Research Paper

The dark side of artificial intelligence in education: a critical analysis of its impact on learners aged 12-14 years

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ABSTRACT

This research explores the connections between Teacher-Led Instruction (TLI), Peer Collaboration (PC), and Artificial Intelligence Assistance (AIA) in influencing Student Cognitive and Social-Emotional Development (SCED). Through exploratory and confirmatory factor analyses, the study found that TLI and PC are important positive predictors of SCED, highlighting the crucial role of collaborative and teacher-led approaches in promoting overall student development. Contrastingly, there is a negative association between AIA and SCED, underscoring the potential disadvantages of excessive dependence on technology at the cost of meaningful human connections. The results indicate that educational settings should give precedence to incorporating effective teaching approaches while utilizing technology as an auxiliary instrument rather than a replacement for conventional teaching methods. By embracing a multifaceted approach to instruction, this study contributes to the ongoing discourse on enhancing educational practices in an increasingly digital landscape, ultimately advocating for a future where students thrive both academically and emotionally while studying with Artificial Intelligence cautiously.

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1. INTRODUCTION

Artificial Intelligence (AI) is transforming education in unprecedented ways, offering personalized learning experiences [1], automating administrative tasks, and improving student engagement through

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adaptive technologies. The deployment of AI systems such as learning platforms, virtual assistants, and data-driven assessments promises to enhance educational efficiency and tailor content to individual learners' needs (AIC, 2023). However, beneath these benefits lies a growing concern about the negative implications of AI use in education, especially for younger learners aged 11-14 years, whose cognitive and emotional development may be particularly vulnerable to the drawbacks of AI. As AI systems become more pervasive in classrooms, it is crucial to examine the "dark side" of these technologies, including ethical issues, unintended consequences, and long-term impacts on students' development and learning environments [2]. There is a growing body of research indicating that over-reliance on AI systems may stunt the development of critical thinking and problem-solving skills in learners. While AI can streamline certain learning tasks, students who rely too heavily on AI for answers may fail to develop the analytical and reflective skills necessary for independent learning (Discover AI, 2022). Moreover, the increased use of AI in classrooms could lead to a reduction in human interaction, which is vital for social-emotional learning, particularly for young learners [2]. Given the potential risks, it is imperative to understand the balance between AI's benefits and its darker aspects in the context of education. This study aims to explore these negative implications through a focused examination of learners aged 11-14 years, a group whose developmental needs are unique and sensitive to external technological influences. Understanding the full spectrum of AI's impact on this demographic is crucial for ensuring that AI's adoption in education serves the interests of all students equitably and ethically.

1.1 Research Objectives

1. Identify and analyze the negative impacts of AI on the cognitive, social, and emotional development of students aged 11-14 years.
2. Assess the over-reliance on AI technologies and their potential to diminish critical thinking, problem-solving skills, and interpersonal interactions among young learners.
3. Provide recommendations for policymakers, educators, and AI developers on mitigating the risks associated with AI in education while maximizing its benefits for students.

By focusing on these objectives, the research seeks to contribute to a more balanced discourse on AI in education, emphasizing the need for ethical oversight and the creation of systems that prioritize student well-being and equitable access to technology.

2. RELATED WORK

Artificial Intelligence (AI) has become increasingly integrated into educational systems, offering personalized learning experiences, enhancing engagement, and automating repetitive tasks. However, the deployment of AI in education, particularly among young learners aged 11-14, has raised concerns about its potential adverse effects. This age group, which is in a critical stage of cognitive, social, and emotional development, may be particularly vulnerable to the unintended negative consequences of AI-based educational tools [3], [2] This literature review examines the potential harms of AI on this demographic, focusing on algorithmic bias, privacy concerns, over-reliance on technology, and the diminishing role of human interaction.

2.1 Algorithmic Bias and its Impact on Learners

For young learners aged 11-14, whose self-esteem and academic identity are still developing, the impact of biased AI can be particularly damaging. Studies have shown that algorithmic bias in educational tools can lead to disproportionately lower grades or incorrect assessments of students' capabilities based on their gender, race, or socioeconomic status [4] These inaccuracies can influence teacher perceptions, peer relationships, and even students' future academic paths, exacerbating existing inequalities and negatively affecting students' confidence and motivation [5].

2.2 Over-Reliance on AI and Cognitive Development

Another significant concern is the over-reliance on AI tools in education, which could potentially hinder the development of critical thinking and problem-solving skills in young learners. AI systems often provide automated solutions to problems, which can limit students' opportunities to engage deeply with the material, explore different solutions, or learn through trial and error [6].

For students aged 11-14, this over-reliance can stifle the development of important cognitive processes. At this age, learners are transitioning from concrete to abstract thinking, and exposure to challenging, open-ended problems is critical for developing higher-order thinking skills [3] If AI systems consistently offer quick, pre-packaged solutions, students may miss out on the chance to develop perseverance, creativity, and critical analysis, which are essential for their future academic and professional success (Discover AI, 2022). Figure 1 represents the conceptual framework of the current study.

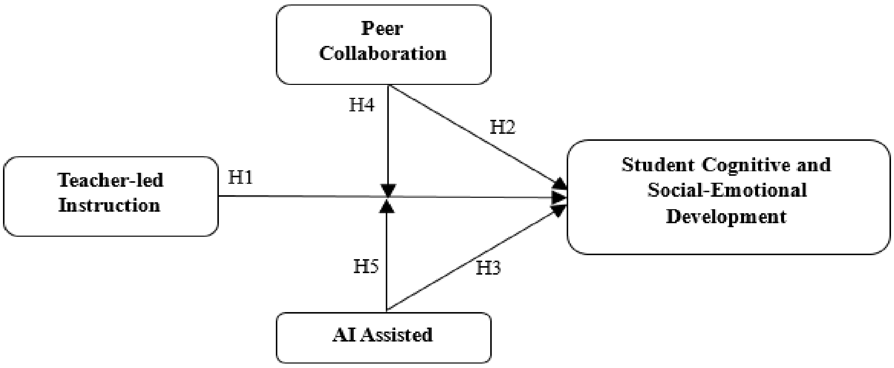

Figure 1. Conceptual Framework

Based on the conceptual framework of the impact of teacher-led instruction, peer collaboration, and AI-assisted learning on student cognitive and social-emotional development, the following hypotheses can be proposed:

2.3 Hypothesis 1 (Main Effect Hypothesis)

- **H1:** Teacher-led instruction will have a positive and significant effect on the cognitive and social-emotional development of students aged 11-14.

  Hypothesis 4 (Moderating Effect of Peer Collaboration):
- **H4:** Peer collaboration will moderate the relationship between teacher-led instruction and student cognitive and social-emotional development, such that the positive effect of teacher-led instruction will be stronger when peer collaboration is present.

  Hypothesis 5 (Moderating effect of AI-Assisted Learning):
- **H5:** AI-assisted learning will moderate the relationship between teacher-led instruction and student cognitive and social-emotional development, such that the positive effect of teacher-led instruction will be affected when AI tools are used.

  [7] (Individual effect of moderators on Student Development):
- **H2 and H3:** The combined effects of peer collaboration and AI-assisted learning will have an interactive effect on student development, with the strongest positive outcomes.

3. METHODOLOGY

3.1 Research Design and Paradigm

3.1.1 Research Design

This study adopts a quasi-experimental design with a within-subjects approach. The aim is to compare the impact of traditional teacher-led instruction without AI assistance and AI-assisted learning tools on student cognitive and social-emotional development. The design allows for direct comparison by having the same group of students experience both learning environments, reducing variability due to individual differences. This design is appropriate because it provides a controlled environment to evaluate the [8] on the same learners.

3.2 Study Phases

Phase 1: Traditional Learning without AI Assistance

In this phase, students aged 11-14 will undergo instruction led entirely by teachers. The teaching method will include lectures, discussions, and peer collaboration, but no AI tools or technology will be integrated into the learning process.

Phase 2: AI-Assisted Learning

In the second phase, students will undergo similar content-based instruction, but this time with the integration of AI tools, such as adaptive learning systems, intelligent tutoring systems, and automated feedback mechanisms. This phase will allow students to use personalized, AI-powered platforms to engage with the material while still having teacher oversight.

Comparison of Results

After both phases, students' cognitive development (measured through academic performance, critical thinking, and problem-solving tests) and social-emotional development (measured through questionnaires on collaboration, empathy, and communication skills) will be compared. The comparison will aim to determine whether AI assistance enhances or hinders learning outcomes compared to traditional methods.

3.3 Sampling Size and Sampling Procedure

In this research, six classes of students were selected to participate, aiming to examine the impact of AI assistance and traditional learning methods on cognitive and social-emotional development among students aged 11-14. The classes were chosen from the same educational institution to maintain consistency in learning environments and minimize external variability.

Sampling Size The sample size consisted of approximately 154 students, distributed across three classes. The exact number of students per class varied slightly, with an average of Twenty-six (26) students in each class. The final [9] was determined based on the total student population in the selected school and the study's inclusion criteria, such as age and grade level. To ensure the study's representativeness, each class was used as a separate unit of analysis, allowing for comparative analysis across groups.

3.4 Measures / Measurement Constructs

A carefully structured questionnaire was created to collect data, emphasizing appropriate language and the proper sequence of questions. Following this, the questionnaire was tested with a small group of participants to gather feedback and make further improvements before distributing it online for data collection. All items were assessed using a five-point Likert scale, enabling participants to express the intensity of their viewpoint on a scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (5), with "Disagree" (2), "Neutral" (3), and [10]. (See Appendix A). The questionnaire had five sections. Section a collected demographic information about respondents. Section B had measurement items of Teacher-Led instruction. Section C presented items under the Peer collaboration. Section D represented AI-Assistance. Section E presented items on Student Cognitive and Social-Emotional Development. The demographic data for this study is represented in detail in Table 1.

Table 1. Respondents' Demographics

Profile of Respondents	Frequencies (N)	%
Gender:	154	100
Male	73	47.4
Female	81	52.6
Age:	154	100
11	11	7.1
12	86	55.8
13	38	24.7

14	15	9.7
15	4	2.6
Preferred Subject:	154	100
Computing	35	22.7
English	18	11.7
Mathematics	51	33.1
Science	50	32.5
Class:	154	100
BS 7	72	46.8
BS 8	61	39.6
BS 9	21	13.6
Owned PC:	154	100
Yes	99	64.3
No	55	35.7

3.5 Ethical Consideration

Ethical considerations are essential in research to protect the rights and well-being of participants, particularly in studies involving minors such as students aged 11-14. The following ethical principles were adhered to in this study.

1. **Informed Consent:** In line with ethical guidelines, both parental consent and student assent were obtained before participation. Since minors were involved, parents or guardians were provided with detailed information about the study's purpose, procedures, potential risks, and benefits. This is consistent with the requirements set out by research ethics boards for studies involving children [11] Participants were also given the right to withdraw at any point without any negative consequences [12].
2. **Confidentiality and Anonymity:** Protecting the privacy of participants was a top priority. All personal information, including names, demographics, and academic data, was anonymized and stored securely to ensure that individual participants could not be identified. Researchers followed data protection regulations such as the General Data Protection Regulation (GDPR), which is increasingly being recognized globally in research [13].

3.6 Exploratory Factor Analysis

An Exploratory Factor Analysis (EFA) was conducted to examine the underlying factor structure of four key educational constructs: Teacher-Led Instruction (TLI), Peer Collaboration (PC), Artificial Intelligence Assistance (AIA), and Student Cognitive and Social-Emotional Development (SCED). These constructs are critical in today's educational landscape, particularly as blended and technology-enhanced learning environments become more prevalent [14], [15] The EFA was performed using Principal Component Analysis (PCA) with Varimax rotation to maximize the interpretability of the results. The analysis aimed to identify how different items group together to form components that reflect the major constructs within the educational framework. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy yielded a value of 0.957, which is considered excellent and indicates that the sample size was highly appropriate for conducting factor analysis [16] Values greater than 0.90 suggest that the data are likely to result in a reliable factor structure. In addition, Bartlett's Test of Sphericity was significant (χ^2 = 1056.1, df = 545, p < 0.001), confirming that the correlation matrix was not an identity matrix and that the data were suitable for factor analysis [17] Together, these measures confirmed the adequacy of the data for EFA.

The EFA extracted four components that together explained 75.78% of the total variance, indicating a robust factor structure. The first component, Teacher-Led Instruction (TLI), comprised seven items with high loadings between 0.860 and 0.926. Teacher-led instruction remains central to classroom learning, providing structure and guidance, even as educational technology becomes more prevalent [18] The highest loading in this component, 0.926, was found for TLI4, indicating that this item is a particularly strong indicator of the role that teachers play in orchestrating and directing student learning. These results suggest that, while technological and collaborative methods are becoming increasingly prominent, the traditional role of teachers remains foundational in shaping student outcomes. The second component, Student Cognitive and Social-Emotional Development (SCED) consisted of 10 items with factor loadings ranging from 0.855 to 0.951. These high loadings suggest that SCED is a well-defined construct, capturing a wide array of developmental dimensions such as cognitive growth and emotional regulation. This result aligns with contemporary educational research highlighting the importance of integrating social-emotional learning (SEL) alongside traditional academic instruction to support holistic student development [19], [20] The strong loadings of the SCED items further affirm that the items within this construct are highly interrelated and collectively provide a valid measure of student development. Peer Collaboration (PC) formed the third component, with nine items showing loadings from 0.612 to 0.814. This component captures the essence of collaborative learning, where students work together to solve problems, engage in discussions, and co-construct knowledge. Research has consistently demonstrated the positive effects of peer collaboration on student learning, particularly in fostering critical thinking and deeper understanding [21] the strong loading of PC7 at 0.814 illustrates the importance of this collaborative interaction in fostering an effective learning environment, making peer-to-peer engagement a key feature of contemporary educational practices. The fourth component, Artificial Intelligence Assistance (AIA), was defined by 10 items with loadings between 0.558 and 0.817. The AIA construct reflects the growing role of AI in education, where it is used to personalize learning experiences, offer immediate feedback, and assist teachers with data-driven insights [22], [5] The relatively high loadings on this factor indicate that AI tools and systems are seen as integral to enhancing educational processes. For instance, items AIA3 and AIA8 had loadings of 0.818 and 0.817, respectively, reflecting the significant impact of AI on both the student learning experience and teacher instruction as detailed in Table 2.

Table 2. Exploratory Factor Analysis (EFA)

Measurement Items	**Components**			
	1	**2**	**3**	**4**
Teacher-Led Instruction (TLI)				
TLI1			.896	
TLI2			.867	
TLI3			.860	
TLI4			.926	
TLI5			.892	
TLI6			.905	
TLI7			.921	
Peer Collaboration (PC)				
PC1				.767
PC2				.612
PC3				.747
PC4				.702
PC5				.774
PC6				.659
PC7				.814
PC8				.731
PC9				.628
Artificial Intelligence Assistance (AIA)				
AIA1		.558		
AIA2		.757		
AIA3		.818		
AIA4		.787		
AIA5		.735		

AIA6		.789		
AIA7		.786		
AIA8		.817		
AIA9		.717		
AIA10		.728		
Student Cognitive and Social-Emotional Development (SCED)				
SCED1	.907			
SCED2	.877			
SCED3	.855			
SCED4	.870			
SCED5	.888			
SCED6	.862			
SCED7	.889			
SCED8	.922			
SCED9	.946			
SCED10	.951			
Total Variance Explained				75.780%
Kaiser-Meyer-Olkin Measure of Sampling Adequacy				.957
Bartlett's Test of Sphericity		Approx. Chi-Square		1056.1
			Df	545
			Sig.	.000
a. Determinant				0.000

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

3.7 Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was conducted to test the hypothesized factor structure for the four educational constructs: Teacher-Led Instruction (TLI), Peer Collaboration (PC), Artificial Intelligence Assistance (AIA), and Student Cognitive and Social-Emotional Development (SCED). CFA is an essential step in validating measurement models, ensuring that the observed variables accurately represent the underlying theoretical constructs [23]. This analysis examined model fit and factor loadings and calculated the Composite Reliability (CR) and Average Variance Extracted (AVE) to evaluate the validity and reliability of each construct. The CFA was conducted using several indices: CMIN/DF, GFI, TLI, CFI, RMSEA, and RMR.

3.8 Model Fit Indices

The model fit indices provide insight into how well the data fit the hypothesised measurement model. The Chi-square/degree of freedom (CMIN/DF) ratio was 1.938, which is within the acceptable range, indicating a good fit [24] this is explained in

Table **3** and supported by Figure 2 below.

Table 3. Confirmatory Factor Analysis (CFA)

Model-fit Summary **CMIN=1056.060; DF=545; CMIN/DF=1.938; GFI=.739; TLI=.913; CFI=.920; RMSEA=.0642; RMR=.069**	**Factor Loading**
Teacher-Led Instruction (TLI): CR=.952; AVE=.742	
TLI1	.834

TLI2	.754
TLI3	.748
TLI4	.995
TLI5	.700
TLI6	.981
TLI7	.963
Peer Collaboration (PC): CR=.898; AVE=.529	
PC1	.605
PC2	.817
PC3	.745
PC4	.844
PC5	.720
PC6	.809
PC7	.712
PC8	.504
AI-Assistance (AIA): CR=.936; AVE=.619	
AIA1	
AIA2	.756
AIA3	.775
AIA4	.864
AIA5	.765
AIA6	.829
AIA7	.829
AIA8	.850
AIA9	.692
AIA10	.700
Student Cognitive and Social-Emotional Development (SCED):CR=.977; AVE=.808	
SCED1	.924
SCED2	.887
SCED3	.842
SCED4	.827
SCED5	.884
SCED6	.875
SCED7	.871
SCED8	.922
SCED9	.965
SCED10	.978

Notes: CFI = Comparative fit index; CMIN/DF = Chi-square/degree of freedom; RMR = Root mean square residual; RMSEA = Root mean square error of approximation; TLI = Tukey-Lewis index.

4. RESULTS AND DISSCUSSION

Structural equation modeling (SEM) analysis exploring the impact of several variables on Student Cognitive and Social-Emotional Development (SCED) was undertaken. Path coefficients were examined for demographic variables such as gender, age, subject, grade, and computer ownership, as well as instructional factors including Teacher-Led Instruction (TLI), Peer Collaboration (PC), Artificial Intelligence Assistance (AIA), and their interactions. SEM is an advanced multivariate technique used to test complex models and assess the relationships between observed and latent variables [24].

4.1 Path Coefficients

The table provides unstandardized estimates, standard errors, and critical ratios (C.R.) for the relationships between predictor variables and SCED. Critical ratios (C.R.) greater than 1.96 are typically considered statistically significant at the 5% level, while values exceeding 2.58 indicate significance at the 1% level [22]. In this analysis, paths with significant relationships are marked with asterisks, with a focus on the variables that have the strongest effects on SCED.

- **Teacher-Led Instruction (TLI)** → SCED: TLI had a positive path coefficient of .164, with a standard error of .071 and a critical ratio of 2.310, indicating that TLI significantly contributes to SCED. This finding is consistent with previous research that underscores the role of teacher guidance in fostering both cognitive and social-emotional skills in students [18].
- **Peer Collaboration (PC)** → SCED: The path coefficient for PC was .409, with a standard error of .106 and a highly significant critical ratio (***). Peer collaboration was the strongest predictor of SCED, aligning with the wealth of literature highlighting the importance of social interaction in fostering emotional and cognitive development in students [21] Collaborative learning environments encourage students to develop critical thinking and communication skills while enhancing emotional intelligence.
- **Artificial Intelligence Assistance (AIA)** → SCED: AIA had a negative path coefficient of -.121, with a standard error of .059 and a critical ratio of -2.063, indicating a significant negative effect on SCED. This result suggests that while AI tools may enhance learning efficiency, over-reliance on AI could potentially. Inder the development of social-emotional skills, as it reduces opportunities for human interaction and peer engagement [5].

4.2 Interaction Effects

- **TLI x PC** → SCED: The interaction between Teacher-Led Instruction and Peer Collaboration had a path coefficient of .041, with a standard error of .045 and a critical ratio of .911, indicating no significant interaction effect on SCED. This suggests that while both TLI and PC independently contribute to SCED, their combined effect does not significantly alter student outcomes [25].
- **TLI x AIA** → SCED: The interaction between TLI and AIA had a negative path coefficient of -.066, with a standard error of .043 and a critical ratio of -1.530, showing no significant interaction effect on SCED. This indicates that the integration of AI in teacher-led instruction does not significantly enhance or detract from students' cognitive and social-emotional development [22].

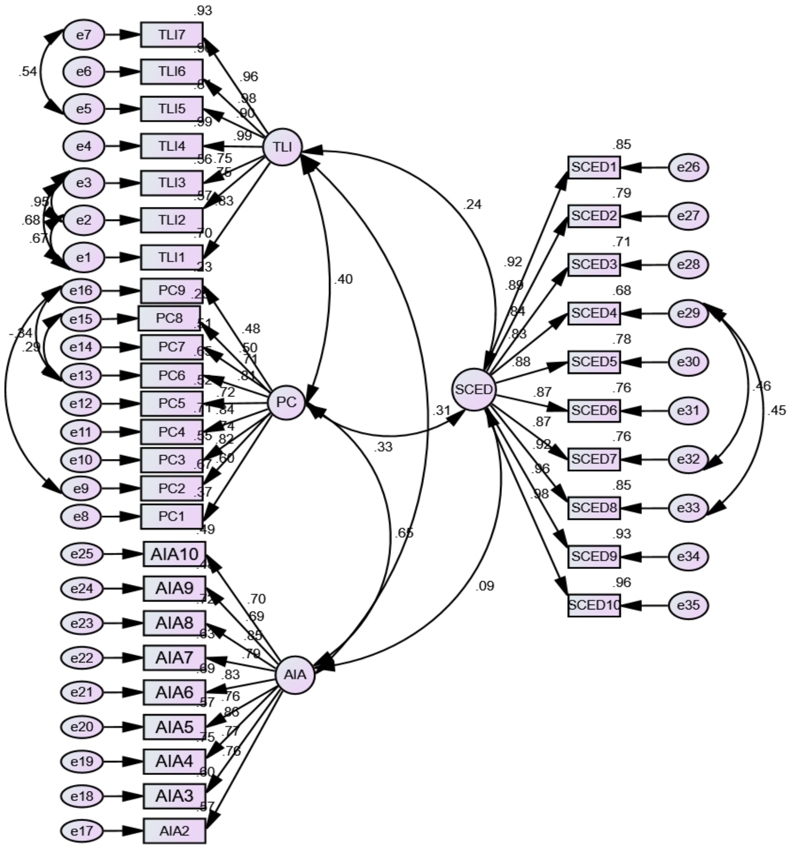

Figure 2. Confirmatory Factor Analysis

Table 4. Path Coefficients

Paths	Unstd. Estimates	S. E.	C. R.
Gender → SCED	.019	.105	.184
Age → SCED	.207	.016	3.377
Subject → SCED	-.008	.046	1.818
Grade → SCED	-.231	.075	-3.076
OwnedPC → SCED	.113	.110	.303
TLI → SCED	.164	.071	2.310
PC → SCED	.409	.106	***
AIA → SCED	-.121	.059	-2.063
TLIxPC → SCED	.041	.045	.911
TLIxAIA → SCED	-.066	.043	-1.530

**~Sig. at 1%; *~Sig. at 5%

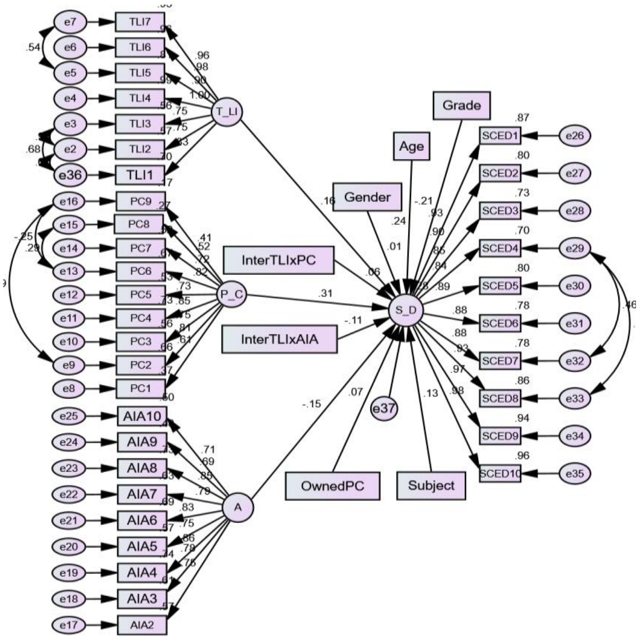

Figure 3. Structural Equation Model

4.3 Discussion

The findings from the analyses conducted in this study provide critical insights into the multifaceted factors influencing Student Cognitive and Social-Emotional Development (SCED). The results underscore the significance of both instructional strategies and demographic factors in shaping educational outcomes, particularly in modern, tech-supported learning environments.

Peer Collaboration as a Critical Predictor of SCED: One of the most striking findings is the strong positive influence of Peer Collaboration (PC) on SCED, with PC emerging as the most significant predictor in the structural equation model. This aligns with substantial evidence from recent research highlighting the benefits of collaborative learning in promoting cognitive and social-emotional development [21]. Peer interaction encourages students to engage in dialogue, problem-solving, and critical thinking, while also fostering emotional growth by requiring students to navigate interpersonal relationships and develop social skills [26].

Negative Impact of AI Assistance on SCED: A somewhat unexpected finding was the negative relationship between Artificial Intelligence Assistance (AIA) and SCED. While AI tools have been shown to enhance learning efficiency and provide personalized feedback, over-reliance on AI may limit opportunities for students to engage in meaningful social interactions, which are essential for emotional and social growth [5]. This finding aligns with concerns in the literature about the potential downsides of AI in education, particularly when AI systems replace human interaction rather than augment it. The results suggest that AI should be carefully integrated into the classroom, ensuring that while students benefit from AI-enhanced personalized learning, they still have ample opportunities to collaborate with peers and receive guidance from teachers.

4.4 Limitations and Future Research

Limitations: The study was conducted within a specific cultural and educational context, which may limit the generalizability of the findings. The effects of TLI, PC, and AIA on SCED could vary across different educational systems, socio-economic contexts, and cultural settings. For instance, the role of AI and peer collaboration in developing social-emotional skills may differ in environments where access to technology or collaborative learning cultures are less prevalent [22] Future research could test the model in various educational systems and cultural contexts to ensure broader applicability and understand how contextual factors influence these relationships.

Future Research Directions: Longitudinal Studies and Causality: Future research should prioritize longitudinal studies to explore how TLI, PC, and AIA influence SCED over time. A longitudinal approach would allow researchers to better understand the developmental trajectories of students' social-emotional skills and cognitive growth, offering clearer insights into the causal relationships between different instructional approaches and learning outcomes [27].

Exploring the Role of AI in Different Educational Contexts: Given the negative relationship between AIA and SCED, future research should delve deeper into how AI is integrated into classroom environments. Studies could investigate whether certain AI applications (e.g., adaptive learning platforms, chatbots, or virtual tutors) are more effective than others in enhancing learning outcomes. Moreover, researchers should explore how blended learning models, which combine AI assistance with human instruction, might mitigate the potential downsides of AI use in education [5], [22].

5. CONCLUSION

This study aimed to explore the relationships between Teacher-Led Instruction (TLI), Peer Collaboration (PC), and Artificial Intelligence Assistance (AIA) on Student Cognitive and Social-Emotional Development (SCED). The findings reveal that TLI and PC significantly contribute to enhancing students' cognitive and social-emotional skills, whereas AIA may exert a negative influence on these outcomes. These results emphasize the importance of carefully considering the integration of technology in educational contexts, as reliance on AI without adequate human interaction may detract from holistic student development. Ultimately, this study contributes to the broader discourse on effective educational practices, emphasizing the necessity of creating learning environments that integrate diverse instructional strategies to promote comprehensive student development. The findings serve as a foundation for future investigations into optimizing teaching and learning in an increasingly digital educational landscape, ensuring that both cognitive and emotional growth are prioritized in student experiences.

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Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study and their voluntary consent was obtained prior to data collection.

Ethical Approval

The study was conducted in compliance with the ethical principles outlined in the Declaration of Helsinki and approved by the relevant institutional authorities.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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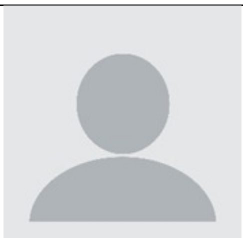	**Mordecai Botchwey**, is a lecturer in the Department of Information Technology Education at AAMUSTED, Ghana. His scholarly interests include educational technology, instructional design, and the integration of digital tools in teaching and learning. Mordecai actively contributes to research exploring how emerging technologies influence student cognitive and social-emotional outcomes. He advocates for thoughtful, student-centered approaches to

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