

Original Article



Effectiveness of an AI Assistant Versus Acceptance and Commitment Therapy in Enhancing Academic Engagement and Social Interaction Among Bilingual Students

Khaled Loveimi^{ID}, Sasan Bavi^{ID}, Reza Johari Fard^{ID}

Department of Psychology, Ahv.C., Islamic Azad University, Ahvaz, Iran

Article info**Article History:****Received:** November 22, 2025**Revised:** June 7, 2026**Accepted:** June 25, 2026**epublished:** September 19, 2026**Keywords:**

AI assistant, Acceptance and commitment therapy, Academic engagement, Social interaction, Bilingual students

Abstract**Introduction:** Bilingual students frequently encounter unique complexities within educational environments, which can pose distinct challenges to their academic engagement and social interaction. This study aimed to comparatively evaluate the effectiveness of an Artificial Intelligence (AI) Assistant and Acceptance and Commitment Therapy (ACT) in fostering academic engagement and enhancing social interaction among seventh-grade Persian-Arabic bilingual male students from Ahvaz suburban areas.**Methods:** Utilizing a quasi-experimental design featuring a pre-test, post-test, and one-month follow-up, alongside a control group, 105 students were recruited via multi-stage cluster sampling. Participants were subsequently randomized into three 35-member groups: AI Assistant, ACT, and control. Over eight weeks, experimental groups engaged in weekly 90-minute sessions, either interacting with the 'Monica' AI Assistant or participating in structured ACT therapy. Academic engagement and social interaction were assessed using standard questionnaires. Data analysis, employing Repeated Measures ANOVA with Bonferroni corrections, revealed significant main effects for time and group, as well as significant time-by-group interaction effects for both outcomes.**Results:** Both interventions were associated with substantial improvements in academic engagement and social interaction compared to the control group immediately post-intervention, with these gains largely maintained at the one-month follow-up. The AI Assistant group yielded significantly higher scores than the ACT group ($P < 0.05$), although the quasi-experimental design warrants cautious interpretation of the comparative advantage.**Conclusion:** These findings highlight the significant potential of technology-supported learning and psychological flexibility interventions in cultivating essential non-cognitive skills within bilingual student populations and hold promising educational significance for supporting diverse learners in resource-limited settings.**Introduction**

The educational trajectory for students, especially those navigating the inherent complexities of bilingualism, is profoundly shaped by a multitude of factors extending beyond solely cognitive abilities.¹ Within this multifaceted landscape, academic engagement and effective social interaction emerge as pivotal determinants of holistic development and long-term scholastic success.² Bilingual learners, frequently traversing distinct linguistic and cultural landscapes, may indeed encounter unique challenges that can inadvertently impede their active participation in learning activities and their capacity to cultivate meaningful connections with peers within school environments.³

Academic engagement, precisely defined as a student's active and multifaceted involvement in learning activities across behavioral, emotional, and cognitive

dimensions, is unequivocally linked to improved academic performance, notable reductions in dropout rates, and an enhancement of intrinsic motivation.^{4,5} Simultaneously, within scholastic environments, robust social interaction plays an indispensable role in cultivating students' psychological well-being, fostering a profound sense of belonging, and facilitating the development of crucial interpersonal competencies.⁶ For bilingual students in particular, strong social connections can further serve to facilitate language acquisition and acculturation processes, thereby effectively mitigating feelings of isolation or marginalization.^{7,8} Consequently, the cultivation of both academic engagement and positive social interaction is paramount for ensuring equitable educational opportunities and actively promoting overall student flourishing.

Despite the widely recognized importance of these

*Corresponding author: Sasan Bavi, Email: sasan-bavi@iau.ac.ir

variables, the development and empirical validation of effective interventions specifically designed to enhance both academic engagement and social interaction, particularly within diverse bilingual student populations, continue to represent an area requiring substantial further investigation. Existing traditional educational approaches may not sufficiently or adequately address the nuanced and evolving needs of these students across these critical domains.⁹ While a broad array of pedagogical strategies are in practice, there is an escalating academic and practical interest in novel, technology-driven interventions and psychologically informed therapies, which possess the capacity to offer highly personalized and robust support. This observation distinctly highlights a pervasive gap in the current literature concerning the comparative effectiveness of such contemporary approaches on these specific and vital student outcomes.

Artificial Intelligence (AI) Assistants are rapidly emerging as transformative tools within educational landscapes, fundamentally reshaping learning experiences through their unparalleled capacity for personalization, adaptive feedback, and highly interactive content.¹⁰ These sophisticated platforms are meticulously engineered to cater to individual student needs, learning paces, and preferences, thereby directly fostering robust academic engagement.¹¹ By delivering immediate, targeted, and non-judgmental feedback, AI assistants empower learners to effectively monitor their progress, comprehend errors, and strategically revise their approaches, which, in turn, cultivates a profound sense of mastery and significantly boosts intrinsic motivation for deeper engagement.¹² Furthermore, the interactive nature of AI-driven platforms, frequently incorporating elements of gamification and adaptive challenges, can transform conventionally mundane tasks into stimulating and highly captivating experiences, thus considerably increasing both cognitive and behavioral engagement.¹³ This heightened academic confidence, coupled with reduced academic anxiety, can subsequently contribute indirectly to enhanced social interaction. As students perceive themselves as more competent and less academically overwhelmed, they may more readily allocate cognitive and emotional resources towards participating in social activities, initiating peer interactions, and fostering a stronger sense of belonging within the school community.

Concurrently, Acceptance and Commitment Therapy (ACT), widely recognized as a sophisticated third-wave cognitive behavioral therapy, provides a distinct and comprehensive framework for fostering psychological well-being and promoting adaptive behavioral change through the cultivation of psychological flexibility, mindfulness, and value-driven action.^{14,15} Within the realm of academic engagement, ACT empowers students to acknowledge and experientially accept challenging internal experiences—such as boredom, frustration, or test anxiety—rather than resorting to suppression or avoidance. This process of acceptance effectively liberates cognitive resources typically consumed by unproductive

internal struggle, thereby enabling students to more fully immerse themselves in learning tasks and persist robustly despite academic difficulties.¹⁶ Furthermore, through cognitive diffusion techniques, learners acquire the skill to detach from unhelpful or self-limiting thoughts (e.g., “I’m not smart enough”) that might otherwise impede their active participation.¹⁷ ACT also directly bolsters academic engagement by guiding students to clarify their personal academic values (e.g., growth, curiosity) and subsequently commit to actions consistently aligned with these values, even when confronted with discomfort or distraction.¹⁸ Regarding social interaction, ACT’s core principles significantly facilitate approaching social situations with increased openness and authenticity. By cultivating acceptance of social anxieties and acting in accordance with values of connection and belonging, students are better able to reduce social avoidance behaviors and engage more genuinely with peers, ultimately leading to improved social relationships within the school environment.¹⁹

The novelty of the present study lies in its direct comparison of these two distinct contemporary approaches—an AI-assisted technological intervention versus a psychologically oriented ACT program—within the understudied context of bilingual students, an area with limited prior empirical investigation. Given the distinct theoretical underpinnings and practical applications associated with both AI Assistant technology and ACT, coupled with the pressing need for empirically validated and effective interventions tailored for bilingual students, the present study was meticulously designed to conduct a rigorous comparative evaluation.

It was hypothesized that both the AI Assistant and ACT interventions would significantly improve academic engagement and social interaction relative to the control group, with the AI Assistant potentially demonstrating superior outcomes due to its adaptive and accessible nature.

Methods

This investigation employed a quasi-experimental research design with a non-equivalent control group, characterized by pre-test, post-test, and one-month follow-up assessments. The defined target population for this inquiry encompassed all seventh-grade male bilingual (Persian-Arabic) students matriculated in suburban schools across Ahvaz, Iran, during the 2023-2024 academic year. Employing a rigorous multi-stage cluster sampling methodology, several suburban educational institutions were first randomly selected, followed by the random selection of specific seventh-grade classes within these schools. All students in the selected classes who met the inclusion criteria (seventh-grade enrollment, male gender, and self-identification as Persian-Arabic bilingual) were invited to participate. No students were excluded due to failing inclusion criteria; however, a small number declined participation ($n=8$), and these were replaced through additional random

selection from the same clusters to reach the final sample of 105 participants. No attrition was observed across the pre-test, post-test, or one-month follow-up assessments. Following this meticulous selection process, these 105 participants were then randomly allocated to one of three discrete groups: an AI Assistant intervention group ($n=35$), an ACT intervention group ($n=35$), or a control group ($n=35$). Note that while allocation to groups was randomized within clusters, the overall design remains quasi-experimental due to the school-based cluster sampling and practical constraints in a real-world educational setting.

Measures

Academic engagement and social interaction were assessed using two standardized instruments, as summarized below:

Academic Engagement Scale (AES): 17 items; 7-point Likert scale (1=completely disagree to 7=completely agree); four dimensions (behavioral, cognitive, emotional, and agency); higher scores indicate greater academic engagement. The AES has demonstrated strong internal consistency in prior research (Cronbach's $\alpha=0.84-0.90$).^{20,21} In the current sample, Cronbach's alpha was 0.87 at pre-test, 0.89 at post-test, and 0.88 at follow-up.

Social Skills Rating System – Secondary Students Form (SSRS-SS): 39 items; 3-point Likert scale (0=never, 1=sometimes, 2=often); four domains (self-control, cooperation, empathy, and assertion); total scores range from 0 to 78, with higher scores reflecting better social interaction skills.²² The Persian adaptation of the SSRS-SS has shown acceptable reliability and validity.²³ In the current sample, Cronbach's alpha was 0.82 at pre-test, 0.84 at post-test, and 0.83 at follow-up.

Interventions

The interventional phase of the study extended over an eight-week period, during which both experimental groups engaged in weekly 90-minute sessions. The control group, in contrast, continued to receive standard conventional education without any additional structured intervention related to academic engagement or social interaction.

The Artificial Intelligence (AI) Assistant Intervention: The AI Assistant group interacted with 'Monica,' a custom-developed AI platform. Students accessed the system via a secure web-based portal on school tablets or computers during scheduled sessions and could also use it asynchronously for additional practice. The AI delivered personalized learning modules, adaptive quizzes, real-time feedback on academic tasks, progress tracking, and gamified activities tailored to each student's performance level. Usage was monitored through platform analytics to ensure consistent engagement (minimum 90 minutes per week). The primary goal was to enhance academic engagement directly and support social interaction indirectly through increased confidence.

The Acceptance and Commitment Therapy (ACT):

The ACT intervention consisted of eight weekly 90-minute group sessions facilitated by a certified clinical psychologist. Sessions followed a structured manual adapted from established ACT protocols for adolescents,^{14,17} covering core processes including cognitive diffusion, experiential acceptance, mindfulness, values clarification, and committed action, with specific exercises targeting academic and social contexts. Intervention fidelity was assessed through session checklists completed by the facilitator and audio recordings of 25% of sessions reviewed by an independent supervisor. Facilitator checklists indicated that 97% of protocol items were completed across all sessions. Independent supervisor ratings of the reviewed recordings yielded a mean adherence score of 95% (range 91–100%), confirming that the ACT intervention was delivered as intended.

The Control Group: Participants continued their regular school curriculum without supplementary intervention.

Procedures

Following ethical approval and informed consent from school authorities and parents, all assessments were administered under standardized conditions (group format in classrooms, identical instructions, and supervised by trained research assistants) at pre-test, post-test (immediately after the intervention), and one-month follow-up. The same team of trained research assistants collected data at all time points to maintain consistency. To minimize contamination between groups, sessions were scheduled at different times, participants were instructed not to discuss intervention content with peers from other groups, and AI access was password-restricted to assigned students only.

Data Analysis

All data were analyzed using SPSS Version 26. Descriptive statistics (means, SDs) were computed, followed by repeated measures ANOVA to assess intervention effectiveness and group differences across the three time points. Before analysis, assumptions were thoroughly checked: data were approximately normally distributed (assessed via Shapiro-Wilk tests), Mauchly's test for sphericity revealed violations for both outcomes (thus Greenhouse-Geisser corrections were applied), and Levene's test confirmed homogeneity of variance ($P>0.05$). Significant effects were further examined via Bonferroni post-hoc tests, with statistical significance set at $P<0.05$. Partial eta squared (η^2) was reported as the effect size measure.

Results

The participant cohort's demographic profile revealed an average age of 12.8 years ($SD=0.65$). Parental educational attainment exhibited notable diversity, with a substantial percentage having attained high school diplomas (65%), while a considerable portion held bachelor's degrees (25%) and postgraduate qualifications (10%).

Descriptive statistics for academic engagement and social interaction across the three groups (AI Assistant, ACT, and Control) at pre-test, post-test, and one-month follow-up are presented in Table 1. A preliminary examination of the mean scores indicated higher scores in both outcomes for the intervention groups from pre-test to post-test, with these scores largely sustained at follow-up. The control group showed only minimal changes.

Prior to conducting the main inferential analyses, the critical assumptions for the repeated measures ANOVA were meticulously evaluated. Mauchly's test for sphericity revealed a violation of this assumption for both academic engagement ($\chi^2=7.89$, $P=0.021$) and social interaction ($\chi^2=8.15$, $P=0.017$). Consequently, Greenhouse-Geisser corrections were systematically applied to all within-subjects effects, as appropriate. Furthermore, Levene's test for equality of error variances was not statistically significant ($P>0.05$), confirming that the assumption of homogeneity of variance was met for all variables at each measurement point.

The repeated measures ANOVA, summarized in Table 2, revealed statistically significant main effects for both time and group across both academic engagement and social interaction variables. Specifically, for academic engagement, significant main effects were observed for time ($F=75.21$, $P<0.001$) and group ($F=48.95$, $P<0.001$). More critically, a significant time $\times$ group interaction effect was also identified ($F=32.78$, $P<0.001$), indicating that the changes in academic engagement over time differed significantly among the three groups. Similarly, for social interaction, significant main effects were evident for time ($F=68.30$, $P<0.001$) and group ($F=45.10$, $P<0.001$). Crucially, a significant time $\times$ group interaction effect was likewise observed ($F=28.90$, $P<0.001$), demonstrating that the trajectory of social interaction scores varied significantly across the groups throughout the measurement period.

Bonferroni-corrected post-hoc analyses, as presented in Table 3, thoroughly elucidated the specific between-group differences for both academic engagement and social interaction. For academic engagement, at both the post-test and one-month follow-up assessments, the AI Assistant group consistently showed significantly higher scores compared to the control group (Post-test: Mean difference=15.81, $P<0.001$; Follow-up: Mean difference=15.37, $P<0.001$). Similarly, the ACT group

also exhibited significantly higher academic engagement scores than the control group at both time points (Post-test: Mean difference=11.52, $P<0.001$; Follow-up: Mean difference=11.03, $P<0.001$). Furthermore, the AI Assistant group yielded significantly higher academic engagement scores than the ACT group at both post-test (Mean difference=4.35, $P=0.003$) and follow-up (Mean difference=4.30, $P=0.004$).

Regarding social interaction, a parallel pattern emerged. Both the AI Assistant group (Post-test: Mean difference=13.21, $P<0.001$; Follow-up: Mean difference=12.74, $P<0.001$) and the ACT group (Post-test: Mean difference=10.70, $P<0.001$; Follow-up: Mean difference=10.32, $P<0.001$) showed significantly higher scores than the control group at both measurement points. Additionally, the AI Assistant group consistently demonstrated significantly higher social interaction scores compared to the ACT group at both post-test (Mean difference=2.53, $P=0.018$) and follow-up (Mean difference=2.45, $P=0.021$).

Scores in the intervention groups remained substantially higher than those in the control group at the one-month follow-up. For academic engagement, both the AI Assistant and ACT groups retained nearly all post-test gains, with mean scores remaining substantially higher than the control group. Similarly, social interaction scores in the intervention groups showed only minimal decline from post-test to follow-up, remaining significantly elevated compared to baseline and the control condition. These patterns are consistent with the durability of the observed score differences associated with both interventions.

Discussion

The current study aimed to evaluate the comparative efficacy of an AI assistant and ACT in enhancing academic engagement and social interaction among Persian-Arabic seventh-grade bilingual male students. The findings demonstrated that both the AI Assistant and ACT interventions were associated with significantly higher scores over the conventional education provided to the control group, with these score differences largely maintained at the one-month follow-up. The AI Assistant group showed modestly higher scores than the ACT group across both outcomes.

The higher academic engagement scores observed in the AI Assistant group align with prior literature on artificial

Table 1. Descriptive Statistics for academic engagement and social interaction scores across groups and time points (Means $\pm$ Standard Deviations)

Variable	Group	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Follow-up Mean $\pm$ SD
Academic engagement	AI Assistant	68.54 $\pm$ 5.23	85.32 $\pm$ 6.15	85.82 $\pm$ 6.34
	ACT	69.26 $\pm$ 5.54	81.05 $\pm$ 5.52	80.54 $\pm$ 6.05
	Control	68.93 $\pm$ 5.04	69.54 $\pm$ 5.14	69.03 $\pm$ 5.21
Social interaction	AI Assistant	42.15 $\pm$ 4.82	55.76 $\pm$ 5.33	55.08 $\pm$ 5.58
	ACT	41.80 $\pm$ 4.53	53.24 $\pm$ 5.07	52.82 $\pm$ 5.24
	Control	42.06 $\pm$ 4.71	42.56 $\pm$ 4.65	42.36 $\pm$ 4.82

Note. Academic Engagement was measured with the AES (higher scores=greater engagement). Social Interaction was measured with the SSRS-SS (higher scores=better social skills). SD=Standard Deviation.

intelligence in education.^{24,25} Data from this study showed that students in the AI group achieved higher post-test and follow-up scores compared to both control and ACT groups. This advantage may be attributable to the AI's personalized learning pathways, immediate feedback, and adaptive content,¹³ although the quasi-experimental design means that unmeasured confounding factors cannot be entirely ruled out. Regarding social interaction, the data indicated indirect benefits, possibly through increased academic confidence and reduced stress, though this interpretation remains hypothetical and requires further process-oriented investigation.

Similarly, the significantly higher scores in the ACT group are consistent with the theoretical principles of ACT.^{14,17} The results directly showed increased academic engagement and social interaction scores, which can be plausibly explained by enhanced psychological flexibility, acceptance of discomfort, and value-driven action fostered through the program. These patterns are in line with previous intervention studies that reported positive effects of ACT on student engagement and social skills in adolescent populations.^{16,26}

The modest advantage of the AI Assistant over ACT, while statistically significant, should be interpreted cautiously given the quasi-experimental nature of the design and the possibility of unmeasured confounders. This difference may stem from the continuous accessibility and real-time responsiveness of the AI platform, yet alternative explanations such as novelty effects or

differential engagement levels cannot be excluded.²⁵

These findings contribute to the growing body of evidence supporting both technology-enhanced and psychologically informed interventions for bilingual students. However, the results are specific to this sample of seventh-grade Persian-Arabic bilingual male students in suburban Ahvaz and may not generalize to female students, other age groups, or different cultural and linguistic contexts. Future theoretical frameworks could usefully explore integrative models that combine the strengths of adaptive AI tools with ACT-based psychological training.

The present study has several limitations that should be considered when interpreting the results. The quasi-experimental design, while practical in a school setting, limits definitive causal inferences and precludes strong claims of intervention effects. Additionally, because participants were drawn from the same school environment, the possibility of intervention contamination between groups cannot be ruled out. The sample was geographically and demographically restricted to Persian-Arabic seventh-grade bilingual male students from suburban Ahvaz, which substantially constrains the generalizability of the findings. The one-month follow-up period is relatively short, and the reliance on self-report measures may introduce response bias. Blinding was not feasible in this study, which may have influenced participant responses. Furthermore, the precise mechanisms underlying the associations observed with the AI Assistant remain somewhat unclear and would benefit from process evaluation and mediation analyses in future research.

Conclusion

This study provides evidence that both the AI Assistant intervention and Acceptance and Commitment Therapy were associated with meaningful and sustained higher scores in academic engagement and social interaction among seventh-grade Persian-Arabic bilingual male students compared to standard schooling. While the AI

Table 2. Results of repeated measures ANOVA for academic engagement and social interaction

Variable	Source	F	P	η^2
Academic engagement	Group	48.95	0.001	0.49
	Time	75.21	0.001	0.42
	Group $\times$ Time	32.78	0.001	0.39
Social interaction	Group	45.10	0.001	0.47
	Time	68.30	0.001	0.40
	Group $\times$ Time	28.90	0.001	0.36

Table 3. Bonferroni-corrected between-group pairwise comparisons for academic engagement and social interaction

Variable	Phases	Comparison	Mean Difference	SE	P	95% Confidence Interval
Academic engagement	Post-test	AI Assistant vs. Control	15.81	1.80	0.001	[12.21, 19.45]
		ACT vs. Control	11.52	1.80	0.001	[7.91, 15.16]
		AI Assistant vs. ACT	4.35	1.69	0.003	[1.14, 7.52]
	Follow-up	AI Assistant vs. Control	15.37	1.93	0.001	[11.50, 19.17]
		ACT vs. Control	11.03	1.94	0.001	[7.22, 14.83]
		AI Assistant vs. ACT	4.30	1.74	0.004	[0.90, 7.73]
Social interaction	Post-test	AI Assistant vs. Control	13.21	1.02	0.001	[11.24, 15.27]
		ACT vs. Control	10.70	1.02	0.001	[8.72, 12.74]
		AI Assistant vs. ACT	2.53	0.95	0.018	[0.96, 4.14]
	Follow-up	AI Assistant vs. Control	12.74	1.10	0.001	[10.53, 14.94]
		ACT vs. Control	10.32	1.10	0.001	[8.16, 12.50]
		AI Assistant vs. ACT	2.45	0.98	0.021	[0.63, 4.25]

Note. SE: Standard Error

Assistant group demonstrated modestly higher scores in this sample, these findings should be interpreted cautiously given the study design and specific participant characteristics. Both approaches show promise as potentially useful tools for supporting non-cognitive skill development in bilingual student populations. Future research employing more robust designs is warranted to confirm and extend these preliminary findings.

Acknowledgments

We would like to express our sincere appreciation to all the students who willingly gave their time to take part in this research.

Authors' Contribution

Conceptualization: Khaled Loveimi
Data Curation: Khaled Loveimi
Investigation: Sasan Bavi
Methodology: Khaled Loveimi
Project Administration: Khaled Loveimi
Resources: Reza Johari Fard
Software: Reza Johari Fard
Supervision: Sasan Bavi
Writing—Original Draft: Khaled Loveimi
Writing—Review & Editing: Sasan Bavi

Competing Interests

The authors declare no conflict of interest.

Ethical Approval

This study was granted ethical approval by the Ethics Committee of Islamic Azad University, Ahvaz Branch, with the approval code IR.IAU.AHVAZ.REC.1403.397.

Funding

None.

References

- Nuri A. Exploring bilingualism: cognitive benefits and cultural challenges. *Acta Glob Human Ling* 2024;1(1):71-81. doi:10.69760/aghel.024053
- Rožman M, Vrečko I, Tominc P. Psychological factors impacting academic performance among business studies' students. *Educ Sci* 2025;15(2):121. doi:10.3390/educsci15020121
- Bialystok E. The bilingual adaptation: how minds accommodate experience. *Psychol Bull* 2017;143(3):233-62. doi:10.1037/bul0000099
- Amerstorfer CM, Frein von Münster-Kistner C. Student perceptions of academic engagement and student-teacher relationships in problem-based learning. *Front Psychol* 2021;12:713057. doi:10.3389/fpsyg.2021.713057
- Nazarieh M, Delzende M, Beigzadeh A. Flipped learning in medical education: enhancing engagement through innovative pedagogy. *Res Dev Med Educ* 2024;13(1):20. doi:10.34172/rdme.33258
- Tahir SI, Jan T. Social relations and scholastic achievement: insights from engineering students through a mixed method study. *Acta Psychol (Amst)* 2025;254:104777. doi:10.1016/j.actpsy.2025.104777
- Tekel E, Ergin-Kocaturk H, Su A, Kocaturk M, Caner M, Karadag E. Impact of culture shock, acculturation approaches, and sociocultural adaptation on perceived proficiency in Turkish and English among international students in Turkey. *Acta Psychol (Amst)* 2025;256:104999. doi:10.1016/j.actpsy.2025.104999
- Oberle E, Ji XR, Alkawaja M, Molyneux TM, Kerai S, Thomson KC, et al. Connections matter: adolescent social connectedness profiles and mental well-being over time. *J Adolesc* 2024;96(1):31-48. doi:10.1002/jad.12250
- Hu S, Ke F, Vyorkina D, Hu P, Luby S, O'Shea J. Artificial intelligence in higher education: applications, challenges, and policy development and further considerations. In: Perna LW, ed. *Higher Education: Handbook of Theory and Research*. Vol 40. Cham: Springer; 2025. p. 1-52. doi:10.1007/978-3-031-51930-7_13-1
- Tan X, Cheng G, Ling MH. Artificial intelligence in teaching and teacher professional development: a systematic review. *Comput Educ Artif Intell* 2025;8:100355. doi:10.1016/j.caeai.2024.100355
- Wu XY, Chiu TK. Integrating learner characteristics and generative AI affordances to enhance self-regulated learning: a configurational analysis. *J New Approaches Educ Res* 2025;14(1):10. doi:10.1007/s44322-025-00028-x
- Zhang M. Enhancing self-regulation and learner engagement in L2 speaking: exploring the potential of intelligent personal assistants within a learning-oriented feedback framework. *BMC Psychol* 2024;12(1):421. doi:10.1186/s40359-024-01917-0
- Saleh S, Alsubhi AI. The role of techno-competence in AI-based assessments: exploring its influence on students' boredom, self-esteem, and writing development. *Lang Test Asia* 2025;15(1):6. doi:10.1186/s40468-025-00344-1
- Tayyebi G, Alwan NH, Hamed AF, Shallal AA, Abdulrazzaq T, Khayayi R. Application of acceptance and commitment therapy (ACT) in children and adolescents psychotherapy: an umbrella review. *Iran J Psychiatry* 2024;19(3):337-43. doi:10.18502/ijps.v19i3.15809
- Li Z, Shang W, Wang C, Yang K, Guo J. Characteristics and trends in acceptance and commitment therapy research: a bibliometric analysis. *Front Psychol* 2022;13:980848. doi:10.3389/fpsyg.2022.980848
- Hsu T, Adamowicz JL, Thomas EBK. The effect of acceptance and commitment therapy on the psychological flexibility and inflexibility of undergraduate students: a systematic review and three-level meta-analysis. *J Contextual Behav Sci* 2023;30:169-80. doi:10.1016/j.jcbs.2023.10.006
- Grégoire S, Lachance L, Bouffard T, Dionne F. The use of acceptance and commitment therapy to promote mental health and school engagement in university students: a multisite randomized controlled trial. *Behav Ther* 2018;49(3):360-72. doi:10.1016/j.beth.2017.10.003
- Levin ME, Krafft J, Twohig MP. An overview of research on acceptance and commitment therapy. *Psychiatr Clin North Am* 2024;47(2):419-31. doi:10.1016/j.psc.2024.02.007
- López-Pinar C, Lara-Merín L, Macías J. Process of change and efficacy of acceptance and commitment therapy (ACT) for anxiety and depression symptoms in adolescents: a meta-analysis of randomized controlled trials. *J Affect Disord* 2025;368:633-44. doi:10.1016/j.jad.2024.09.076
- Reeve J. How students create motivationally supportive learning environments for themselves: the concept of agentic engagement. *J Educ Psychol* 2013;105(3):579-95. doi:10.1037/a0032690
- Ramazani M, Khamesan A. Psychometric characteristics of Reeve's academic engagement questionnaire 2013: with the introduction of the agentic engagement. *Quarterly of Educational Measurement* 2017;8(29):185-204. doi:10.22054/jem.2018.22660.1555
- Gresham FM, Elliott SN. *Social Skills Rating System (SSRS)*. Circle Pines, MN: American Guidance Service; 1990.
- Eslami AA, Amidi Mazaheri M, Mostafavi F, Abbasi MH,

- Noroozi E. Farsi version of social skills rating system-secondary student form: cultural adaptation, reliability and construct validity. *Iran J Psychiatry Behav Sci* 2014;8(2):97-104.
24. Wang S, Wang F, Zhu Z, Wang J, Tran T, Du Z. Artificial intelligence in education: a systematic literature review. *Expert Syst Appl* 2024;252:124167. doi:[10.1016/j.eswa.2024.124167](https://doi.org/10.1016/j.eswa.2024.124167)
25. Ukwandu E, Omisade O, Jones K, Thorne S, Castle M. The future of teaching and learning in the context of emerging artificial intelligence technologies. *Futures* 2025;171:103616. doi:[10.1016/j.futures.2025.103616](https://doi.org/10.1016/j.futures.2025.103616)
26. Anusuya SP, Gayatri Devi S. Acceptance and commitment therapy and psychological well-being: a narrative review. *Cureus* 2025;17(1):e77705. doi:[10.7759/cureus.77705](https://doi.org/10.7759/cureus.77705)