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Teacher candidates' critical thinking and learning autonomy: the mediating role of self-regulation

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ABSTRACT
This age we live in is called the information age, and it has a point of view that is argued that the learner should have control of constructing the knowledge and the learning process and also think critically. This study aims to look into the connections between critical thinking, self-regulation, and learning autonomy in teacher candidates and the mediating role of self-regulation in the effect of critical thinking on learning autonomy. From this point forth, a relational comparison design was used in the research. The research sample comprised 368 teacher candidates studying in the primary and preschool teaching programs of 20 state universities located in different regions of Turkey constituted the research sample. The data collected were analyzed using correlation and path analysis models. Consequently, it has been set forth that there is a positive and significant relationship between the critical thinking skills, learning autonomy, and self-regulation skills of the teacher candidates studying in the last year of the preschool and primary teaching program. It has been detected that self-regulation has a mediating effect in predicting the learning autonomy of critical thinking. In accordance with the results, content that will support the development of critical thinking, learning autonomy, and self-regulation skills can be included in the undergraduate program to be applied in the training of teachers who will teach at the primary education level. As the development of these skills will enrich the learning processes, it may possibly also increase the quality of the education given at the primary education level.

Keywords: critical thinking; self-regulation; learner autonomy; teacher candidates; teacher training.

INTRODUCTION

In today's world, the age we live in is called the 'information age,' and the communities living in this age are called the 'information society.' As a necessity of the information age, the learning processes of individuals have also changed, and lifelong learning and learner-centered approaches have been adopted. Lifelong learning can be defined as the acquisition and updating of all kinds of knowledge, skills, values, and qualities that individuals acquire from the cradle to the grave (Yaman & Yazar, 2015). It is expected that the learner will move from the information-receiving position to the organizer and manager of their own learning processes (İskamya, 2011; Kozikoğlu & Altunova, 2018).

Today, in order to adapt to the requirements of the information age, people need to have some skills. These skills are defined as '21st-century skills' by the Partnership for 21st Century Skills. 21st-century skills are listed as critical thinking, collaboration, creative thinking, and problem-solving skills (MoNE, 2017). A study by Whitebread and Coltman (2010) set forth that the use of pedagogical approaches that give control to the learning in the activities, the classroom environments that provide the learning with mentally challenging situations and the emotional warmth, and the learning topics that enable the learners to talk freely about their learning can be used to support self-regulation and metacognitive skills (as cited in Bayındır, 2016). When thinking about the 21st-century skills that are thought to be necessary for success in the information age, it is very important and necessary that future generations and teacher candidates who are about to raise these generations are mainly people who can think critically and manage their own learning processes, that is, who have learner autonomy and self-regulation skills.

Critical thinking

21st-century skills, defined as the use of analysis, reasoning, and cooperation skills in identifying and solving problems in the individual's areas of interest, have an inclusive structure (Dishon & Gilead, 2020; Kazemi et al., 2020). As a cognitive activity that includes analysis and evaluation, critical thinking is one of the 21st-century skills that everyone should have (Partnership for 21st Century Learning, 2015). Critical thinking, which includes accepting or rejecting information/data, making judgments to find the truth, turning the wrong information into creating new ideas, and enabling active learning, is also defined as observing and evaluating the reasons correctly and distinguishing the wrong thought (Epstein, 2006; Fisher, 2008; Florea & Hurjui, 2015). It has also been stated that it is a metacognitive skill that consists of many skills such as analyzing, synthesizing, evaluating, and summarizing the ideas or solutions set forth to solve a problem (Dwyer et al., 2014). It can be said that critical thinking has a strong relationship with language and thinking (Li, 2022; Liang & Fung, 2021) and thus remains among the skills to be primarily acquired.

Critical thinking, which focuses on the process of learning rather than the outcome thereof, also plays a vital role in making decisions for individuals' careers and lives (Perkins & Murphy, 2006). The development of critical thinking in children is realized through being entrepreneurial, inquisitive, creative, and able to evaluate their behavior correctly, having their own ideas and opinions (Renatovna & Renatovna, 2021). In support of the critical thinking skills that start to be developed in early childhood, it is possible to say that children's own perspectives will become stronger as they develop different perspectives on events/situations (Yağcı, 2008). It is required for teachers to create the cognitive dissonance that children need and thus trigger critical thinking. For the purpose of doing this, the teacher must also be an individual who can think critically and have a positive view of critical thinking (Çelik, Çokçalışkan & Yorulmaz, 2018).

Self-regulation

Even though the concept of self-regulation first emerged in the field of psychology, this concept has also started to be used in the field of education. While self-regulation takes place in a limited space, the definitions made of the concept have become different and become more important (Boekaerts et al., 2000) as it appears in a wide area. Zimmerman (1989) described self-regulation as' the order of active participation of the individual in her/his own learning processes in terms of metacognition, motivation, and behavior'; Pintrich (2000) described it as' an active and constructive process in which teacher candidates adjust their own learning goals, try to regulate their cognition, motivation, and behavior, and are guided and limited by their goals and the contextual features of their environment.' Kauffman (2004) has defined self-regulation as' the learning's effort to control and manage complex learning activities' On the other hand, Zimmerman and Schunk (2008) expressed the concept of self-regulation as the control of current behavior based on motives related to the next goal or idea a person determines for her/himself.

As the process of development of self-regulation in the individual is handled in a holistic structure, self-regulation has a comprehensive research field starting from preschool, which is the first years of life, to university (Perry et al., 2004). Self-regulation that appears from a very early age is expressed as a developmental process that occurs with increasing age (Bronson, 2019). Internal and external conditions influence behavior in self-regulated educational environments (Usher & Schunk, 2018). Individuals with self-regulation skills can, at the end of this learning environment, control themselves by making self-evaluations with the help of metacognitive, motivational, and behavioral strategies and improve the problems they experience in the learning process (Winne, 2017). As self-regulation is not an innate skill but an ability that can be acquired later (Zimmerman, 2010), teachers have an important role in supporting and developing these skills in an individual's student life (Von Gog & Van Hansel, 2020). It is seen that teachers have a wide range of strategies to help students develop self-regulation skills (Zimmerman, 2010). Through the development of children's self-regulation skills, teachers can provide support with activities such as being a model, creating a learning environment that will organize children's learning, giving feedback to children, and providing social support. Besides, teachers should adopt the principles of guidance for effective learning in the development of children's self-regulation skills, facilitating organization for children's cognitive and executive cognitive processes; teaching goals and feedback; and continuous self-evaluation (Ley & Young, 2001). In this orientation, teachers have an important role in gaining self-regulation skills (Eshel & Kohavi, 2003), and teachers are expected to have self-regulation skills. Teachers with high self-regulation skills prepare a more efficient learning environment for their children for the development of self-regulation skills (Kramarski & Kohen, 2017; Toussi et al., 2011).

Learner autonomy

In recent years, learner autonomy has been seen as an important part of education (Benson, 2013). In line with the constructivist learning theory, learning is a process that is based on the learning's previous learning and can be observed by the learning her/himself. Learning to grow up as an autonomous individual is possible only by focusing on the learning's individual learning and needs in the learning process (Wang, 2011). Holec (1981)

defines learner autonomy as 'the ability of a person to take responsibility for her/his learning,' and this autonomy is a feature of the learning, not learning. On the other hand, Raya et al. (2007) define learner autonomy as 'from a perspective that sees education as the strengthening of personality and social transfer, the ability of a person to develop participation in the educational environment, making her/his own decisions, having social responsibility and awareness.' Learner autonomy is not an easy process as it requires teachers' time, effort, responsibility, and autonomy (Orakçı, 2021). In Vygotsky's socio-cultural theory, autonomy is emphasized and defined as the basis of moving from one learning stage to another. It has been stated that the learning's ability to do something in the future with the support she/he receives is a circumstance that increases her/his autonomy (Little, 2004). Mynard and Sorflaten (2003) defined autonomous learners as individuals who are self-confident and aware of their own strengths and weaknesses, who make decisions in relation to their learning, reflect their knowledge on real-life situations, take control of their learning, plan and set goals, and assess their learning processes and achievements. On the other hand, Chan (2010) defined the skills that autonomous learners should have as follows: a) determining learning objectives, b) defining and developing the learning strategies needed to achieve the learning objectives it has set and c) developing work plans, d) identifying problem areas and producing solutions and reflecting them on education, e) identifying and selecting relevant resources and support; f) defining it as the assessment of one's own progress. Autonomous learners need to decide what, how, and when they learn. Learner autonomy has eight basic features: active participation, goal-oriented behavior, metacognitive skills, intrinsic motivation, learning feature, design feature, initiating a learning task, and controlling the learning environment (Murray, 2014). Little (2000) stated that learner autonomy could also be developed in a social context through language classes, cooperation, and solidarity, and for learners with learner autonomy, it depends on whether teachers are also autonomous.

Purpose of the study

It is very important for primary education level teachers, namely preschool and primary teachers, who work in the early childhood period, which has developmentally critical importance in human life, to have these skills and to know what needs to be done in order for children to gain them. Starting from the student period, teachers at different grades need to be equipped to help get these skills acquired, learn how to gain them, and be supported to develop these skills themselves. From this point of view, the preference in the present study was towards the participation of teacher candidates who will work at the primary education level. In order to present and plan learning experiences of the desired quality, it is necessary to examine the relationship between teacher candidates' self-regulation, learner autonomy, and critical thinking skills. Revealing the relationship between these skills can make a significant difference in teacher training processes. Also, when the literature was reviewed, no study was found to examine the relationship between learner autonomy, self-regulation, and critical thinking together. In accordance with this hypothesis, it is aimed to investigate the mediating role of self-regulation in the relationship between teacher candidates' critical thinking and learner autonomy.

METHOD

Research design

In this quantitative study that aimed to determine the mediating effect of self-regulation in the relationship between learner autonomy and critical thinking of teacher candidates studying in primary and preschool teaching, the correlational research design was used (Fraenkel et al., 2012).

Participants

Teacher candidates studying in primary and preschool teaching programs in 20 state universities located in different regions of Turkey were invited to participate in this study in the fall semester of the 2021-2022 academic year, and participation in the research was completely voluntary. The online questionnaire was filled out by a total of 368 teacher candidates studying in the primary and preschool teaching programs. Attention was paid to including the final year teacher candidates, who are the closest group to the end of the university education process and to starting professional life, and all the participants were selected from the last year. It was determined that 172 (46.7%) of the participating university senior teacher candidates aged 19-41 years (M = 22.4, SD = 2.60) were primary school teachers, and 196 (53.3%) were preschool teachers. The minimum sample size in route analysis depends on the number of observed and suppressive variables, the minimum effect, power, and significance (Westland, 2010). Using a website tool made by Soper in 2021, the minimum sample size for this study was calculated to be 296 people with an effect size of 0.2, a statistical power of 0.8, and a probability level of 0.05. This number was thought to be enough.

Data collection tools

The online data collection tool that was prepared to collect the data for the research consists of two parts; in the first part, three demographic variables, namely age, the university they are enrolled in, and the program, were

used. In the second part, data were collected from the participants by using the 'Learner autonomy Scale,' 'Perceived Self-Regulation Scale,' and 'Marmara Critical Thinking Tendency Scale.'

Learner autonomy Scale

Developed by Macaskill and Taylor (2010), this scale was adapted into Turkish by Alkan and Arslan (2019). The scale consists of two dimensions, namely study habits (5 items) and learning independence (7 items) and 12 items. Some of the items of the 5-Likert scale used to determine the level of participation of the participants in the items are as follows: 'I enjoy working on my own.', 'I take responsibility for learning experiences.' As a result of the confirmatory factor analysis (CFA) performed for the construct validity of the scale, it was observed that the scale was suitable for Turkish culture (CFI= .92, RMSEA=.07, RMR= .06, GFI=.93, and AGFI=.90). The Cronbach Alpha coefficient for the entire scale was .78, .73 for learning independence, and .76 for study habits. As a result of the reliability analysis conducted for the whole scale in the current study, it was determined that the Cronbach Alpha coefficient was .81, and the item-total correlation ranged between .37 and .66.

Perceived Self-Regulation Scale

The scale developed by Arslan and Gelişli (2015) consists of two dimensions, namely, being open (8 items) and seeking (8 items) and 16 items. In order to determine the participants' level of agreement with the items, the following items can be given as examples regarding the 5-point Likert scale: 'I can follow my progress towards my goals.', 'Most of the time, I pay attention to what I do while learning a subject. 'The fit indices was determined to be appropriate as a result of the DFA performed to confirm the two-factor structure of the scale (RMSEA= .04, CFI= .99, GFI= .94, AGFI= .92, and SRMR= .03). The Cronbach Alpha coefficient for the entire scale was .90, .84 for being open, and .82 for seeking. In the current study, it was determined that the Cronbach Alpha coefficient was .83, and the item-total correlation ranged between .31 and .98.

Marmara Critical Thinking Tendency Scale

The scale developed by Özgenel and Çetin (2018) consists of six dimensions and 28 items: reasoning (6 items), reaching judgment (6 items), seeking evidence (4 items), seeking truth (4 items), open-mindedness (4 items) and systematicity (4 items). The following items can be given as examples regarding the scale in which the level of participation is determined using a five-point Likert. The Cronbach Alpha coefficient for the entire scale was found to be .91, while the dimensions ranged between .85 and .64. As a result of the CFA conducted for the current study, it was observed that the scale exhibited a one-dimensional structure and the fit indices indicated a good fit (X2/sd=3.04, RMSEA=.07, SRMR=.05). Together with that, it was determined that the Cronbach Alpha coefficient for the entire scale ranged from .93, and the item-total correlation ranged between .48 and .86.

Analysis of Data

In line with the purpose of the research, 'relationship analysis' and 'mediation analysis' were used. All statistical analyzes performed in the research were performed from R software (R Core Team, 2019) using the Lavaan package (Rosseel, 2021). Correlation analysis was performed to determine the relationships between teacher candidates' critical thinking, self-regulation, and learner autonomy. Mediation analysis is a method used to investigate the effect of one variable on the size of another variable (Hayes, 2013). If path 'axb' is significant, path c is significant, and product 'axbxc' is positive, complimentary mediation analysis (Zhao et al., 2010) was used as the mediation analysis fulfilled the requirement that the coefficients a, b, and c; all have the same sign.

FINDINGS

In Table 1, descriptive statistics for teacher candidates' learner autonomy, critical thinking, and self-regulation variables are shown.

Table 1: Descriptive statistics on learner autonomy, critical thinking, and self-regulation variables

	N	M	SD	Skewness	Kurtosis
Learner autonomy (LA)	368	3.81	0.569	-0.363	-0.403
Critical Thinking (CT)		4.19	0.465	-0.721	0.891
Self Regulation (SR)		4.04	0.458	-0.410	0.0147

It was determined that the average learner autonomy score was 3.81, the critical thinking score was 4.19, and the self-regulation score was 4.04. It can be said that the critical thinking states of the teacher candidates' participating in the research are higher than self-regulation and learner autonomy.

Table 2: Correlation coefficients related to learner autonomy, critical thinking, and self-regulation

		1	2	3
1.Learner autonomy (LA)				
2.Critical Thinking (CT)		0.525***	—	
3.Self Regulation (SR)		0.561***	0.688***	—
*** p < .001				

In Table 2, the results of the correlation values between the continuous variables of the participants are shown. A significant positive relationship was observed between learner autonomy and critical thinking (r=0.52) and self-regulation (r=0.56). To put it differently, learner autonomy increases as critical thinking and self-regulation increase. In addition, a significant positive relationship was found between critical thinking and self-regulation (r=0.68). It can be said that when critical thinking increases, self-regulation will also increase.

Table 3: Mediation values of the analysis

				95% CI		
Effect	Label	Estimate	SE	LL	UL	p
Indirect	a × b	0.319	0.057	0.209	0.434	< .001
Direct	c	0.323	0.074	0.174	0.467	< .001
Total	a × b + c	0.642	0.045	0.549	0.728	< .001

In Table 3, mediation analysis results are given. According to the mediation analysis results, it is seen that critical thinking directly affects learner autonomy at a significant level (b=0.32, CI: 0.17 | 0.46, p<.001), and the effect is 50.3%. Besides, it was determined that critical thinking predicted learner autonomy (indirect effect) through self-regulation (b=0.31, CI: 0.20 | 0.43, p<.001) and constituted 49.7% of the total effect.

Table 4: The effect of critical thinking and self-regulation on learner autonomy

						95% CI		
			Label	Estimate	SE	LL	UL	p
Critical Thinking (CT)	→	Self Regulation (SR)	a	0.677	0.032	0.614	0.740	< .001
Self Regulation (SR)	→	Learner autonomy (LA)	b	0.472	0.080	0.311	0.630	< .001
Critical Thinking (CT)	→	Learner autonomy (LA)	c	0.323	0.074	0.174	0.467	< .001

a: Critical Thinking (CT) → Self Regulation (SR), b: Self Regulation (SR) → Learner autonomy (LA), c: Critical Tihnking (CT) → Learner autonomy (LA)

In Table 4, significant ways for learner autonomy of critical thinking and self-regulation in mediation analysis are given. The results of the analysis showed that critical thinking significantly predicted self-regulation (b= 0.67, CI: 0.61 | 0.74, p<.001). The increase in critical thinking has an increasing effect on self-regulation. Accordingly, self-regulation significantly predicted learner autonomy (b= 0.47, CI: 0.31 | 0.63, p<.001). The increase in self-regulation has an increasing effect on learner autonomy. Besides, critical thinking significantly predicted learner autonomy (b= 0.32, CI: 0.17 | 0.46, p<.001). The increase in critical thinking has an increasing effect on learner autonomy.

In the research, 'path analysis' was used to explore the mediating role of self-regulation in the effect of critical thinking on learner autonomy. In Figure 1, the path diagram of the analysis is given.

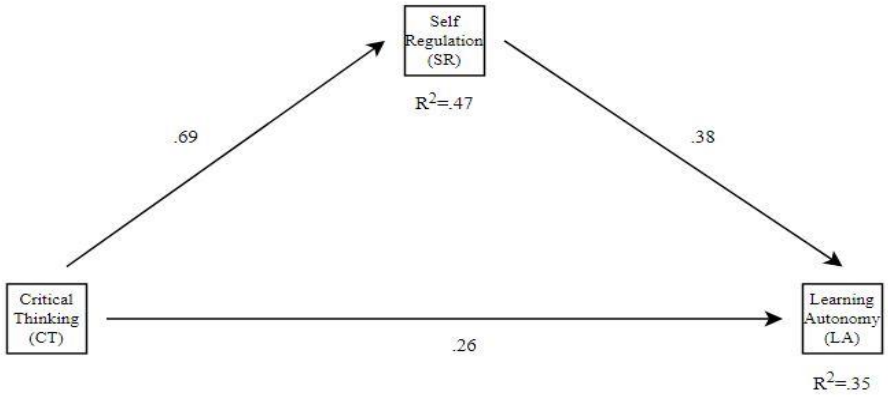

Figure 1: Mediating role of self-regulation in the impact of critical thinking on learner autonomy (standardized predictions)

In Figure 1, the mediating role of self-regulation in the impact of critical thinking on learner autonomy is given. Critical thinking explains 47% of self-regulation, while critical thinking and self-regulation explain 35% of learner autonomy. According to the results of the analysis, self-regulation is a fundamental variable between critical thinking and learner autonomy.

RESULTS AND DISCUSSION

At this age, it is essential for individuals who can construct knowledge and control their learning process to also think critically. Also, the literature review showed that all of these skills affect each other in certain ways. In order to enrich individuals with the desired characteristics, all of these skills should be worked on from an early age. It is very important for the primary education level teachers—preschool and primary teachers—who work in the early childhood period to have these skills and to know what needs to be done in order for children to develop them. Starting from the student period, teachers at the primary education level need to be equipped to help get these skills acquired, learn how to gain them, and be supported to develop these skills themselves.

As a result of this research, in which the relationship between the critical thinking skills, learner autonomy, and self-regulation skills of the last year's teacher candidates studying in the preschool and primary teaching programs of the education faculties was examined, it has been found that self-regulation has a mediating role between critical thinking and learner autonomy. Besides that, it has been observed that there is a significant and positive relationship between critical thinking and self-regulation, self-regulation-learner autonomy, and critical thinking-learner autonomy.

The results of this research reveal that there is a significant positive relationship between participants' critical thinking and self-regulation skills.

These results are also consistent with the relevant literature. Hyytinen et al. (2019) conceptualize critical thinking as an intentional, goal-oriented, self-regulating judgment about what to do and what to believe in a given situation. While defining critical thinking, self-regulation is defined as a function and vital piece that guides this complex thinking process (Lau, 2015). In the same way, Ghanizadeh and Heydarnejad (2015) confirmed the intertwined relationships between critical thinking and self-regulation. The more the teaching of critical thinking skills, including self-regulation skills, is expanded, the richer the use of self-regulation skills within these skills will get (Hyytinen et al., 2021; Lau, 2015). Pintrich (2000) emphasized that the high level of participation of teachers in critical thinking has a significant effect on the management of self-regulation skills.

In the study, it was found that there is a significant positive relationship between the self-regulation skills of teacher candidates and learner autonomy. Murray (2014), in his research, stated that learner autonomy and self-regulation have common points and listed these as active participation, goal-oriented behaviors, metacognitive skills, intrinsic motivation, and learning character. As the self-regulation skills of individuals with autonomy are higher, it is thought that they will be more successful in controlling the learning process. On the basis of this information, it is possible to say that a teacher who can manage her/his emotions, behaviors, and cognition at a good level will be able to control her/his own learning process very well; that is, she/he will have a more autonomous learning experience (Nakata, 2014). In this study, in which results were obtained that the learner autonomy of the teacher candidates increased as the critical thinking levels increased, it was determined that there was a significant positive relationship between critical thinking and learner autonomy. When the relevant literature is examined, it is observed that there are studies that support this result.

On the other hand, Raya et al. (2007) stated that critical thinking skills are complemented by the concepts of self-sufficiency and autonomy. In academic environments, it is very important to develop student's critical

thinking and learner autonomy for the success of learning and lifelong learning processes (Behar, 2011). Critical thinking and learner autonomy are defined as important mental abilities, and it is considered important to examine the relationship between these two metacognitive skills and other mental and personal factors (Fahim & Ahmadian, 2012; Nosratinia et al., 2015; Nosratinia & Zaker, 2013; Weinstein & Preiss, 2017). It can be said that teacher candidates with higher learner autonomy will be more successful in critical thinking processes such as interpretation, analysis, evaluation, and inference, and thus, active learning will take place at a higher level.
In the light of the outcomes of the research, it can be suggested that arrangements should be made to support the development of critical thinking, learning autonomy, and self-regulation skills in the undergraduate program to be applied in the training of teaching students who will work particularly at the primary education level. The quality of education can be increased by supporting the critical thinking, self-regulation, and learning autonomy skills of teaching students, thereby enriching the learning processes they will design.

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