International Journal of New Findings in Health and Educational Sciences (IJHES)
ISSN 2980-0641
DOI: 10.63053/ijhes.122

The effectiveness of Argumentation schema -based education on critical thinking tendencies in female students

Ali Akbar Salari[1], Nooshin Salımi[2]*
1. Master Student of Clinical Psychology, Department of Clinical psychology, Islamic Azad Kermanshah University, Kermanshah, Iran
2. Department of Public Health, Kermanshah Branch, Islamic Azad University, Kermanshah, Iran (Corresponding author)

ARTICLE INFO

Keywords:
Schema-based Argumentation education, critical thinking orientation, students

ABSTRACT

The present study aimed to investigate the effectiveness of schema-based argumentation training on critical thinking tendencies in female students. The research method employed was an experimental study with a pre-test/post-test design that included a control group. The statistical population of the study consisted of all seventh-grade students at the first high school during the 2024-2023 academic year in Sonqor County. Sampling was conducted using the convenience sampling method. A total of 120 students were selected and assigned to two groups: an experimental group and a control group (60 students in the experimental group and 60 in the control group). In this study, the critical thinking tendency questionnaire developed by Fasion et al. was utilized. Critical thinking training sessions were conducted over 9 sessions for the experimental group, based on the Paul Elder (2019) model. Finally, a post-test was administered to both groups after the training sessions. For data analysis, analysis of covariance (ANCOVA) was performed using SPSS-26 software.

The results indicated that schema-based argumentation education has a positive effect on critical thinking tendencies. Consequently, it can be concluded that schema-based argumentation education can be effectively used to enhance critical thinking among students.

Introduction

A person first experiences life and interacts with the world within the context of their family. In fact, the foundation of an individual's beliefs, values, and behaviors is rooted in their family. The family, followed by relatives, serves as the source of a child's initial experiences and knowledge, typically satisfying their early curiosity. As the child matures, the family circle and relatives alone cannot sufficiently support their development. This is when the individual enters the second critical and formative institution of their life: school. School is often considered a student's second home and is an irreplaceable component of the social structure (Sadrizadeh et al., 2023). Studies have shown that the school environment significantly impacts personality formation, motivation, emotional and social performance, and overall quality of life (Makjiboni, 2023). The closure of schools during the coronavirus pandemic has increased mental health problems in teenagers (Esposito et al., 2023). One of the key responsibilities of schools is teaching life skills (Elgun and Uysal, 2022).

The World Health Organization (WHO) defines life skills as the ability to develop positive and adaptive behaviors that enable individuals to effectively manage everyday needs and challenges. UNICEF also views life skills as an approach to behavior change and development that aims to balance knowledge, attitudes, and skills (United Nations, 2023). The goal of education should not be solely focused on achieving high grades in academic subjects, but rather on providing students with opportunities to enhance their life skills (Nograheini, 2022). While UNICEF acknowledges that a comprehensive and definitive list of life skills is unattainable, the WHO recommends learning ten core life skills: self-awareness, empathy, creative thinking, critical thinking, problem-solving skills, decision-making ability, coping with stress, and emotion management. However, some organizations and institutions believe that the scope of life and social skills extends beyond these ten items. This raises the question: Given the vast array of cognitive, social, and emotional skills, which should receive the most attention in schools? (Kirchoff & Keller, 2021).

In the 21st century, with its rapid advancements in science and technology, society requires individuals who can think effectively, identify problems, and develop practical solutions (Arisoy and Aybek, 2021). To be an active and creative citizen, many researchers emphasize the importance of creative and critical thinking (Silva et al., 2023). The Oxford Dictionary defines "critical" as being derived from the Greek word "kritikos," meaning "to decide and judge." Critical thinking is highly valued and considered the ultimate goal of the education system (Yaki, 2022). Although a universally accepted definition of critical thinking remains elusive among psychologists, philosophers, educators, and scientists (Lombardi et al., 2022), it generally emphasizes the adjustment, adaptation, change, and improvement of thought processes to make informed decisions that yield favorable outcomes (Zakaria, 2021). Gerald Nosich (2018) succinctly defines critical thinking as "thinking about your thinking, in order to improve it." Critical thinking involves identifying the root cause of a problem whenever we encounter one (Ojim, 2021).

In 2020, the World Economic Forum identified critical thinking as the second most important skill for every individual in the 21st century (Chowdar, 2023). Facione (2011), a prominent theorist of critical thinking and co-creator of the California Critical Thinking Test, emphasized its significance: "Weakness in critical thinking is associated with patient death, loss of income, chaos and lawlessness, job loss, deceived voters, broken relationships, imprisonment, high casualties in wars, expensive housing, death from accidents, bad decisions, unplanned pregnancies, financial mismanagement, heart disease, domestic violence, repeated suicide attempts, divorce, addiction, and academic failure." Individuals with strong critical thinking skills can differentiate between truth and falsehood, good and bad, and positive and negative (Castell, 2022). Equipped with this vital skill, people

exhibit self-confidence, lead well-planned lives (Yilmaz, 2022), make independent decisions (Tajic, n.d.), are more responsible and capable (Al-Huwail & Al-Baqami, 2024), and excel in problem-solving (Hitchcock, 2020). They strive to improve society and advocate for a more civilized world, free from prejudices, cognitive distortions, and irrational social taboos (Afiyum, 2022). Conversely, critical thinking is often deficient in individuals with narcissistic personality disorder (Grundman et al., 2022).

Furthermore, enhancing inference skills, a component of critical thinking, reduces the incidence of depression, while teaching critical thinking increases life satisfaction (Herati et al., 2022). Low critical thinking skills can lead to decreased environmental sensitivity (Akgun et al., 2023). Another notable study found that high scores in critical thinking predict high performance in mathematics (Eyre, 2024). A study involving 1129 Spanish medical interns demonstrated that critical thinking training reduced their stress levels (Escola Gaschon, 2021). UNICEF recommends incorporating critical thinking into textbooks to address children's misconceptions and thoughts regarding the COVID-19 pandemic (UNICEF, 2023). Research suggests that critical thinking skills can help individuals navigate the vast amount of information available on the Internet (Chen, 2022). The United States, Indonesia, and Turkey are among the leading publishers of articles on critical thinking, with research in this area experiencing significant growth since 2019 (Nur and Sihes, 2022). Therefore, teaching critical thinking to students is essential (Aktash, 2022).

The foundation of human existence is rooted in thoughts, beliefs, knowledge, and early family influences. This foundation requires the nurturing oxygen and sunlight of education to flourish. However, it is crucial to recognize that education in a school environment is most effective when it considers the individual's initial impressions and perceptions from their family. In other words, education is most impactful when it values the individual's worldview and attitude. A meta-analytic study indicates that early knowledge is a strong predictor of learning and academic success (Sevensmeyer et al., 2022).

This initial knowledge is often referred to as a "schema" in psychology. The term "schema" originates from a Greek word and has gained prominence in psychology and philosophy. Immanuel Kant first used the word "schema" in his works, defining it as a bridge between a person's learning and life experiences (Ma, 2021). In a book review in 1781, Kant wrote, "New concepts will be meaningful when they connect with what people already know." A schema is a pattern of thinking and behavior that organizes the classification of information and the relationships between them. For example, a schema can encompass behavioral styles in society (how to react in certain situations), worldviews (interpreting events based on religious beliefs), and archetypes (rules that should be followed when events occur). In essence, schemas are cognitive frameworks that help us understand how we acquire and process new information (Piddock et al., 2020).

Understanding Schema in Psychology

This initial knowledge is referred to as “schema” in psychology. The word “schema” is the Persian equivalent of the English term "schema." This term was first borrowed from a Greek word and became popular in the fields of psychology and philosophy. Immanuel Kant was the first to use the word “schema” in his works, defining it as a bridge between a person’s learning and experiences in life (Ma, 2021). Kant wrote in a book review in 1781: “New concepts will be meaningful when they connect with what people already know”.

A schema is a pattern of thinking and behavior that organizes the classification of information and the relationships between them. For example, a schema can include behavioral styles in society (how to react in certain situations), worldviews (interpreting events based on religious beliefs), and archetypes (i.e., what rules should be followed when certain events occur). In short, schemas are cognitive frameworks that help us understand how we acquire and process new information (Piddock et al., 2020).

The Development of Schema Theory

British psychologist Bartlett (1930) established the basis of schema theory. He concluded from his research on memory that regardless of previous knowledge, new information becomes distorted over time. This research brought the term "schema" into the mainstream of psychology and revealed the role of past experiences in advancing cognitive processes and altering our understanding of the world. He considered schemas to be dynamic organizations of previous information and responses that can be combined with new information to guide our behavior (Bartlett, 1995; Liu et al., 2023).

American artificial intelligence expert Rumelhart (1980) brought schema theory to its peak, defining schemas as sets of general knowledge that record the characteristics and specifications of objective matters in the brain (Bo, 2023). Research conducted in neuroscience has shown that schema theory is rooted in brain functions. Based on this model, representation in semantic memory may integrate new information independently from the temporal lobe, influenced by regions such as the medial prefrontal cortex (mPFC) (Maxim and Brown, 2023).

The Role of Schemas

Schemas do not only have mental functions; they also play a significant role in guiding our behaviors (Wang and Yin, 2023). Schemas possess three characteristics:

Expandability: Humans can add new content to existing schemas.

Adaptability: If a schema is incorrect or incompatible with the environment, it can be modified with new information .Creation: Humans can create new schemas (Gu, 2023).

Utilizing schemas can scaffold knowledge in memory, providing a structured approach for problem-solving (University of Calgary Blackbook, 2022). However, not all schemas are adaptive or beneficial. Some schemas established during childhood or adulthood may be harmful, inconsistent, traumatic, or conflict with reality. This is where teachers and educators have a duty to encourage students to express their schemas (Camarta & Dhaliwal, 2023).

Schemas should be practiced and repeated if they are consistent and beneficial, or revised if they are inconsistent and harmful (Glass Health from the Glass Handbook, 2022). In the 1980s, Jeffrey Young was inspired to develop schema therapy to assist those suffering from acute and chronic mental illnesses who were not helped by conventional cognitive approaches; this therapy targets maladaptive schemas (Pilington et al., 2023). The aim is to identify and modify maladaptive schemas over time while strengthening or creating positive and consistent ones. If schemas can be beneficial in treating mental disorders, why not use them in education and prevention processes? Has the argumentation schema—closely linked to metacognition and involved in decision-making—proven efficient and effective in teaching critical thinking?

Research Methodology

The research design is experimental with a post-test type involving a control group. In this study, one group of students will participate in an intervention followed by taking the Facsion critical thinking test. The control group will be tested without receiving argumentation schema-based training. Argumentation schema-based training will serve as an independent variable while its effect on critical thinking will be considered as a dependent variable.

The statistical population for this study includes all seventh-grade students at the first high school in Sonqor city during the academic year 2024-2023. Sampling was conducted using convenience sampling methods. A total of 120 students were selected and assigned to two groups: an experimental group (60 students) and a control group (60 students). Necessary arrangements were made for sample selection through questionnaires prepared with confidence regarding confidentiality.

The inclusion criteria for this study are female seventh-grade junior high school students who do not have neurodevelopmental disorders or learning disabilities, reside in Sonqor city, and voluntarily participate in educational sessions as well as the questionnaire process.

Research Tools

Critical Thinking Questionnaire

The Critical Thinking Questionnaire is also known as the California Critical Thinking Disposition Inventory (CCTDI), which evaluates critical thinking abilities designed by Peter Facione and his colleagues at Santa Clara University. This test is based on conceptualizations of critical thinking developed by a panel composed of 46 experts participating in a Delphi research project conducted by the Philosophy Association of America between 1987-1989.The CCTDI assesses skills related to critical thinking through various aspects such as evaluation, inference, analysis, deductive reasoning, and inductive reasoning. The test consists of 75 items measuring these dimensions. It has been shown to be stable and valid through factor analysis involving a collection derived from 200 items over two decades of research for narrative testing reliability .Validity refers to how well a measurement tool measures what it intends to measure (Sarmad et al., 2011). In this study, questionnaire validity was assessed through previous projects (Abbasi et al., 2013). Reliability pertains to the degree of stability across measurements; it indicates how consistently results can be replicated under similar conditions (Sarmad & Employees, 2011). The Cronbach's alpha coefficient calculated for this questionnaire was above 0.70 according to research conducted by Abbasi et al.(2013) .

Training Protocol

The description of critical thinking training sessions based on the Paul Elder (2019) model is presented in detail below:

Goals and Components

Critical thinking training based on Paul Elder's model includes several key components that are reviewed and analyzed in each session. These components include:

Elements of Thinking: These include goals, hypotheses, efforts, points of view, data, concepts, conclusions, and consequences.

Description of Meetings

First Session: This session will examine the Myside schema. This schema refers to a type of thinking in which a person only pays attention to opinions and data that are consistent with their own views.

Second Session: Intellectual standards, including clarity, accuracy, relevance, depth, and breadth, will be discussed. These standards help thinkers evaluate the quality of their thinking.

Third Session: This session examines the intellectual trait of humility. Humility means accepting one's limitations and being willing to learn from others.

Fourth Session: The intellectual trait of courage will be considered. Courage in thinking means the ability to face challenges and express opposing views.

Fifth Session: The intellectual trait of empathy will be examined in this session. Empathy means the ability to understand the feelings and perspectives of others.

Sixth Session: In this session, the intellectual attribute of integrity will be discussed. Integrity means adherence to ethical principles and honesty in thinking.

Seventh Session: The intellectual trait of perseverance will be examined. Perseverance means persistence in the face of problems and challenges.

Eighth Session: In this session, the intellectual trait of confidence will be considered. Confidence in thinking helps a person make better decisions.

Ninth Session: The last session is dedicated to examining the intellectual attribute of impartiality. Impartiality means the unbiased evaluation of different information and opinions.

This training program is designed to strengthen critical thinking skills, with each session focusing on one or more specific components so that participants can improve their critical thinking abilities.

Teaching Methodology

To teach critical thinking, we combined the theory of Argumentation Schema with insights from other constructivist theories such as those proposed by Vygotsky and Piaget, resulting in a new design. We have named this educational style based on the theory of Argumentation Schema (WDCD) for short. The method of implementation is as follows:

WATCH (Watch!); (Step Activation Schema Hi Initial)

The teacher plays a five-minute video or short film and asks students to watch it carefully in complete silence without talking to their classmates.

The teacher plays the video or short film again and asks students to watch it carefully once more, noting down points that seem important to them.

DISCUSS (Discuss!); (Step Occurrence and Correction Schema I See)

The teacher divides students into pairs.

The teacher asks students to discuss the background and story of the short film with each other.

The teacher then asks the groups to discuss the common points they have agreed upon and express the main message of the short film.

The teacher encourages groups to express opposing views compared to those of other students.

The teacher asks both supporting and opposing groups to present evidence and reasons that support their claims regarding the conclusion of this short film.

At the end of this stage, students are asked to vote on the views expressed and indicate their agreement with them.

CLARIFY (Clarify!); (Step Education Schema Hi New and Fallacy Decontamination)

The teacher writes the main theme of the short film on the whiteboard and refers to it as a "hypothesis".

The teacher presents evidence and documents that support this hypothesis.

The teacher points out correct and incorrect views, stating reasons for rejecting or approving them.

The teacher explains one component of critical thinking (e.g., intellectual humility) and how it relates to the topic of the short film.

The teacher identifies fallacies and inconsistent schemas, explaining why they are incorrect.

DISCOVER! (Schema Single Stage)

The teacher provides students with stories to answer questions based on them.

The teacher provides students with open-ended questions for them to complete.

The teacher gives students a story with an incorrect argument and asks them to identify errors within it.

The teacher asks a group of students to prepare a play related to the topic for the next session.

This structured approach aims not only to enhance critical thinking skills but also to engage students actively in their learning process through discussion, analysis, and creative expression.

Findings

In this study, multivariate analysis of covariance was used to analyze the data. Before analyzing the hypotheses, the assumptions were first examined .To review the differences, the first assumption tests were conducted. The results from the Kolmogorov-Smirnov test indicated that the level of significance for the variable in groups was greater than 0.05, which suggests that this variable follows a normal distribution ($p < 0.05$).

Before confirming the assumption of homogeneity of variance, Levene's test was conducted for the variables. The reslts showed a lack of significance for this test ($p < 0.05$) .Before reviewing the assumption of homogeneity of regression coefficients, it is essential to examine the interaction effect between the independent variable (groups) and the dependent variable (scores) in the pre-test. The results indicate that there is no significant interaction effect between the independent variable and the dependent variable .Furthermore, linearity was assessed using scatter plots. The results demonstrated a linear relationship between the critical thinking variable in the pre-test and post-test.

Table 1. Mean and standard deviation of critical thinking in the experimental and control groups

Dependent variable	Group	Number	Post-test		Before the test	
		people 60	SD	M	SD	M
Truth seeking	Test	people 60	2/92	56/63	21/3	27/20
	Proof	people 60	17/3	26/35	3/71	26/76
Open mindedness	Test	people 60	4/54	54/35	21/3	23/58
	Proof	people 60	2/42	24/31	2/81	23/45
Analyticity	Test	people 60	4/68	46/01	2/12	22/45
	Proof	people 60	3/02	25/05	95/1	22/33
Systematicity	Test	people 60	2/64	48/11	2/92	25/25
	Proof	people 60	3/10	25/61	3/02	25/05
Confidence in Reasoning	His / her party	people 60	96/1	40/83	48/3	21/91
	Proof	people 60	49/2	24/38	2/02	22/95
Inquisitiveness	Test	people 60	3/85	46/70	2/58	24/36
	Proof	people 60	2/4	24/85	49/2	24/38
Cognitive Maturity	Test	people 60	34/2	44/16	43/2	22/93
	Proof	people 60	2/05	23/06	99/1	23/18
Total critical thinking score	Test	people 60	93/9	337/81	8/381	167/70
	Proof		8/48	169/60	22/9	165/34

As the results of Table 4 show, critical thinking scores increased in the experimental group in the post-test situation. A multivariate covariance test was used to analyze the research data, the results of which are presented in the tables below.

The results of Table 2 indicate that the Wilks Lambda effect (P = 0.001; F = 2194.58) is significant. The results show that there is a significant difference between the subjects of the experimental and control groups in terms of the post-test of the general variables with the pre-test control. For this purpose, the multivariate analysis of covariance (MANCOVA) test has been used, the results of which are presented in Table 3.

Table 2. Results Multivariate analysis of covariance (MANCOVA)

Test type	Statistical power	Impact factor	Significance level	F test-	Amount
The Pillai Effect	1	0/993	0/001	2194/58	0/993
Lambda and lex	1	0/993	0/001	2194/58	007/0
The effect of the hotel is	1	0/993	0/001	2194/58	146/306
The biggest problem is on the . way	1	0/993	0/001	2194/58	146/306

Table 3. Between-subject effects of multivariate analysis of covariance in the post- test of the critical thinking variable

Dependent variable	Power statistics	Impact factor	P-Value	F statistic-	df	Sum of squares
Truth seeking	1	0/977	0/001	4688/973	1	25935/845
Open mindedness	1	0/957	0/001	2453/196	1	25405/299
Analyticity	1	0/933	0/001	1549/495	1	16977/050
Systematicity	1	0/955	0/001	2340/151	1	14365/445
Confidence in Reasoning	1	0/968	0/001	3313/996	1	9305/936
Inquisitiveness	1	950/0	0/001	2115/838	1	13731/143
Cognitive Maturity	1	0/961	0/001	12451/401	1	12451/401

The results of the multivariate analysis of covariance (MANCOVA) in Table 3 show that the intervention (by controlling for the effect of the pretest as a covariate on the posttest) had a significant effect on increasing critical thinking and its components.

Discussion and Conclusion

The present study aimed to investigate the effectiveness of argumentation schema-based education on critical thinking tendencies in female students. The results showed that argumentation schema-based education has a significant effect on critical thinking tendencies. This finding is consistent with the results of studies conducted by Latifian (2023), Fotohi (2022), Mokhtari (2022), Saeedzadeh (2021), Ebrahimi (2021), Soleimani (2021), Hassanpour (2017), Ashaji Tundra et al. (2024), Mallory Skinner and Joshua Kovas (2023), Marcel and Julian (2023), Adam Langston Poole (2023), Chang-Healy (2022), and Friedman.(2020)

In explaining these results, it can be stated that the development of critical thinking skills is regarded as one of the most important objectives of formal education (Marin and Halpern, 2011). Halpern (2002) defines critical thinking as the use of cognitive skills and strategies that enhance the likelihood of achieving desired outcomes. With metacognitive-based education, learners take responsibility for their own learning, while the teacher's role is to lay the groundwork and provide the necessary facilities for learning (Wang et al., 2022). Therefore, critical thinking refers to the ability to think at a higher level, enabling individuals to employ skills such as analysis, synthesis, argumentation, and evaluation to solve problems. Recent developments in critical thinking ability have attracted significant attention from researchers. Students with strong critical thinking skills manage their thought processes effectively, possess greater self-awareness, analyze and evaluate ideas more thoroughly, and exert greater control over their learning, values, and lives (Paul & Elder, 2019). Ziki (2015) defines critical thinking as the art of analyzing, evaluating, and improving one's own thinking.

Critical thinking is one of the fundamental structures of thought and serves as a key foundation for creative thinking. Inquiry and argumentation are recognized as essential dimensions in the critical thinking process (Norris and Phillip, 1987). Furthermore, it can be argued that critical thinking is increasingly understood as a life skill that enables thoughtful individuals to challenge their own thoughts (Naghizadeh et al., 2023). Additionally, Butler et al. (2012) assert that the role of critical thinking in education has garnered widespread attention from educational philosophers. Undoubtedly, one of the most popular research topics today is the

exploration of various aspects of critical thinking. The scope of this topic is vast; researchers worldwide across different disciplines have taken steps to explain and investigate this valuable issue.

Critical thinking involves thoughtful and logical reasoning. It encompasses making decisions based on beliefs or actions (Aness, 2010). Fassone and Gitten (2016) describe five critical thinking skills in their Delphi report and book “Critical Thinking” as follows:

Interpretation: This includes classification, decoding sentences, and clarifying meaning.

Analysis: This involves examining ideas, identifying reasons, and analyzing arguments.

Inference: This refers to examining evidence, speculating about various situations, and drawing conclusions.

Explanation: This is the process of clarifying results, explaining methods for presenting reasons, and articulating important arguments.

Self-regulation: This involves evaluating one's own actions and making necessary corrections.

To interpret ideas and beliefs effectively and synthesize information, students must recognize the importance of high-level critical thinking skills according to their abilities and strive to master these skills (Almanza et al., 2023). Therefore, it can be concluded that education based on argumentation schema is effective in promoting students' critical thinking.

Statistical Society of this Research

This research included all seventh-grade students from first secondary schools in Sonqor city. Thus, generalizability to all students at other educational levels may be limited. The data collection method was based on self-report questionnaires. The teaching method using argumentation schema was notably more time-consuming compared to traditional methods outside the classroom; it required additional hours to be allocated and complicated coordination with parents for this research.

It is suggested that to enhance critical thinking—especially among students with low levels of argumentation—this educational method should be utilized extensively to develop critical thinking skills. Educational systems should provide teachers with opportunities to benefit from this teaching method by offering in-service courses and creating sufficient platforms for training in argumentation schema through workshops and free courses at Farhangian University.

Additionally, future research could incorporate interviews alongside questionnaires to assess factors affecting students' critical thinking more qualitatively. It is recommended that future studies evaluate the impact of reasoning schema training on various variables across different educational levels. Furthermore, an analysis of the disadvantages and challenges associated with implementing the argumentation schema method in schools should be conducted.Resources .

References

- Ajam, A. A., Akbarian Khalil Abad, M., & Ajam, A. (2021). Evaluation of the role of critical thinking disposition and academic self-efficacy in acceptance of e-learning by tenth-grade male students in experimental sciences and mathematics disciplines. *Quarterly of Iranian Distance Education Journal*, 3(1), 55-67.
- Aktas, M. (2022). Sosyobilimsel topics Socratic questioning via BİLSEM students' critical thinking and problem-solving skills effect. *Alanya Aladdin Keykubat University / Postgraduate Education Institute*.
- Almanza-Cabe, R. B., Sairitupa-Sanchez, L. Z., Morales-García, S. B., Rivera-Lozada, O., Flores-Paredes, A., & Morales-Garcia, W. C. (2023). Critical thinking, generalized anxiety in satisfaction with studies: The mediating role of academic self-efficacy in medical students. *Behavioral Sciences*, 13, 665.
- Arisoy, B., & Aybek, B. (2021). The effects of subject-based critical thinking education in mathematics on students' critical thinking skills and virtues. *Eurasian Journal of Educational Research*, 92, 99–119.
- Bartlett, F. C. (1995). *Remembering: A study in experimental and social psychology*. Cambridge University Press.
- Çavdar, Ö. Ü. (2023). Eğitimde eleştirel düşünme. *Eğitimde Current Approaches*, 2(9).
- Chen, C. (2022). Critical thinking ability in the age of digital media: Employing an updated measurement to understand fitness and nutrition information process among young adults in the US. *Washington State University*.
- Eggers, F., Lovelace, K. J., & Kraft, F. (2017). Fostering creativity through critical thinking: The case of business start-up simulations. *Creativity and Innovation Management*, 26(3), 266–276.
- Elgün, İ. Ö., & Uysal, F. (2022). Hayat bilgisi dersi eğitim programı: Their achievements life skills within the scope examination. *Baskent University Journal of Education*, 9(2), 122–135.
- Guo, J. (2022). The application of schema theory in the process of interpretation. In *Proceedings of the 3rd International Conference on Language, Communication and Culture Studies (ICLCCS 2022)* (pp. 115–123).
- Hitchcock, D. (2020). Seven philosophical conceptions of critical thinking: Themes, variations, implications. In *Critical Thinking and Argumentation* (pp. 9–30). Brill.
- Kirchhoff, E., & Keller, R. (2021). Age-specific life skills education in school: A systematic review. *Frontiers in Education*, 6, 660878.
- Kozikoğlu, İ. (2019). Investigating critical thinking in prospective teachers: Metacognitive skills, problem-solving skills and academic self-efficacy. *Journal of Social Studies Education Research*, 10(2), 111-130.
- Kusumi, T. (2020). Cultivation of a critical thinking disposition and inquiry skills among high school students. In E. Manalo (Ed.), *Deeper learning, dialogic learning, and critical thinking* (pp. 298-320). Routledge.
- Li, J., Jia, S., Wang, L., Zhang, M., & Chen, S. (2023). Relationships among inferiority feelings, fear of negative evaluation, and social anxiety in Chinese junior high school students. *Frontiers in Psychology*, 13, 1015477.
- Ma, Y. (2021). The application of schema theory in the teaching of English reading in senior high schools. *Region-Educational Research and Reviews*, 3(3), 17–20.
- Marin Lisa M., & Halpern D.F.(2011). Pedagogy for developing critical thinking in adolescents: Explicit instruction produces greatest gains. *Thinking Skills and Creativity*, 6(1), 1-13.
- Maxim, P., & Brown T.I.(2023). Toward an understanding of cognitive mapping ability through manipulations and measurement of schemas and stress.*Topics in Cognitive Science*, 15(1), 75–101.
- McGiboney,G.W.(2023). The psychology of school climate.*Cambridge Scholars Publishing*.
- Norris,S.P., & Phillips,L.M.(1987). Explanations of reading comprehension: Schema theory and critical thinking theory.*Teachers College Record*,89(2),281-306.
- Nugraheni,B.I., Surjono,H.D., & Aji,G.P.(2022). How can flipped classroom develop critical thinking skills? A literature review.*International Journal of Information and Education Technology*,12(1),82–90.
- Peng,X.H., Huang,H.R., Lu,J.et al.(2014). MiR-124 suppresses tumor growth and metastasis by targeting Foxq1 in nasopharyngeal carcinoma.*Molecular Cancer*,13(186).
- Sadrizadeh,S., Yao,R., Yuan,F., Awbi,H., Bahnfleth,W., Bi,Y., Cao,G., Croitoru,C., de Dear,R., & Haghighat,F.(2022). Indoor air quality and health in schools: A critical review for developing the roadmap for the future school environment.*Journal of Building Engineering*,104908.

- Silva,H., Lopes,J., Morais,E., & Dominguez,C.(2023). Fostering critical and creative thinking through cooperative learning jigsaw and group.*International Journal of Instruction*,16(3),261–282.
- Tu,X.Y.& Lin,Z.L.(2018). The relationship among proactive personality, critical thinking and problem-solving ability.*Journal of Social Sciences*,10(38–48).
- Wang,Y.P., Zhao,C.X., Zhang,S.E., Li,Q.L., Tian,J., Yang,M.L., Guo,H.C., Yuan,J., Zhou,S.Y., Wang,M.& Cao,D.P.(2022) Proactive personality and critical thinking in Chinese medical students: The moderating effects of psychological safety and academic self-efficacy.*Frontiers in Psychology*,13:1003536.doi:10.3389/fpsyg .2022 .1003536
- Wang,Y.-X.& Yin,B.(2023). A new understanding of the cognitive reappraisal technique: An extension based on the schema theory.*Frontiers in Behavioral Neuroscience*,17 ,1174585.
- Yaki,A.A.(2022) Fostering critical thinking skills using integrated STEM approach among secondary school biology students.*European Journal of STEM Education*,7(1),6.
- Zakaria,Z.(2021) Kecakapan abad 21 dalam pembelanja pendidikan dasar masa pandemi Covid-19.*Dirasah: Jurnal Pemikiran dan Pendidikan Dasar Islam*,4(2),81–90.