Artificial Intelligence in Education and Value Education

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Abstract: Delivering moral education requires a unique teaching methodology that differs from traditional learning. Educational technology offers a platform for providing personalized education. In this paper, we present an extensive review of recent advancements in Artificial Intelligence (AI) applications in education. The study aims to answer two fundamental questions: how AI technologies are used in education, and how they can be integrated into value, moral, and character education. The review focuses on AI-related educational research carried out in the last five years and reveals a prevalent focus on understanding learners to facilitate personalization, customization, and recommendations.

1 INTRODUCTION

The integration of Artificial Intelligence (AI) into education has undergone a transformative journey, progressing from computer technology to web-based intelligent systems and even extending to humanoid robots taking on teaching roles and chatbots assisting educators (L. Chen et al., 2020). This evolution has entailed collaborative efforts from a diverse range of professionals, including data scientists, statisticians, psychologists, linguists, and education experts, who have collectively engineered intelligent systems capable of decision-making. These systems not only support educators in their tasks but also empower them to navigate an ever-changing landscape, enhancing their knowledge and competencies (S. Pokrivcakova., 2019).

Against this backdrop of technological advancement, this paper delves into the recent strides made in education technology within the past five years, with a particular focus on applications of Artificial Intelligence in moral education. Through a systematic literature review, this study seeks to address pivotal questions driving the evolution of AI-based education:

- Which domains and AI-driven technologies have been explored in the context of education?
- To what extent has research been undertaken to leverage AI for value education?

The paper is structured into six distinct sections. In Section II, the methodology employed for conducting the comprehensive literature review is expounded upon. Moving to Section III, a detailed exploration of AI-based research within mainstream education is presented. Subsequently, Section IV is dedicated to scrutinizing AI's impact on value education. Section V visualizes the findings. The concluding Section VI briefly summarizes the findings and delineates prospects for future research.

2 METHODOLOGY

Literature selection for this review followed a systematic and comprehensive approach to ensure the inclusion of relevant and recent research findings on applications of AI in education. Only studies published within the last five years, from 2018 to 2023, were considered eligible for inclusion. As evident from Figure 1, the number of papers published on Artificial Intelligence applications in education has been increasing since 2018, although many studies have been conducted from 2008 to 2014.

Papers were included if they contributed to the application of Artificial Intelligence in education. The relevance of each study was assessed based on the title, abstract, and keywords. Only peer-reviewed journals were considered for inclusion, to maintain the quality and reliability of the included studies.

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Conference proceedings, books, and other non-peer-reviewed sources were excluded.

The IEEE and Science Direct databases were searched. Keyword 'applications of Artificial Intelligence' and search terms 'Education technology,' 'Moral Education', 'Value Education,' and 'Ethics Education' were used to retrieve relevant articles. Boolean operators (AND, OR) were employed to effectively combine search terms.

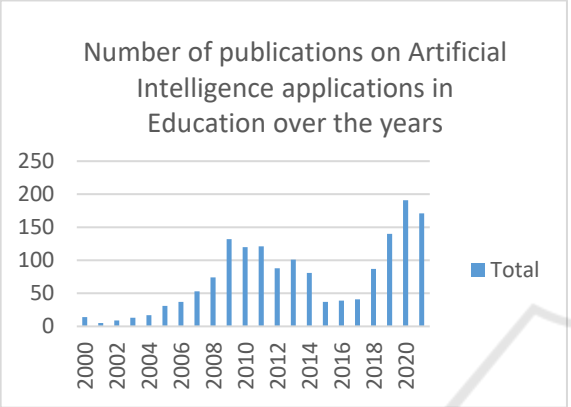

Figure 1: Number of publications on Artificial Intelligence applications in Education in IEEE over the years.

A total of 152 results were generated, of which 127 papers were weeded out based on topics, use of technologies other than AI, and abstracts. 25 relevant papers were identified.

These 25 papers were grouped based on their areas of application in education. The six areas of AI application in education are smart campuses, library systems, intelligent tutoring, Examinations, Laboratories, and Learner Analytics. The search for moral education resulted in 46 open-access papers published in Computer Science Journals.

Studies addressing the social science aspects of ethics were excluded. Of the 46 shortlisted papers, 3 good quality papers with real-life complete applications matched the criteria. The criteria for inclusion in the literature review were an AI-based application for value/moral/character education.

AI-Powered Applications and Technologies in Education: Educational institutions perform multiple functions such as academics, governance, student guidance, examinations, etc. daily for which the faculty has to spend a lot of time.

These activities are getting automated to an extent, to facilitate faculty with some right tools for their work. Technology allows management to get a holistic view of the organization.

This not only empowers the faculty but also gives them the necessary tools for 21st-century teaching. Considerable Work has been done in the past decade, especially in the last 5 years on developing such tools.

The summary of the applications of Artificial Intelligence in the field of education is given in Table 1 and the technologies are summarized in Table 2.

Table 1: AI applications in areas of education.

Application	Technological Advancement	Research Publications
Smart Campus	Networked infrastructure, cloud storage, IoT for wearables and smart gadgets, surveillance, biometric and smart attendance	[3], [4], [5], [6], [7]
Library	AI based search suggestions, identifying hot topics for research	[8], [9], [10], [11], [12]
Intelligent tutoring	Personalized learning, dashboards for teachers, AI-based question classification on BLOOM's taxonomy, AI-based curriculum builder, chat-bots for learning resource suggestions, teaching robots using NLP, English writing intelligent tools	[13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27],
Examination	e-proctoring, safe exam browsers, AI-based auto-evaluation, AI-based formative assessments	[28], [29],
Laboratory	Virtual laboratories based on 3D modeling	[30], [31], [32], [33], [34]
Learner Analytics	Learner Profiling, performance prediction, career path recommendation, Mapping of skills with course outcomes, identification of open educational resources for skills, mapping learners to skills	[35], [36], [37], [38], [39], [40], [41], [42], [43], [44]
Generative AI applications	Language translation, personalized responses, Tutoring support material generation,	[45], [46], [47]

Table 2: Technologies used in areas of education.

Area of Application	Technologies used	Ref.
Examination	Machine learning techniques to help understand the learner learning style, such as KNN-means for regression and Deep Neural Networks for improving machine learning on the basis of weights. Data mining processing model SEMMA	[29]
	Recurrent Neural Networks are used for creating the prediction model for the learner performance.	[35]
	Decision Trees, Support Vector Machine (SVM), Naïve Bayes (NB), K-Nearest Neighbour (kNN), Logistic Regression (LR) and Random Forest (RF). Synthetic Minority Oversampling Technique (SMOTE)	[36]
	DNN to train machine on facial images; CLAHE algorithm for light normalization; multi-level, multi-modal and multi-task learning for face recognition RNN based on LSTM for voice recognition (identification of d-vector) CNN+RNN for typing recognition	[28]
	Random forest, K-Nearest Neighbour, Large-margin nearest neighbour regression. Creation of numeric features for the social media activities as data set. Regression models were applied in Weka tool	[37]
	Improved conditional generative adversarial network based deep support vector machine (ICGAN-DSVM) algorithm Comparison between ICGAN and CGAN, while DSVM is compared with SVM Heuristic based multiple kernel learning (MKL) is used	[38]
Research area Identification and library	DeepWalk was used to extract keywords from single paper. Graph Convolutional Network (GCN) was used to extract relevant keywords from multiple papers. TextRank, SurfKE, S-DWKE, M-GCKE are used for ranking the extracted keywords for hot topic. Googlenews-vecctors-negative300.bin, with 300-dimensional news corpus pre-trained by Google with word2vec, and newsblogbbs.vec a pre-trained Chinese word vector were used for testing hot topics	[10]
	Unbalanced multistage Heat Conduction and Mass Diffusion (UHM) algorithm	[9]
Laboratory	MATLAB/Simulink environment 3DS Max for 3D modelling PD control algorithm for movement control	[32]
	Robotic ‘Equilibrium Player’ Ultimatum Game	[33]
	Parts of Speech (POS) for breaking word problem into keywords Object oriented analysis and design (OOAD) to classify the keywords into numbers and operators Machine Learning algorithms for classifying keywords into categories	[34]
Learner Analytics	Random walk strategy for creating the traversal graph Precision, recall and F1 score to evaluate the recommender system Graph embedding methods like DeepWalk, Node2vec, LINE, Graph Factorization, SDNE	[42]
	Python for creation of Quiz Making Language and LMS automator	[40]

	latent Dirichlet allocation (LDA) statistical method Sentiment Analysis	[41]
	W3C standards, such as RDFs and OWL Linked-data ontologies Protégé LOV plugin OOPS tool for validation	[27]
	Fuzzy logic based on the Mamdani inference	[43]
Smart Campus	Support Vector Machine (SVM), Decision Tree (DT), Random Forest (RF), and K-nearest neighbor (KNN) for identifying the request burst	[6]
	Monte Carlo Tree Search (MCTS) and Location Verification (LV) algorithms are used	[7]
	A brief discussion on technologies like google glass, fitbit, oculus rift, emotive insight, Samsung gear, apple watch, Empatica, sensewear, etextiles, tactile vest, hip disk, motiv GI, leg mounted RFID, Go Pro 4 and fitbit iconic, head and pen motion modules was made	[4]
Teaching/ Intelligent Tutoring	Machine Learning Sentiment Analysis	[14]
	LSTM model Wiki Word Vectors pre-trained word embedding	[22]
	Speech Act Classifier SVM algorithm Google's Dialog-Flow technology	[17]
	LSTM-CRF algorithm brat rapid annotation tool	[18]
	Input channel addition algorithm Event bundle encoding algorithm Alternative template learning algorithm	[13]

Table 3: Applications and technologies used in Moral/ ethics education.

Ref.	Technologies used
[48]	Thematic analysis of literature on CAI Typically, CAI systems include an Automatic Speech Recognition (ASR), Natural Language Understanding (NLU), Dialogue Management (DM), Natural Language Generation (NLG), and Text to Speech (TTS) modules, which together constitute the high-level architecture of CAI.
[52]	Normative reasoning and deontic logics The enabling technology are higher-order theorem proving systems via the Shallow Semantical Embedding technique. Interactive theorem proving (ITP) and automated theorem proving (ATP) for HOL, and also the overall coalescence of heterogeneous theorem proving systems, as witnessed, in particular, by Isabelle/HOL, LEO-II and Leo-III, which fruitfully integrate other specialist ATP systems
[49]	Five separate Binary Logistic Regression models were run. Each model focused on a different predictor detecting profanity or offensive words. Six separate Ordinary Least Squares (OLS) Multiple Regression models were run, analyzing how different factors influence chatbot responses
[53]	Value Group Classifier for identifying stakeholders in the ethical decision-making tool designed using SVM for educational purposed

Research in Artificial Intelligence Assisted Value Education

The importance of ethics in education is emphasized in the National Education Policy 2021 of India through inclusion of ethical concepts in holistic education, such as service to society, love, peace duty, non-violence and scientific temperament. Applications like interactive storytelling (N. Park et al., 2021) using Conversational Artificial Intelligence can help young children understand the impacts of their decisions. A chat-bot that predicts the use of profane languageduring interaction and replies in a human-like manner to avoid such interactions was developed in (P. E. Torres et al., 2021).

The rules for detecting the use of profanity was based on the participant's profile. Physical-digital play applications are helping shape the personalities and values of young children (R. A. Shweta Bhatnagar., 2025) by including strategies of motivation, collaboration, problem-solving, decision-making and physical activity.

The research suggests techniques of action regulation, social expectations, goal-tool-action alignment and technical feature creation for improving the behavior of children. Also, the numerous bio-wearables are being developed for the children. The data collected by these can have a lot of impact on the behavior of children (B. Coppin., 2004). Ethico-Legal reasoning is exemplified using HOL for technology applications, as demonstrated in LogiKEy (R. H. Hassan et al., 2021). The court rulings on ethical matters were encoded in HOL and are now available as open reference for reuse by all. These examples show the existing research in the field of moral education. Table 3: Applications and technologies used in moral/ethics education

3 RESULTS AND DISCUSSION

Literature for the past 5 years was studied to analyze the first research question on areas of application of AI and the technologies mostly used for education. The second research question about the applications in the field of moral education was searched to understand the depth of research in this area. Out of the papers studied on applications of AI in education, the maximum was in the category of intelligent tutoring and examination. 20% of the applications in education focused on understanding the learner or improving the content delivery for the learner These three are the core activities of the educational institutions. Figure2 explains the breakup of the literature review.

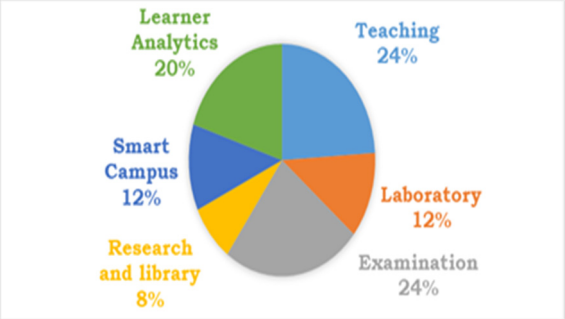

Figure 2: Distribution of research papers on applications in AI on education.

The technology-wise grouping of applications is given in Figure 3. Most of the research in this field has happened using Machine learning algorithms. Apart from the wearables, laboratories requiring visualizations, and chatbots requiring NLP; most of the applications reviewed involved prediction, recommendation, and classification of information. Generative AI tools can develop a safe environment for learners, where their exposure to unwanted content is reduced, although there is limited research on building personalized learning environments using Generative AI.

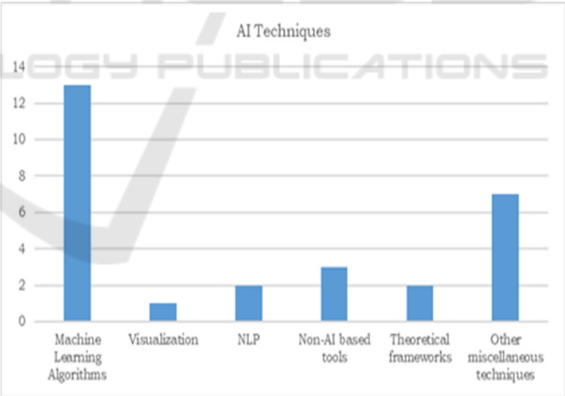

Figure 3: AI techniques used in education.

The second question about research in moral education discusses applications with moral implications. Ethical education has always been a part of national policies and recommendations of committees formed for evaluating the education system. The use of Artificial Intelligence in addressing value education is limited and has scope for further research.

4 CONCLUSIONS

A comprehensive literature review was undertaken to identify applications centered around Artificial Intelligence in education. The research aimed to address two key inquiries: the domains of application of AI in education, and specific instances of application in the realm of value education. The outcomes show that Artificial Intelligence aids in establishing a personalized and tailored connection with learners. Machine learning algorithms and tools process data for data-driven functions such as recommendations, classification, and predictions. Popular applications primarily cater to mainstream educational contexts, with a lack of representation in the domain of value education.

In future, the identified gap in the application of technological solutions within the sphere of moral, ethical, and value education will be addressed by noel methods. This approach advocates for the incorporation of existing digital tools into this particular domain. By adapting and integrating these tools, the proposed research seeks to bridge the technological gap in the field and enhance the delivery of moral, ethical, and value education in future.

REFERENCES

A. Takacs, G. Eigner, L. Kovacs, I. J. Rudas and T. Haidegger, "Teacher's kit: Development, usability, and communities of modular robotic kits for classroom education," IEEE Robotics & Automation Magazine, vol. 23, no. 2, pp. 30-39, 2016.

A. Jobin, M. Ienca and E. Vayena, "The global landscape of AI ethics guidelines," Nature Machine Learning, p. 389–399, 2019.

A. Tamò-Larrieux, "Decision-making by machines: Is the 'Law of Everything' enough?," Computer Law and Security Review, vol. 41, 2021.

A. N. Antle and A. Kitson, "1,2,3,4 tell me how to grow more: A position paper on children, design ethics and biowearables," International Journal of Child-Computer Interaction, vol. 30, 2021.

B. Coppin, Artificial Intelligence Illuminated, MA, USA: Jones and Bartlett, 2004.

B. Wang, B. Yang, S. Shan and H. Chen, "Detecting Hot Topics from Academic Big Data," IEEE Access, vol. 7, pp. 185916-185927, 2019.

B. E. V. Comendador, W. F. C. Becbec and J. R. P. d. Guzman, "Implementation of fuzzy logic technique in a decision support tool: Basis for choosing appropriate career path," International Journal of Machine Learning and Computing, vol. 10, no. 2, p. 339–345, 2020.

B. Custers, "New Digital Rights: Imagining additional fundamental rights for the digital era," Computer Law and Security Review, vol. 44, 2022.

C. S. Tzafestas, N. Palaiologou and M. Alifragis, "Virtual and Remote Robotic Laboratory:Comparative Experimental Evaluation," IEEE Transactions on Education, vol. 49, no. 3, pp. 360-369, 2006.

C. Benzmüller, X. Parent and L. v. d. Torre, "Designing normative theories for ethical and legal reasoning: LOGIKEY framework, methodology, and tool support," Artficial Intelligence, 2020.

C. G. Duran and C. M. Ramirez, "Integration of Open Educational Resources using Semantic Platform," IEEE Access, vol. 9, pp. 93079-93088, 2021.

C. K. Lo, "What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature," Education Sciences, 2023.

D. Sampson and D. Fytros, "Competence Based Educational Metadata for Supporting Lifelong Competence Development Programmes," in IEEE, 2008.

D. Carlander-Reuterfelt, Á. Carrera, C. A. Iglesias, Ó. Araque, J. F. S. Rada and S. Munoz, "JAICOB: A Data Science Chatbot," IEEE Access, vol. 8, pp. 180672-180680, 2020.

D. Baidoo-Anu and L. O. Ansah, "Education in the Era of Generative Artificial Intelligence (AI): Understanding the Potential Benefits of ChatGPT in promoting Teaching and Learning," Journal of AI, 2023.

E. Popescu and F. Leon, "Predicting Academic Performance Based on Learner Traces in a Social Learning Environment," IEEE Access, vol. 6, pp. 72774-72785, 2018.

H. A. Almusawi, C. M. Durugbo and A. M. Bugawa, "Wearable Technology in Education:A Systematic Review," IEEE transactions on Learning Technologies, vol. 14, no. 4, pp. 540-554, 2021.

J. Zheng, Q. Zhang, S. Xu, H. Peng and Q. Wu, "Cognition-based Context-aware Cloud Computing for Intelligent Robotic Systems in Mobile Education," IEEE Access, vol. 6, pp. 49103-49111, 2018.

J. E. Auerbach, A. Concordel, P. M. Kornatowski and D. Floreano, "Inquiry-Based Learning with RoboGen: An Open-Source Software and Hardware Platform for Robotics and Artificial Intelligence," IEEE transcations on Learning Technologies, vol. 12, no. 3, pp. 356-369, 2019.

J. Chubb, S. Missaoui, S. Concannon, L. Maloney and J. A. Walker, "Interactive Storytelling for Children: A Case-study of Design and Development Considerations for Ethical Conversational AI," International Journal of Child-Computer Interaction, 2021.

J. Nieuwazny, K. Nowakowski, M. Ptaszynski, F. Masui, R. Rzepka and K. Araki, "Does change in ethical education influence core moral values? Towards history- and culture-aware morality model with application in automatic moral reasoning," Cognitive Systems Research, vol. 66, p. 89–99, 2021.

K. T. Chui, R. W. Liu, M. Zhao and P. O. d. Pablos, "Predicting Students' Performance with School and

Family Tutoring using Generative Adversarial Network based Deep Support," IEEE Access, 2020.

K. Manning, "8 Smart Campus Technology Examples," Process Maker, 16 07 2020. [Online]. Available: https://www.processmaker.com/blog/8-examples-of-smart-campus-technology/. [Accessed 05 01 2022].

L. Rodriguez-Gil, J. Garcıa-Zubia, P. Orduna and D. Lopez-de-Ipina, "Towards New Multiplatform Hybrid Online Laboratory Models," IEEE Trannsactions on learning technologies, vol. 10, no. 3, pp. 318-330, 2017.

L. Chen, P. Chen and Z. Lin, "Artificial Intelligence in Education: A Review," IEEE Access, vol. 8, pp. 75264-75278, 2020.

M. Coccolia, A. Guerciob, P. Marescac and L. Stanganelli, "Smarter universities: A vision for the fast-changing digital era," Journal of Visual Languages and Computing, vol. 25, no. 6, pp. 1003-1011, 2014.

M. Qamhieh, H. Sammaneh and M. N. Demaidi, "PCRS: Personalized Career-Path Recommender System for Engineering Students," IEEE Access, vol. 8, pp. 214039-214049, 2020.

M. A. Razzaq, J. A. Mahar, M. Ahmad, N. Saher, A. Mehmood and G. S. Choi, "Hybrid Auto-Scaled Service-Cloud-Based Predictive Workload Modeling and Analysis for Smart Campus System," IEEE Access, vol. 9, pp. 42081-42089, 2021.

M. Labayen, R. Vea, J. Florez, N. Aginako and B. Sierra, "Online Student Authentication and Proctoring System Based on Multimodal Biometrics Technology," IEEE Access, vol. 9, pp. 72398-72411, 2021.

M.-H. Chen, W.-F. Chen and L.-W. Ku, "Application of Sentiment Analysis to Language Learning," IEEE Access, 2018.

N. Fiorini, K. Canese, G. Starchenko, E. Kireev, W. Kim, V. Miller, M. Osipov, M. Kholodov, R. Ismagilov, S. Mohan, J. Ostell and Z. Lu, "Best match: New relevance search for pubmed," PLOS Biology, 2018.

N. Park, K. Jang, S. C. a and J. Choi, "Use of offensive language in human-artificial intelligence chatbot interaction: The effects of ethical ideology, social competence, and perceived humanlikeness," Computers in Human Behavior, vol. 121, 2021.

P. Yin, G. Wang, M. Z. A. Bhuiyan, M. Shan and F. Qi, "Unbalanced Multistage Heat Conduction and Mass Diffusion Algorithm in an Educational Digital Library," IEEE Access, vol. 7, pp. 147302-147313, 2019.

P. E. Torres, P. I. Ulrich, V. Cucuiat, M. Cukurova, M. C. F. D. l. Presa, R. Luckin, A. Carr, T. Dylan, A. Durrant, J. Vines and S. Lawson, "A systematic review of physical-digital play technology and developmentally relevant child behaviour," International Journal of Child-Computer Interaction, vol. 30, 2021.

P.-H. Lin, A. Wooders, J. T.-Y. Wang and W. M. Yuan, "Artificial Intelligence, the Missing Piece of Online Education?," IEEE Engineering Management Review, vol. 46, pp. 25-28, 2018.

Q. Liu, Z. Huang, Y. Yin, E. Chen, H. Xiong, Y. Su and G. Hu, "EKT: Exercise-aware Knowledge Tracing for Student Performance Prediction," IEEE transactions on knowledge and data engineering, vol. 33, no. 1, pp. 100-115, 2019.

R. A. Shweta Bhatnagar, "Value Group Classifier Model for Ethical Decision-making," Indonesian Journal of Electrical Engineering and Computer Science, vol. 37, no. 3, pp. 1899-1907, 2025.

R. Winkler and M. Söllner, "Unleashing the Potential of Chatbots in Education: A State-Of-The-Art Analysis," in Academy of Management Annual Meeting (AOM), Chicago, USA, 2018.

R. H. Hassan, M. T. Hassan, S. Naseer, Z. Khan and M. Jeon, "ICT Enabled TVET Education: A Systematic Literature Review," IEEE Access, vol. 9, pp. 81624-81650, 2021.

R. L. Amyatun and A. Kholis, "Can Artificial Intelligence (AI) like QuillBot AI Assist Students' Writing Skills? Assisting Learning to Write Texts using AI," ELE Reviews: English Language Education Reviews, pp. 135-154, 2023.

S. Pokrivcakova, "Preparing teachers for the application of AI-powered technologies in foreign language education," Journal of Language and Cultural Education, vol. 7, p. 135–153, 2019.

S. Nahhas, O. Bamasag, M. Khemakhem and N. Bajnaid, "Bridging Education and Labor Skills by a Novel Competency-Based Course Linked-Data Model," IEEE Access, vol. 7, pp. 119087-119098, 2019.

S. Cunningham-Nelson, M. Baktashmotlagh and W. Boles, "Visualizing Student Opinion Through Text Analysis," IEEE Transactions on Education, vol. 62, no. 4, pp. 305-311, 2019.

S. Orlando, E. Gaudiso and F. D. L. Paz, "Supporting Teachers to Monitor Student's Learning Progress in an Educational Environment With Robotics Activities," IEEE Access, vol. 8, pp. 48620-48631, 2020.

S. Shaikh, S. M. Daudpotta and A. S. Imran, "Bloom's Learning Outcomes' Automatic Classification Using LSTM and Pretrained Word Embeddings," IEEE Access, vol. 9, pp. 117887-117909, 2021.

S. D. A. Bujang, A. Selamat, R. Ibrahim, O. Krejcar, E. Herrera-Viedma, H. Fujita, N. Azura and M. Ghani, "Multiclass Prediction Model for Student Grade Prediction Using Machine Learning," IEEE Access, vol. 9, pp. 95608-95621, 2021.

S. Mandal and S. K. Naskar, "Classifying and Solving Arithmetic Math Word Problems—An Intelligent Math Solver," IEEE Transactions on learning technologies, vol. 14, pp. 28-41, 2021.

S. Kleanthous, M. Kasinidou, P. Barlas and J. Otterbacher, "Perception of Fairness in Algorithmic decisions: Future developers' perspective," Patterns, 2021.

T. Qian, Q. Li, B. Liu, H. Xiong, J. Srivastava and P. C.-Y. Sheu, "Topic formation and development: a core-group evolving process," World Wide Web, pp. 1343-1373, 2014.

T. P. Tran and D. Meacheam, "Enhancing Learners' Experience through Extending Learning Systems," IEEE Transactions on Learning Technologies, vol. 33, no. 3, pp. 540-551, 2020.

T. N. Fitria, "QuillBot as an online tool: Students’ alternative in paraphrasing and rewriting of English writing," Englisia: Journal of Language, Education, and Humanities, pp. 183-196, 2021.

W. Zhao, J. Jhang, X. Liu and Z. Jiang, "Application of ISO 26000 in digital education during Covid 19," Ain Shams Engineering Journal, vol. 13, 2022.

W. M. Lim, A. Gunasekara, J. L. Pallant, J. I. Pallant and E. Pechenkina, "Generative AI and the future of education: Ragnarok ¨ or reformation? A paradoxical perspective from management educators," The International Journal of Management Education, 2023.

W.-H. Kim and J.-H. Kim, "Individualized AI Tutor Based on Developmental Learning Networks," IEEE Access, vol. 8, pp. 27927-27937, 2020.

X. Xiao, R. Sun, Z. Yao, C. Zhang and X. Chen, "A Novel Framework With Weighted Heterogeneous Educational Network Embedding for Personalized Freshmen Recommendation Under the Impact of COVID-19 Storm," IEEE Access, vol. 9, pp. 67129-67142, 2021.

Y. Nieto, V. García-Díaz, C. Montenegro and R. G. Crespo, "Supporting academic decision making at higher educational institutions using machine learning-based algorithms," Soft Computing, 2018.

Y. Li, "An application of EDM: Design of a New Online System for Correcting Exam Paper," in ICCSE, Colombo, Sri Lanka, 2018.

Y.-H. An, L. Pan, M.-Y. Kan, Q. Dong and Y. Fu, "Resource Mention Extraction for MOOC Discussion Forums," IEEE Access, vol. 7, pp. 87887-87900, 2019.

Z. Zhang, L. Yu and R. Un, "Academic Hot-Spot Analysis on Information System Based on the Co-Term Network," In Proceedings of the 18th Pacific Asia Conference on Information Systems, pp. 109-117, 2014.

Z. Lei, H. Zhou, W. Hu, Q. Deng, D. Zhou, Z.-W. Liu and X. Gao, "3-D Interactive Control Laboratory for Classroom Demonstration and Online Experimentation in Engineering Education," IEEE Transactions on Education, vol. 64, no. 3, pp. 276-282, 2020.

Z. Gao, Y. Huang, L. Zheng, X. Li, H. Lu, J. Zhang, Q. Zhao, W. Dia, Q. Fang and J. Fang, "A Student Attendance Management Method Based on Crowdsensing in Classroom Environment," IEEE Access, vol. 9, pp. 31481-31492, 2021.