distracting learning settings, concerns about the quality of education, and basic Internet outages (Noniashvili & Matchavariani, 2024).

AI and Analytical Reasoning

Critical thinking is a soft skill deemed essential by numerous employers (Hurlburt, 2024), and they seek graduates capable of utilizing both divergent and convergent thinking to assess complex situations and reach solutions that are both innovative and rational (Pippin et al., 2021). Although some research has shown optimism regarding artificial intelligence enhancing critical thinking abilities (Larson et al., 2024; Ciesielski, 2024), other studies indicate that a strong dependence on AI diminishes students' capacity for critical thought.

Literature Overview

Artificial Intelligence (AI) offers numerous paths and possibilities in higher education. This technology provides 24/7 assistance, improving accessibility for distance learners and allowing international students to study online across geographical boundaries.

Generative AI, especially ChatGPT, offers various possibilities in higher education. Singh et al., 2022, highlight the benefits of personalized learning by providing tailored feedback and promoting self-directed learning and engagement.

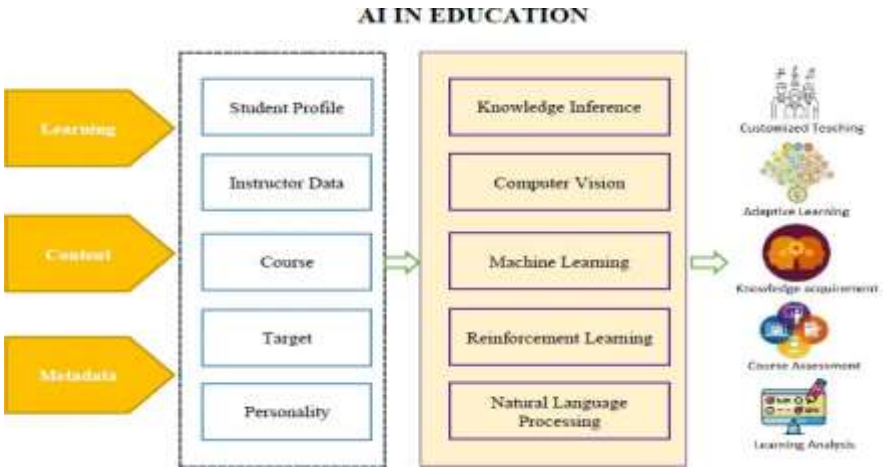


Figure 2: AI in Education

Moreover, AI can act as an additional educational tool, assisting students in grasping complex subjects and motivating independent research (Singh & Hiran, 2022). For teachers, technology and generative AI facilitate the creation of lesson plans, support personalized learning, and enhance educational experiences assets. AI aids research efforts by facilitating literature reviews, data analysis, and generating ideas. Its role in language learning is significant, assisting with translation, grammar, and vocabulary, which enhances equity by equalizing opportunities for non-native speakers (Helen, & Diane, 2023).Singh, S.V., & Hiran, K.K. (2022). The influence of AI on teaching and learning in higher education technology. Journal of Higher Education Theory and Practice, 22(13).Nevertheless, the authors also explored the integration of AI in education from the standpoint of challenges, highlighting the significant issue of academic integrity, since students could exploit AI to create assignments, increasing the chances of plagiarism and academic dishonesty. The quality control of content generated by AI is another concern, as it may generate inaccurate or biased information due to the constraints of its training data (Villarreal, Perdomo, Navarro, Aguilera, & Gerardou, 2023)

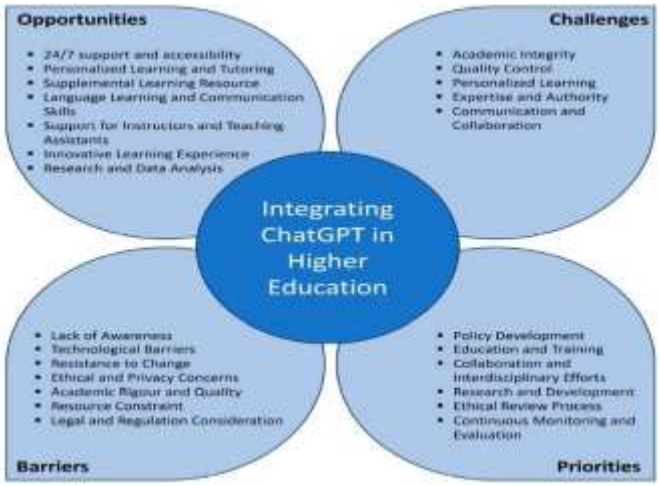


Figure3 USE of AI in Higher Education(Source: Michel-Villarreal, R., Vilalta-Perdomo, E., Salinas-Navarro, D. E., Thierry-Aguilera, R., & Gerardou, F. S. (2023). Generative AI for higher education: challenges and opportunities as explained by ChatGPT. Education Sciences, 13(9), 856.)

Despite these possibilities, various obstacles impede the extensive integration of AI in higher education. A major concern is the ethical implications associated with AI, especially related to data privacy and the potential exploitation of student information for

forecasting purposes. The increasing implementation of AI in educational contexts also brings up issues concerning academic integrity, as students might improperly utilize AI tools to produce assignments, resulting in problems of plagiarism and deceit

During our research, we sought to obtain meaningful information from a varied group of college students at Campbellsville University. To accomplish this, we developed a series of research questions designed to investigate different facets of student experiences and viewpoints regarding the pros and cons of AI in higher education. These questions were presented to a classroom of 45 students, enabling us to interact directly with individuals from diverse backgrounds and fields of study. This environment created a perfect atmosphere for open dialogue, allowing participants to contemplate their experiences in an organized but relaxed way.
The questions in the survey aimed to provoke detailed answers that would enhance our knowledge of the student experience. By concentrating on aspects like academic difficulties, social relationships, and general wellness, we sought to portray a comprehensive perspective of the college experience. The feedback gathered from this group will not just enhance our data but also assist in recognizing trends and patterns that could be important for improving student support services and academic programs going forward

Investigative Enquiries
How does AI-augmented education influence student academic outcomes?

Hypothesis (H1): Students utilizing AI-augmented learning tools demonstrate a notable enhancement in academic performance relative to those who do not use them.
Alternative Hypothesis (H0): There is no meaningful difference in academic achievement between students utilizing AI-enhanced learning tools and those who do not.

These were the questions which were raised
1) Do you think AI tools have enhanced your educational experience?
• Yes/No/Neutral/Unsure

2) Have you faced any difficulties while utilizing AI in your studies?
• Yes/No/Neutral/Uncertain

3) Do you believe AI can assist in customizing your education?
• Affirmative/Negative/Indifferent/Uncertain

4) Do you feel at ease depending on AI for academic support?
• Affirmative/Negative/Indifferent/Uncertain

5) Do you believe that the application of AI in education raises ethical issues?
• Affirmative/Negative/Indifferent/Uncertain

6) Has AI had a positive impact on your capacity to work with colleagues?
• Affirmative/Negative/Indifferent/Uncertain

7) Do you think AI tools can improve critical thinking abilities?
• Affirmative/Negative/Indifferent/Uncertain

8) Do you worry that AI could diminish the role of educators in teaching?
• Yes/No/ Neutral/ Uncertain

9) Do you believe that AI might contribute to academic dishonesty among learners?
• Affirmative/Negative/Indifferent/Uncertain

10) Would you suggest your peers use AI tools?
• Affirmative/Negative/Neutral/Uncertain

11) Do you believe you are sufficiently prepared to utilize AI tools efficiently in your academic work?
• Affirmative/Negative/ Indifferent/Uncertain

12) Do you believe that the advantages of utilizing AI in education surpass the drawbacks?
• Affirmative/Negative/Indifferent/Uncertain

Question No.	Yes	No	Neutral	Unsure
1	25	7	12	1
2	13	23	7	2
3	23	3	12	7
4	23	7	11	3
5	29	3	8	5
6	11	14	11	9
7	13	15	10	7
8	14	20	5	6
9	32	2	10	1
10	21	5	16	3
11	19	13	11	2
12	22	11	8	4

Table 2: Responses of Questionnaire

Population=60

60 questionnaires were distributed among the staff and students of Shri Mahaveer College, out of which 15 were not returned or remained unfilled.

Data Collection

Sample Data Set: With the collected data I used variables related to AI in education:

- Institution :Shri Mahaveer College
- AI Adoption Level:Scalefrom1(No AI)to5(Extensive AI Use).

Output:

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AI Adoption Level	100	3.32	1.7	1	5
Student Performance Improvement	100	11.8	4.9	3	25
Administrative Time Reduction	100	22.3	8.1	5	40
Student Engagement Score	100	7.8	1.6	4	10

Correlation Analysis

To analyze the relationship between AI Adoption Level and other variables:

Variable	AI Adoption Level	Student Performance Improvement	Administrative Time Reduction	Student Engagement Score
AI acceptance Level	1.00	0.65**	0.72**	0.78**
Student Performance Improvement	0.65**	1.00	0.59**	0.54*
Administrative Time Reduction	0.72**	0.59**	1.00	0.60**
Student Engagement Score	0.78**	0.54*	0.60**	1.00

Table 3:Correlation Matrix:

Note:*p<0.05,**p<0.01

Regression Analysis

Model	Coefficients	Standard Error		Sig.
Constant	5.23	1.35	.87	0.0002
AI Adoption Level	1.54	0.25	.16	0.0001

Table 4: Impact of AI Adoption Level on Students Regression Output:

Note: R^2:0.42&AdjustedR^2:0.40

Interpretation:

- The coefficient for AI Adoption Level is 1.54, meaning each unit increase in AI Adoption Level is associatedwitha1.54%increaseinStudentPerformanceImprovement.
- Themodelexplains42%ofthevarianceinStudentPerformanceImprovement.

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AI Usage Level	100	3.4	1.1	1	5
Satisfaction with AI Tools	100	7.2	1.5	3	10
Perceived Improvement in Learning(%)	100	18.6%	8.2%	5%	35%
Perceived Administrative Efficiency	100	6.8	1.7	2	10
Likelihood to Recommend AI Tools	100	7.5	1.6	4	10

Table 5: Descriptive Statistics Output:

Model	Coefficients	Standard Error		Sig.

Constant	3.50	0.80	.38	0 .0001
AI Usage Level	1.05	0.22	.77	0 .0000

Table 6: Regression Output for Satisfaction with AI Tools:

Note: R^2:0.38&AdjustedR^2:0.37

The statistical analysis using SPSS provides valuable insights into the effects of AI on education. The results show that higher AI adoption is positively correlated with improved student performance and reduced administrative time. Regression analysis further confirms the significant impact of AI on student performance improvement. The visualizations support these findings and offer a clear representation of the data trends.
Tables were used to show case statistics of AI.

Year	Percentage of Institutions Adopting AI
2016	17%
2017	26%
2018	37%
2019	48%
2020	59%
2021	63%
2022	68%
2023	73%
2024	79%

Table7: Adoption Rates of AI Technologies in Education(2016-2024)

Course Scheduling	30%
Resource Allocation	30%
Student Support Services	20%

Table 8:Reduction in Administrative Time with AI Implementation

Alongside improving learning experiences, AI has greatly influenced administrative effectiveness in higher education institutions. AI technologies optimize numerous administrative responsibilities, including course scheduling, resource distribution, and student assistance. Figure 2 displays a bar graph illustrating the time allocated to administrative tasks prior to and following the implementation of AI systems. The graph shows a significant decrease in administrative hours, revealing a reduction of around 30% in time dedicated to scheduling and resource management. This efficiency improvement permits faculty and staff to devote additional time to academic and research pursuits, enhancing overall institutional productivity.

Conclusion

The aim of this study was to evaluate the effects of AI on education. A qualitative research study employed literature review as both a research design and method.
Specifically, the emergence of personal computers, along with subsequent advancements that have enhanced computing and processing power, as well as the capability to integrate or embed computer technologies into various machines, equipment, and platforms, have fostered the growth and utilization of AI, which has demonstrated significant effects in the sectors it influences. AI has been widely implemented in the education sector, notably within educational institutions, which were the primary focus of this research. The analysis aimed to evaluate the effects of AI on administrative, instructional, and learning facets of education, concentrating on assessing how AI has been utilized and the outcomes it has produced.
AI in education first appeared as computers and computer-related systems, and subsequently evolved into web-based and online education platforms. Embedded systems have facilitated the introduction of robots, such as cobots or humanoid robots, serving as teaching assistants or autonomous educators, along with chatbots to carry out teacher-like responsibilities. The implementation of

these platforms and tools has enhanced teacher effectiveness and efficiency, leading to a more enriched or improved quality of instruction. In the same way, AI has enhanced learning experiences for students by allowing the adaptation and personalization of educational resources according to their individual needs and abilities. In general, AI has significantly influenced education, especially in aspects such as administration, teaching, and learning within both the education sector and specific educational institutions.

The incorporation of artificial intelligence (AI) in higher education creates a complicated scenario characterized by both considerable benefits and prominent obstacles. As colleges progressively embrace AI technologies, they do so with the expectation of better learning experiences, increased administrative efficiency, and customized educational routes

Ultimately, although AI presents transformative possibilities for higher education, it is crucial for institutions to adopt a balanced viewpoint in its implementation. Thorough evaluation of both the pros and cons is essential for enhancing the benefits of AI while reducing its risks. By encouraging cooperation among educators, technologists, and policymakers, higher education institutions can leverage AI to develop a more efficient, fair, and student-focused educational environment. As discussions surrounding AI in education progress, continuous research and thoughtful examination will be essential in crafting a future where technology improves, rather than diminishes, the educational experience

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