

An Exploratory Study of Techno-Pedagogical Skills and Happiness of Prospective Teachers in relation To Generative AI

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Abstract

Generative AI has democratizing the Education field by generating novel learning material from the existing text, audio, or images. It refers to the technology which can be utilized to develop new content in form of unique audio, code, images, text, simulations, and videos. Keeping in mind the importance of Generative AI, the present study is aimed at achieving two main objectives i.e. to investigate the effect of Generative AI on techno-pedagogical skills and to find out the effect of Generative AI on happiness of prospective teachers. A case study also has been conducted to find out the role of Generative AI in teaching-learning process. Single group design with pre-test and posttest is applied for experiment on prospective teachers. Mixed method with qualitative and quantitative method is also followed to study the effect of using Generative AI tools in teaching. The sample of study consists of 30 prospective teachers who have been doing their teaching practice in online mode with the help of Generative AI. The prospective teachers have been studying in Faculty of Education, Dayalbagh Educational Institute, Agra, India. The Institute is selected through purposive sampling and prospective teachers are selected through simple random sampling technique. Self Constructed scale for techno-pedagogical skills and Happiness scale (2017) by R.L. Bhardwaj and P.R. Das. have been applied on the sample to collect the data. After analyzing the data, positive effect of using Generative AI based applications on techno-pedagogical skills and happiness is revealed among Prospective teachers. This study proves that the integration of Generative AI tools is helpful in providing the happiness and techno-pedagogical skills of prospective teachers, so it will give insight to teacher educators and policy makers to provide such opportunities to the prospective teachers which will result in shaping them to adjust in future era of Artificial Intelligence.

Keywords:

Artificial Intelligence, Generative AI, Techno-Pedagogical Skills, Happiness, Prospective Teachers

Introduction

Rapid technological developments have been introduced since 20th century. These developments have changed living and working styles in every sphere of life. Artificial Intelligence is one of them which help to solve major challenges of any work within very less time. AI has revolutionized every field like medical, research, agriculture, business, and teaching-learning process. In this perspective, Generative AI is one of the types of AI and an extraordinarily effective technology. It is a form of digital technology that can generate innovative and realistic visual, textual, and animated content quickly. By learning patterns from the given data, generative AI creates innovative and inimitable outputs. It describes algorithms (such as Chat GPT) that can be applied to develop new and updated content, including audio, code, images, text, simulations, and videos. Lim, W.M. (2023) defined Generative AI as a technology that (i) leverages deep learning models to (ii) generate human-like content (e.g., images, words) in response to (iii) complex and varied prompts (e.g., languages, instructions, questions).

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Applications of Generative AI have ensured less workload for teachers and more academic success for students by providing updated content, automated evaluation system, more interactive and personalized teaching and many more. In this perspective, UNESCO’s mandate asks for a human-centred approach to Artificial Intelligence which aims to address existing inequalities regarding access of information, research, and cultural diversity and ensure that AI is not widening the technological divide within and between countries. It is suggested that “AI for all” must be promised so that everyone can be benefited for innovation and knowledge.

Generative AI and Education

The ways of educating children are changing day by day and advanced technology is playing a significant role in it. Generative AI has created virtual instructors to help students anytime, anywhere and at their own pace. This is very helpful for those students who are facing different problems in learning. Generative AI is a modern technology which can create new and unique content by using machine learning algorithms. Generative AI provides highly realistic, simple as well as complex content with lots of creativity. It can contribute for skill development among learners and address teacher-related challenges also. The students, who have not the facility of traditional classroom education, can take advantage of it. It could also be used to provide adaptive learning experiences which would be adjusted in real time according to the needs and abilities of students. It can be easily done by using generative AI applications to analyze students' learning patterns and their preferences and then adapting the learning material and teaching methods accordingly. Therefore, Generative AI could contribute effectively in teaching-learning process. Main contributions of Generative AI in Education Sector are as follows:

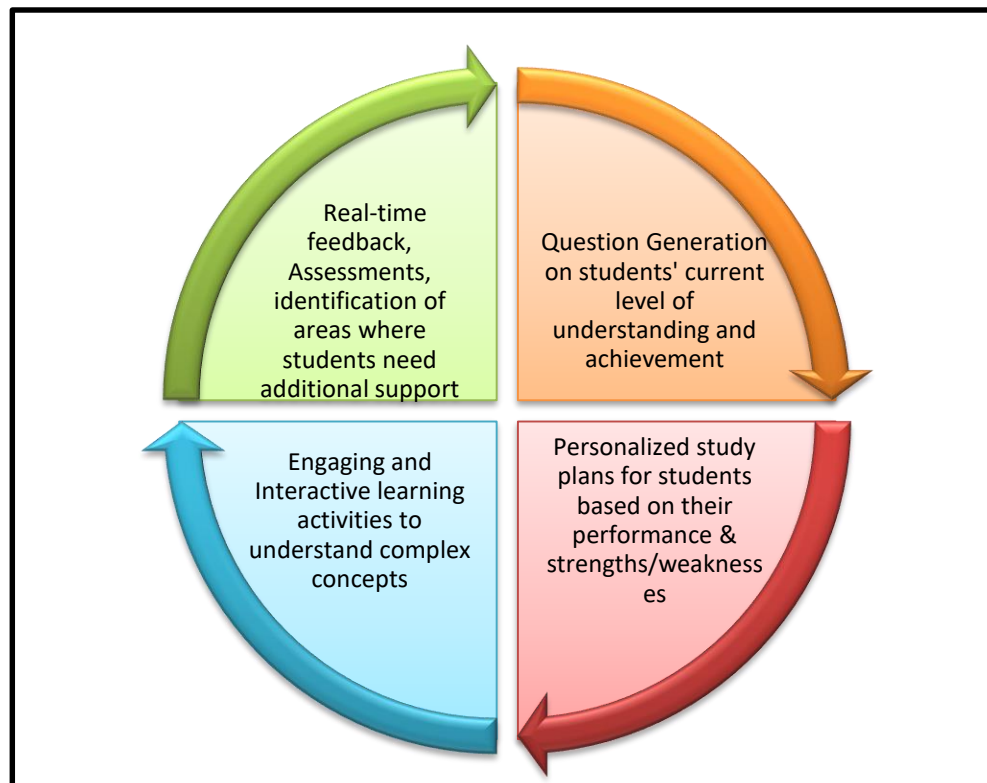


Figure 1: Exhibiting Contributions of Generative AI in Education

Generative AI provides various opportunities to create different forms of learning content and mining the text systematically to learn in an effective way. Generative AI is resolving low quality related issues of content and providing automated systems of learning. There are following applications of Generative AI which are opening the doors for learning in better and interactive way:

Table 1

Exhibiting Application of Generative AI for Learning

S.No.	General Applications	Key Features
1	Visual Applications	<ol style="list-style-type: none"> 1. Image generations 2. Semantic Image to Photo Translation 3. Image to Image Conversion 4. Image Resolution Increase 5. Video Prediction 6. 3D Shape Generation
2	Audio Applications	<ol style="list-style-type: none"> 1. Text-to-Speech Generator 2. Speech-to-Speech Conversion 3. Music Generation
3	Text-based Applications	<ol style="list-style-type: none"> 1. Text Generation 2. Personalized content creation 3. Sentiment analysis / text classification
4	Code-based Applications	<ol style="list-style-type: none"> 1. Code generation 2. Code completion 3. Code review 4. Bug fixing 5. Code refactoring 6. Code style checking
5	Education Applications	<ol style="list-style-type: none"> 1. Personalized lessons 2. Course design 3. Content creation for courses 4. Tutoring 5. Data privacy protection for analytical models 6. Restoring old learning materials
6	Other Applications	<ol style="list-style-type: none"> 1. Conversational AI 2. Data Synthesis

However, extremely challenging tasks are done in singles of minutes with the help of Generative AI and its use in education is revolutionizing the ways of learning in a very simple and interesting manner. The figure 2 shows that how Generative AI contributes for teaching-learning process:

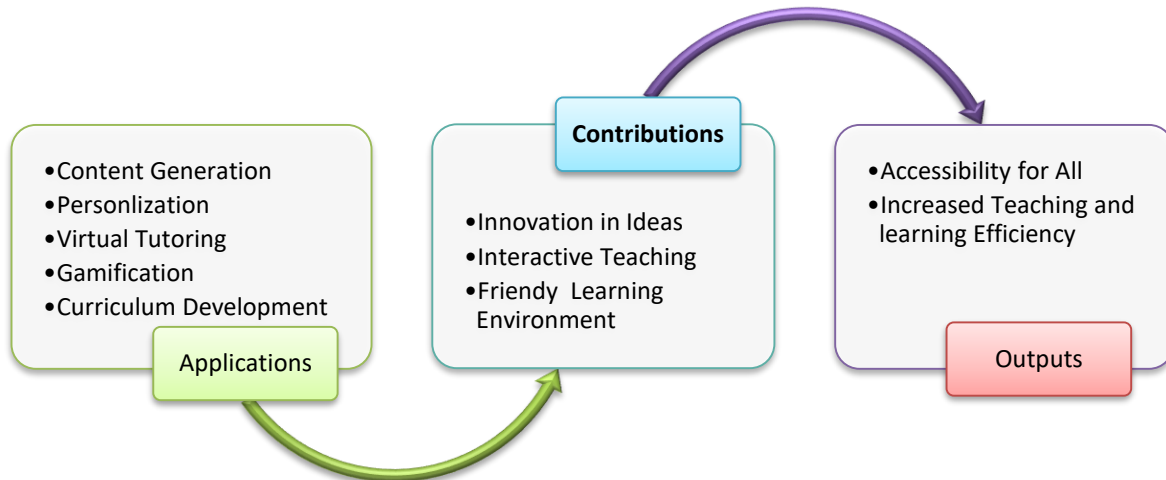


Figure 2. Contributions of Generative AI in Teaching-Learning Process

Therefore, Generative AI could be very helpful for the call of “Education for All, Technology for All and AI for All”.

Techno-Pedagogical Skills

The ability to integrate technology for fulfilling pedagogical objectives and the use of technology in creative manner in classroom activities is referred to as "techno-pedagogy skills." It is a blended or hybrid teaching approach in which information and communication technology (ICT) or electronic resources are applied to the educational process. These abilities effectively direct the educational process. Digital teaching abilities are crucial for converting the traditional learning process in to enjoyable because they will fundamentally alter the teacher's interaction style. Digital pedagogy is helpful in the classroom, and situations like the pandemic have raised the value or necessity of these skills when real set up off line classes are replaced with virtual ones. If a teacher is knowledgeable about the subject, pedagogy, and technology, he/she can maximize the benefits of technology. Knowing about techno-pedagogy can help teachers to use technology and content effectively.

Happiness

Due to the stress and attrition they experience daily, school teachers have become recognized as a group of professionals who are particularly vulnerable to a range of psychological, emotional, and physical issues (Borrelli et al., 2014; Benevene and Fiorilli, 2015). The more focus has been given on teacher's health over the past century (Skaalvik and Skaalvik, 2011). Positive psychology's methodology has demonstrated that dispositional features affect how teachers, and more broadly, individuals, successfully manage the obstacles they must face in the job and survive with anxious events (Xanthopoulou et al., 2007; De Stasio et al., 2017). It is also true that one's own professional experiences and events can have a big impact on one's satisfaction at work. It is also true for prospective teachers because of the complex working of teachers. One of the contributing factors of good student's

performance is effectiveness of teacher and teacher would be effective only if she gets satisfaction in the activities to teaching learning.

The ability to feel like an individual and provide purpose to one's work may have an effect on one's degree of happiness. Interpersonal and intrapersonal communications are recommended by Ginting et al. (2021) as an element that contributed to the high level of satisfaction. These included a good life, independence, and possibilities for knowledge and value exchange. Furthermore, according to Arora (2020), elements affecting a lecturer's happiness include fringe perks, personal growth, job security, remuneration, and social activities. In conclusion, happiness can foster an environment that is conducive to teaching and learning for both students and teachers (Applasamy et al., 2014), which will improve performance for aspiring teachers as well.

A Case study of Generative AI based training of prospective teachers involved in online teaching in Dayalbagh Educational Institute, Agra, India

Dayalbagh Educational Institute is one of the leading institutes in contributing towards nation building by providing quality education with covering the Last, the Least, the Lowest and the Lost. The intensive Teacher Education Program is running with the courses Diploma in Elementary Education, Bachelor of Education, Master of Education and Ph.D. for preparing teachers at all levels. Faculty of Education, Dayalbagh Educational Institute got the status of School of Education(Under the PMMMNMTT Scheme, Government of India) in 2018. Under the School of Education, two centers have been started which are CAIE (Centre of Artificial Intelligence in Education) and CKART (Centre of Knowledge acquisition, Retention and Transformation). CAIE promote the use of Artificial Intelligence in Teaching – Learning process to make it more effective, interesting and efficient. It is also an integral component of teaching through online mode which is the unique feature of DEI’s Teacher Education Program. Four courses based on Artificial Intelligence have been introduced in four years Bachelor of Education Program.

A theory course “Fundamentals of Artificial Intelligence in Education” make the pupil teachers aware about the various areas of AI and its applications in education and the practical course “Applications of AI Tools in Education provide the opportunity to students to practice the AI tools in all aspects of teaching learning. This practical component prepares pupil teachers for facing the various challenges of teaching learning effectively in future life. As AI is the need of today’s scenario, it will be demanding in schools to get teachers who are aware about the applications of AI in Education. DEI has already taken initiative to provide theoretical as well as practical training to prospective teachers about the effective use of AI Tools in making the educational task easy. Many Generative AI tools have been introduced them through practical course which provided hands on experiences for meaningful learning. The major details of the tools are given below:

Table 2

Exhibiting Generative AI Based Tools used in Dayalbagh Educational Institute

Generative AI Based Applications	Functions	Applicability
OZOBOT	Coding And Colour Recognition	Mobile App & Web based
AI:R MATH	Image Processing And Text Recognition	Mobile App & Web based
OTTER.AI	Text Analysis And Speech Authentication	Mobile App & Web based both

COPYLEAKS AI GRADER	Text Analytics & Image Recognition	Web based
SYNTHESIA AI	Text Analysis & AI Video Creator	Web based
PREPAI	Quiz Generation	Web based
WORD CLOUD	Text Analysis	Web based
PYTORCH	Face Recognition, Language Processing	Web based
QUIGECKO	Quiz Generation Tool By AI	Web based
COPYLEAKS	Text Analysis (Plagiarism Detector AI Tool)	Web based
RUNWAY	Text Analysis, Image Processing, Video Creator & Editor, Train Custom Models.	Web based
DOUBTNUT	Text Analysis, Image Recognition	Mobile App & Web based
QUILLBOT	Text Analysis	Web based
CYBERLINK PHOTO DIRECTOR 365	Face And Image Recognition	Web Based
VOICE MAKER	Text Analysis	Web Based
QUILLIONZ	Text Analysis	Web Based
MENTIMETER	Text Analysis	Mobile App
HYPERWRITE	Text Analysis	Web Based
BRAINA CHAT	Speech Recognition	Mobile App & Web Based

After observing the teaching practice in online mode conducted in Dayalbagh Educational Institute, researchers have found that prospective teachers were curious to learn about Generative AI based tools, its functioning and uses in teaching. They applied Generative AI based applications for their teaching practice as an output it is revealed that lecture delivery, classroom interaction, assessment, immediate feedback, classroom environment and relation with students were positively changed. They were happy with the variety of learning material which they created by their own with the use of Generative AI based Applications.

Objectives

1. To examine the effect of Generative AI on Techno-Pedagogical skills of prospective teachers
2. To investigate the effect of Generative AI on Happiness of prospective teachers

Hypotheses

1. There will be a positive effect of Generative AI on Techno-Pedagogical skills of prospective teachers
2. There will be a positive effect of Generative AI on Happiness of prospective teachers

Research Design

One group Pre test - Post test design has been used in the present study.

Table 3
Exhibiting Research Design

Design	Data Collection before Experiment	Experiment	Data Collection after Experiment
Single Group Design 30 Prospective Teachers	Pre-test Self-Constructed Scale for Techno-Pedagogical Skills	Training of Generative AI tools in teaching	Posttest Self-Constructed Scale for Techno-Pedagogical Skills
	Happiness Scale by R.L. Bhardwaj and P.R. Das (2017)		Happiness Scale by R.L. Bhardwaj and P.R. Das (2017)

Research Method

Mixed method of research has been used in the present study with qualitative and quantitative method.

Sampling Technique

This study has been conducted on prospective teachers who have been studying in Faculty of Education, Dayalbagh Educational Institute (Deemed to be University) Agra, Uttar Pradesh, India. The researchers have selected the Institute through purposive sampling technique. The sample of 30 prospective teachers (teaching in online mode) has been done by simple random sampling technique. These prospective teachers were doing Online Internship where they were using different Generative AI based Applications for teaching practice.

Measures- Psychological Tool

This study has three main variables Generative AI, Techno-pedagogical Skills and Happiness. The following tools were used to measure these variables:

1. Various Generative AI tools were incorporated in providing the practical training of teaching to prospective teachers.
2. Researchers have constructed a 5-point rating scale for Techno-Pedagogical Skills for teachers. There were total 40 items under two dimensions i.e. technological skills (20 items) and pedagogical skills (20 items). The rating scale consists of five alternatives i.e. Very Unfamiliar (1), Unfamiliar (2), Some Familiar (3), Familiar (4) and Very Familiar (5). There were only positive items included in this scale. The reliability is tested through Split half method and it is calculated 0.78. For obtaining the Validity, Researchers have checked the content validity which is calculated 0.86.
3. The Happiness of prospective teachers was measured by Happiness scale (2017) developed by R.L. Bhardwaj and P.R. Das.

Statistical Techniques

Mean, standard deviation and t-test has been applied to analyze the data. The data has also been presented through graphical presentation.

Analysis and Interpretation

Objective 1: To examine the effect of Generative AI on techno-pedagogical skills of prospective teachers.

Researchers have applied Mean, Standard Deviation and t-test to find out the effect of Generative AI on techno-pedagogical skills of prospective teachers which is shown in table 1.

Table 4

Effect of Generative AI on Techno-Pedagogical Skills of Prospective Teachers

Analysis	N	Mean	Standard Deviation	t-test	Significance Level
Pre-Test	30	132.76	26.64	4.93	0.01
Post-test	30	165	12.07		

The table 4 presents that the mean value for pre-test and post-test is calculated 132.76 and 165 respectively. The values of standard deviation for pre-test and post-test are obtained 26.64 and 12.07 respectively. After calculating the t-test, the value is found 4.93 which is significant at 0.01 level. It means that the alternative hypothesis that “There will be positive effect of Generative AI on Techno-pedagogical Skills of prospective teachers” is accepted and it can be said that Generative AI contributed positively to the techno-pedagogical skills of prospective teachers. It shows that after using the Generative AI Applications, prospective teachers has gained more techno-pedagogical skills. As a reason of it, it may be said that when prospective teacher were given the exposure of Generative AI for their teaching process, they used various Generative AI based applications and felt that these applications were creating interest among students as well as making their workload less and giving more feasibility. The generative AI based Applications were creating real view of objects and providing different forms of learning content with 3D effect. Therefore, prospective teachers liked to be skilled in techno-pedagogical perspective.

Objective 2: To investigate the effect of Generative AI on Happiness of prospective teachers.

Researchers have applied Mean, Standard Deviation and t-test to find out the effect of Generative AI on Happiness of prospective teachers which is shown in table 2.

Table 5
Effect of Generative AI on Happiness of Prospective Teachers

Analysis	N	Mean	Standard Deviation	t-test	Significance level
Pre-Test	30	65.83	12.04	7.80	0.01
Post-test	30	113.56	13.70		

The table no. 5 reveals the effect of Generative AI on Happiness of prospective teachers. Before giving the exposure of Generative AI Applications, the mean and standard deviation is found 65.83 and 12.04 respectively. After providing the exposure of Generative AI based Applications, the value of mean and standard deviation is obtained 113.56 and 13.70 respectively. The t-value is 7.80, which is significant at 0.01 level of significance. It means that the alternative hypothesis that “There will be positive effect of Generative AI on Happiness of prospective teachers” is accepted and it can be said that Generative AI influences happiness of prospective teachers positively. The reason behind it may be that after using Generative AI based Applications in teaching, prospective teachers have created a unique form of content, interactive classroom environment and creative ideas of teaching in very less time. They find more natural and near to original forms of learning material which were found interesting. The work load of teachers was very less after using Generative AI based Applications and their more focus was on teaching. It makes them happy and stress free for their teaching.

Conclusion

Generative AI has made the education process advanced and easy to apply in classrooms as well as for distant learning. It is helping not only to the teachers but also to the students in many ways. Generative AI is contributing effectively by allowing teachers to create positive, engaged and interactive classroom environment for teaching and learning process which is fostering the academic progress of students. Generative AI is strengthening the teaching-learning process by providing various facilities i.e. Personalized learning, interactive learning activities like games and simulations, immediate feedback and continuous assessment of students based on their current level of understanding. By providing such opportunities, generative AI is helpful in improving techno-pedagogical skills and increasing happiness among teachers in their teaching. If the teachers will happily teach their students with proper techno-pedagogical skills, the achievement of students will increase definitely. However, it is today's demand to teach students with modern technology and understanding their learning needs, generative AI is helping in it continuously.

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