"The Mediating Role of Social-Emotional Competence in the Relationship between Cognitive Flexibility and Attitude Toward AI among Pre-service Teachers."

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Abstract

The study intended to examine the mediating effect of social-emotional competence in the connection between cognitive flexibility and attitudes towards artificial intelligence among pre-service teachers. The research methodology adopted is descriptive, and purposive sample of three hundred (300) pre-service teachers in government, government aided and private colleges in the Punjab region was taken. The researchers used the Cognitive Flexibility Inventory (Dennis and Vander Wal, 2010), the Social-Emotional Competence Questionnaire (S. and R., 2019) and an Attitude toward AI Scale (Mukherjee, S. and Dasgupta, S. 2024) to conduct the research. The results of the correlation analysis indicated that there was a moderate positive correlation between cognitive flexibility, social-emotional competence, and attitudes toward AI among pre-service teachers. Moreover, multiple regression analysis revealed that cognitive flexibility and social-emotional competence were both significant contributors to explaining a significant percentage of variance in attitudes towards AI among the participants. Path analysis proved that social-emotional competence mediates the connection between cognitive flexibility and attitude toward AI. The paper finishes with an explanation of the implications on education, which includes the proposal that teacher education programmes need to include training to enhance both cognitive and social-emotional skills to equip future educators to positively adapt to AI-driven educational settings. This integration might not only help them become professionally prepared but also more able to participate in technology mediated classrooms.

Key Words: *Cognitive Flexibility, Social-Emotional Competence, Attitude Towards AI, Prospective Teachers, Punjab.*

Introduction

In the sphere of teacher preparation, the entire development of future teachers plays the developmental role in not only developing their careers, but also outlining the future direction of future students under whom the teachers will serve. This process is inherently psychological in nature, such as cognitive flexibility or social-emotional competence, it is very sensitive to such aspects as adaptability, decision-making, and resilience in the educational settings that continually change. The attitudes of educators to artificial intelligence (AI) are equally significant in the modern context, where the integration of artificial intelligence in education and learning are actively being implemented. Recent studies reveal that social-emotional competence may mediate between a complex interaction between cognitive flexibility and AI attitudes, and, as a result, mediate the perception, adaptation, and utilization of technology in the educational practice of educators (Li et al., 2024). These dynamics are important to be known so as to be able to train educators who are competent enough to operate in the AI-based education environment with confidence, yet with sensitive understanding.The constructs of social-emotional Competence, cognitive flexibility and attitudes towards AI were very interdependent and strongly impacted pedagogy outcomes. Social-emotional competence that enables classroom practices, empathy and integration is also the ability to observe, modulate, communicate emotional experiences and develop beneficial relationships (Brackett et al., 2019). Such competence promotes resilience and enables the teachers to manage any potential stress and develop a positive learning environment, even when pedagogical or technological problems appear . Cognitive flexibility, or the capacity to alternate tasks, change to less familiar situations, and view situations in endless different angles is required of technology-rich classrooms (Martin & Rubin, 1995). It allows future teachers to be creative in their pedagogy and to mix and match AI-driven technologies and tools in a flexible way, and this method can better promote student learning after all. It is the perception of AI as the utility, reliance, and an object that can be seamlessly incorporated into the activities of the educator that predestines the path to whether educators would embrace the technological advancements or they will reject them (Chounta et al., 2022). The positive attitudes give rise to openness toward AI applications to personalize instructions and simplify them pedagogically, and the negative ones present a barrier to the adoption of technology (Dobrovská et al., 2024).

Advanced theoretical orientation suggests that the connection between cognitive flexibility and attitude towards AI is mediated with the social-emotional competence. High cognitive flexibility improves the receptiveness of teachers to new ideas and technology, yet its effects become bolstered in the presence of a high social-emotional competence that will encourage positive interaction and will decrease the resistance towards AI (Garner, 2010). Positive views of AI are also directly related to social-emotional competence because, in its framework, teachers can handle their anxieties related to technology integration, moderate classroom interactions during the process, and continue using a student-centered approach (Noor Nafees et al., 2025). Additionally, it indirectly contributes to adaptive solutions to the use of AI through the development of empathy and collaboration and keeps the technology as an enhancement but not an alternative to human interaction (Lv et al., 2022). In this way, social-emotional competence is a protection and moving power, which supports the positive influences of cognitive flexibility on the willingness of teachers to use the new elements of the pedagogical process generated by AI.

The sustainable development of teacher education (TESD) has become the popular mechanism to educate teachers in the context of the modern environment including digitalization and ethical AI applications (Tilbury, 2011). Institutions engaged in training teachers share a two-fold task, to impart knowledge of the given field of knowledge and of dynamic teaching, which relies on technology. In this respect, resilience, adaptability, and ethical awareness are among the qualities that should be in the focus of prospective educators (Sharma et al., 2008). The adaptable educators are able to absorb the shocks of uncertainty in terms of AI implementation and guarantee their education is uninterrupted and of high quality (Dorozh et al., 2021). Similarly, social-emotional competence can guide teachers to achieve a balance between cognitive and emotional aspects of AI integration to create increased equity and social inclusion in the learning environment with technology acting as an additional resource rather than a disenfranchising tool (Henriksen et al., 2025).

Social-emotional competence is one of the most important competencies that should be trained in pre-service teachers. This skill would help them stabilize emotions and feel resilient against the technological and pedagogical challenges and effectively participate in the teaching-learning process ("Teachers' Social and Emotional Competencies," 2023). More socially and emotionally competent teachers are better fitted to handle the ambiguities of the digital transformation process in the context of AI integration to maintain effective practices in classrooms, but at the same time taking into consideration the discrete needs of students. Promoting empathy, flexibility, and positive interaction through social-emotional competence, one builds an inclusive and interesting classroom environment that will subsequently promote openness to the implementation of AI-based educational resources (Palmquist et al., 2025).In line with this, cognitive flexibility gives pre-service teachers the ability to think outside the box, develop creative solutions and easily adapt to new technologies in education. When practiced along with social-emotional competence, cognitive flexibility fosters positive attitudes to AI that further decrease resistance and help educators feel more confident about new practice (Öztürk et al., 2022). The competencies enhance teaching dynamics and enhance learning experiences and ultimately empower the future teachers to venture into their education environments with AI use. Appreciating the advantages of developing socio-emotional awareness along with flexibility, teacher education programmes can make sure that pre-service teachers in their teaching will promote the further evolution of the inclusive, future-ready, and sustainable education system (Ng et al., 2023).

Positive attitudes toward AI, cognitive flexibility, and social-emotional competence are in line with the Sustainable Development Goal 4 (Quality Education) that supports such values as equitable, inclusive, and future-oriented education. The use of cognitive flexibility allows teachers to utilize various pedagogical practices that would fit in AI-enhanced settings (Strielkowski et al., 2025). Social-emotional competence governs that educators will be ethical, empathetic and through coverage of various needs of students will interact with AI technologies (Jennings & Greenberg, 2009). Affirmative emotional responses to AI can provide teachers with the opportunity to use technology as an aid to the better performance of the educational process, student involvement, and the ability to think critically. Collectively, the constructs facilitate in producing educators that not only possess technological expertise, but also emotionally intelligent, flexible, and practitioner reflective professionals.Regarding policymakers, teacher educators, and stakeholders, the adaptation of training units about cognitive flexibility and social-emotional competence in the curricula of teacher preparation will help in developing positive predispositions toward AI, as it will help to make sure that potential teachers have positive attitudes toward the world of digitalized learning contexts (Felix, 2020). These overlapping skills formed through teacher preparation programs have the potential to create resilient, caring, and future-proof teacher candidates who will be able to use AI ethically so that they can generate inclusive and sustainable learning. The integrated process does not only increase the effectiveness of individual teachers but also helps the development of strong educational systems that can be aligned in accordance with the global developmental priorities (Guan et al., 2025).

Literature Review

The role of psychological constructs like social-emotional competency, cognitive flexibility, and the role of attitudes linked to technology have remarkably garnered the attention of researchers in the field of teacher education. The competence in the social Emotional domain (SEC), the capacity to perceive and control emotions, display empathy, and sustain positive relationships, has been established as an ongoing association with effective teaching. (Alzahrani et al., 2019) also focused on the fact that high SEC teachers create positive classroom environments, decrease behavioral issues and improve student achievement. (Cahill & Dadvand, 2020) presented recent evidence of the contribution of SEC in predicting teacher well-being and professional resilience. SEC is equally important in alleviating threat to stress due to emergence of new tools, as well as promoting adaptive teaching behaviors in the context of technological incorporation. The ability to change the direction of the vision and transfer to new conditions, cognitive flexibility, is also elemental in forming the possibility of adaptation of teachers to new methods of work. A study by Dennis & Vander Wal, 2010 revealed that those persons who had stronger cognitive flexibility were more adaptive and skilled at problem-solving. Through teacher education, cognitive flexibility has received positive correlation with pedagogical creativity, management of the classroom, and willingness to embrace the use of digital tools (Tasaduk Musood, 2025). To a more recent but equally compelling extension, Al Shlowiy et al., 2021 determined the cognitive flexibility of teachers would predict markedly the willingness to work with emerging technologies in language learning with a teaching focus, which is foundational to the development of constructive forms of attitudinal mindfulness towards AI-driven language learning categorizations.Another dire thread of new research is the attitudes toward artificial intelligence (AI) in education. These attitudes indicate how teachers perceive the use of AI, whether they feel open to it, and accept the idea of using the technology in the classrooms. The research shows that the positive attitudes toward AI highly correlate with the perceived usefulness, ease of use, and confidence in digital pedagogy (Teo, 2019). As an illustration, Zawacki-Richter et al. (2019) found that previous digital competence and institutional support affected the acceptance of the AI tools by the teachers. Fear of replacement, ethics, and unreadiness, on the other hand, tend to define the fear of uncontrollable AI. This ambivalence explains why mediating factors, like SEC, are vital since they can dissipate the negative perceptions and instill openness to AI.Additional evidence indicates the mediating role that social-emotional competence plays between cognitive flexibility and attitudes toward AI. High SEC teachers can further handle the uncertainty of technological change and control emerging fears more successfully to convert the cognitive flexibility into positive attitudes towards AI. Indicatively, Kullman et al. (2023) believed that emotional regulation and empathy assist teachers in traversing the ethical and personal aspects of AI in a classroom. On the same note, Li et al. (2024) found that SEC mediated the extent to which cognitive flexibility influenced attitudes towards technology in a way that allowed teachers to view AI as not a threat but a source of enhanced pedagogy. The given body of research points at the necessity of involving not only socio-emotional but also cognitive factors in the preparation of pre-service teachers to the AI-enhanced education.Lastly, these constructs have different effects in the cultural and educational backgrounds. In the West where teachers are encouraged to rely on their personal effort and exploration capacities, SEC has been connected with teacher leadership in implementing AI (Schleicher, 2020). Comparatively, surveys in Asian contexts have shown that the institutional norms and collective values define how the SEC mediates attitudes towards AI assimilation (Zhang & Zhao, 2022). Such as, even in collectivist educational backgrounds, SEC not only acts as a moderating influence on personal adaptability, but also enhances collaborative readiness to AI-based reforms. These differences in cultural traditions indicate that SEC, cognitive flexibility, and intentions towards AI are largely embedded in socio-cultural processes requiring such research to be conducted cross-contextually to provide a rich and in-depth perspective on AI in teacher education.

Rationale of the Study

The reviewed literature notes that cognitive flexibility, social-emotional competence, and predispositions towards AI are of great importance in pre-service teacher training. The previous studies have demonstrated the relationships between cognitive flexibility and adaptive problem-solving (Aygun, 2018), techno-pedagogical competencies (Öztürk et al., 2022) and interpersonal effectiveness (Stenhaug & Solem, 2024). Exactly the same social-emotional competence has been correlated with emotional regulation, resilience, empathy and adequate classroom management, which are in turn beneficent to teaching efficacy. Attitudes to AI in teaching, especially the introduction of AI into the educational process, are proving to be the important factors defining pedagogical progress as a manifestation of technological change in general. Still, this creates a research gap related to how the social-emotional competence mediates the connection between cognitive flexibility and attitudes toward AI, particularly, pre-service teachers that would be entering AI-driven educational environments.

Although in different parts of the world, different types of research designs have been used to investigate various related constructs, including experimental designs and correlational designs, to the best of knowledge, no empirical study has been carried out in the Indian teacher education environment, where AI attitudes have been contextualized in relation to psychological capacities. This research involves the use of a descriptive survey method which does not impose any manipulation of variables, it does not distort the perspectives of pre-service teachers, but rather systematizes data without distortion. The approach also allows statistical investigation of mediating effects, and thus, possessed delicate knowledge concerning the points where psychological traits coincide with technology adoption in teacher education.

The proposed study will therefore seek to address the mediating role of social-emotional competence in the association between cognitive flexibility and attitude towards AI among pre-service teachers in the state of Punjab.

Objectives of the Study

The objectives of the study are:

1. To study the relationship between Social Emotional Competence, Cognitive Flexibility, and Attitude towards AI among pre-service teachers.
2. To study Social Emotional Competence and cognitive flexibility as predictors of Attitude towards AI among pre-service teachers.
3. To study whether Social Emotional Competence mediates the relationship between cognitive flexibility and Attitude towards AI among pre-service teachers.

Hypotheses of the Study

The hypotheses of the study are:

1. There is no significant relationship between social-emotional competence, cognitive flexibility, and attitude towards AI among pre-service teachers.
2. Social-emotional competence and cognitive flexibility are not significant predictors of Attitude towards AI among preservice teachers.
3. Social-emotional competence does not mediate the relationship between cognitive flexibility and attitude towards AI among pre-service teachers.

Research Methodology

This study adopted a descriptive survey research design to comprehensively probe into the research problem. the importance of social-emotional competence in the research on the correlation between cognitive flexibility and attitude towards AI amongst the pre-service teachers in the Bachelor of Education Programmes offered by government, government-aided, and private colleges in Punjab province.

Sampling Strategy

The sample technique used was purposive sampling that involved the careful selection of 300 pre-service teachers in different educational institutions within Punjab region. The approach has been used to give full representation of varied categories of colleges such as government, government-aided, and private colleges. Data was collected in July 2025; inclusion criteria being based on participants being enrolled in teacher education programmes at the time the study was conducted. The recruitment was done by directly approaching educational institutions and asking them to take part depending on their availability and desire to contribute in the research. By selecting the sample composition, the demographic diversity and educational background of the region was represented, which strengthened the generalizability of findings to the analogous educational settings. This design allowed bridging the gap in specifically examining the moderating effects of social-emotional competence on the connection between cognitive flexibility and attitudes toward AI in pre-service teachers having diverse institutional backgrounds.

Data Collection Procedure

The data gathering process began first by providing the respondents with detailed information concerning the objective of the research, research procedures and confidentiality procedures. Voluntary consent of the participants was ensured, and it was made clear that no one would use data other than in the study sphere. Data were collected using Google Forms to implement the Social-Emotional Competence Questionnaire (S. & R., 2019), cognitive Flexibility Inventory (Dennis & Vander Wal, 2010) and standardized Attitude Toward Artificial Intelligence Scale by (Mukherjee, S. & Dasgupta, S., 2024) transferred to the teacher education setting. Distribution was accompanied with standardized instructions in order to have consistency in the responses of the Participants.Considerations of ethics were of principle and it was ensured that there were confidentiality and anonymity. Information was retained in secure places and had restricted access to the research team. The subjects had the prerogative to turn down unexpectedly. The research was guided by the institutional review board regulations, and ethical approval was made prior to data harvesting exercises.As shown in Table 1, the sampling population included 300 pre-service teachers of whom females formed the majority (63%) against 37% of males. In reference to residence, 54 percent of the respondents were urbanites and 46 percent were rural, indicative of equal distribution of both settings. The statistics also showed that most of the respondents (79%) were in nuclear families as opposed to 21 percent who were in joint family systems. Most of the participants were single (71), 29 were married, which would mean that the sample composition would be largely unmarried.

Table 1 Demographic Characteristics of the Sample.

Variable	Option	N	%
Gender	Male	112	37
	Female	188	63
Place of Residence	Urban	163	54
	Rural	137	46
Nature of Family	Joint	62	21
	Nuclear	238	79
Marital Status	Single	212	71
	Married	88	29

Tools and Procedures

1. **Cognitive Flexibility Inventory (CFI)**- assuming that the level of cognitive flexibility is measurable, the Cognitive Flexibility Inventory (CFI) 2010- the self-report assessment tool developed by Dennis & Vander Wal (2010), will be used to measure it in a sample of prospective teachers. This is a seven- point Likert scale with 20 items. The inventory assesses the skills of a person to perceive maladaptive thoughts, question them and substitute those with more adaptive and functional ones. The score is between 20 and 140 where a high score portrays greater cognitive flexibility. There are two underlying subscales: Alternative and control elements: Alternatives are the capacity of the individual to perceive different explanations to life events, and multiple ways of solving problems. Control is the perception that one is able to deal with a situation and that it is in his/her grasp and comprehension on how to deal with it well. Greater test-retest reliability of the 20-item cognitive flexibility inventory (CFI) were that the correlation coefficient was.81 total score, .75 Alternatives subscale and.77 Control subscale.

2. **Social-emotional Competence-** In this study, The Social-emotional competence scale developed by Bhaskaran S & Portia R (2019) will be used to determine the level of social-emotional competence of Pre-service teachers. It illustrated 7point Likert four-point Likert scale with 48 items. The scale is centered on the main elements of social-emotional competence such as Self-awareness, Self-management, social awareness, relationship skills and responsible decision-making. It assesses how a learner is able to interact and communicate with others, be able to manage his or her emotions and attitudes and handle problems. The internal consistency of 48 item scale is strong, as the scale has reliability score of 0.83, and validity score of 0.74.

3. **Attitude Towards AI-** In this study, the Scale of Attitude Toward Artificial Intelligence (SATAI) developed by Mukherjee S. & Dasgupta S.,2024 will be used to evaluate attitudes of pre-service teachers toward Artificial Intelligence. The scale is organized upon four key dimensions, these being: General Attitude, Perceived Benefits, Concerns and Applications. It is comprised of standardized items meant to measure perceptions, evaluations and reactions towards the increase in the influence of AI on the academic and professional fields. The instrument has shown good psychometric feature with an inter-rater reliability coach of .438, Cronbach Alpha reliability of 0.832 and construct validity score of 0.679, expressing good internal consistency and validity. The scoring process will depend on the median 90 with any score exceeding the median depicting positive attitude and when the score is below the median it would mean negative attitude towards AI. Therefore, the higher the scores the more positive the orientations towards artificial intelligence, both on the acceptance and the adaptability in learning settings.

Validation and Suitability of Instruments

The instruments employed to conduct this research were the Social-Emotional Competence Scale created by Bhaskaran and Portia (2019), the Scale for Attitude Toward Artificial Intelligence (SATAI) proposed by Mukherjee and Dasgupta S. (2024), and the Cognitive Flexibility Inventory (CFI) by Dennis and Vander Wal (2010), all of which had satisfactory reliability and validity. Social-Emotional Competence Scale effectively captured the following major domains of self-knowledge, self-regulation, social awareness, interpersonal skills, and good decision maker. Comprising of a 40-item analysis of attitudes toward AI, ranging in dimensions of general orientation and perceived benefits, concerns, and applications, the SATAI scores high to reflect more positive attitudes towards AI. The CFI measures the basic construct of cognitive flexibility as a strong indicator of how an individual can adjust thinking and shift perspective situations as they change. Cumulatively, all these instruments provide well and satisfactorily tested and valid measures thereby making them qualified to be used in the study of pre-service teachers in the Punjab context.

Analysis of Data

The data were statistically analyzed using SPSS version 26.0 and AMOS to conduct descriptive, inferential, and meditation analyses. The descriptive analysis gave an exhaustive overview of the distributions and central tendencies of cognitive flexibility, social-emotional competence and attitude towards AI. A correlation analysis was subsequently made to test the relationship between these variables and to establish important patterns. The contributions of the predictive significance of cognitive flexibility and social-emotional competence to attitude toward AI were used via multiple regression analysis and the covariates were controlled. Path analysis with Structure Modelling equation in AMOS showed some direct and indirect paths between the variables, which validated the mediating role of social-emotional competence. Dissection of the impacts of these interactions brought in an indirect understanding of the role in establishing attitude towards AI that cognitive flexibility plays based on social-emotional competence in addition to projecting implications to educational research in teacher preparation.

Table 2 Descriptive Analysis of Data

		AI	SEC	CF
N	Valid	300	300	300
	Missing	0	0	0
Mean		66.43	69.18	73.42
Median		72.00	71.00	70.00
Std. Deviation		13.160	17.859	25.192

Table 2 offers a descriptive breakdown of the three most important variables: Artificial Intelligence (AI), Social-Emotional Competence (SEC), and Cognitive Flexibility (CF) according to 300 respondents. In the case of AI, the mean score is 66.43 with a median equal to 72.00 and a standard deviation of 13.160 showing that there is a moderate level of AI-related attributes with a slight negative skew, since the median is greater than the mean, and the level of responses variability is moderate. The mean, median, and standard deviation of SEC are 69.18, 71.00, and 17.859 indicating a moderately high level of societal-emotional competence with a slightly balanced distribution and higher variability compared to AI. CF has the greatest mean score of 73.42, median of 70.00, and the highest standard deviation of 25.192 which indicates that the levels of cognitive flexibility among the respondents are relatively high but with a wide range of dispersion and heterogeneity. Taken as a whole, these statistics indicate that the average scores of all three variables lie in the moderate to the high ranges, with the cognitive flexibility displaying the highest degree of variance in the sample.

Table 3 Interrelations between Cognitive Flexibility, Social-emotional Competence, and Attitude towards AI among Pre-Service Teachers.

			AI	SEC	CF
AI	Pearson Correlation	R	1	.854**	.658**
	Sig. (2-tailed)	P		.000	.000
	N	N	300	300	300
SEC	Pearson Correlation	R	.854**	1	.713**
	Sig. (2-tailed)	P	.000		.000
	N	N	300	300	300
CF	Pearson Correlation	R	.658**	.713**	1
	Sig. (2-tailed)	P	.000	.000	
	N	N	300	300	300
**. Correlation is significant at the 0.01 level (2-tailed).					

Table 3 displays Pearson product-moment correlation coefficients of the variables Artificial Intelligence (AI), Social-Emotional Competence (SEC) and Cognitive Flexibility (CF) using a sample of 300 respondents. The findings indicate strong relationships with statistically significant positive correlations among all the three variables at the 0.01 level (2-tailed). In more detail, AI also has a highly positive correlation with SEC (r = 0.854, p < 0.01), which indicates that more advanced AI-related characteristics are closely linked with more advanced social-emotional competence. In its turn, the relationship between AI and CF is positive (r = 0.658, p < 0.01), which means that people who have higher AI-associated competencies are more likely to demonstrate cognitive flexibility. Also, SEC positively correlates and significantly, negatively with CF (r = 0.713, p < 0.01), indicating that high social-emotional competence is directly connected with high cognitive adaptability. These strong correlations indicate that the three constructs are interrelated and that any advancement in one area can be linked to a corresponding improvement in the other areas. In this way, the initial hypothesis will be rejected, which says "There is no significant relation between social-emotional competence, cognitive flexibility, and attitude towards AI among pre-service teachers".

Regression Analysis of Data

Table 4 Multiple Regression Analysis Results of Cognitive Flexibility and Social-Emotional Competence Predicting Attitude Towards AI Among Pre-Service Teachers.

Coefficients ª						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	22.715	1.579		14.382	.000
	CF	.052	.022	.100	2.328	.021
	SEC	.577	.031	.783	18.311	.000
a. Dependent Variable: AI						

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.856ª	.733	.732	6.817
a. Predictors: (Constant), SEC, CF				

The paper discussed the predictive value of cognitive flexibility and social-emotional competence on pre-service teacher attitude towards artificial intelligence (Table 4). The results revealed that cognitive flexibility contributed 10% (β = 0.100, p = 0.021) to the variance in attitude toward AI, while social-emotional competence accounted for a much larger and highly significant 78% (β = 0.783, p < 0.001). These findings indicate that both predictors have a significant positive influence on attitude toward AI, with social-emotional competence emerging as the dominant factor in the model. The unstandardized coefficients further demonstrate that for every one-unit increase in cognitive flexibility, attitude toward AI increases by 0.052 units, and for every one-unit increase in social-emotional competence, attitude toward AI increases by 0.577 units. Therefore, the hypothesis stating that "Cognitive flexibility and social-emotional competence are not significant predictors of attitude toward AI among pre-service teachers" stands rejected, confirming that both variables significantly and positively predict attitudes toward AI, with social-emotional competence contributing more substantially to the prediction.

To accomplish the above goal, a mediation analysis involving AMOS was conducted to investigate the mechanisms behind the relationship between the predictor and outcome variables. The two paths of the conceptual analysis in which the independent variable is realized, one as a direct influence of the dependent variable, and the other as an indirect influence of a mediating construct, are conceptualized as (Elibol & Şengor, 2015). This theoretical framework has been graphically depicted in the corresponding path diagram shown below to highlight both the direct and the indirect associations between the variables in the proposed model.
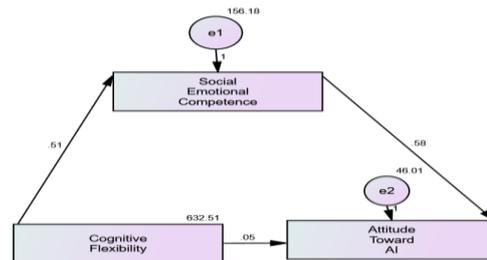

Figure 1. Path Diagram Showing the Direct and Indirect Effects

To assess the overall impact of cognitive flexibility on artificial intelligence attitudes, the direct and indirect effects were summed up (Figure 1). The results provided an indication of a direct impact of cognitive flexibility on attitudes towards AI of 0.05, and the indirect impact moderated by social-emotional competence of 0.51 x 0.58=0.30. The summation of these effects provided the overall effect of 0.35, which means that cognitive flexibility not only has a direct but also an indirect influence on the attitudes toward AI through social-emotional competence. Both of the paths are statistically significant (p = 0.01), which also supports the fact that social-emotional competence partially mediates the relation between cognitive flexibility and attitudes toward AI in pre-service teachers. This results in the rejection of the hypothesis, which states that social-emotional competence has no mediating influence in the relationship between cognitive flexibility and attitude towards AI in pre-service teachers, thus supporting the assumption of the mediator role offered by social-emotional competence in this model.Table 5 shows the results of the regression estimates of cognitive flexibility and social-emotional competency in forecasting attitudes towards artificial intelligence in pre-service teachers. The regression weight of cognitive flexibility predicting social-emotional competence has been also reported in the table. The findings suggest that cognitive flexibility is a strong predictor of social-emotional competence (.506, p = 0.001), which implies that an increasing level of cognitive flexibility is connected with the improvement of social-emotional competence. In addition to this, cognitive flexibility has a considerable positive impact on AI attitudes (β = 0.052, p = 0.019), which is why people having higher cognitive adaptability are also more inclined to hold positive attitudes towards AI. Also, social-emotional competence is a strong predictor of attitudes towards AI (β = 0.577, p= 0.001), showing that people of increased social-emotional competence are more prone to develop positive attitudes and opinions on AI. Altogether, these results prove that cognitive flexibility, as well as social-emotional competence, are influential factors influencing the pre-service teachers attitude towards artificial intelligence.

Table 5 Regression Weights: (Group number 1 - Default model)

Model	Estimates	S.E.	C.R.	P
SEC← CF	.506	.029	17.595	***
AI ← CF	.052	.022	2.336	.019
AI← SEC	.577	.031	18.373	***

Discussion

The results of the current research have shown the significant and positive interrelations among cognitive flexibility, social-emotional competence and attitude towards artificial intelligence (AI) among pre-service teachers and it is possible to note the interdependence of these processes in the educational environment. The findings have shown that cognitive flexibility and social-emotional competence are important predictors of attitude toward AI with social emotional competence proving to be the most significant predictor of positive orientation towards AI. The mediation analysis also supported the fact that there is a partial effect of social-emotional competence that mediates the correlation between cognitive flexibility and attitude to AI and therefore, those more adaptive are more likely to experience emotional competence and thus, to be more receptive to the AI technologies. This is in line with the previous studies that have underscored the role of emotional intelligence and adaptive cognition in facilitation of technology acceptance and innovation in education (Eissa, 2021; Shah, 2020; Rekabi et al., 2024). It is theoretically explainable with the help of the Cognitive Flexibility Theory (Jacobson and Spiro, 1995) that demonstrates that the capability to reorganize knowledge and adapt to new information improves the problem-solving in complex situations, as well as the Social-Emotional Learning (SEL) Framework (CASEL, 2020), which illustrates the role of emotional awareness, self-control and empathy in adaptive behaviour and engaging with others in a positive manner. Altogether, these conceptual bases indicate that the preparation of cognitive and emotional skills in pre-service educators could greatly contribute to making them more prepared to embrace AI successfully in the context of changing pedagogical paradigms.The results related to the attitude towards artificial intelligence (AI) can be explained with references to the Technology Acceptance Model (TAM; Davis, 1989), which states that the willingness of people to use the technology is dependent on their attitude to its utility and convenience. Social-emotional competence in this research showed a significant positive effect on attitude towards AI which meant that, pre-service educators who have greater emotional intelligence and empathy tend to view AI more positively and wholeheartedly in an educational context. The given relationship is not new as it can be discussed within the framework of the Socio Cognitive Perspective on the Attitude Formation (Bandura, 1986, 1989), according to which the attitude to the innovation depends on the self-efficacy, adaptive thinking, and the factors of the context. The intervening nature of social-emotional competence in links between cognitive flexibility and attitude toward AI emphasises the role of cognitive flexibility and emotional regulation that enables openness to technological change. Such findings are aligned with the previous studies that established the combined impacts of emotional intelligence and cognitive flexibility on technology acceptance and innovation in education (Eissa, 2021; Shah, 2020; Rekabi et al., 2024; Kaur, 2024). In its turn, the inclusion of specific programmes on emotional intelligence improvement and cognitive flexibility training in teacher education programmes has a potential application in fostering the development of positive attitudes and readiness among pre-service teachers and, thus, empowering them to successfully incorporate AI into the sphere of education as a revolutionary trend.

Regression analysis found that both cognitive flexibility and social-emotional competence are acting as important predictors of the attitude of the pre-service teachers towards artificial intelligence. Even though the social-emotional competence showed statistically significant positive relation, cognitive flexibility also played an important role in developing adaptive attitudes towards technology integration. These findings are in line with previous empirical research works that indicate that emotional intelligence, cognitive adaptability, and technology acceptance are interdependent in the academic context (Şahin, 2025; Cheng et al., 2021). The heightened impact of social-emotional competence reminds of the primary role of openness, empathy, and resilience in implementing innovative educational products. At the same time, cognitive flexibility supports critical evaluation and adaptive interaction with artificial-intelligence-based pedagogies and therefore will act to support a positive technological orientation among teacher students. In aggregate, these results can be added to the ever-accumulating literature that demonstrates emotional-cognitive synergy as a determining factor in the adoption of technology and teaching innovations.

Moreover, the mediation analysis has elucidated the intrinsic processes through which the attitudes toward artificial intelligence are determined by social-emotional competence, which indicates cognitive flexibility as one of the key mediating variables. The outcome aligns with the principles of modern theories (Priamono et al., 2024), according to which cognitive flexibility is a cognitive transitional system between emotional regulation and adaptive interaction with technology. Social-emotional competence also increases the capacity of people to interpret, assess and positively discuss the emergent technological changes by developing the flexible thought pattern, thus creating positive attitudes to the AI implementation in the educational settings. This flexibility enables pre-service teachers to overcome technological uncertainties, organize classroom innovations in effective ways, and strike an emotional balance in digitally mediated classrooms. As a result, emotionally competent and cognitively flexible teachers are better placed to embrace the AI-based pedagogies with positivity and flexibility and thereby improve the quality of instruction and promote the culture of innovation in teacher education (Sánchez Vera, 2024).

The current results can be interpreted as the parts of a greater conceptual framework, the contributions and implications to which should be described as unique and extensive in terms of the teacher education in technologically-enhanced pedagogical settings. The originality of the formulated relations between cognitive flexibility, social-emotional competence, and attitudes toward artificial intelligence is obvious when compared to the existing empirical data, thus, contributing to the conceptual discussion of adaptive and affective skills in the digital age of teachers. Pedagogically, these findings have the implication of systematically combining interventions that promote cognitive flexibility and the acquisition of social-emotional competence as part of the pre-service teacher preparation programmes. The use of reflective practice, emotional regulation and technology-oriented problem solving models in curriculum development further develops the capability of pre-service teachers to negotiation of initially innovation stressing factors, psychological stability and responding to AI enhanced teaching. Together, all these programmes should produce an intelligent generation of teachers who are resiliently adaptive, open to technology and emotionally intelligent and thus enable the enhancement of dynamic inclusive and empathetic learning experiences that will become the methods of dynamic development of the professions amongst the learners and their holistic development.

Conclusion

The current paper will provide a detailed focus on the interdependence of cognitive flexibility, social-emotional competence, and attitudes toward artificial intelligence (AI) in pre-service teachers. The results show that these variables have strong positive correlations, which means that pre-service teachers with high scores on cognitive flexibility and social-emotional competence are more likely to adopt positive attitudes towards AI in the educational processes. Notably, social-emotional competence was found as an intermediary between cognitive flexibility and AI attitudes which means that emotional intelligence is a pivotal channel via which cognitive adaptability is translated into openness to technological innovation. Such findings create a pressing need to include the elements of cognitive and socio-emotional development in the programmes of teacher education. Through preparing educators in advance of these pedagogical models, institutions can develop educators that are emotionally stable, cognitively responsive, and technologically confident enough to interact reflectively, ethically, and innovatively with AI-driven approaches to instruction, hence improving the quality and responsiveness of teacher education.However, the explanation of the current results should be viewed with a certain amount of attention considering some methodology and contextual shortcomings. Specifically, the use of pre-service teachers in Punjab limits the generalizability of findings to other communities or other educational contexts, which may vary in terms of cultural, institutional, or technological attributes. In addition, the cross-sectional and correlational nature of the study does not allow making any firm causal conclusions on the directional effect between the cognitive flexibility, the social-emotional competence, and the attitude towards the artificial intelligence (AI). Even though the results indicate the mediating effect of social-emotional competence between cognitive flexibility and attitudes towards AI, there is no longitudinal evidence and therefore one is incapable of determining temporal or causal effects of mediation. Also, the fact that the contextual determinants, including the presence of technological infrastructure, institutional support systems, and sociocultural differences, have not been considered, could have affected the intensity and character of the detected associations. Subsequent studies with the inclusion of these extraneous variables as well as more rigorous research methods could provide a more detailed and holistic picture of how emotional and cognitive processes interact in technologically changing learning settings.In future, future research can be enhanced by using longitudinal or quasi-experimental or mixed research design that can be more effective in tracing the causal pathways and dynamic changes to be observed over time. Increasing the study to a broader educational and cultural presentation would not just increase the ecological validity of the results, but also shed some light on context-specific differences in the interrelationship between cognitive flexibility, social-emotional competence, and AI-related attitudes. Additionally, it is possible to consider how the long-term effects of the interventions of social-emotional competence and cognitive adaptability on the professional identity, pedagogical innovativeness, and technological integration of teachers can be used to act upon effective change in the education system. Incorporation of systematic emotional-cognitive training programs into teacher preparation programs would thus be a decisive move towards the production of reflective, flexible and morally responsible teachers. The ability to guide the future educators through the challenges of AI-enhanced educational settings through understanding and insight may completely change teaching methods and learners' learning experiences in the modern education system.

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