



**EFFECTS OF TRANSFORMATIONAL EDUCATIONAL LEADERSHIP ON STUDENT ATTITUDES TOWARD AI IN FORMATIVE ASSESSMENT: A STRUCTURAL EQUATION MODELING APPROACH**

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**Abstract**

*This study examines the effects of transformational educational leadership on students' attitudes toward artificial intelligence (AI) in formative assessment using a Structural Equation Modeling (SEM) approach. As AI tools such as automated feedback systems and intelligent tutoring platforms become integral to education, their success depends on student acceptance and engagement. Drawing on transformational leadership theory and the Technology Acceptance Model (TAM), the research explores how leadership behaviors influence trust in AI, perceived usefulness, and behavioral intention to use AI-supported feedback. Data were collected from 412 secondary and higher education students through a validated survey instrument. SEM results revealed that transformational leadership significantly and positively affects students' attitudes toward AI, both directly and indirectly, through the mediating effects of trust and perceived usefulness. The structural model demonstrated strong explanatory power ( $R^2 = 0.61$ ) and satisfactory fit indices. Findings underscore the pivotal role of transformational leadership in fostering student trust, motivation, and openness toward AI-driven learning innovations. This study contributes to educational leadership and technology integration literature by highlighting leadership's role in creating ethical, learner-centered, and sustainable AI adoption environments.*

**1. Introduction**

The adoption of artificial intelligence (AI) in education has quickly changed the conventional patterns of teaching, learning and evaluation (Saputra et al., 2024). One of the most influential innovations is the application of AI-enabled tools in the formative assessment including automated feedback generator or intelligent tutoring system that can offer real-time and personalized advice to the students. (Trajkovski & Hayes, 2025). These technologies are more and more being implemented to improve the learning results, assist teachers with feedback provision, and allow them to make instructional decisions based on data. Nevertheless, regardless of AI technical capacities in the formative assessment, the effectiveness of such incorporation eventually depends on the perception, acceptance, and use of these tools by students (Mousa, 2025). In the absence of good attitude towards AI-based feedback among students, the pedagogical worth of the latter can be reduced drastically.

With the changing face of education system to become more digitally-adaptive, leadership in schools has become very important in the way the innovations are implemented and embraced (Jiang, 2023). Specifically, transformational educational leadership has been generally recognized as a powerful force in instilling vision of change, inspirational drive, and

friendly culture that encourages technological advancements (Yakobet al., 2025). Transformational leadership is based on the ideas suggested by Burns (1978) and developed by Bass (1985) and consists in the leader being able to influence, intellectually energize and personally serve his or her followers into reaching greater levels of performance and personal growth. Transformational leaders tend to foster experimentation, professional development, and trust-based cultures in the educational setting, which is particularly critical when implementing disruptive technology such as AI in the classroom (Djuwari, 2025).

Although much of the literature available has been on the issue of teacher or institutional readiness in the implementation of AI, little has been done in the area of how student attitudes are informed by the leadership practices, especially those that are based on the transformational paradigm. The functionality of AI systems has an impact on what comes with student perceptions, although the larger cultural and relational processes in the learning environment equally affects that (Jeilani & Abubakar, 2025, March). To illustrate, the school leaders are able to create an environment of innovation, openness, and mutual respect and that means that the students will likely perceive AI tools as reliable and useful and aligned with their educational objectives (Kim & Cho, 2022). On the other hand, some of the students who are in the rigid or transactional leadership setting may resist or disengage with the AI interventions, which will be seen as impersonal or intrusive (Orji, 2024).

To fill this gap, the given study examines the impact of transformational educational leadership on the student attitude to AI in formative assessment with the help of Structural Equation Modeling (SEM) approach. The research currently conducted is appropriate to SEM more because it offers an opportunity to explore the multidimensional relationships between latent variables, like the leadership style, trust of student, perceived usefulness, and intention to use AI tools. With this paradigm of analysis, the study shall attempt to give empirical evidence on the direct and indirect pathways in which leadership has an effect on the cognitive and affective response of the student to AI-mediated responses. These relations are significance to be learned either by the educators or those making the policies and the creators of the technology. The effectiveness can no longer be assessed based on efficiency and accuracy as AI steams through the educational ecosystems. Rather, a more humanist approach is necessary the one that takes into account the contribution of the context of leadership to the acceptance of the AI-enhanced assessment systems by the students. The study is enriching to both theoretical and practical in the context of learning how transformational leadership can be applied in order to create conducive conditions where AI tools are not only used but also accepted by the learner. Overall, the research is put on the crossroads where educational leadership, student psychology, and adoption of technology are discussed in order to gain more insight into sociocultural factors that underpin the use of AI in formative assessment. The shift of focus on students as the agents of the process, as they were the passive recipients of artificial intelligence implementation, and the evaluation of the leadership environment that fosters the positive attitudes contribute to the fact that the study may take new directions of more ethical, efficient, and learner-focused application of artificial intelligence in the learning process.

## **2. Research Objectives**

1. To examine the influence of transformational educational leadership on students' attitudes toward AI-supported formative assessment.
2. To identify the mediating role of perceived usefulness and trust in the relationship between leadership style and student intention to use AI feedback tools.
3. To develop and validate a structural equation model explaining the interrelationships among leadership, perception, and AI acceptance in the classroom.

4. To provide practical recommendations for educational leaders on promoting AI adoption through transformational practices.

### 3. Research Hypotheses

**H1:** Transformational leadership positively influences students' attitudes toward AI-supported formative assessment.

**H2:** Perceived usefulness mediates the relationship between transformational leadership and students' intention to use AI-based feedback tools.

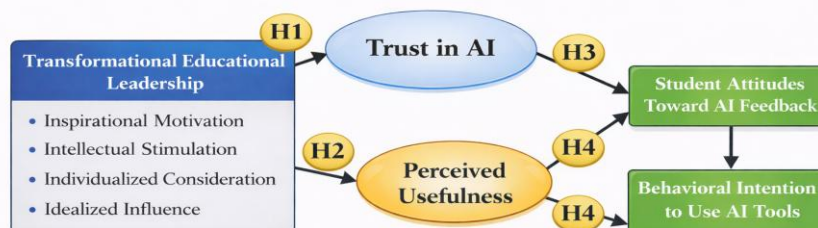
**H3:** Trust in AI systems mediates the relationship between transformational leadership and student acceptance of AI feedback.

**H4:** The proposed structural model significantly predicts students' behavioral intention to use AI-supported assessment tools.

### 4. Significance of the Study

The paper is both theoretical and practical in the educational technology and education field. In theory, it addresses the gap between the transformational leadership theory and the Technology Acceptance Model (TAM) by investigating the impact of leadership styles on the psychological and behavioral reactions of students working in the context of AI-assisted learning. The research adopts Structural Equation Modeling (SEM) for providing a rock-fast analytical framework of the complex interrelationships between leadership, trust, perceived usefulness and technology acceptance. In practical terms, the observations provide useful information to educational leaders, teachers, and policymakers to promote the culture of trust, innovation, and student-centered adoption of AI. Since AI is getting integrated into formative assessment, it is critical to comprehend the leadership circumstances that facilitate acceptance of the students to ensure its implementation is ethical, sustainable, and effective. Finally, this paper underpins the importance of human values of trust, interaction, and equity in ensuring that the education potential of AI is fully achieved. It shows that transformational leadership may be used as one of the factors driving the technological innovation to align with the holistic development and engagement of learners.

**Figure 1**



**Conceptual Framework**

### 5. Research Design

The research design applied in this study is quantitative, correlational and cross-sectional survey research design. The main objective is to investigate the structural associations between transformational educational leadership and the attitude of students towards AI-supported formative assessment, the mediation role of trust in AI and perceived usefulness.

Structural Equation Modeling (SEM) was used to test these relationships in the hypothesis-driven framework, and it enables the assessment of complicated causal directions between latent variables (Newman & Constantinides, 2021). The quantitative methodology is fitting due to the purpose of the research to draw conclusions to a wider student population, and to statistically prove the conceived conceptual framework. The application of SEM also allows the researcher to evaluate the direct and indirect impact of multiple constructs at the same time, which is consistent with the multifactorial concept of leadership influence and technology acceptance (Schepers et al., 2005).

### **6. Population, Sampling and Sample Size**

The sample used in this study was the secondary and higher education students at institutions that had implemented AI-assisted formative assessment tools in the teaching and learning processes. These technologies had automated assessment platforms, intelligent tutorial systems, and automated feedback systems. The institutions were selected on the basis of the observable practice of transformational leadership whether at classroom level or at the school level of leadership and this was also in line with the theoretical framework of the study. A stratified random sampling approach was used in order to create sufficient representation of the various academic levels (secondary and higher secondary), types of institutions (public and private), and geographical areas. The participants inside a stratum were randomly selected to minimize the selection bias and increase the generalizability of results. Purposive sampling was employed in instances where limited access to randomly selected institutions was involved since schools and university that adopted AI-based assessment tools and exhibited the traits of transformational leadership were the target.

The last sample consisted of 412 students, which is more than the minimum required limit of structural equation modeling (SEM). Considering that SEM involves at least 10-15 participants per parameter to estimate, the chosen sample size was an adequate one to follow the complexity of the proposed model and included about 20 parameters. This sample size was sufficient to attain the necessary statistical power, reasonably estimate the parameters, and may be analyzed in a subgroup down the line based on the academic level or other institutional factors.

### **7. Instrumentation**

The questionnaire was used to gather data in a structured questionnaire and it included five correct scales that were measured by a 5-point Likert scale (1 Strongly Disagree to 5 Strongly Agree). Transformational leadership was evaluated by means of a modified form of Multifactor Leadership Questionnaire (MLQ) by Bass and Avolio (1995) that consists of four dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Hinkin & Schriesheim, 2008). The measurement of the trust in AI comprised questions tailored to the former studies on the subject of human-AI interaction, where students are asked about their perceived trustworthiness, openness and ethical application of AI in formative assessment. Constructs of Technology Acceptance Model (TAM) were used to evaluate perceived usefulness and behavioral intention and included beliefs of students towards the usefulness and effectiveness of AI-supported feedback tools (Otto et al., 2024). The student responses to AI feedback were also quantified by measuring emotion and cognitive acceptance such as openness, satisfaction, and resistance. All the items were expertly reviewed and pilot tested to assure content validity, then solutions to reliability and construct validity were conducted through Cronbach alpha and confirmatory factor analysis.

### **8. Data Collection Procedures**

A cross-sectional survey design was used in the study. The secondary and higher educators in schools implementing AI-based formative assessment tools in their schools participated in data collection. Ethical approval was also obtained before the data collection and informed consent was given to all the participants. The questionnaire was tested through a pilot study of 40 students to determine the clarity and reliability of the questionnaire. Corresponding revisions were done. The last tool was administered electronically through Google Forms and in a hardcopy format in places with low internet penetration. The study participants were chosen by the stratified random sampling method to represent the participants in terms of their educational levels and the type of institutions. The four weeks of data collection were completed, and the reminders were conducted to improve the response rates.

### 9. Data Analysis Techniques

The descriptive statistics and reliability test of data were performed with the assistance of SPSS 26, and the structural equation modeling (SEM) with the help of AMOS 24. First screening was done to check the missing data, outliers and normality.

Cronbach's alpha was used to measure reliability and the alpha above 0.70 was deemed as acceptable. The construct validity was defined by CFA assessing model fit indices such as CFI, TLI, RMSEA, and  $\chi^2/df$ . The structural model was then subjected to test the direct and indirect relationships between transformational leadership, trust in AI, perceived usefulness, student attitudes, and behavioral intention.

### 10. Findings

#### Descriptive Statistic and Reliability

Table 1 provides descriptive statistics and reliability coefficients of the main constructs. The results showed that there was a moderately high level of agreement between constructs. The inherent consistency between all scales was good with the Cronbach alpha coefficients ranging between 0.82 and 0.89.

**Table 1**

*Descriptive Statistics and Reliability Coefficients*

<b>Construct</b>	<b>Mean</b>	<b>SD</b>	<b>Cronbach's <math>\alpha</math></b>
Transformational Leadership	3.87	0.61	0.89
Trust in AI	3.71	0.66	0.86
Perceived Usefulness	3.76	0.59	0.84
Attitude Toward AI Feedback	3.68	0.63	0.82
Behavioral Intention to Use AI Tools	3.74	0.68	0.88

#### SEM Model

The structural equation model shows that transformational educational leadership can directly and indirectly influence the attitudes and behavioral intentions of students towards AI in formative assessment. The main mediators in this connection are trust in AI and perceived usefulness.



**Table 4**  
**Model Fit Summary**

Fit Index	Value	Interpretation
$\chi^2/df$	2.46	Acceptable fit (< 3.0)
CFI	0.947	Good fit (> 0.90)
TLI	0.938	Good fit (> 0.90)
RMSEA	0.059	Acceptable fit (< 0.06)
<b>R<sup>2</sup> (Behavioral Intention)</b>	<b>0.61</b>	<b>High explanatory power</b>

Figure 3, Table 3 and 4 depict the ultimate structural model between Transformational Leadership and Trust in AI, Perceived Usefulness, Attitude Towards AI Use, and Behavioral Intention toward AI Tools. Each of the hypothesized paths was significant and matched with the theory. Transformational Leadership ( $\beta = .89$ ) significantly positively affected Trust in AI ( $\beta = .42, p < .001$ ), which proves that supportive and visionary leadership positively affected the confidence of people towards AI systems. The effect of Transformational Leadership on Behavioral Intention to Use AI Tools ( $\beta = .23, p < .01$ ) was also indirect, that is, Perceived Usefulness mediated the impact of effective leadership on the perceived value of AI tools, which in turn influenced stronger intentions to use AI tools. The Trust in AI ( $\beta = .86$ ) had a positive influence on the Perceived Usefulness ( $\beta = .56, p < .01$ ), indicating that the higher the trust, the more users will regard AI tools as useful. The use of Perceived Usefulness ( $\beta = 0.84$ ) significantly influenced both Attitude Towards AI Use ( $\beta = 0.74, p < .01$ ) and Behavioral Intention ( $\beta = 0.39, p < .01$ ), which validated the mediating variable that it is central to the process of technology acceptance. Also, Attitude Toward AI Use ( $\beta = .88$ ) had a significant predictive power on Behavioral Intention, with the significance of positive attitudes of users. Behavioral Intention ( $R^2 = .61$ ) was explained by the model (61%), which is a large amount of explanatory power. The fit indices ( $\chi^2/df = 2.46, CFI = 0.947, TLI = 0.938, RMSEA = 0.059$ ) were within reasonable limits (Byrne, 2010), indicating a good overall fit to the model. Overall, the findings confirm that transformational leadership increases the level of trust and usefulness perception, which reinforces the attitude and intention of the users to use the AI tools. The results demonstrate the significance of leadership and psychological trust to support the adoption of AI in the educational setting.

**Table 5**  
**Summary of Hypothesis Testing**

Hypothesis	Path	$\beta$	p-value	Supported
H1	Transformational Leadership → Attitude Toward AI Feedback	0.42	< .001	Yes
H2	Transformational Leadership → Perceived Usefulness → Behavioral Intention	0.23 (indirect)	< .01	Yes
H3	Transformational Leadership → Trust in AI → Attitude Toward AI Feedback	0.19 (indirect)	< .01	Yes
H4	Structural Model → Behavioral Intention (R <sup>2</sup> )	0.61	—	Yes

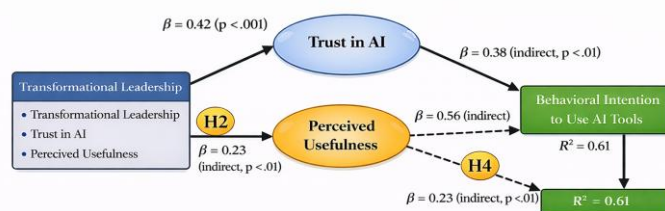


Figure 4: Structural Equation Model

## 11. Discussion

This research explored the importance of transformational educational leadership in influencing the attitude and behavioral intentions of students to AI-supported formative assessment. The outcomes of structural equation modeling revealed that the use of transformational leadership has a significant impact on the acceptance of AI tools in students both directly or indirectly via trust in AI and perceived usefulness. The hypothesis (H1) that indicates a positive correlation between transformational leadership and positive student attitudes toward AI feedback implies that the leadership behaviors related to prioritizing vision, support, and innovation increase the willingness of students to new technologies. These results are consistent with the previous literature that claimed that the successful integration of digital integration is achieved through the creation of psychologically safe, inclusive, and future-oriented learning conditions by leaders (Ossiannilsson, 2025). The relationship between leadership and behavioral intention was also determined to be mediated by perceived usefulness (H2), which is in line with the Technology Acceptance Model (Davis, 1989). In a similar manner, the mediation of trust between AI and leadership-attitudes (H3) indicates the socio-emotional nature of AI acceptance. When leaders create environments that are transparent, fairness, and ethical use of technology, students are likely to take interest in AI tools. The structural model suggested in this study accounted for a considerable percentage of variance in behavioral intention ( $R^2 = 0.61$ ), which approved the concept of the strength of the proposed structure (H4). These finds justify the significance of contextual and relational variables especially leadership practice in technology adoption in the learning institutions.

## 12. Conclusion

The research paper has concluded that the educational leadership which is transformational plays critical role of formation of attitude and behavioral intention of the students in the aspects of using artificial intelligence (AI) for the formative aspects of assessment. Using Structural Equation Modeling (SEM), the results have been confirmed and revealed that transformational leadership has direct and indirect effect on student acceptance of AI tools that mediated by trust and perceived usefulness. The power of the proposed framework can be marked by the good quality of the model fit and the high explanatory power ( $R^2 = 0.61$ ). The inspiring, intellectually stimulating and thoughtful leaders provide learning environments of trust, openness and innovation -environment which is of paramount importance to the process of engaging a student with AI technologies in a positive way. Besides, the usefulness perception appeared to be one of the central issues that affected the intention of students to use AI feedback systems, which implies the importance of attribution

of technological support to educational needs and values of students. This is an additional mediation effect of trust which asserts that the ethical transparency and fairness in the implementation of AI strengthens the confidence and acceptance of the students. Overall, the current research proves the opinion according to which the application of AI to education is not only technologically predetermined, but it is also an anthropocentric leadership that is grounded on the principles of trust, equity, and active involvement of the students. Transformational leadership can, therefore, be said to be a catalyst to sustainable, ethical and student-led AI application in modern learning environment.

### 13. Recommendations

In view of the findings, the recommendations suggested include the following:

- **Training of Leadership:** The leaders and the teachers of education are expected to be made available with leadership training in transformational approaches that combine innovation, exhibit trust in the students, and apply ethical use of AI technologies.
- **Ethical AI Housing:** Transparency and fair play in AI feedback system should be given priority in the institutions to gain confidence of the students and minimize resistance against AI.
- **Student Readiness Programs:** Orientation and digital literacy programs will have to be created to enable students to know how to use AI tools and access them as a part of the learning and assessment process.
- **Policy and Strategy alignment:** The educational policy needs to consider AI integration metrics on leadership quality to ensure sustainable and learner-centric AI integration.
- **Future Study:** Future study can take longitudinal impacts, cultural impact, or AI acceptance between different leadership styles can be compared for more generalizability of the results.

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