



ORIGINAL RESEARCH PAPER

Education

DIGITAL COMPETENCY ESTIMATION OF TEACHER EDUCATORS: ALIGNING WITH NATIONAL EDUCATION POLICY 2020

KEY WORDS: Artificial Intelligence, Digital competency, Machine learning, National Education Policy (NEP-2020), Teacher Educators.

Anupam Kumari*

Indian Institute of Teacher Education Gandhinagar Senior Research Fellow
*Corresponding Author

Prerana Shelat

Indian Institute Of Teacher Education Gandhinagar Professor

ABSTRACT

This article reflects on the importance of digital competency of teacher educators that is mentioned in National Education Policy 2020 and National Professional standards for Teachers (Draft). It also reflects on how artificial intelligence approach is useful to analysing the teacher educators digital competency related data and data representation in a meaningful way. The teacher educators competency may prediction after data analysis. It will help in design the required steps for enhancing the competency of the teacher educators.

INTRODUCTION

Education is the foundation of individual improvement, societal development, and national advancement. Education gives people the metamorphic power to realize their full potential by equipping them with the information, skills, and critical and analytical thinking abilities needed in today's world. The combined efforts of teachers and teacher educators determine a nation's destiny. Economic growth is fuelled by a well-educated populace that produces a talented and inventive workforce. The value of education is a driving force behind the prosperity and advancement of both the people and the country. Teachers have an obligation to set up their pupils so they can give their expertise to the advancement of the country. Thus, it is accurate to say that educators play a key. According to National Education Policy 2020, "The quality of teacher education, recruitment, deployment, service conditions, and empowerment of teachers is not where it should be, and consequently the quality and motivation of teachers does not reach the desired standards." It is said that teaching profession should be at high status that inspire the best students to be part of it. It emphasised on Integrated Teacher Education Program to provide high quality content knowledge and pedagogical knowledge to the future teachers. It is mentioned that by 2030 all teacher education will gradually convert into multidisciplinary colleges and universities. NEP 2020 focused on the main role of teachers in the life of learners. For effectively implementing the role of teacher National Professional standards for teachers 2021(Draft) has been prepared by National Council of Teacher Education. NPST 2021(Draft) emphasised the role of teachers and teacher educators in the development of learners. NPST 2021 described some domains those are important for upliftment of teacher's standards. One of the domains from them is Technology use and integration in education. This domain demands the command of teachers on the technology and its integration with teaching and learning, their proficiency on the use of ICT. The UNESCO framework for teachers (2011) described digital competency in the form of "policy and framework, curriculum and assessment, pedagogy, knowledge and skills, learning environments and administration, and personal development and professional understanding". These documents and research emphasised on the requirement of digitally competent teachers for the digitally skilled students.

Artificial Intelligence (AI) stands at the forefront of technological innovation, representing a paradigm shift in how machines can mimic and even surpass human intelligence. At its core, AI encompasses a set of advanced algorithms and computational models designed to enable machines to perform tasks that typically require human cognitive functions, such as learning, reasoning, problem-

solving, and perception. This field of study seeks to imbue machines with the ability to adapt and improve their performance over time, learning from data inputs and experiences. From image recognition and natural language processing to autonomous decision-making, AI holds immense potential to revolutionize industries ranging from healthcare and finance to education and beyond. As AI continues to evolve, its impact on society, ethics, and the way we approach problem-solving is becoming increasingly profound, marking a new era in the relationship between humans and technology.

Literature Reviews AI and digital education:

(Imbrie et al., 2008) used Artificial intelligence to predict Engineering students academic performance. This paper is about whether students cognitive and non-cognitive factor affects their future retention. Artificial Neural Network model of AI was used for the prediction. This paper examines whether students' non-cognitive factors can be used, alone or in combination with cognitive factors, in artificial neural network (ANN) models to predict engineering student's future retention. (Zabolotska et al., 2021) focused on the importance of digital competency of teachers for transforming education system. The authors show that the digital technologies play a key role in the organization of the educational process, if you use them as a tool for collaboration, inclusion, and involvement in the process of all participants, the personification of learning. (Pedro et al., 2019) emphasised on challenges of use of Artificial Intelligence in education. Mainly six challenges were in focused i.e. development of public policy for Artificial Intelligence, advancement of technological condition, preparation of teacher for effective use of AI, systemization of data collection, research based on AI and education and ethical consideration related to AI. (Salas-Pilco et al., 2022) done systematic reviews related to AI and learning analytics in teacher education. Researcher found that mostly focus on behaviour and digital competency in teacher education and machine learning algorithms used for analysis. (Skakun, 2021) explained digital competencies as a part of major flexible skills, as a component of essential skills, and as a self-determining element of pedagogical professional training. The article's findings outline a satisfactory distribution of teacher abilities that yields a high degree of qualification and establish the function and positioning of digital skills within the framework of professional excellence. (Adamu et al., 2020). This study looks into the computer-related competencies that Technical and Vocational Education (TVE) teachers need for effective teaching and learning in the classroom. The results show that computer technology proficiency among technical and vocational education instructors is high, and that there is a strong association between competency and number of years of classroom

experience as well as a weaker correlation between gender and competency. (Meidrina et al., 2017) and (Aydin, 2013) Computers have been used in education since the 1960s for experimental learning, inspiration, improving student achievement, providing authentic research materials, promoting collaboration, individuality, self-reliance from a single source of information, and enhancing global understanding. (Kumar & Pal 2023) and (Swain et al., 2023) explain the different application of machine learning for the prediction of electrical load and bush fire respectively. (Kumari & Shelat 2023) has described about the importance and role of professional competency in education. The research paper (Kumar et al., 2023) and (Kumar & Pal 2022) gives detail information about methodology of machine learning implementation for forecasting. (Atman & Usluel 2019) Information and communication technology plays a major part in the development of 21st-century talents including creativity, critical thinking, and inventiveness. In this case, the purpose of ICT usage should be clearly stated rather than the amount of time, frequency, or range of innovation when determining how teachers and students use ICT.

Artificial Intelligence as data handling and analysis

Artificial Intelligence (AI) plays a significant role in data handling and analysis, transforming the way organizations manage and extract insights from large and complex datasets. Here are several ways in which AI contributes to data handling and analysis:

Data Cleaning and Preprocessing: AI algorithms can automate the process of cleaning and preprocessing data. This includes handling missing values, removing outliers, and normalizing or scaling features to ensure data quality and consistency.

Automated Feature Engineering: AI can assist in the creation of new features or the transformation of existing ones to enhance the predictive power of models. Automated feature engineering algorithms can identify relevant patterns in the data, reducing the manual effort required.

Pattern Recognition and Anomaly Detection: Machine learning algorithms, a subset of AI, excel at recognizing patterns in data. This capability is particularly useful for identifying trends, outliers, or anomalies that might be indicative of important information or issues within the dataset.

Natural Language Processing (NLP): AI, particularly NLP, is employed to analyse and extract valuable information from unstructured text data. This includes sentiment analysis, named entity recognition, and topic modelling.

Predictive Analytics: AI models, such as regression and classification algorithms, enable organizations to predict future trends or outcomes based on historical data. This is valuable for making informed decisions and planning strategies.

Machine Learning for Data Classification and Segmentation: AI models can automatically classify and segment data into different categories, making it easier to organize and analyse information. This is particularly beneficial in tasks such as customer segmentation or fraud detection. The machine learning process is start with data preprocessing. This step focuses on preparing the data for machine learning algorithms. It includes handling missing values, addressing outliers, scaling features, encoding categorical variables, and other transformations to ensure the data is suitable for model training. Data analysis in machine learning is often an iterative process. After training a model, the results are analysed, and adjustments may be made to the data preprocessing or model parameters to improve performance.

Recommendation Systems: AI-driven recommendation systems analyse user behaviour and preferences to provide personalized suggestions. This is commonly seen in applications like content recommendations on streaming platforms or product recommendations in e-commerce.

Automated Data Analysis and Reporting: AI tools can automate the process of analysing data and generating reports. This includes summarizing key findings, creating visualizations, and presenting insights in a format that is easily understandable to stakeholders.

Continuous Learning and Adaptation: AI models can be designed to continuously learn and adapt to new data, ensuring that analyses remain relevant and effective over time. This is particularly important in dynamic environments where data patterns may evolve.

Enhanced Decision-Making: By providing actionable insights derived from data, AI contributes to more informed decision-making processes. This is crucial for organizations looking to gain a competitive edge and optimize their operations.

In summary, AI technologies contribute significantly to data handling and analysis by automating tasks, uncovering patterns, and facilitating more sophisticated and efficient processing of large datasets.

Overall, effective data analysis is crucial for building robust and accurate machine learning models, and it requires a combination of statistical techniques, domain knowledge, and a deep understanding of the specific characteristics of the dataset.

Research Methodology:

In this research descriptive survey was the research method. A digital competency scale related to understanding use of digitalization in education was prepared by the researcher to know about the current scenario of digital competency of teacher educators of Gujarat state. The independent variables were age, gender and teaching experience and dependent variable were digital competency score.

RESULTS AND ANALYSIS

In machine learning approach, the dataset is divided in training and testing data. The dataset is divided into 80% and 20% for training and testing respectively. The testing dataset is used for preparing different statical model. The training dataset is analysed using different statical methodology for checking the quality of data. Root means square error (RMSE) are calculated after analysis the data for the different machine learning model. RMSE is the key factor for the finalizing the model.

CONCLUSION

Linear regression is the best prediction model for the present data related to digital competency of teacher educators. The RSME error for the linear regression for the dataset is about 19. The high RSME error is coming due to limited dataset. As the data is more the model will predict better value. In this way the artificial intelligence plays crucial role in decision making related to education sector like teacher competency prediction, student performance prediction etc and ultimately the overall quality of education may improve. The National education policy brief about integrated teacher education program for enhance the quality of the education. Artificial intelligence and machine learning based data analysis related to education data support implementation and strengthen the National education policy and National Professional standards for Teachers.

REFERENCES:

1. ICT Competency Framework for Teachers: UNESCO guidelines – UNESCO 2011 Microsoft Corporation (2011). Direct access: <http://iite.unesco.org/pics/publications/ru/files/3214694.pdf>

2. Imbrie, P. K., Lin, J. J., & Malyscheff, A. (2008, June). Artificial Intelligence Methods To Forecast Engineering Students' Retention Based On Cognitive And Non Cognitive Factors. In 2008 Annual Conference & Exposition (pp. 13-222).
3. Zabolotska, O., Zhyliak, N., Hevchuk, N., Petrenko, N., & Alieko, O. (2021). Digital competencies of teachers in the transformation of the educational environment. *Journal of Optimization in Industrial Engineering*, 14(Special Issue), 25-32.
4. Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial intelligence in education: Challenges and opportunities for sustainable development.
5. Salas-Pilco, S. Z., Xiao, K., & Hu, X. (2022). Artificial intelligence and learning analytics in teacher education: A systematic review. *Education Sciences*, 12(8), 569.
6. Skakun, I. (2021). Digital competencies of the teacher of the future. *Futurity Education*, 1(2), 39-48.
7. National Education Policy 2020. https://www.mhrd.gov.in/sites/upload_files/mhrd/files/nep/NEP_Final_English.pdf referred on 10/08/2020.
8. National Professional standards for Teachers 2021 (Draft). National Council of Teacher Education.
9. Adamu, I., Kanbul, S., Gambo, A., & Zanna, T. (2020). Technical and vocational education teachers computer competencies using artificial intelligence. *Journal of Advanced Research in Social Sciences and Humanities*, 5(6), 256-269.
10. Kumar, M., & Pal, N. (2023). Machine Learning-based Electric Load Forecasting for Peak Demand Control in Smart Grid. *CMC-Computers Materials & Continua*, 74(3), 4785-4799.
11. Swain, D., Kumar, M., Jain, N., & Devnani, C. (2023). Prediction of Bushfire Area Using Machine Learning Techniques. In 2023 7th International Conference On Computing, Communication, Control And Automation (ICCUBEA) (pp. 1-7). IEEE.
12. Kumar, M., Swain, D., Raval, Z., & Patel, T. (2023). Machine learning based approach for metaphoric investigation of ground water quality. In AIP Conference Proceedings (Vol. 2981, No. 1). AIP Publishing.
13. Kumar, M., & Pal, N. (2022). Simulation and Modeling of Electrical Load Data Using Machine Learning. In *Machine Learning in Information and Communication Technology: Proceedings of ICICT 2021, SMIT* (pp. 311-316). Singapore: Springer Nature Singapore.
14. Kumari, A., & Shelat, P. (2023). Role of Professional Competency for the Development in Education in New Challenging Situation. *Journal of Online Engineering Education*, 14(1s), 83-87.
15. Aydin, S. (2013). Teachers' perceptions about the use of computers in EFL teaching and learning: The case of Turkey. *Computer assisted language learning*, 26(3), 214-233.
16. Atman Uslu, N., & Usluel, Y.K. (2019). Predicting technology integration based on a conceptual framework for ICT use in education. *Technology, Pedagogy and Education*, 28(5), 517-531.