IOSR Journal Of Humanities And Social Science (IOSR-JHSS)
Volume 29, Issue 9, Series 7 (September, 2024) 12-23
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Literacy And Artificial Intelligence: Applications And Concerns

Andreas Karatzas[1], Konstantinos Zogopoulos[2]
[1](Dr. Of Educational Sciences – Dr. Of Theology, Professor-Advisor At The Hellenic Open University, Director Of Primary Education In Ilia, Greece)
[2](M. Sc In Educational Administration, Phd Candidate University Of Patras., Greece)

Abstract:
Background*: The intersection of literacy and Artificial Intelligence (AI) holds transformative potential for education. AI can significantly enhance literacy by offering personalized learning approaches, automated assessments, and diverse educational applications. In this paper, specific examples of AI's role in literacy are provided, alongside discussions of challenges such as reduced human interaction and the risk of perpetuating educational inequalities. Emphasizing the ethical and social considerations in developing and using AI in education is crucial.*
Materials and Methods*: Our research falls under exploratory studies and aimed to capture the current state in the field of Primary and Secondary Education educators regarding Artificial Intelligence. It was conducted through data collection via an anonymous questionnaire. The questionnaire was sent to all school units in the country through the Primary and Secondary Education Directorates in December 2023. Data were collected through the Google Form platform, and statistical processing was done using SPSS 28. The research sample was formed from the voluntary participation of N=1736 educators. A unique aspect of our research was that after the demographic information, participants were asked not to proceed with completing the questionnaire if they answered "Not at all" to question A1: How well do you know what Artificial Intelligence is? Thus, the first data showed that 51% of the participating educators knew nothing about AI, while 49% knew a little, a lot, or very much. After filtering out incomplete questionnaires, our sample was N=866, and data processing was based on this.*
Results*: Our research aimed to explore educators' perceptions regarding the application of AI in literacy development and to identify the key factors influencing these perceptions. The theoretical framework highlighted the potential benefits of AI in education, such as personalized learning, automated assessment, and increased student engagement. Our findings largely align with this framework, indicating that educators recognize the positive effects of AI, particularly in areas such as efficient teaching methods and enhanced learning.*
Conclusion: *The conclusion highlights the importance of harnessing AI for literacy development while fostering students' critical thinking to mitigate potential negative impacts. Initial findings from exploratory research on AI in education are also presented.*
Key Word*: Literacy; Artificial intelligence; Applications; Concerns*

Date of Submission: 07-09-2024 Date of Acceptance: 17-09-2024

I. Introduction

The relationship between literacy and AI in the educational process is both complex and multifaceted. Integrating AI into the field of literacy opens new avenues for education, offering innovative approaches to student learning and development.

Linguistic literacy—the ability to read, write, understand, and use language effectively and critically—is fundamental to education and student development. According to UNESCO[29], literacy is "the ability to identify, understand, interpret, create, communicate, and compute using printed and written materials associated with varying contexts." This definition underscores the importance of literacy as a foundation for education and social inclusion, serving as the primary tool for learning and accessing knowledge. Reading and writing skills enable students to engage with textbooks, comprehend scientific articles, and gather information from various sources[25]. These skills facilitate active participation in the learning process and foster the development of critical and analytical abilities[12].

Moreover, a strong command of language helps students articulate their thoughts and emotions clearly and accurately. Written communication skills are vital not only for academic performance but also for social

interaction and problem-solving[1]. Effective communication through writing is essential for fostering collaboration and teamwork, which are key elements of modern education. Additionally, it enhances critical thinking; through reading and writing, students encounter diverse perspectives and ideas, prompting them to evaluate information and form well-founded opinions[10]. Critical thinking is necessary for addressing contemporary societal challenges and making responsible decisions[7].

Furthermore, linguistic literacy is crucial for social and economic empowerment. Students who are proficient in language have better chances of succeeding in their studies, securing better job prospects, and actively participating in public life[18]. Social participation and professional success are closely linked to language proficiency, making linguistic literacy a key driver of personal and social advancement.

Linguistic literacy has undergone significant changes from antiquity to the present, evolving alongside society and technology. In ancient societies, literacy was a privilege limited to a few who had access to knowledge and writing tools. During the Renaissance and the Enlightenment, literacy expanded significantly with Gutenberg's invention of the printing press in 1440, which allowed for the mass production of books and the widespread dissemination of knowledge[6]. In the 20th century, literacy became a central goal of educational systems worldwide, with schools providing basic reading and writing skills to all students[13]. However, with the advent of the digital age, the concept of literacy has broadened to include digital literacy—the ability to understand and use new technologies and digital media[3].

Artificial Intelligence (AI), by contrast, is a field of computer science dedicated to developing algorithms and systems capable of performing tasks that require human intelligence, such as speech recognition, problem-solving, learning, and decision-making[22]. The first concepts of AI emerged in the 1950s with Alan Turing's work and the creation of the first machines capable of performing basic cognitive functions[28]. Over the years, AI has experienced various phases of development, ranging from initial enthusiasm to periods of skepticism and stagnation[21]. Today, AI has made remarkable advances and finds applications in diverse fields, including speech and image recognition, natural language processing, robotics, medical diagnosis, and education. In the educational sector, AI applications encompass adaptive teaching systems, e-learning platforms, and tools that support student assessment and feedback[20].

The educational utilization of AI in literacy development would not have been possible without the prior creation of specific computational technologies such as:

a) Natural Language Processing (NLP)

NLP enables computers to understand, interpret, and respond to human language. Applications of NLP in language education include:

• Text Analysis: Tools such as Grammarly utilize NLP to analyze and correct written texts, aiding students in improving their grammar, syntax, and style[14].

• Automatic Translation: Services like chatGPT allow students to translate texts in real-time, enhancing their understanding of foreign languages and facilitating multilingual communication[17].

• Digital Assistants: Applications like Siri and Alexa use NLP to comprehend and respond to voice commands, making interaction with technology more intuitive and natural.

b) Speech Recognition

Speech recognition technology allows computers to understand and convert spoken language into written text. This technology is widely used in education to enhance linguistic literacy and includes:

• Dictation Tools: Tools like Dragon Naturally Speaking allow students to dictate texts, helping those with writing or typing difficulties to improve their language skills.

• Reading Tools: AI-supported reading programs can help students improve comprehension and phonetic skills through the use of natural language and text processing. Tools such as speech recognition systems can evaluate a student's reading and provide feedback on pronunciation and reading pace[35]. These platforms enhance the learning experience by making the process more engaging and tailored to students' needs.

• Educational Software: Learning platforms that use speech recognition help students practice pronunciation and phonetics, improving their second language skills.

c) Sentiment Analysis Systems

Sentiment analysis is an AI technology that uses NLP to understand and interpret emotions expressed in written or spoken text. This technology can be applied in education to:

• Customized Learning: Systems that analyze students' emotions during reading or writing can adapt content and exercises based on students' engagement and feelings, enhancing the learning experience.

• Feedback and Support: Sentiment analysis tools can provide more targeted and personalized feedback to students, enhancing emotional and academic support.

d) Automated Assessment

Automated assessment is another significant AI technology that facilitates evaluation and feedback in language education, offering:

• Automated Essay Scorers: Tools like ETS's e-rater use AI algorithms to automatically assess written texts, providing immediate feedback to students on the structure, coherence, and quality of their writing.

Main Connections between Literacy and AI

The main connections between literacy and AI can be summarized into three key axes: improving accessibility and personalization of written language learning, facilitating assessment and feedback, and predicting learning difficulties in written language.

a) Improving Accessibility and Personalization of Learning

AI can significantly increase accessibility to education, particularly for students with special needs or those in remote areas, by offering remote, personalized education through adaptive algorithms. These algorithms analyze data from students' interactions with educational tools and adjust the content and activities to match each student's skill level and needs. Adaptive learning systems provide personalized educational material tailored to individual learning needs and pace.

One prominent example of AI application in literacy is the "Intelligent Tutoring System" (ITS) used on various learning platforms. ITSs are designed to tailor teaching to each student's needs, offering personalized instructions and materials. For instance, the "ALEKS" system (Assessment and Learning in Knowledge Spaces) uses AI to diagnose a student's knowledge and adapt educational content accordingly[5]. Similarly, the "Duolingo" application employs AI to help students learn new languages by adapting exercises and lessons based on user performance, providing a continually personalized learning experience[31].

During the period of emergent literacy, which includes a child's initial skills, knowledge, and attitudes before formal reading and writing instruction, literacy skills begin to develop through exposure to spoken language and continued interaction with books and written language[32]. AI can assess the development of these skills and offer personalized exercises and activities to enhance them. For example, an AI system like "Reading Eggs" can identify a child's struggle with basic word recognition and adapt the material to include more pictures and audio examples, enhancing visual and auditory learning. This approach helps develop phonological awareness and letter recognition, which are critical skills for emergent literacy[26].

Similarly, for literacy development, a student struggling to understand complex texts can use the "Socrative" system, which offers personalized explanations and examples to facilitate comprehension. The system can pinpoint specific paragraphs causing difficulty and provide detailed comments or additional information to improve understanding[20]. This method can significantly enhance learning effectiveness and reduce student anxiety by offering appropriate tools and support tailored to their literacy stage. Through personalized approaches, AI contributes significantly to improving literacy skills in both emergent and developed literacy.

b) Predicting Learning Difficulties in Children's Writing

AI can evaluate the performance of children with special or specific needs at an early age (4-7 years), paving the way for early diagnosis and intervention, and providing the support necessary for success in writing skills. Here are some ways AI is applied:

• Assessment of Writing Skills: AI can evaluate children's early writing abilities, such as letter formation, phrase usage, and short sentence construction. AI platforms can analyze writing samples, assessing parameters like flow, coherence, and correctness. Tools like Grammarly and WriteLab offer immediate feedback to educators on students' performance. This data can predict future difficulties in composition and grammar during school age[21].

• Pattern Recognition: Machine learning models can identify performance patterns related to learning difficulties. For example, analyzing data from early writing exercises can help predict issues in composition and grammar. AI can examine writing samples to detect patterns indicating potential learning difficulties, including coherence, organization, originality, and proper use of words and punctuation[21].

• Correlation between Reading and Writing Skills: Research shows a close link between reading ability and writing skills. AI can monitor reading development and predict its impact on written expression and composition during school age.

• Predicting Learning Outcomes: By analyzing performance data from ages 4-7, AI can forecast future written language performance, enabling early intervention and adaptation of educational programs to support children with potential learning difficulties[21]. Specific tools include:

- Lexplore: This platform uses machine learning algorithms and eye movement analysis to assess reading skills, helping predict learning difficulties that may affect writing skills in the future.

- CogniABle: Provides AI-based assessments for children with autism, identifying early signs of learning difficulties, including issues in written language. It adapts teaching methods to meet children's needs.

- Qustodio: Primarily a tool for monitoring online activity, it employs AI to analyze behavior patterns and identify potential problems related to learning difficulties, such as concentration and attention issues that impact writing ability.

c) Facilitating Assessment and Feedback

Assessing student performance and providing feedback are central elements of the educational process. AI can automate and enhance these processes, enabling more immediate, accurate, and detailed feedback. AI tools, such as automatic correction programs and text analysis algorithms, can provide instant feedback to students, helping them understand their mistakes and improve their skills without the need for continuous human intervention. For example, automatic correction systems can identify grammatical and syntactical errors while offering explanations and suggestions for correct language use[24]. These technologies not only accelerate the learning process but also reduce educators' workloads, allowing them to focus on more creative and complex aspects of teaching. For instance, the "Grammarly" tool uses AI to analyze and correct students' written texts, providing detailed suggestions for improvements in grammar, syntax, and style[14].

Potential Problems, Challenges, and Questions

Despite the significant benefits AI can offer in literacy, several challenges need to be addressed. A major concern is the potential loss of human interaction, which is crucial for developing social and emotional skills. The presentation of information and provision of feedback through machines cannot replace human empathy and personal interaction, which are essential for students' holistic development[16]. Additionally, there is a risk that AI could exacerbate existing educational inequalities, particularly for students without access to modern technologies. These inequalities can stem from differences in access to technological tools and the necessary infrastructure for effective use of AI in education[34].

Therefore, the impact of AI on educational processes must be carefully examined to ensure that technology enhances rather than marginalizes students. For instance, educational AI systems must be designed to promote inclusion and provide equal access to all students, regardless of their social or economic background[34]. Moreover, the development and use of AI in education raise significant ethical and social issues that must be considered. One major concern is protecting students' personal data. Collecting and processing large amounts of student data require strict rules and regulations to ensure privacy and prevent abuse. Furthermore, the development and implementation of AI systems must be transparent and subject to continuous oversight to avoid biases or unfair outcomes[16].

Additionally, the use of AI in literacy raises new ethical questions. How do we perceive students' autonomy in the face of a system designed to correct or guide them? How do we address the ethical dilemmas arising from the application of AI in education?

The Importance of Forming a Positive Perception of Introducing AI in Education: The Case of Literacy

A positive perception of the new and unknown is crucial for adaptation and success in a constantly changing environment. From a psychological perspective, a positive outlook helps individuals face challenges with confidence and seize opportunities arising from change. Adapting to something new and unfamiliar often causes anxiety and uncertainty. However, those who maintain a positive perception are more likely to view the unknown as an opportunity for growth and learning. A positive attitude can increase the willingness to take risks and the ability to face obstacles with greater composure[9].

According to Bandura[2], self-efficacy—the belief in one's ability to achieve goals—plays a significant role in dealing with the new and unknown. Individuals with high self-efficacy are more likely to approach challenges with optimism and seek solutions rather than avoid problems. Enhancing self-efficacy can be achieved through positive self-talk and recognizing past successes.

A positive perception of the new can also be bolstered by the development of positive emotions such as optimism and gratitude. Fredrickson[9] argues that positive emotions broaden individuals' cognitive repertoire, enabling them to see more possibilities and be more creative in problem-solving. Additionally, support from the social environment plays a crucial role in fostering a positive perception. Encouragement from friends, family, and colleagues can boost confidence and determination to face the unknown[11].

The introduction of AI in education is one of the most significant innovations of the last decade, offering capabilities that can enhance the learning experience and improve teaching. However, the successful implementation of such innovations largely depends on the perception of educators and students regarding this new technology. Forming a positive perception is critical for the acceptance and sustainable integration of AI into educational systems. According to Davis[4], the perception of usefulness and ease of use of technology influences individuals' intention to adopt it. In the case of AI, a positive perception can arise from understanding its potential to personalize learning, improve student assessment, and enhance classroom interactivity[20].

Positive perceptions are shaped by various factors, including teacher education, technological support, and usage experiences. Educators who receive adequate training and support in using AI are more likely to effectively integrate it into their teaching[15]. Additionally, students' experiences with AI can boost their

confidence in technology, creating positive expectations for their learning progress. Despite the benefits, significant obstacles can negatively impact the perception of AI in education. The lack of technical support and a clear understanding of AI's advantages can create insecurity and resistance[8]. Concerns about data privacy and the potential loss of human-centric elements in education can also negatively affect the willingness to adopt AI[33].

To foster a positive perception, it is important to implement strategies that build educators' and students' trust in AI. One such strategy is continuous training and support for educators to acquire the skills and confidence they need[19]. Additionally, AI integration should enhance existing pedagogical practices rather than fully replace them[23]. Transparency regarding data use and ensuring student privacy can alleviate concerns and foster AI acceptance. Involving students and parents in the decision-making process for technology integration can also create an atmosphere of trust and cooperation[30].

Based on this theoretical framework, a key question that concerned us in this study is the attitude of educators regarding the educational use of AI for literacy development. In this presentation, we will present the research results concerning question G1: In which areas can AI applications be beneficial for education, specifically in Sector 13: Developing students' literacy.

Thus, the following research objectives were formulated:

• To what extent is the perception of educators positive or negative regarding the use of AI for literacy development?

• Does this perception of educators vary depending on their demographic characteristics?

• Are there specific predictive factors among those examined in our study that explain their positive or negative perception?

• How do these factors contribute to the development of positive or negative perceptions among educators regarding the implementation of NT in students' literacy development?

II. Material And Methods

Our research falls under exploratory studies and aimed to capture the current state in the field of Primary and Secondary Education educators regarding Artificial Intelligence. It was conducted through data collection via an anonymous questionnaire. The questionnaire was sent to all school units in the country through the Primary and Secondary Education Directorates in December 2023. Data were collected through the Google Form platform, and statistical processing was done using SPSS 28.

Sable: The research sample was formed from the voluntary participation of N=1736 educators. A unique aspect of our research was that after the demographic information, participants were asked not to proceed with completing the questionnaire if they answered "Not at all" to question A1: How well do you know what Artificial Intelligence is? Thus, the first data showed that 51% of the participating educators knew nothing about AI, while 49% knew a little, a lot, or very much. After filtering out incomplete questionnaires, our sample was N=866, and data processing was based on this.

The Questionnaire: The research questionnaire included six sections and a total of 47 questions, with responses ranging from Not at all, a little, a lot, very much, or Yes, No. The sections covered knowledge about AI (A), its educational use (B), its applications (G), ethical and deontological issues of AI introduction in education (D), fears of negative consequences from AI introduction in education (E), and educators' attitudes and needs towards AI introduction in education (F), as shown in Appendix.

Statistical analysis

Data analysis was conducted using descriptive and inferential statistics with the IBM SPSS v.28 software. Frequencies and percentage calculations were done, and results were presented in tables and graphs. The normality of variables was tested using the Kolmogorov-Smirnov test and kurtosis and skewness indices. The results showed normal distribution of variables (p-value > 0.05). For investigating correlations, parametric tests such as Pearson's t-Test, ANOVA, and Multiple Linear Regression were used. For creating a Structural Model based on predictability variables, the STATA 17 statistical program was used to define causal relationships between factors and the adaptability of patterns to data. Factor analysis of data was done using Principal Components Analysis with the Varimax orthogonal rotation method in SPSS v.28.

III. Result

Table no 1 *Frequency and Percentage Distribution of Application for Developing Students' Literacy*. According to the results of our research, the majority (57.1%) of the 862 educators in the sample believe that AI application in developing students' literacy is from very much to very much).

Table no 1: Frequency and Percentage Distribution of Application for Developing Students' Literacy.

Question G1: In which of the following areas can AI applications be positive for Education, according to your opinion?	N=862
Areas	Not at all-A little N (%) Very much N (%)
Developing students' literacy	370 (42.9%) 492 (57.1%)

Correlations with Demographic Characteristics

Table no 2 *Descriptive Measures of Student Literacy Development by Gender.* For the correlation of developing students' literacy with gender, a t-test was used. Shows that the mean value for males (1.60) is higher than for females (1.56).

Table no2: Descriptive Measures of Student Literacy Development by Gender.

	Gender		N	Mean	Std. Deviation	Std. Error Mean
Developing students' literacy	Male		278	1,60	0,491	0,029
	Female		584	1,56	0,497	0,021

Table no3 *Comparisons of Mean Values of Literacy Development by Years of Service.* However, t-test results according to Levene's Test ($p=0.022<0.05$) based on the second line of the Table ($t=1.083$ $p=0.279>0.05$) show that the mean values for males and females do not differ. There is no statistically significant correlation between perceptions of developing literacy with AI applications based on gender. To examine the difference in mean values of perceptions of developing students' literacy with AI applications by demographic characteristics (Education Level, Age, Years of Service, Additional Studies, Training, and Position/Role in school), one-way ANOVA was used. The findings of this analysis regarding variance for Education Level, Age, Additional Studies, and Position/Role in school show that there is equality of mean values and thus no statistically significant difference ($p>0.05$). Conversely, for perceptions of developing students' literacy with AI applications, it is shown that there is no equality of mean values with Years of Service and Training, indicating a statistically significant difference ($p<0.05$). Years of Service and Training of participants affect their perceptions of developing students' literacy with AI applications. Comparisons of mean values show statistically significant differences in developing students' literacy based on years of service between categories of "31-40" and "11-15" years of service ($p=0.016<0.05$).

Table no3: Comparisons of Mean Values of Literacy Development by Years of Service

Test Tukey HSD						95% Confidence Interval	
Dependent Variable	(I) Years of Service 31-40	(J) Years of Service	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Developing literacy	31-40	11-15	0,277	0,081	0,016	0,03	0,52

Table no4 *Comparisons of Mean Values of Literacy Development by Training.* This difference shows that the mean perception of developing students' literacy with AI applications for those with "31-40" years of service is 0.277 units higher compared to those with "11-15" years of service and vice versa. Regarding Training, differences are found between "Training in Teaching Methodology & Educational Administration" and "Training in Teaching Methodology" ($p=0.007<0.05$). This difference shows that the mean perception of developing students' literacy with AI applications is 0.182 units higher for those with both Training in Teaching Methodology and Educational Administration compared to those with Training only in Teaching Methodology and vice versa.

Table no4: Comparisons of Mean Values of Literacy Development by Training

Test Tukey HSD						95% Confidence Interval	
Dependent Variable	(I) Training	(J) Training	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Developing literacy	Training in Teaching Methodology & Educational Administration	Training in Teaching Methodology	0,182	0,051	0,007	0,03	0,33

Pearson correlation test does not show a statistically significant correlation of perceptions of developing students' literacy with AI applications with demographic characteristics, except for Years of Service (r=0.081, weak positive correlation) and Training (r=0.141, weak positive correlation). Regarding dimensions (Sections of the questionnaire) of AI in education, perceptions of developing students' literacy with AI applications show statistically significant correlations with Educational Use of AI (r=0.542, moderate positive correlation), AI Applications in Education (r=0.650, strong positive correlation), Ethical/Deontological Issues of AI Introduction in Education (r=-0.139, weak negative correlation), Fears/Negative Consequences of AI Introduction in Education (r=-0.135, weak negative correlation), Addressing Negative Consequences of AI in Education (r=0.131, weak positive correlation), Educators' Attitudes towards AI Introduction in Education (r=0.253, weak positive correlation), and Needs for Educator Support in AI Introduction in Education (r=0.185, weak positive correlation). The strongest correlation of developing students' literacy is mainly with Educational Use of AI and AI Applications in Education.

Multiple Regression with Dependent Variable the Perception of Developing Students' Literacy with AI Applications

Table no5 *Entered Variablesa.* To create a model for predicting the independent variables related to artificial intelligence and education in relation to the dependent variable (Application of artificial intelligence for literacy development), Multiple Regression using the Stepwise method identified 15 variables (Table 5). With the inclusion of these 15 variables, the final model was formed, where R Square = 0.519, predicting 51.9% of the total variance in students' literacy development with artificial intelligence. The contribution of individual independent variables, aside from Augmented Learning Applications, is consistently minimal. Additionally, model validation using ANOVA demonstrates statistical significance ($p < 0.05$) for all 15 variables. The regression model equation resulting from the final step of the 15th model is:

$$Y=b0+b1x1+b2x2+b3x3+\ldots+b15x15$$

Table no5: Entered Variables[a]

Model	Entered Variables	Method
1	Enhancing Learning Applications	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
2	Applications for Promoting Creativity and Innovation	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
3	Applications for More Efficient and Effective Teaching Methods	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
4	Automated Assessment and Feedback Applications	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
5	Applications for Developing Critical Thinking	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
6	Applications for Developing Safe AI Usage Skills	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
7	Applications for Developing Problem-Solving Skills	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
8	Can AI Increase Inclusion of Students with Special or Specific Needs in the Learning Process?	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
9	Can AI Free the Teacher from Bureaucratic Work (e.g., lesson planning)?	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
10	Do You Feel Concerned About AI's Introduction in Education?	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
11	Can AI Support the Teacher in Differentiating Instruction?	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
12	Can AI Adapt a Teaching Method to Student Needs?	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
13	Need for Continuous Training and Daily Support from a Team of Experts via Distance Learning	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
14	Curricula with Specific AI Application Proposals in Each Subject and Teaching Unit	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)
15	Can AI Monitor the Learning Progress of the Student?	Stepwise (Criteria: Probability-of-F-to-enter <=0.050, Probability-of-F-to-remove >=0.100)

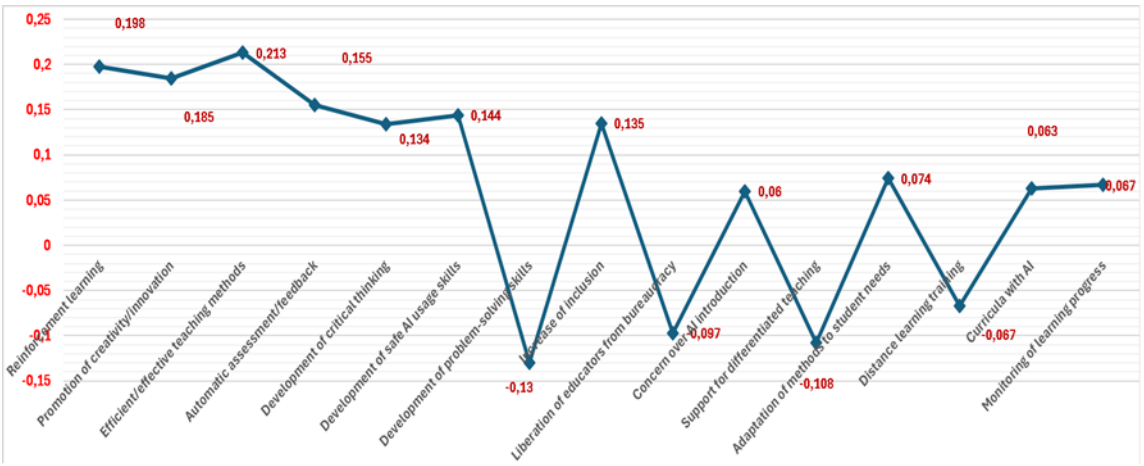
a. Dependent Variable: Applications for developing students' literacy.

Table no6 *Standardized Beta Values of Independent Variables.* Graph no1. *Standardized Beta Values of Independent Variables.* In conclusion, the impact of the independent variables on the dependent variable remains relatively low. The variables making the greatest absolute contributions to the model include Augmented Learning Applications, Applications for more efficient and effective teaching methods, and Applications for promoting students' creativity and innovation. The variable with the greatest influence on

perceptions of literacy development through AI applications is Applications for more efficient and effective teaching methods (0.213). The second most influential variable is positive perception of AI applications for augmented learning (0.198). In cases where the B value is negative, there is a corresponding decrease in perceptions of literacy development through AI applications.

Table no6: Standardized Beta Values of Independent Variables

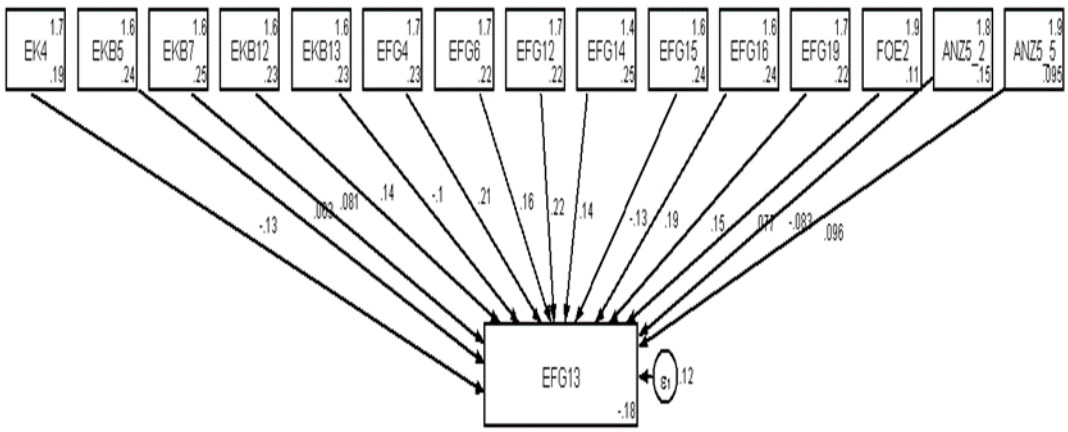
Independent Variable	Beta Value
(EFG4) Enhancing Learning	0.198
(EFG16) Promoting Creativity/Innovation	0.185
(EFG12) Efficient/Effective Teaching Methods	0.213
(EFG6) Automated Assessment/Feedback	0.155
(EFG14) Developing Critical Thinking	0.134
(EFG19) Developing Safe AI Usage Skills	0.144
(EFG15) Developing Problem-Solving Skills	-0.130
(EKB12) Increasing Inclusion	0.135
(EKB13) Freeing the Teacher from Bureaucracy	-0.097
(FOE2) Concern About AI Introduction	0.06
(EK4) Supporting Differentiated Instruction	-0.108
(EKB7) Adapting Methods to Student Needs	0.074
(ANZ5_2) Distance Training	-0.067
(ANZ5_5) Curricula with AI	0.063
(EKB5) Monitoring Learning Progress	0.067



Graph no1: Standardized Beta Values of Independent Variables

Structural Model

Graph no2 *Flow Diagram of Structural Model.* To create the model based on the Path diagram, the variables were used as exogenous observed variables and one endogenous observed variable.



Graph no2: Flow Diagram of Structural Model

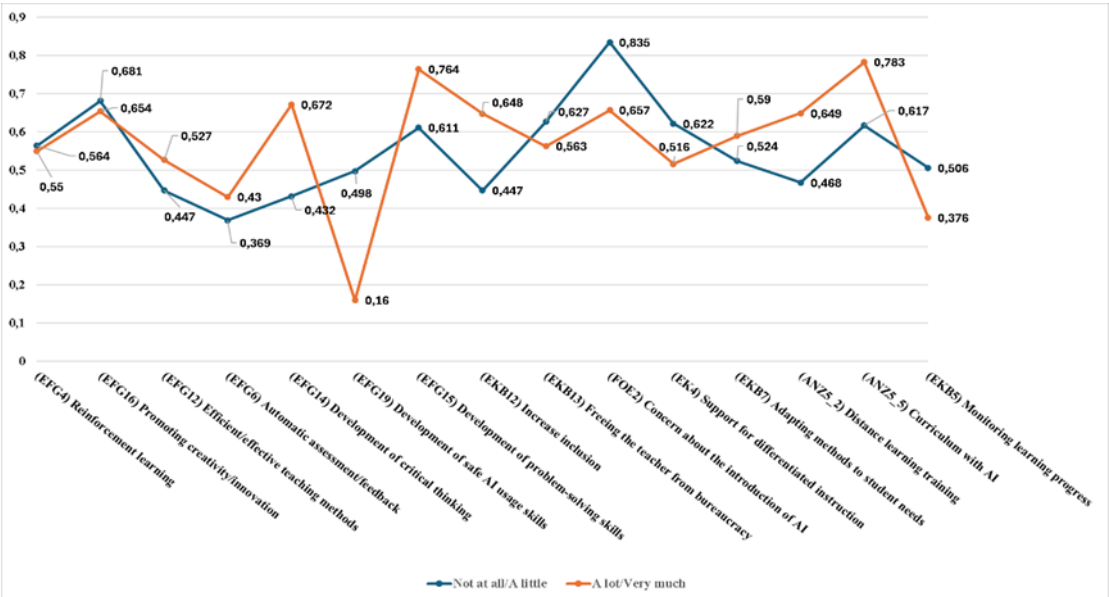
Goodness-of-fit indices show very good fit ($\chi 2/df=0.000<2$; RMSEA=0.000=0%; CFI=1.000=100%>95%; TLI=1.000=100%>95%; SRMR=0.000=0%<5%). The CD index=0.518=51.8%<95% shows moderate fit. In conclusion, almost all fit indices indicate a model with good fit, with the most significant indices (SRMR and CFI) having good fit. According to the results of the structural model analysis, the most significant variables in the model are as follows: (EFG12) "Efficient/effective teaching methods" with a significance value of z=6.55, (EFG16) "Promotion of creativity/innovation" (z=5.61), (EFG4) "Augmented learning" (z=5.59), (EFG19) "Development of safe ICT skills" (z=5.01), and (EFG6) "Automatic assessment/feedback" (z=5.00).

Factor Analysis

Finally, we conducted factor analysis of the independent (exogenous) variables as presented above with the dependent variable EFG13 "Applications for literacy development using AI." All variables were recoded into two values (1=Not at all/a little and 2=Very/much). Factorization occurred in two stages for each exogenous variable. In the first stage, the value 1=Not at all/a little was chosen for the endogenous variable, and in the second stage, the value 2=Very/much was chosen.

Graph no3 *Factor Variances.* Two groups of common factor variations were created for the endogenous variable.

For those who responded with the value 1 (Not at all/a little) for "Applications for literacy development using AI," the variables that had the greatest impact on their response compared to those with a more positive stance towards Literacy Development (value 2=Very/much) were [(EFG16) Promotion of creativity/innovation (0.681)], [(EFG19) Development of safe ICT skills (0.498)], [(FOE2) Concerns about ICT introduction (0.835)], [(EK4) Support for differentiated teaching (0.622)], and [(EKB5) Monitoring of learning progress (0.506)]. For those who responded more positively (value 2=Very/much), the variables that made a greater contribution were [(EFG12) Efficient/effective teaching methods (0.527)], [(EFG6) Automatic assessment/feedback (0.430)], [(EFG14) Development of critical thinking (0.672)], [(EFG15) Development of problem-solving skills (0.764)], [(EKB12) Increase in inclusion (0.648)], [(EKB7) Adaptation of methods to student needs (0.590)], [(ANZ5_2) Distance training (0.649)], and [(ANZ5_5) ICT-based study programs (0.783)]. It is noteworthy that the variable [(EFG19) Development of safe ICT skills] had a very low impact (0.160).



Graph no3: Factor Variances

IV. Discussion - Recommendations

The educators who participated in our research consider AI to be positive for the development of students' literacy, with 45.9% indicating "very" positive and 11.1% indicating "extremely" positive. However, there are also those who consider AI to be "a little" (36%) or "not at all" (7%) positive for literacy development.
Regarding demographic data, there is no statistically significant correlation between perceptions of literacy development with AI applications and gender. Additionally, the findings of the variance analysis for Education Level, Age, Additional Studies, and Position/Role in the school show that these factors do not significantly affect educators' perceptions ($p > 0.05$).

Conversely, Years of Service and Training of participants seem to influence their perceptions of the development of students' literacy with AI applications. The mean perception of literacy development with AI applications for those with "31-40" years of service is 0.277 units higher compared to those with "11-15" years of service, and vice versa. This suggests that educators with many years of service have a more positive perception of AI applications in literacy development. This might be due to the frustration experienced in trying to develop literacy in their students with poor results. This sense of inadequacy might justify the search for help through modern technology. Regarding Training, the differences are found between "Training in Teaching Methodology & Educational Administration" and "Training in Teaching Methodology" ($p=0.007 < 0.05$). This difference shows that the mean perception of literacy development with AI applications is 0.182 units higher for those with training in both Teaching Methodology and Administration compared to those with training only in Teaching Methodology, and vice versa. This finding might be due to the fact that participants trained in Administration have been exposed to AI applications and have gained positive experiences from the effective contribution of AI to their work.

It is also important that specific factors from those examined in our research emerged, explaining the positive or negative perception of participants regarding the use of AI applications for literacy development. We could highlight the contribution to the positive perception of literacy development from the simultaneous positive perception of the use of AI applications for:

- Efficient/Effective Teaching Methods (0.213): The most significant predictor of positive perception was the positive perception of AI applications for efficient and effective teaching methods. This supports the theoretical view that AI can optimize teaching processes, making them more effective and tailored to the needs of each student. This finding is consistent with previous research showing that AI can enhance teaching efficiency through automation and data analysis (Holmes et al., 2019).
- Enhanced Learning (0.198): The second most significant factor was the perception of AI's role in enhanced learning. This shows that educators appreciate AI for its ability to provide additional support both inside and outside the traditional classroom, confirming theoretical views on AI's effectiveness for personalized and adaptive learning[20].
- Promoting Creativity/Innovation (0.185): The positive impact of AI on promoting creativity and innovation was also significant. This finding aligns with the theoretical view that AI can offer new tools and methodologies to enhance creative thinking and innovative problem-solving[1].

Our findings align with contemporary studies on AI in education. For example, Luckin et al.[20] emphasize the transformative potential of AI in creating personalized learning experiences tailored to the unique needs of each student. Similarly, Holmes et al.[16] highlight the role of AI in automating administrative tasks, enabling educators to focus more on interactive and student-centered teaching.

However, our study also highlighted areas of concern and potential problems such as:

- Developing Problem-Solving Skills (-0.130): The negative coefficient for developing problem-solving skills suggests that educators may have reservations about AI's effectiveness in this area. This could be due to the perceived complexity of problem-solving skills, which often require nuanced human judgment and creativity that AI might not fully replicate[34].
- Supporting Differentiated Instruction (-0.108): Another area with a negative impact was educators' perceptions of AI's ability to support differentiated instruction. Educators' skepticism about AI's capacity to effectively respond to diverse learning needs reflects concerns about whether AI can provide the same level of personal attention and adaptability as a human teacher[8].

Our findings highlight educators' concerns about the ethical and social implications of AI in literacy development. Critical issues include data privacy protection, equitable access to technology, and maintaining human interaction. Variables such as "Freeing Teachers from Bureaucracy" (-0.097) and "Concern About AI Introduction" (0.06) reflect underlying concerns about over-reliance on AI and the potential loss of the human element in teaching.

Our study confirms that participating educators generally perceive AI as a positive factor in literacy development, particularly in enhancing teaching efficiency and providing supplemental learning. However, challenges related to developing problem-solving skills, differentiated instruction, and the ethical dimensions of AI implementation in education must be addressed to fully realize AI's benefits in education.

Based on our theoretical framework and research findings, we believe that future research should continue to explore these areas, providing insights into how AI can be effectively integrated into education while minimizing the ethical and social impacts that this technological evolution might create and increasing educators' positive perceptions of its use to support literacy development. Additionally, before the official introduction of AI in education in the Greek context, systematic actions should precede such as:

- Implementation of an extensive training program on AI in literacy with the organization of seminars and educational programs focusing on the use of AI for literacy development and providing training on using tools

such as automated assessment programs and adaptive learning systems, which can improve students' literacy skills[20,15].

- Integration of AI into the Curriculum by developing and integrating courses that use AI to enhance skills in understanding and producing spoken and written language with activities that use AI applications for reading texts, analyzing complex texts, and producing written texts, and encouraging the use of AI platforms like Grammarly and WriteLab, which provide immediate feedback and help develop students' grammatical and syntactical skills[5].
- Support and provision of resources for educators by creating support networks for educators applying AI in literacy development, offering technical support, guidance, and sharing best practices[16], as well as providing access to AI resources and tools, such as digital resource libraries and AI platforms, to support teaching and literacy development[8].
- Development of collaborations and research such as collaboration with universities and research centers to conduct studies and research on the effectiveness of AI in literacy development. Educators can actively engage in these research projects, helping evaluate and provide feedback on AI tools[34]. Additionally, creating pilot programs in collaboration with experimental schools to evaluate new AI tools and applications aimed at literacy development[23].
- Addressing ethical and social issues by ensuring that student data is protected and used ethically. This requires the establishment of clear data protection policies and ensuring transparency in the use of AI tools[30]. Also, by providing equal access to technology for all students, regardless of their social and economic background, to avoid creating inequalities in education[33].
- Creating a positive perception through awareness and sensitization by organizing awareness-raising events for parents and the wider school community about the benefits of AI in literacy development, where presentations, workshops, and demonstrations of AI tools will be showcased[9]. Additionally, by creating positive examples of success and case studies from educators who have successfully integrated AI into their students' literacy development[2].

V. Conclusion

Our research aimed to explore educators' perceptions regarding the application of AI in literacy development and to identify the key factors influencing these perceptions. The theoretical framework highlighted the potential benefits of AI in education, such as personalized learning, automated assessment, and increased student engagement. Our findings largely align with this framework, indicating that educators recognize the positive effects of AI, particularly in areas such as efficient teaching methods and enhanced learning.

References

[1]. Baker, L. Handbook Of Early Literacy Research. Guilford Press. 2006.
[2]. Bandura, A. Self-Efficacy: The Exercise Of Control. W.H. Freeman. 1997.
[3]. Bawden, D. Origins And Concepts Of Digital Literacy. Digital Literacies: Concepts, Policies And Practices, 2008;30(2008):17-32
[4]. Davis, F. D. Perceived Usefulness, Perceived Ease Of Use, And User Acceptance Of Information Technology. Mis Quarterly. 1989; 13(3):319-340
[5]. Doignon Jp, Falmagne J C. Knowledge Spaces. Springer-Verlag.1999.
[6]. Eisenstein El. The Printing Press As An Agent Of Change. Cambridge University Press. 1980.
[7]. Ennis, R. H. Critical Thinking. Prentice Hall.1996.
[8]. Ertmer P A, Ottenbreit-Leftwich A. Teacher Technology Change: How Knowledge, Confidence, Beliefs, And Culture Intersect. Journal Of Research On Technology In Education. 2010; 42(3):255-274
[9]. Fredrickson Bl. The Role Of Positive Emotions In Positive Psychology: The Broaden-And-Build Theory Of Positive Emotions. American Psychologist. 2001; 56(3):218-226
[10]. Freire P, Macedo D. Literacy: Reading The Word And The World. Bergin & Garvey. 1987.
[11]. Gable Sl, Reis Ht, Impett Ea, Asher E R. What Do You Do When Things Go Right? The Intrapersonal And Interpersonal Benefits Of Sharing Positive Events. Journal Of Personality And Social Psychology. 2004; 87(2):228-245
[12]. Gee Jp. Social Linguistics And Literacies: Ideology In Discourses. Routledge. 2008.
[13]. Graff Hj. The Legacies Of Literacy: Continuities And Contradictions In Western Culture And Society. Indiana University Press. 1987.
[14]. Grammarly (N.D.). Grammarly: Free Online Writing Assistant. Retrieved From Https://Www.Grammarly.Com
[15]. Hattie J. Visible Learning: A Synthesis Of Over 800 Meta-Analyses Relating To Achievement. Routledge. 2009.
[16]. Holmes W, Bialik M, Fadel C. Artificial Intelligence In Education: Promises And Implications For Teaching And Learning. Center For Curriculum Redesign. 2019.
[17]. Jiao, W., Wang, W., Huang, J., Wang, X., & Tu, Z. (2023). Is Chatgpt A Good Translator? A Preliminary Study. Arxiv.
[18]. Kirsch Is, Jungeblut A, Jenkins L, Kolstad A. Adult Literacy In America: A First Look At The Findings Of The National Adult Literacy Survey. National Center For Education Statistics. 2002.
[19]. Koh Jhl, Chai Cs. Teacher Clusters And Their Perceptions Of Technological Pedagogical Content Knowledge (Tpack) Development Through Ict Lesson Design. Computers & Education. 2016; 91, 161-171
[20]. Luckin R, Holmes W, Griffiths M, &Forcier Lb. Intelligence Unleashed: An Argument For Ai In Education. Pearson Education. 2016.

[21]. Reading Rockets: Provides A Detailed Description Of Methods For Assessing Written Expression, Focusing On Early Written Expression And How It Can Be Evaluated To Identify Potential Issues. Https://Www.Pbs.Org/Launchingreaders/Abouttheseries.Html
[22]. Russell Sj, Norvig P. Artificial Intelligence: A Modern Approach (4th Ed.). Pearson. 2020.
[23]. Selwyn N. Should Robots Replace Teachers? Ai And The Future Of Education. Polity. 2019.
[24]. Shermis Md, Burstein J. Handbook Of Automated Essay Evaluation: Current Applications And New Directions. Routledge. 2013.
[25]. Snow Ce. Reading For Understanding: Toward An R&D Program In Reading Comprehension. Rand Corporation. 2010.
[26]. Solportal.Ibe-Unesco.Org. Emergent Literacy: Building A Foundation For Learning To Read. 2021. Https://Solportal.Ibe-Unesco.Org
[27]. The Centre For Education And Youth (Cfey): Analyzes The Relationship Between Reading Ability And Educational Outcomes, Indicating How Reading Ability Can Be Used To Predict Written Skills. Https://Cfey.Org
[28]. Turing Am. Computing Machinery And Intelligence. Mind. 1950; 59(236):433-460
[29]. Unesco. The Plurality Of Literacy And Its Implications For Policies And Programmes. Unesco Education Sector Position Paper. 2004
[30]. Van Der Laan S, Pels T. Parental Involvement And Partnership In Inclusive Education. European Journal Of Special Needs Education. 2020; 35(1):89-104
[31]. Von Ahn L. Duolingo: Learn A Language For Free While Helping To Translate The Web. In Proceedings Of The 2013 International Conference On Intelligent User Interfaces.2013; 1-2
[32]. Whitehurst Gj, Lonigan C J. Emergent Literacy: Development From Prereaders To Readers. In S. B. Neuman & D. K. Dickinson (Eds.), Handbook Of Early Literacy Research. 2001;11-29. The Guilford Press.
[33]. Williamson B. Policy Networks, Performance Metrics And Platform Markets: Charting The Expanding Data Infrastructure Of Higher Education. British Journal Of Educational Technology. 2019; 50(6):2794-2809
[34]. Williamson B. Big Data In Education: The Digital Future Of Learning, Policy And Practice. Sage Publications. 2017.
[35]. Zhu M, Mai H, Wang Z, Johnson, K. Natural Language Processing In Educational Applications. In Proceedings Of The 2020 Conference On Empirical Methods In Natural Language Processing. 2020.