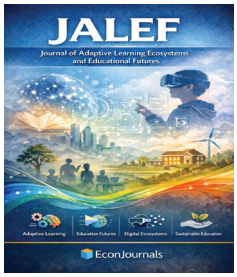


Journal of Adaptive Learning Ecosystems and Educational Futures

available at http: www.econjournals.com

Journal of Adaptive Learning Ecosystems and Educational Futures, 2026, 2(1), 1-10.

How Ecosystemic School Leadership Influences Teachers' Instructional Creativity? The Mediating Effect of Cognitive Adaptation Readiness

Ilknur Ozturk*

Faculty of Economics, Administrative and Social Sciences, Nisantasi University, Istanbul, Turkiye.
*Email: ilknur.ozturk@nisantasi.edu.tr

Received: 02 January 2026 **Accepted:** 20 March 2026 **DOI:** https://doi.org/10.32479/jalef.23868

ABSTRACT

Instructional creativity (IC) in teachers has gained more importance in the last 10 years because it has a strong impact on the adaptive learning ecosystems and future-oriented learning outcomes. This paper examines the mediating effect of the cognitive adaptation readiness (CAR) of teachers between ecosystemic school leadership (ESL) and instructional creativity (IC) of teachers. In this section, we suggested teachers CAR as one of the mediating mechanisms in the association between ESL and IC. Structural equation modelling (SEM) was used to analyse data that was collected in a sample of 399 teachers in Jordan. The findings showed that ESL had a positive and a direct influence on teachers IC, and their CAR. The results also pointed to the fact that CAR had a positive and direct correlation with teachers IC. Moreover, CAR was identified to play an important role in mediating the correlation between ESL and IC. The results demonstrate the need to reinforce the ecosystem-based leadership practices and the CAR of teachers as the tool to support the innovative practices in the changing educational settings. Our results can offer viable suggestions to formulate school leadership solutions that can facilitate adaptive thinking, creativity, and innovation in the teaching practices in contemporary education ecosystems.

Keywords: Ecosystemic School Leadership, Instructional Creativity, Cognitive Adaptation Readiness, Adaptive Learning Ecosystems, Jordan
JEL Classification: I21

1. INTRODUCTION

The last 10 years have seen a fundamental change in the world education system due to the digital disruption, the rise of artificial intelligence (AI) and the need to create more adaptive learning systems that can equip learners with the uncertain, complex and rapidly changing future. Education is no longer seen as a traditional model of teaching delivery anymore, but rather, as a dynamic ecosystem where leadership, teacher cognition and instructional innovation interplay and impact learning quality and student outcomes in a continuous way (Ageli et al., 2025; Maswadi et al., 2026). These changes are especially important in the new education markets such as Jordan where national reforms are currently underway to enhance the quality of teaching, digital preparedness, and innovation in both the state and private education systems (Wang, 2025; Liu, 2025). Even with these reforms, there is still a lack of classroom level instructional innovation which demonstrates the gap that exists between policy intentions and the actual pedagogical practices. In this changing space, ESL has become a modern leadership paradigm which views schools as adaptive, interrelated systems as opposed to bureaucracies. This leadership style focuses on distributed decision-making, cross-stakeholder cooperation, and sensitivity to the complexity of the environment, allowing schools to operate as adaptive learning ecosystems instead of fixed institutions (Yuting et al., 2026; Huang et al., 2025).

Ecosystemic leadership is especially applicable in digital education whereby the swift technological change requires

constant institutional and classroom adaptation. In conjunction with this, IC is the ability of teachers to develop new, versatile, and student-focused teaching methods that improve engagement, problem-solving and learning performance in heterogeneous classrooms (Yang and Zhou, 2025; Amemasor et al., 2025). CAR, meanwhile, indicates the psychological and cognitive willingness of the teachers to change the methods of instruction depending on technological, pedagogical and situational changes, which makes it a key facilitator of innovation in current educational ecosystems (Wang, 2025; Ho et al., 2025). The key issue being discussed in the current research is that despite the numerous studies conducted on the topic of leadership practices in schools so far, little is known about the translation of ecosystemic leadership into the IC of teachers, especially on a cognitive level. The current body of research indicates that leadership has a positive impact on teacher innovation, although the mechanisms through which the two are connected are either incomplete or loosely theorized (Chahal et al., 2024; Yuting et al., 2026).

The majority of existing research is based on the traditional approaches to leadership like transformational or instructional leadership which are not able to reflect interconnectedness and systemic view of contemporary educational settings (Liu, 2025; Aldhi et al., 2025). In addition, cognitive readiness variables which define the capacity of teachers to change and innovate are not extensively explored in empirical leadership-innovation models. According to the previous research, it is true that leadership influences the teacher creativity and instructional performance to a considerable extent (Naskar and Digar, 2025; Zhang and Cao, 2025). Also, it has been evidenced that the organizational climate and leadership support can contribute to teacher innovation and professional engagement (Elfira et al., 2024; Yang and Zhou, 2025). But these studies do not always consider cognitive adaptability as a mediating process. Adaptive expertise studies emphasize that cognitive flexibility is critical in innovation in dynamic settings, Ageli et al. (2025); Salamah et al. (2024), but this notion has seldom been incorporated into innovation in leadership models. In addition, the amount of research done within the Middle East remains negligible, even though the process of educating teachers and making them digital savvy continues to be upgraded (Fan and Chu, 2025; Yuting et al., 2026).The main aim of the research is to focus on the impact of ESL on the IC of teachers and to explore the mediating effect of CAR in this relationship. Based on this, the study will answer the following research questions: (1) Does ESL have a significant effect on teachers IC? (2) Does ESL have a significant influence on CAR of teachers? (3) Is CAR an important factor affecting teachers IC? And (4) Is CAR a mediator between ESL and IC?

This research is thus theoretical and practical in nature. It is theoretically relevant because it builds upon the existing literature on educational leadership and creativity by establishing CAR as an important mediating process between ESL and IC. It also relates to the complexity theory and adaptive systems theory by situating schools as dynamic learning ecosystems where leadership and cognition are in constant interaction. In practice, the results used by school leaders in Jordan and other education systems with a comparable leadership structure to develop leadership strategies that enhance the adaptive cognitive abilities of teachers thus enhancing instructor innovation. These insights can be used by policymakers to develop leadership development programs that are congruent with the objectives of digital transformation and 21st-century education. At the social scale, creativity of teachers lead to increased student interest, quality of learning, and improvement of human capital over time in rapidly evolving economies. Finally, this work places educational institutions as dynamic ecosystems in which leadership organization and cognitive processes interplay to produce instructional novelty. This study, with its attention to important theoretical, contextual, and methodological gaps, and its emphasis on a developing education market (Jordan) with its digital transformation, is a timely and relevant contribution to the understanding of how future-ready school systems can develop teacher creativity in the era of complexities, uncertainty, and constant change.

2. THEORETICAL BACKGROUND

The proposed research is based on two complementary theoretical frameworks: Complexity Theory (CT) and Dynamic Capabilities Theory (DCT). The two views are chosen as they together give a strong explanatory perspective on how ESL can be translated by teachers to their IC via CAR. CT describes education systems as nonlinear, self-organising, and dynamic ecosystems, and DCT describes how individuals and organisations sense, adapt and reconfigure competences in response to environmental change (Teece, 2007).

CT, originally based on the contributions of Xu (2024) and extended to organizations by Stacey (2011) and Marion and Uhl-Bien (2001) is a concept that considers organizations like schools as complex adaptive systems. Here, schools are not linear systems but dynamic ecosystems that bring about emergent outcomes such as innovation and creativity through interactions between agents (principals, teachers, learners, and policies) (Huang et al., 2025; Xu et al., 2025). The ESL theory is highly consistent with this theory since it lays the stress on distributed influence, interdependence, and adaptive interaction throughout the school environment (Cai et al., 2025; Xu, 2024). CT is mostly based on key concepts like emergence, self-organization and adaptability (Anderson, 1999; Holland, 1995). The conceptualization of instructional creativity as the emergent attribute due to the complex interactions of leadership conditions and teacher cognition but not to direct managerial control (Liu and Zaman, 2025; Amemasor et al., 2025). In this context, CAR demonstrates the mental adaptability enabling teachers to work efficiently in the changing and unpredictable classroom ecosystem (Maswadi et al., 2026; Yang and Zhou, 2025). The theory presupposes that educational settings are highly unpredictable, that minimal change in the leadership may have significant systemic impacts, and that innovation is not created in a vacuum but arises as a result of interactions (Elfira et al., 2024; Syarifudin and Muttaqin, 2025). This supposition directly underpins the current research use of ecosystemic leadership as a system-level facilitator of IC.

A complementary explanation offered in the micro-cognitive level is DCT (Teece, 2007). It implies that individuals and

organizations should be able to build capabilities to perceive opportunities, capture them and rearrange resources in the wake of changing environments. Initially, DCT was created to be used in the context of strategic management, but has since been used in education to describe teacher adaptability and innovation in dynamic learning contexts (Ageli et al., 2025; Liu and Zaman, 2025). CAR in this study reflects the sensing and seizing aspect of dynamic capabilities, as teachers are aware that pedagogical needs are changing and adapt instructional strategies (Ganon-Sharon and Becher, 2026, Salamah et al., 2024). IC is based on the reconfiguration result, when the teachers create new instructional solution to meet the changing needs of classrooms (Zhang and Cao, 2025; Fan and Chu, 2025). The fundamental belief of DCT is that adaptability and innovation are based on how the capabilities continually renew themselves to respond to environmental turbulence (Maswadi et al., 2026; Elfira et al., 2024). This resonates well with the contemporary education systems that are undergoing digital transformation, especially in situations like in Jordan where educators are experiencing a rapid pedagogical, and technology change (Koraag et al., 2025; Amemasor et al., 2025).

Combining CT and DCT results in a multi-level explanatory framework. CT describes ESL system-level dynamics and DCT describes individual-level thinking processes by which teachers convert inputs into creative teaching outputs (Syarifudin and Muttaqin, 2025; Ho et al., 2025). They create a cyclic chain together: adaptive school ecosystems are shaped by leadership, ecosystems, in turn, have a cognitive readiness, and cognitive readiness leads to IC, which in turn provides creativity, which provides feedback on ecosystem evolution. This is a theoretical bridge that is backed by earlier empirical research. The study of leadership has proved that distributed and adaptive leadership increases teacher innovation (Naskar and Digar, 2025; Xu et al., 2025). Research in organizational behavior shows that dynamic capabilities are a major predictor of innovation and adaptive performance (Amemasor et al., 2025; Wang, 2025). The research on education also reveals that creative teaching behavior is highly predicted by cognitive flexibility and adaptive readiness (Liu and Zaman, 2025; Xu, 2024). Moreover, the study of ecosystem-based learning underlines the significance of school ecosystems being interconnected in order to foster innovation (Chahal et al., 2024; Salamah et al., 2024). Although the existing frameworks have strong theoretical underpinnings, they are still disjointed. CT describes the behavior of a system but is not specific in the identification of cognitive mechanisms. On the other hand, DCT explicates adaptability but is not applied in learning leadership. Not many studies combine the two sides of the equation to understand how leadership on the ecosystem level is converted to teacher-level instructional creativity with cognitive readiness mechanisms (Zhang and Cao, 2025; Ho et al., 2025). In addition, this dual-theory model is not empirically validated, especially in developing education systems like Jordan (Liu et al., 2025; Ageli et al., 2025). Thus, combining CT and DCT, this research offers a strong and multi-tiered explanatory model of ESL and its impact on IC. The complexity of the system and adaptability of individuals provide a holistic approach that supports the proposed model and solves major gaps in current educational leadership literature.

2.1. Ecosystemic School Leadership and Teachers' Cognitive Adaptation Readiness

This paper based on CT and DCT, contends that leadership activities in contemporary schools are systemic activators, which influence the adaptive thinking of teachers. In complex adaptive education systems, leadership is not only commanding but also a facilitating energy that boosts the pattern of interaction, sense-making, and responsiveness in teachers (Xu et al., 2025). In specific, ESL enhances environmental interconnectedness, as well as fosters the concept of distributed decision-making, leading to higher adaptability of teachers to the changing instructional requirements (Liu, 2025). Out of a DCT, this kind of leadership better equips teachers with the ability to sense alterations in pedagogical demands and redesign their instruction methods (Aldhi et al., 2025). Empirical evidence on this relationship is supported by previous studies that show that adaptive and distributed leadership styles have a positive impact on the cognitive flexibility of teachers and their professional responsiveness (Naskar and Digar, 2025; Fan and Chu, 2025). Equally, the research conducted by Chahal et al. (2024) and Zhang and Cao (2025) suggests that the supportive leadership contexts can greatly promote the adaptability and learning-driven mentality of teachers. Moreover, Elfira et al. (2024) discovered that leadership empowerment models enhance the readiness of teachers to explore new teaching methods, whereas Wang (2025) emphasized that adaptive work environments enhance cognitive preparedness to change. Moreover, Huang et al. (2025) established that contextual conditions of leadership have a strong influence on adaptive performance and this supports the significance of readiness development that is leadership driven. Mechanistically, ecosystemic leadership is capable of improving cognitive adaptation preparedness by promoting psychological safety, collaborative learning, and feedback loops within schools, which, in turn, help teachers reframe challenges as opportunities to learn (Ageli et al., 2025; Syarifudin and Muttaqin, 2025). This is in line with the results presented by Chahal et al. (2024), who highlighted the fact that creativity develops to a greater extent in settings that facilitate cognitive flexibility and experimentation. Similarly, Liu et al. (2025) and Xu (2024) propose that favorable contextual frameworks play a significant role in boosting cognitive receptivity and adaptive reasoning, which is crucial in adapting instruction. Thus, a combination of system-level complexity and individual-level adaptability implies a good positive correlation between ESL and CAR of teachers.

H_1: There is a significant positive impact of ecosystemic school leadership on teachers' cognitive adaptation readiness.

2.2. Ecosystemic School Leadership and Teachers' Instructional Creativity

This paper continues CT and DCT by suggesting that ESL is central to influencing teachers, IC, through the development of an adaptive, inter-relational and innovation-supportive school environment. Leadership within complex educational systems is an emergent phenomenon that impacts the manner in which teachers perceive problems, exchange knowledge and create new instructional solutions (Amemasor et al., 2025; Salamah et al., 2024). ESL enhances interpersonal connections and fosters distributed influence that fosters experimentation and innovation in instructional practice (Fan and Chu, 2025). With a DCT, this

leadership type helps teachers to reorganize their instructional patterns and come up with imaginative reactions to swiftly evolving classroom needs (Xu, 2024; Ganon-Shilon and Becher, 2026). This relationship has good support in empirical studies. The works of Yuting et al. (2026) and Ho et al. (2025) prove that the leadership of the school is one of the main factors that contribute to teacher innovation and professional creativity. Likewise, Chahal et al. (2024) established that empowered leadership structures promote creative interaction through enhancing the psychological ownership of teaching activities among the teachers. Salamah et al. (2024) also highlights that creativity is very contextual with factors like autonomy, support and availability of resources that are reinforced during the ecosystemic leadership circumstances. Moreover, Elfira et al. (2024) points out that creativity in learning is fostered by networked and collaborative learning processes, as opposed to individual effort. Additionally, in line with this opinion, Naskar and Digar (2025) and Zhang and Cao (2025) concluded that leadership practices that foster professional learning and reflective practice had a significant positive impact on teacher innovative instructional behaviors. Koraag et al. (2025) also found out that adaptive work environments increase the ability of employees to solve problems creatively and Salamah et al. (2024) established that adaptability is a major predictor of innovative performance in dynamic environment. Amemasor et al. (2025) and Liu and Zaman (2025) further hold that the supportive leadership climates enhance intrinsic motivation which is a fundamental force behind creativity. Mechanically, ESL improves the creativity of instruction by promoting collaboration, minimizing uncertainty, and allowing educators to explore new pedagogical strategies in a safe and supportive setting (Aldhi et al., 2025; Xu, 2024). This forms a perpetual loop in which an environmental support that is driven by leadership results in increased cognitive engagement, which culminates in an increase in innovative instructional practices. Thus, a combination of complexity-based system interactions and development of dynamic capabilities postulates a positive relationship between ESL and IC of the teachers.

H_2: There is a significant positive impact of ESL on teachers' IC.

2.3. Teachers' Cognitive Adaptation Readiness and Instructional Creativity

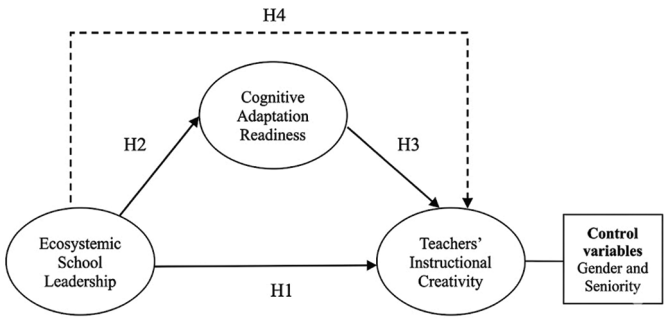
This research, based on CT and DCT, hypothesizes that CAR of teachers is a critical psychological process that motivates IC in adaptive learning ecologies. The dynamic nature of pedagogical requirements, integration of technology, and the needs of various learners constantly subject teachers in complex educational settings to cognitive flexibility and adaptable thought (Liu, 2025; Wang, 2025). In this context, CAR shows the willingness of teachers to accept change, re-construe the issues of instruction, and adjust the approaches to teaching (Zhang and Cao, 2025; Maswadi et al., 2026). It is proposed that creative instructional behaviors can be activated by such adaptive cognition (CT) because the individual cognition and the environmental stimuli interact continuously (Cai et al., 2025; Yuting et al., 2026). In terms of DCT, CAR can be considered one of the fundamental personal skills that allow educators to detect shifts in teaching needs, seize the possibilities to enhance pedagogical performance, and re-organize their teaching approaches to yield new results (Ganon-Sharon and Becher, 2026). This cognitive adaptive process is critical to creativity because not only must one be motivated to do it, but also have the capability to reorganize knowledge and utilize it in new contexts in the classroom (Xu, 2024). This relationship is highly supported by empirical research. Ageli et al. (2025) discovered that adaptive cognitive skills are effective in improving performance in dynamic work situations. Correspondingly, Syarifudin and Muttaqin (2025) also established that highly adaptive people exhibit greater problem-solving creativity. Fan and Chu (2025) also established the positive relationship between cognitive flexibility and innovative instructional practices of teachers. Furthermore, Liu and Zaman (2025) and Yang and Zhou (2025) highlight that cognitive openness and adaptability are two important predictors of creativity in schools. Elfira et al. (2024) also emphasize that IC arises when teachers are cognitively flexible and sensitive to the complexity in the classroom. To further support this mechanism, Koraag et al. (2025) believes that creativity is basically motivated by the cognitive processes that enable individuals to recombine knowledge in new manners. Similarly, Yang and Zhou (2025) discovered that teachers who possess more adaptive capacities tend to use more creative teaching methods, and Huang et al. (2025) affirmed that cognitive engagement improves creative performance in the workplace. Collectively, these results suggest that cognitive readiness is a powerful predictor of IC. Therefore, integrating adaptive cognition with complexity-driven educational dynamics suggests a strong positive relationship between teachers' CAR and IC.

H_3: There is a significant positive impact of teachers' CAR on IC.

2.4. Mediating Role of Cognitive Adaptation Readiness

Based on CT and DCT, this research suggests that the CAR of teachers is one of the mediating processes where ESL is transformed to IC. In complex adaptive educational systems, leadership influences are not often linear, but rather function through more than one cognitive and behavioral channel modulating how individuals perceive, process, and react to change in the environment (Ageli et al., 2025; Naskar and Digar, 2025). The interconnectedness, dissemination of influence, and lifelong learning, which ES plays a role in, can create an environment that leads to increased cognitive preparedness of teachers to change the instructional practices (Elfira et al., 2024; Xu et al., 2025). Nevertheless, the influence of leadership on creativity does not necessarily matter, but it is mediated by internal adaptive mechanisms of teachers, especially their cognitively mediated processes of change into innovative teaching behavior (Elfira et al., 2024; Wang, 2025). In terms of DCT, CAR is the essential micro-level mechanism, which allows turning inputs of leadership into outputs of creativity. The environmental stimulus is leadership, and cognitive readiness decides how the teachers can sense, interpret, and reconfigure instruction strategies to the environmental stimulus (Cai et al., 2025). In the absence of this adaptive cognitive ability, even powerful leadership constructs might not lead to significant instructional innovation. Salamah et al. (2024) also points out that dynamic capabilities mediate in such a way that individual cognition mediates organizational inputs and innovative outcomes. This is a mediating mechanism that is well supported by empirical evidence. Wang (2025) proved that adaptive cognitive skills play an important role in mediating the relationship between workplace conditions and

Figure 1: Research model



teacher performance outcomes. In like manner, Ganon-Sharon and Becher (2026) and Liu and Zaman (2025) also affirmed that, adaptability is an intervening factor between the environmental factors and the performance in terms of creativity and adaption. Amemasor et al. (2025) and Salamah et al. (2024) also support that contextual factors can affect creativity via cognitive processes, which form vital pathways. Ho et al. (2025) also points out that cognitive interpretation of environmental complexity is the cause of the emergence of IC instead of direct structural influence alone. Further research supports such a mediational rationale. Syarifudin and Muttaqin (2025) highlights that creativity is based on internal cognitive processes that process external conditions to generate new products. Elfira et al. (2024) and Xu et al. (2025) discovered that leadership can drive innovation in the form of cognitive and motivational intermediaries. The same argument is made by Koraag et al. (2025) and Aldhi et al. (2025) that dynamic capabilities operate on internal processes that transform inputs in the environment to innovated behavior. The combination of these studies validates that CAR plays a significant role in mediating between the leadership systems and creative instructional outcomes. Thus, the combination of system-level complexity and cognitive-level processes of dynamic capability implies that CAR plays a major role in mediating the relationship between ESL and IC. Research model applied in the study is presented in Figure 1.

H_4: CAR significantly mediates the relationship between ESL and teachers' IC.

3. METHODS

This study utilized a cross-sectional survey design that employed quantitative methods to investigate the relationships between the variables.

3.1. Participants and Procedures

The study population included 11,780 teachers in elementary, lower secondary and upper secondary schools in the provinces of Amman and Irbid in Jordan, the 20252026 academic year. A disproportionate cluster sampling method was used to select the sample of the study. At least 368 participants were used to represent the population since it was calculated based on the 95% level of confidence (Cochran and Talwani, 1977). The researchers made visits to the schools that were part of the study sample to gather data and questionnaires were also administered to teachers who were willing to participate in the study. Here, a total of 405 teachers were used to collect the data. Nonetheless, before the analysis phase, the data of six teachers were identified to be extreme values and were filtered out of the original data. Thus, there were 399 sets of data which were valid to be used in the analysis phase of the study. This was the number (N = 399) that was decided to be adequate to represent the population of study. Of the 399 teachers involved in the research, 58.9% were female (n = 235) and 41.1% (n = 164) were male, whilst 29.1% worked as classroom teachers (n = 116) and 70.9% (n = 283) were subject teachers. Of the participant teachers, 19.8% (n = 79) had 9 years of teaching experience or less, 42.6% (n = 170) had 10–19 years and 37.6% (n = 150) had 20 years or more of teaching experience. With respect to the level of education the participants had 78.4% (n = 313) completed a bachelors' degree with 21.6% (n = 86) completing a graduate degree.

3.2. Measures

Ethical permission to carry out the study was given by the Social and Human Sciences Research Ethics Committee of Zarqa University (Decision No. 20254/2.18, dated March 18, 2026) before the data was collected. The ESL Scale, the CAR Scale and the IC Scale were used in the data-gathering phase of the research.

3.2.1. Ecosystemic school leadership scale

This scale was modified to indicate ecosystem-based leadership in educational institutions and initially based on distributed and adaptive leadership models by Ganon-Shilon and Becher (2026) and subsequently expanded by (Syarifudin and Muttaqin, 2025). This scale consists of 18 Likert-type questions, and the answers to them are in a scale between 1 (Strongly Disagree) and 5 (Strongly Agree). The scale has three dimensions, including systemic collaboration, adaptive coordination and knowledge integration, comprising of 10 items in the systemic collaboration dimension and four items in the adaptive coordination and knowledge integration dimensions. The scale scores above 20 represent better ecosystemic leadership practices of school principals. The internal consistency coefficients of Cronbach alpha were determined in the initial development and adaptation process to be ranging between 0.78 and 0.84. Reliability coefficients of the adapted scale were recalculated in the present study and were observed to be 0.98 in terms of the systemic collaboration dimension, 0.87 in terms of adaptive coordination dimension, 0.88 in terms of the knowledge integration dimension and 0.97 in terms of the entire scale.

3.2.2. Teacher's instructional creativity scale

Huang et al. (2025) originally developed The Teacher IC Scale and consists of 17 Likert-type items depending on the answers to a scale between 1 (Strongly disagree) to 5 (Strongly agree). The scale has four dimensions; instructional originality, pedagogical flexibility, classroom innovation and teaching experimentation. The initial calculation of alpha internal consistency coefficients of the four dimensions and the scale as a whole was found to be ranging between 0.79 and 0.91 (Zhang and Sternberg, 2006). An increase in the scale scores indicates that teachers are more creative in terms of their instruction in their practice. Reliability coefficients were also re-determined in the present study and they were found as 0.81 instructional originality, 0.84 pedagogical flexibility, 0.78 classroom innovation and 0.82 teaching experimentation and the overall total score of the scale showed as 0.90.

3.2.3. Cognitive adaptation readiness scale

Xu et al. (2025) created the CAR Scale that consists of 15 Likert-type items that are dependent on the answers in the scale that range between 1 (Strongly disagree) and 5 (Strongly agree). The scale contains three dimensions, one of which is cognitive flexibility, another change anticipation and adaptive problem-solving. The original internal consistency coefficients of Cronbach alpha of the three dimensions and the scale in general were found to range between 0.76 and 0.88 (Pulakos et al., 2000). A score of higher magnitude on the scale points to the high cognitive preparedness of teachers to meet changing instructional conditions. The reliability coefficients were re-calculated in the present research and were found to be 0.79 of cognitive flexibility, 0.81 of change anticipation and 0.80 of adaptive problem solving and 0.87 of the total score of the scale.

3.3. Control Variables

Individual respondents' characteristics of gender and teachers' seniority were included as control variables in the current study since they were thought to potentially affect instructional creativity. Previous studies on instructional creativity showed male teachers as having displayed slightly higher levels of classroom innovation (Zhou and George, 2003), whilst other studies revealed no notable differences based on gender (Shalley et al., 2004; Elfira et al., 2024). In terms of the seniority of teachers or the number of years of professional teaching experience, certain studies have shown that teachers who are more senior are more likely to be affected by IC because they have gained pedagogical knowledge over the years (Sawyer, 2017; Griffin and Hesketh, 2003). Considering the existing literature, we introduced both gender (1 = Female, 2 = Male) and seniority as control variables in the present study, as both might have an impact on instructional creativity.

3.4. Analytic Techniques

In the evaluation of the data collected we utilized descriptive statistics (standard deviation and arithmetic mean), correlation analysis and SEM. It has been mentioned that correlation coefficients define a negligible relationship with $r < 0.10$, a weak relationship with $0.10 \leq r < 0.40$, a moderate relationship with $0.40 \leq r < 0.70$, a strong relationship with $0.70 \leq r < 0.90$ and a very strong relationship with $r < 0.90$ (Schober et al., 2018). The hypotheses postulated in the current research were tested using the IBMS version 22 statistical software. We preferred a two-stage approach when conducting SEM. To begin with, a model was developed and tested to measure all the variables of the study. Second, a structural model was then developed to explore the effects between latent variables and to investigate mediation. With the help of such a model, we were able to estimate direct effects between the constructs of ESL, CAR and IC as well as the indirect effects of ESL on IC.

Before analyses were done, the dataset had been analyzed with regards to multivariate analysis assumptions. In this range, we investigated the data on outliers, multicollinearity and normality problems. Six outliers were dropped out of the dataset and 399 valid scale forms were analyzed. Regarding normalization, the kurtosis and skewness coefficients of the latents of the study were within the range of −1 and +1, which showed that the data in the dataset were normally distributed (Salamah et al., 2024). We checked tolerance values and variance inflation factors (VIFs) to check the problem of multicollinearity, and a VIF value exceeding 10 with a tolerance value lower than 0.10 indicated that a multicollinearity problem was present (Chahal et al., 2024). The tolerance value of 0.81 and the VIF value of 1.18 in the present analysis showed that there were no multicollinearity problems in the data set.

The goodness of fit of the structural model based on the analyses was assessed based on the goodness of fit measures of 2/df, GFI, RMSEA, CFI and SRMR. In the literature, a eland value below 3 (0.08) is considered as a good fit (Hoe, 2008; Kahn, 2006), and Hair et al. (2011) had indicated that the value of CFI and GFI should be above 0.90 indicating a good fit model. Moreover, it is stated in the literature that SRMR must be 0.08 or lower in order to have a fairly good fit between a structural model and its data (Hu and Bentler, 1999).

4. RESULTS

4.1. Descriptive Statistics and Correlations between Variables

Table 1 gives the descriptive statistics and interrelationship among the study variables. Both ESL behaviours (M = 3.92, SD = 0.71) and CAR (M = 3.88, SD = 0.73) were identified to be at a high level as per the respondent teachers. The participants also exhibited high level of IC (M = 4.01, SD = 0.56). We found moderate, significantly positive correlations between ESL and CAR ($r = 0.43$, $P < 0.01$), ESL and IC ($r = 0.52$, $P < 0.01$), along with CAR and IC ($r = 0.54$, $P < 0.01$).

4.2. Measurement Model

Before testing the hypotheses of the study, a measurement model of all the latent variables in the structural model was developed and estimated. The χ^2 value of the model was found to be 96.48 and the degrees of freedom was 34 ($\chi^2/df = 2.84$). Other fit measures were calculated as follows: GPI = 0.95, RMSE = 0.06, SRMR = 0.05 and CFI = 0.97. On the whole, these values indicated a good fit of the model to the data. Moreover, all standardized loading of factors of the underlying constructs proved to be significant ($P < 0.001$). These loadings spanned from 0.48 to 0.93 for ESL, from 0.51 to 0.79 for CAR, and from 0.60 to 0.84 for IC.

4.3. Structural Model

We developed a structural model with the latent variables of the study. In this model ESL was declared as the independent variable,

Table 1: Descriptive results

Variables/values	M	SD	α	1	2	3
ESL	3.92	0.71	0.97	–		
CAR	3.88	0.73	0.87	0.43**	–	
IC	4.01	0.56	0.90	0.52**	0.54**	–
Skewness	-	-	-	−0.72	−0.26	−0.28
Kurtosis	-	-	-	0.78	0.12	−0.31
TI	-	-	-	0.81	0.81	-
VIF	-	-	-	1.18	1.18	-

α, Cronbach's alpha coefficient. M: Mean, SD: Standard deviation, TI: Tolerance index, VIF: Variance inflation factor. P<0.01

Table 2: Results for standardized effects, standard errors and confidence intervals

Pathways	β	SE	95% Bootstrap CI lower	Upper	P
Standardized direct effects					
ESL→IC	0.402	0.039	0.271	0.517	***
ESL→CAR	0.519	0.044	0.371	0.628	***
CAR→IC	0.462	0.065	0.318	0.591	***
Gender→IC	0.112	0.036	0.028	0.203	0.007
Seniority→IC	0.051	0.003	−0.048	0.137	0.382
Standardized indirect effects					
ESL→IC	0.253	0.041	0.176	0.336	***
Standardized total effects					
ESL→IC	0.655	0.052	0.512	0.738	***

R^2=0.561. ESL: Ecosystemic school leadership, IC: Instructional creativity, CAR: Cognitive adaptation readiness. ***P<0.001

IC as the dependent variable and CAR as the mediating variable. The hypothesized model displayed a reasonable fit to the data, which led to 2/df = 2.69, RMSEA = 0.06, GFI = 0.95, SRMR = 0.05 and CFI = 0.95. The structural model showed that ESL positively and directly predicted IC (0.40, P < 0.001) and CAR (β = 0.52, P < 0.001). These results confirmed H1 and H2. Moreover, CAR was positively and directly associated with IC (β = 0.46, P < 0.001), which was expected to support H3. In terms of mediation, H4 posited that CAR mediates the relationship between ESL and IC. It was shown that the mediation model allowed ESL to have an indirect influence on IC via CAR (β = 0.25, P < 0.001); therefore, H4 was accepted. Another control variable in the mediation model that we examined was gender and seniority (years of teaching experience). Gender proved to be a significant predictor of IC (β = 0.11, P < 0.01) and it was found that female teachers who exhibited more creative instructional behaviours than their male counterparts. Seniority was the other control variable that failed to show itself as a considerable predictor of IC (β = 0.05, P = 0.01) (Table 2).

5. DISCUSSION

The current research explored the effects of ESL on the IC of teachers, and CAR was a mediating process. On balance, the results are a solid empirical evidence of all hypotheses and the significance of system-level leadership and individual cognitive preparedness in the process of innovation in teaching. In particular, ESL was observed to contribute to a significant improvement in both CAR and IC, and CAR also was a significant predictor of IC. Furthermore, the findings substantiated a significant mediating role, which suggests leadership has direct and indirect effects on creativity via direct and indirect influence of cognitive readiness of teachers. The initial significant finding was that ESL positively and significantly impacts CAR. This implies that once school leaders work in an ecosystemic context, which focuses on collaboration, shared decision-making, and adaptive coordination, teachers better cognitively equipped to deal with change. This finding is consistent with CT, which states that adaptive leadership structures contribute to self-organization and cognitive flexibility of complex systems (Aldhi et al., 2025; Wang, 2025). It is also in line with earlier empirical research that has shown that distributed leadership fosters the adaptive capacity and responsiveness of teachers (Liu and Zaman, 2025; Xu, 2024). In the same manner, Huang et al. (2025) and Aldhi et al. (2025) discovered that a supportive leadership climate enhances the willingness of teachers to accept change, which supports the results of the current research. Nevertheless, in contrast with previous researches with the primary emphasis on motivational mechanisms, the work emphasizes CAR as a further specific explanatory route, building upon the work by Naskar and Digar (2025) and (Xu et al., 2025). The second result indicated that ESL has a significant impact on IC. This implies that adaptive school ecosystems leadership practices directly incite the creative teaching behaviors of teachers. This finding is aligns with Fan and Chu (2025), who highlighted that the contextual conditions are very supportive of creativity. It is as well consistent with Zhang and Cao (2025) and Maswadi et al. (2026), who established that such leadership structure that encourages autonomy and support boosts creativity.

Moreover, Sawyer (2017) contended that creativity in education is a product of collective systems as opposed to solo teacher work, which is fundamentally consistent with the ecosystemic leadership view. A CT perspective on this observation validates that instructional creativity is a system-level product of interrelated leadership interactions and not a linear managerial impact (Chahal et al., 2024; Liu and Zaman, 2025). Nonetheless, other previous researchers like Yang and Zhou (2025) implied that the impact of leadership on creativity is indirect, not direct, which partly contradicts the current direct impact conclusions, probably because of the use of the broader concept of ecosystemic leadership. The third result proved that CAR is a strong predictor of IC. This finding highlights the fact that cognitively ready teachers to respond to new instructional needs are better placed to come up with new teaching methods. This observation is closely backed by DCT that states that adaptive cognitive skills allow people to feel the difference and reorganize their actions in an imaginative way (Ageli et al., 2025; Liu, 2025). According to Cai et al. (2025) and Xu (2024) empirical studies have confirmed that adaptive performance has great association with innovation in dynamic environments. Likewise, Ho et al. (2025) and Wang (2025) discovered that teacher innovation is promoted by cognitive flexibility. Zhang and Cao (2025) and Elfira et al. (2024) also substantiate the point that cognitive openness is an important factor in creativity. All these results support the idea that IC is not merely a product of external circumstances but heavily relies on internal cognitive preparedness.

The fourth and the most important finding of this study is that CAR mediates the relationship between ESL and IC. This finding confirms that not only does leadership have a direct impact on

creativity, but it also has an impact on creativity via cognitive transformation processes. This observation is consistent with that of Salamah et al. (2024) and Fan and Chu (2025) who pointed out the mediating role of dynamic capabilities between environmental inputs and innovative outputs. In a similar fashion, Zhang and Cao (2025) and Koraag et al. (2025) argued that the impact of leadership on teacher outcomes is usually indirect and mediated by psychological and cognitive variables. It was also established by Ageteli et al. (2025) and Naskar and Digar (2025) that adaptability is also a major intervening mechanism in performance outcomes. In addition, Yuting et al. (2026) and Chahal et al. (2024) discussed that cognitive interpretation processes have a strong impact on creativity, which substantiates the mediating role in this research. In terms of complexity, this mediation is a repeated cycle whereby leadership influences adaptive thinking, which subsequently produces innovative teaching reactions to support the ecosystemic framework (Amemasor et al., 2025; Maswadi et al., 2026). Generally, the results indicate a good theoretical overlap between CT and DCT. Whereas CT describes the role of leadership as a system-level enabler, DCT describes how these systemic conditions, when cognitive readiness, are converted into creative outcomes. Such a combination of views offers a more holistic view of IC in current educational ecosystems. This study builds upon the existing knowledge; compared to past studies, the research combines both system-level and cognitive-level processes into a comprehensive explanatory framework, especially in the context of Jordanian education that has not been fully studied (Elfira et al., 2024; Yang and Zhou, 2025).

5.1. Theoretical Contributions

This research has profound theoretical implications in that it incorporates both DCT and CT in a single model of explaining IC in adaptive learning ecosystems. To start with, the study is a DCT perspective that expands the theory to the field of education and proves that the CAR of teachers is a micro-level dynamic capability that can convert the inputs of the environment into innovative teaching outputs (Ganon-Sharon and Becher, 2026; Syarifudin and Muttaqin, 2025). This development shifts the emphasis of the organizational-level capability renewal to the individual-level processes of cognitive adaptation, which broadens the scope of applications of DCT in educational research (Wang, 2025; Aldhi et al., 2025). Second, in terms of CT, the research supports the notion that schools are complex adaptive systems, in which leadership is an emergent, non-linear process that influences the behavior of teachers through interactional, as opposed to control-oriented, mechanisms (Naskar et al., 2025; Cai et al., 2025). The results are consistent with the idea that IC is the result of interrelated system relations and not individual leadership behaviors (Ageli et al., 2025; Koraag et al., 2025). Above all, this research is able to bridge the two theories that show a dual level mechanism, ESL (system level) affects CAR (individual level), which in turn affects IC (behavioral level). This combined model bridges a major gap in the two theories since DCT and CT do not provide a good system-level embedding and cognitive mechanisms respectively. Therefore, the research provides a more comprehensive theoretical perspective to the future studies of educational leadership.

5.2. Practical Implications

This research offers a number of valuable practical implications to school leaders, policymakers, and stakeholders of education. To begin with, school principals must leave previous administrative leadership methods and embrace ecosystemic leadership practices, which focus on collaboration, distributed decision-making, and continuous learning. These practices result in an adaptive school climate that enhances the responsiveness of teachers to challenges in instruction. Second, the educational training programs must be aimed at increasing the cognitive adaptation preparedness of teachers because it is the key in changing the impact of leadership to IC. Adaptive thinking, reflective practice, and problem-solving in uncertain circumstances are also to be incorporated in the professional development workshops to enhance the cognitive flexibility of teachers. Third, education policymakers in Jordan and other education systems should invest in the leadership development structures that are in tandem with digital transformation and adaptive learning ecosystems. Schools are supposed to be reinforced as integrated systems and not as independent units so that leadership changes can be extended down to the classroom level. Lastly, teacher evaluation systems must not just focus on performance outcomes but also take into account cognitive and adaptive competencies because they are key predictors of IC in the long run. Overall, the study provides actionable insights for building more innovative, resilient, and future-ready education systems.

6. CONCLUSION, LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This research aimed to investigate the role of ESL in enhancing IC in teachers using CAR in an ecosystem of adaptive learning framework. The results validate the importance of leadership as a major factor not only in having a direct influence on IC but also in having an indirect effect on the cognitive readiness of teachers to change and be innovative. The combination of DCT and CT in this study offers a detailed account of the interaction between system-level leadership and individual level cognition to yield creative teaching results. On the whole, the findings emphasize that IC in contemporary education systems is not a solitary characteristic of teachers but a result of interrelated leadership and cognitional activities. Enhancing the practice of ecosystemic leadership and development of CAR is thus a key to designing innovative, resilient, and future-oriented education systems, especially in fast-changing settings like Jordan.

There are a number of limitations to this study even though it has contributed. First, the cross-sectional design precludes the possibility of making causal links between ESL, CAR, and IC. Longitudinal research is suggested to help us record the dynamic changes with time. Second, the research is based on self-reported information that can lead to common method bias and social desirability effects. To enhance validity, future studies need to include multi-source data, including classroom observations or supervisor ratings. Third, sample is restricted to teachers in specific areas in Jordan, which can limit the extrapolation to other educational settings. The model should be replicated in various

cultural and institutional contexts in future research. Fourth, although the study revolves around CAR as a mediator, other possible mediators like emotional resilience, digital competence, or professional identity were not addressed. The model should be enriched with several mediating mechanisms that should be included in future studies. Lastly, further research could investigate moderating factors, like technological infrastructure or school climate, to further develop the ecosystemic leadership model in education.

REFERENCES

Ageli, R., Alzubi, A.B., Aljuhmani, H.Y., Iyiola, K. (2025), How and when entrepreneurial leadership drives sustainable bank performance: Unpacking the roles of employee creativity and innovation-oriented climate. Sustainability, 17(20), 9259.

Aldhi, I.F., Suhariadi, F., Rahmawati, E., Supriharyanti, E., Hardaningtyas, D., Sugiarti, R., Abbas, A. (2025), Bridging digital gaps in smart city governance: The mediating role of managerial digital readiness and the moderating role of digital leadership. Smart Cities, 8(4), 117.

Amemasor, S.K., Oppong, S.O., Ghansah, B., Benuwa, B.B., Agbeko, M. (2025), The influence of digital professional development and professional learning communities in the relationship between school digital preparedness and digital instructional integration. PLoS One, 20(7), e0328883.

Anderson, P. (1999), Perspective: Complexity theory and organization science. Organization Science, 10(3), 216-232.

Cai, H., Tegeh, I.M., Parwati, N.N. (2025), Artificial intelligence literacy, external support, and teaching competence development among kindergarten teachers: Evidence from Guizhou province. Indonesian Journal of Instruction, 6(3), 471-482.

Chahal, J., Shoukat, M.H., Ayoubi, R. (2024), How entrepreneurial environment and education influence university students' entrepreneurial intentions: The mediating role of entrepreneurial motivation. Higher Education, Skills and Work-Based Learning, 14(3), 591-609.

Cochran, J.R., Talwani, M. (1977), Free-air gravity anomalies in the world's oceans and their relationship to residual elevation. Geophysical Journal International, 50(3), 495-552.

Elfira, E., Rasdiana, R., Fitrawati, F., Jasman, M. W., Reski, K., Anwar, A., Enaldi, E. (2024), How does principal's instructional leadership shape teacher performance mediated by teacher self-efficacy in Indonesian education context? Frontiers in Education, 9, 1401394.

Fan, X., Chu, Z. (2025), The influence of distributed leadership on Chinese teachers' job satisfaction: The chain mediation of teacher collaboration and teacher self-efficacy. International Journal of Environmental Research and Public Health, 22(4), 507.

Ganon-Shilon, S., Becher, A. (2026), Principals' sense-making and sense-giving of their professional role tensions: School leaders' professionalism and creative mediation strategies during Covid-19 crisis. Educational Management Administration and Leadership, 54(2), 302-324.

Griffin, B., Hesketh, B. (2003), Adaptable behaviours for successful work and career adjustment. Australian Journal of Psychology, 55(2), 65-73.

Hair, J.F., Ringle, C.M., Sarstedt, M. (2011), PLS-SEM: Indeed a silver bullet. Journal of Marketing Theory and Practice, 19(2), 139-152.

Ho, J., Ng, D.F.S, Chua, P.H., Binte Munir, N. (2025), Leadership across schools to diffuse an education innovation: Applying complexity leadership theory with ecological leadership. International Journal of Leadership in Education, 28(2), 307-329.

Hoe, S.L. (2008), Issues and procedures in adopting structural equation modelling technique. Journal of Quantitative Methods, 3(1), 76-83.

Holland, J.H. (1995), Hidden order. Business Week-Domestic Edition, 21, 93-136.

Hu, L.T., Bentler, P.M. (1999), Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6(1), 1-55.

Huang, Y., Yuan, Y., Sun, W., Li, P. (2025), From classroom to workplace: How entrepreneurship education influences university students' employability. Humanities and Social Sciences Communications, 12(1), 1-15.

Kahn, J.H. (2006), Factor analysis in counseling psychology research, training, and practice: Principles, advances, and applications. The Counseling Psychologist, 34(5), 684-718.

Koraag, S.T.G., Zaki, A., Rahmawati, S.A., Oktafiani, B. (2025), Exploring the influence of entrepreneurial education and environment on entrepreneurial readiness: The mediating effects of entrepreneurial mindset and financial literacy in shaping student intentions. Jurnal Ekonomi Bisnis Dan Kewirausahaan (Jebik), 14(1), 1-24.

Liu, J., Darko, E.N.K.O., Aziku, M. (2025), Relationship between digital preparedness and digital integration: Mediation evidence on the role of school climate. Journal of New Approaches in Educational Research, 14(1), 18.

Liu, L., Zaman, U. (2025), From leadership to innovation: Psychological mechanisms behind teacher creativity in physical education. Acta Psychologica, 255, 104965.

Liu, N. (2025), Exploring the factors influencing the adoption of artificial intelligence technology by university teachers: The mediating role of confidence and AI readiness. BMC Psychology, 13(1), 311.

Marion, R., Uhl-Bien, M. (2001), Leadership in complex organizations. The Leadership Quarterly, 12(4), 389-418.

Maswadi, K., Gulzar, Y., Hakim, T., Mir, M.S. (2026), Digital experiential learning ecosystems and perceived sustainability outcomes: A partial mediation model of learning engagement. Sustainability, 18(8), 3738.

Naskar, D.P., Digar, B., Sajit, S.K., Kundu, P. (2025), Mediating creativity and HR element in education ecosystem: An exploratory study. Journal of Strategic Human Resource Management, 14(1), 39-59.

Pulakos, E.D., Arad, S., Donovan, M.A., Plamondon, K.E. (2000), Adaptability in the workplace: Development of a taxonomy of adaptive performance. Journal of Applied Psychology, 85(4), 612-624.

Salamah, M.J.B., Alradi, M.N., Tanni, A.B.A., Alquran, N.M., Alqudah, R.A., Daradkah, A.M., Jawarneh, A.I., Yousef Alshorman, H. (2024), The influence of innovative leadership on teachers? Green behavior: The mediating role of psychological capital. Revista Iberoamericana de Psicología del Ejercicio y el Deporte, 19(3), 364-381.

Sawyer, R.K. (2017), Teaching creativity in art and design studio classes: A systematic literature review. Educational Research Review, 22, 99-113.

Schober, P., Boer, C., Schwarte, L.A. (2018), Correlation coefficients: Appropriate use and interpretation. Anesthesia and Analgesia, 126(5), 1763-1768.

Shalley, C.E., Zhou, J., Oldham, G.R. (2004), The effects of personal and contextual characteristics on creativity: Where should we go from here? Journal of Management, 30(6), 933-958.

Stacey, K. (2011), The PISA view of mathematical literacy in Indonesia. Indonesian Mathematical Society Journal on Mathematics Education, 2(2), 95-126.

Syarifudin, A., Muttaqin, M.A. (2025), Tech-supported strategic management, digital leadership, and play-based interactive learning: A multilevel survey of quality improvement in early childhood education. International Journal of Educational Qualitative Quantitative Research, 4(1), 47-60.

Teece, D.J. (2007), Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319-1350.

Wang, J. (2025), The impact of AI teaching on teaching quality: The mediating effect of student motivation and teacher expertise. International Journal of Web-Based Learning and Teaching Technologies (IJWLTT), 20(1), 1-22.

Xu, B. (2024), Mediating role of academic self-efficacy and academic emotions in the relationship between teacher support and academic achievement. Scientific Reports, 14(1), 24705.

Xu, Y., Chang, B., Guo, Q. (2025), How the teacher development ecosystem influences career success: The chain mediation role of school climate and job crafting. Frontiers in Psychology, 16, 1596058.

Yang, Y., Zhou, D. (2025), The effect of inclusive school climate on job burnout among elementary school inclusive teachers: The mediating role of teaching efficacy under the ecosystem theory. Education Sciences, 15(5), 634.

Yuting, L., Binti Ahmad Rashid, R.A., Xiaoying, Z., Cheng, C. (2026), The dynamics of educational transformation: Empirical insights into how innovation, collaboration, and professional development influence digital resource usage across 81 countries. PLoS One, 21(3), e0341914.

Zhang, H., Cao, J. (2025), From digital disruption to mental health: The impact of AI-induced educational anxiety on teacher well-being in the era of smart education. BMC Public Health, 25(1), 4010.

Zhang, L.F., Sternberg, R.J. (2006), The role of individual differences in approaches to learning. In: Human Learning. England, UK: Routledge. p66-86.

Zhou, J., George, J.M. (2003), Awakening employee creativity: The role of leader emotional intelligence. The Leadership Quarterly, 14(4-5), 545-568.