

# The Effect of 21<sup>st</sup> Century Learner Skills and Metacognitive Awareness on Early Teacher Identity<sup>1</sup>

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## Abstract

*This study aims at identifying the effect of pre-service teachers' 21<sup>st</sup> century learner skills and metacognitive awareness on their early teacher identity. Employing a correlational design, the study collected data from 523 pre-service teachers studying at Afyon Kocatepe University, Turkey, in the 2020-2021 academic year. The instruments used in the data collection process were the "21<sup>st</sup> Century Learner Skills Use Scale", "Metacognitive Awareness Scale", and "Early Teacher Identity Measure". The study revealed medium and high-level positive relationships between 21<sup>st</sup> century learner skills and metacognitive awareness, 21<sup>st</sup> century learner skills and early teacher identity, and metacognitive awareness and early teacher identity. Additionally, the pre-service teachers' 21<sup>st</sup> century learner skills and metacognitive awareness significantly predicted their early teacher identity and have a positive effect on their teacher identity.*

**Keywords:** 21<sup>st</sup> Century Skills, Learner Skills, Metacognition, Metacognitive Awareness, Teacher Identity, Pre-service Teachers.

## Introduction

21<sup>st</sup> century skills, which have become a key concept lately (Velez, 2012), comprise abilities needed to achieve future career and success. These skills are presented to students as a remedy for compensating for their deficiencies (McDowell, 2017). In this sense, 21<sup>st</sup> century skills are the basic skills needed for becoming successful in individuals' present and future social and work-life (Partnership for 21<sup>st</sup> Century Skills, 2010).

Numerous studies have pointed out the significance of 21<sup>st</sup> century skills; however, there are differing views and categorizations regarding these skills (Yalçın, 2018). An examination of the literature suggests that one of the critical sources covering these skills is a skill framework called P21 (Partnership for 21<sup>st</sup> Century Learning, 2007). The P21 framework lists 13 skills under three headings which are learning and innovation skills (critical thinking, creativity, problem-solving, collaboration, and communication), life and career skills (flexibility and adaptability, social and cross-cultural skills, initiative and self-direction, productivity and accountability, leadership and responsibility), information, media and technology skills (information literacy, media literacy, information, and communication technology-ICT- literacy). P21 skills framework is a common and comprehensive project adopted by various countries and put into practice in their education systems (Gelen, 2017).

1 This study was produced from the master's thesis named "The Effect of 21<sup>st</sup> Century Learning Skills and Metacognitive Awareness on Pre-Occupational Teacher Identity of Teacher Candidates (Afyonkarahisar Smaple)" carried out at Afyon Kocatepe University Social Sciences Institute.

In the process of raising people of the 21<sup>st</sup> century, it is highlighted that individuals should be educated holistically with the capability to possess these skills and characteristics (Tutkun, 2010). Individuals can attain these 21<sup>st</sup> century skills at each school level, from elementary to tertiary level. Therefore, schools and teachers are responsible for the attainment of these skills by individuals (Anagün, Atalay, Kılıç & Yaşar, 2016).

Accordingly, education faculties are responsible for training pre-service teachers with the appropriate and needed skills for the current century as well as equipping them with teaching qualities (Orhan-Göksün, 2016). Köğçe, Özpinar, Şahin and Yenmez (2014) similarly argue that the education provided to pre-service teachers should be in an appropriate structure to equip them with these qualities in order for them to meet the demands when they become teachers.

Another concept that has come to the fore in the information age in line with 21<sup>st</sup> century skills is metacognitive awareness. In the most general sense, metacognition can be defined as “thinking about thinking”, and this concept has spread a vast area of interest. It has become one of the main concepts of educational psychology (Türk, 2011). According to Flavell (1979), who brought forward the concept of metacognition in the 70s, metacognition is the individual’s awareness regarding one’s own thinking processes and control over these processes. The individual’s knowledge of one’s metacognition, or one’s perception of the level of his/her metacognitive experiences, in other words, forms his/her metacognitive awareness (Yıldırım, 2010). The individual’s knowledge regarding one’s place in the learning process, how much information one has on the field, which and for what purposes one uses personal learning strategies, what one has done formerly, and what one needs to do later are defined as metacognitive awareness (Alemdar, 2009). Doğanay and Kara (1995) define it briefly as the individual’s awareness of one’s own thought system.

Acting consciously, planning, auto control, arrangement, monitoring how one learns and the learning process, evaluating and learning to learn lay on the basis of metacognitive awareness. Hence, metacognitive awareness can be defined as acquiring

metacognitive thinking skills and using them effectively (Selçioğlu-Demirsöz, 2010). Taking responsibility for helping students participate in metacognitive processes and being an individual who takes responsibility for one’s own learning processes is the duty of teachers in teaching metacognition (Williamson, 1996). Yıldırım (2012) argues that teachers arrange and conduct instruction processes, and for teachers to be able to teach metacognitive awareness, they should first possess metacognitive awareness and metacognitive strategies themselves. In this sense, education faculties are critical with respect to training teachers who have a high level of metacognitive awareness for quality education (Kuvaç, 2014). Furthermore, Gunstone and Northfield (1994) emphasized that teaching metacognition should be at the center of teacher education.

Considering teachers’ these duties and responsibilities, teacher identity and its formation are quite significant due to their duties in ensuring the development of societies (Bacakoğlu, 2018). According to Karalı (2018), teachers should possess a professional identity to be able to fulfill their professional responsibilities effectively. There are various definitions of teacher identity in the literature. Zembylas (2003) defines teacher identity as the total of elements including which the teacher is, how the teacher interacts with the environment and how the teacher uses his/her personal identity in designing and implementing instruction. According to Lasky (2005), teacher identity is related to how teachers see themselves as teachers and how they define themselves to others.

Beauchamp and Thomas (2009) emphasize the significance of teacher identity formation for teachers. They see the teacher education programs as an ideal starting point for developing teacher identity and ensuring awareness regarding the changes in the identity and the factors effective in them. Danielewicz (2001) focuses on the significance and role of the basic approaches in pre-service teacher training programs on developing professional identity and assumes that teacher identity formation is developed through educational institutions and teacher training programs. Accordingly, pre-service teacher education or training programs should be

structured in a way to help teacher identity formation and encourage pre-service teachers.

What kind of teacher pre-service teachers will be when they start their career is mainly up to the teacher identity they formed throughout their own educational experiences. Therefore, identifying how they formed their early teacher identity (ETI) and their related perceptions is essential for enhancing the quality of the teaching profession and hence the quality of education (Aykaç, Yıldırım, Altinkurt & Marsh, 2017). The teaching profession in the 21st century requires possessing the skills of problem-solving and critical thinking, constantly searching and finding alternatives in managing the process, implementing these alternatives effectively, continuously monitoring, evaluating, and developing oneself, and also being able to question all these actions.

These skills and capabilities can be employed only when teachers have enhanced metacognitive skills, or possess metacognitive awareness, in other words. Accordingly, metacognition and 21st century teacher capabilities overlap (Aykut, Karasu & Kaplan, 2016). Pre-service teachers' possessing 21st century skills and metacognitive awareness affects their ETI formation positively and enables them to acquire the basic skills needed in the 21st century and feel ready for the policies of the new century. Therefore, it is very significant that pre-service teachers who will be educators in the future possess these skills. Based on the arguments mentioned above, 21st century learner skills and metacognitive awareness are expected to have an effect on ETI because of the parallel relationship between 21st century learner skill and metacognitive awareness. However, there are not any studies examining this issue. This indicates a gap in the literature to reveal the relationships among pre-service teachers' 21st century learner skills, metacognitive awareness, and their ETI perceptions. To the researchers' best knowledge, there are no studies examining these relationships. Therefore, this study is expected to contribute to the literature by filling this gap.

This study aims at identifying the effect of pre-service teachers' 21st century learner skills and metacognitive awareness on their early teacher identity. To this end, this study sought to answer the research questions below:

1. What are the pre-service teachers' levels of 21st century learner skills, metacognitive awareness, and ETI perception?
2. Is there a significant relationship between pre-service teachers' levels of 21st century learner skills and metacognitive awareness?
3. Is there a significant relationship between pre-service teachers' levels of 21st century learner skills and ETI perceptions?
4. Is there a significant relationship between pre-service teachers' levels of metacognitive awareness and ETI perceptions?
5. Do 21st century learner skills and metacognitive awareness concomitantly predict ETI perceptions significantly?

## Method

### Research Design

This study employed a correlational survey design. Correlational design is a research design to reveal the existence and degree of change between two or more variables (Karasar, 2018). The researcher does not intervene in variables or phenomena. Research in correlational design is used to understand factors with complex characteristics better and reveal relationship among variables (Hocaoğlu & Akkaş-Baysal, 2019). This study employed a correlational survey design because it aimed to examine the relationships among 21st century learner skills, metacognitive awareness, and early teacher identity.

### Population and Sample

The population of the study consisted of pre-service teachers in Turkey in the 2020-2021 academic year. The study's target population involved the pre-service teachers studying in the education faculty of AfyonKocatepe University in the same academic year. The study sample consisted of 523 pre-service teachers in this faculty selected through convenience sampling. Convenience sampling involves collecting adequate data from respondents whom the researchers can easily access (Büyüköztürk, Çakmak, Akgün, Karadeniz & Demirel, 2019). The sample size was determined based on the sample size table recommended by Yazıcıoğlu and Erdoğan (2014). This table suggests that the sample size for 2500 people is 333, with the error margin of  $\alpha = 0.05$ .

The researchers reached 527 pre-service students. Four scale forms were excluded as they were not filled inappropriately, and 523 scale forms were added to the analysis.

Of the sample, 82,4% were female, and 17.6% were male. Over 20% of the pre-service teachers from all grade levels participated in the study. Participants were from the departments of primary school teaching (20,7%), pre-school teaching (19,5%), social studies teaching (27,2%), mathematics teaching (15,5%), science teaching (10,7%), and Turkish teaching (6.5%).

### Instruments

The “21st century learner skills use scale”, used to measure pre-service teachers’ 21st century learner skills, was developed by Orhan-Göksün (2016). The scale has four factors, which are cognitive, autonomous, collaboration and flexibility, innovativeness skills, and 31 items. The original scale development study reported the internal consistency coefficient as  $\alpha=.892$ . The Cronbach Alpha reliability coefficient calculated in the current study was  $\alpha=.856$ . This value refers to very high-level reliability (Tavşancıl, 2006).

“Metacognitive awareness scale”, developed by Fırat-Durdukoca and Arıbaş (2019), was used to measure pre-service teachers’ metacognitive awareness levels. The scale includes three factors (personal awareness, organizational awareness, and judgmental awareness) and 18 items. The original scale development study reported the internal consistency coefficient as  $\alpha=.75$ . The current study calculated the Cronbach alpha reliability coefficient as  $\alpha=.889$ , indicating a high-reliability level.

The “Early teacher identity measure” (ETIM), developed by Friesen and Besley (2013) and adapted to Turkish by Arpacı and Bardakçı (2015), was used to measure the pre-service teachers’ perceptions of early teacher identity. Friesen and Besley (2013) developed a measure to identify pre-service teachers’ teacher identity consisting of three factors and 17 items. Arpacı and Bardakçı (2015) adapted ETIM to Turkish and performed analysis for the three-factor and single-factor structures of the scale. Their study revealed that representation of teacher identity with a single-factor structure produced more reliable and valid results, and the total score from the scale could

be used as pre-service teachers’ ETIM scores. The internal consistency coefficient of the scale was calculated as  $\alpha=.93$  in the scale adaptation study. This coefficient was  $\alpha=.915$  in the current study, indicating a very high-reliability level.

The criteria used in interpreting the mean scores are as follows: “1.00–1.80: never /I totally disagree”, “1.81–2.60: rarely/I disagree”, “2.61–3.40: sometimes/ I am not sure”, “3.41–4.20: often/I agree”, “4.21-5.00: always/I totally agree”.

### Data Analysis

The data obtained through the scales in the study were analyzed via a statistics program. The normality test was conducted to determine whether to use parametric or nonparametric tests to check the data distribution. Normality checks both for the total scores and all the variables were performed by calculating skewness and kurtosis coefficients separately. The data had normal distribution, and parametric tests were used.

The means of the responses to the scales were used to identify the pre-service teachers’ 21st century learner skills, metacognitive awareness, and ETIM levels. Other descriptive statistics, including frequency, mean and standard deviation, were also used. Pearson product-moment correlation coefficient was used to reveal the relationships among the scales. In the correlation analysis, coefficients of 0-0.30 refer to low correlation, 0.30-0.70 refers to moderate correlation, and 0.70-1.00 refers to high correlation (Büyüköztürk, 2019). Multiple regression analysis was used to check whether 21st century learner skills and metacognitive awareness predict ETIM perceptions. Whether the assumptions for multiple regression analysis were met or not checked before the analysis. The results of the multiple regression analysis were interpreted considering the results of the t-test and standardized Beta ( $\beta$ ) coefficients. .05 value was accepted for identifying the significance level of the analysis and results.

### Findings

#### Findings Regarding the First Research Question

The statistics regarding the pre-service teachers’ 21st century learner skills, metacognitive awareness, and ETI levels are presented in Table 1.

**Table 1 The Descriptive Statistics Regarding the Pre-Service Teachers' 21<sup>st</sup> Century Learner Skills, Metacognitive Awareness, and Eti Levels**

Scale/Factor	N	Minimum	Maximum	$\bar{x}$	Standard Deviation
21 <sup>st</sup> Century Learner Skills	523	88,00	147,00	117,40	10,66
Cognitive	523	50,00	85,00	70,42	6,25
Autonomous	523	11,00	28,00	19,46	3,06
Collaboration and Flexibility	523	9,00	29,00	19,68	3,40
Innovativeness	523	3,00	10,00	7,82	1,55
Metacognitive Awareness	523	36,00	90,00	67,57	9,64
Personal	523	16,00	40,00	30,30	4,25
Organizational	523	12,00	30,00	23,17	3,78
Judgmental	523	5,00	20,00	14,09	2,99
Early Teacher Identity	523	31,00	85,00	70,74	8,91

As seen in Table 1, the pre-service teachers' scores from the overall 21<sup>st</sup> century learner skills scale are at "generally" level. Their scores in the factors of cognitive skills and innovativeness skills were also at "generally" level, while their scores in the factors of autonomous skills and collaboration and flexibility skills were at "sometimes" level. These results indicate that the participating pre-service teachers employed 21<sup>st</sup> century learner skills in instructional processes. The pre-service teachers' scores from the overall metacognitive awareness scale are also at "generally" level. They were also at the same level for the factors of the scale. These results demonstrate that the participating pre-service teachers had a high

level of metacognitive awareness. Finally, the pre-service teachers' perception of ETI was at "I agree" level. This result shows that the participating pre-service teachers' ETI was at a high level.

**Findings Regarding the Second Research Question**

The Pearson product-moment correlation analysis results, performed to examine the relationship between the pre-service teachers' 21<sup>st</sup> century learner skills and metacognitive awareness and the significance level of this relationship, are presented in Table 2.

**Table 2 The Correlation Analysis Results Regarding the Relationship Between the Pre-Service Teachers' 21<sup>st</sup> Century Learner Skills and Metacognitive Awareness**

		21 <sup>st</sup> century learner skills	Metacognitive awareness
21 <sup>st</sup> century learner skills	r	1,00	,719*
	p		,000
	N	523	523
Metacognitive awareness	r	,719*	1,00
	p	,000	
	N	523	523

\*p<.01

The analysis results presented in Table 2 reveal a significant, positive, and high-level relationship between the pre-service teachers' levels of 21<sup>st</sup> century learner skills and metacognitive awareness (r = .719, p<.01).

**Findings Regarding the Third Research Question**

The Pearson product-moment correlation analysis results, performed to examine the relationship between the pre-service teachers' 21<sup>st</sup> century learner skills and early teacher identity and the significance level of this relationship, are presented in Table 3.

**Table 3 The Correlation Analysis Results Regarding the Relationship Between the Pre-Service Teachers' 21<sup>st</sup> Century Learner Skills and Early Teacher Identity**

		21 <sup>st</sup> century learner skills	ETIM
21 <sup>st</sup> century learner skills	r	1,00	,467*
	p		,000
	N	523	523
ETIM	r	,467*	1,00
	p	,000	
	N	523	523

\*p<.01

Table 3 shows a significant, positive, and moderate relationship between the pre-service teachers' levels of 21st century learner skills and early teacher identity ( $r = .467, p < .01$ ).

**Findings Regarding the Fourth Research Question**

The Pearson product-moment correlation analysis results, performed to examine the relationship between the pre-service teachers' metacognitive awareness and early teacher identity and the significance level of this relationship, are presented in Table 4.

**Table 4 The Correlation Analysis Results Regarding the Relationship Between the Pre-Service Teachers' Metacognitive Awareness and Early Teacher Identity**

		Metacognitive awareness	ETIM
Metacognitive awareness	r	1,00	,518*
	p		,000
	N	523	523
ETIM	r	,518*	1,00
	p	,000	
	N	523	523

\*p<.01

The analysis results suggest that there is a significant, positive, and moderate relationship between the pre-service teachers' levels of metacognitive awareness and early teacher identity ( $r = .518, p < .01$ ).

**Findings Regarding the Fourth Research Question**

The study finally performed multiple regression analysis to determine whether the pre-service teachers' 21st century learner skills and metacognitive awareness significantly predicted their perception of early teacher identity. Before running the analysis, whether the prerequisites and assumptions of collinearity and normality were met was checked. First, the researchers examined the correlations among the variables to control the multicollinearity problem. In multiple regression

analysis, there is a multicollinearity problem when there are high-level correlations (such as .80 or .90) among the predictor variables. Therefore, a high-level correlation should not be present between the predictor variables, and the correlation values of the predictor variables should be smaller than .80 (Field, 2005; Büyüköztürk, 2019). Additionally, the correlation value between the predictor variables and the dependent constant variable should be .30 or over (Pallant, 2007). The correlation coefficient between the predictor variables was .719, and the correlation coefficients between the predictor and dependent variables were .467 and .518 in this analysis. These findings suggest that there was no multicollinearity problem between the predictor variables.

Second, variance inflation factor (VIF) values and tolerance values are calculated to

check the multicollinearity problem. There is no multicollinearity problem among predictor variables when VIF values are smaller than 10 and tolerance values are larger than .20 (Büyüköztürk, 2019). The VIF values for ‘21st century learner skills’ and ‘Metacognitive awareness’ variables were

calculated as .483 and 2.070, respectively. The correlation coefficients and VIF and tolerance values met the assumptions of multiple regression analysis. The results of the multiple regression analysis are presented in Table 5.

**Table 5 Multiple Regression Analysis Results Regarding the Prediction of the Pre-Service Teachers’ ETI Perceptions By Their 21St Century Learner Skills And Metacognitive Awareness**

Variable	B	Standard Error	$\beta$	t	p	Pairwise r	Partial r
(Constant)	27,942	3,673		7,608	,00*	-	-
21 <sup>st</sup> century learner skills	,164	,045	,197	3,693	,00*	,467	,160
Metacognitive awareness	,348	,049	,376	7,063	,00*	,518	,296
R=,536; R <sup>2</sup> =,287; F(2,520)=104,572; p=.00							

Table 5 demonstrates that the pre-service teachers’ 21<sup>st</sup> century learner skills and metacognitive awareness significantly predicted their perception of ETI [F(2,520)=104,572; p=.00]. The pre-service teachers’ levels of 21<sup>st</sup> century skills and metacognitive awareness accounted for 29% of the change in their ETIM scores. The most important variable predicting the pre-service teachers’ perception of ETI was metacognitive awareness ( $\beta = .376$ ). 21<sup>st</sup> century learner skills predicted their perception of ETI at a lesser degree ( $\beta = .197$ ) when compared to their metacognitive awareness. As a result, the pre-service teachers’ levels of 21<sup>st</sup> century learner skills and metacognitive awareness significantly affect their early teacher identity and predict it.

The regression equation prediction the pre-service teachers’ ETI perceptions:

$$ETI = 0,164 * 21^{st} \text{ century learner skills} + 0,348 * \text{metacognitive awareness} + (27,942)$$

**Conclusion, Discussion and Recommendation**

This study first revealed that the participating pre-service teachers’ 21<sup>st</sup> century learner skills were at “generally” level. Similarly, their scores in the factors of cognitive skills and innovativeness skills were also at “generally” level, while their scores in the factors of autonomous skills and collaboration and flexibility skills were at “sometimes” level. These findings suggest that the participating pre-service teachers’ levels of 21<sup>st</sup> century learner skills were

above the medium level, and they employed these skills in instructional processes. That the pre-service teacher had autonomous skills and collaboration and flexibility skills at “sometimes” level indicates that they employed self-management and collaboration and flexibility skills less. This may be due to the fact that they do not have adequate activities to use self-management and individual autonomy skills actively in their courses and the programs do not include adequate courses to practice collaboration and flexibility skills.

The literature hosts studies that support these findings. Orhan-Göksün (2016) reported that pre-service teachers’ 21<sup>st</sup> century learner skills were above the medium level. She also identified that they had the highest scores in the factor of cognitive skills, and the least scores in the factor of autonomous skills. İpekşen (2019) and Alkoç (2020) also reported that pre-service teachers’ 21<sup>st</sup> century learner skills were above the medium-level, and the factor of cognitive skills had the highest mean scores. Peker (2019) found that pre-service teachers’ use of 21<sup>st</sup> century learner skills was at “generally” level, and Aydemir, Karalı and Coşan (2020) reported their mean score was above the medium level.

The second result of the study informed that the pre-service teachers’ level of metacognitive awareness was at “generally” level on the overall scale. They were also at “generally” level in personal, organizational, and judgmental awareness factors. This result indicates that the level of the

pre-service teachers' metacognitive awareness was high. Studies in the literature support this result. In parallel with this study, Yavuz (2009) concluded that pre-service teachers' metacognitive awareness was at a high level. Öztürk (2019) worked with primary school pre-service teachers and found that their metacognitive awareness was at "I agree" level. Similarly, Şahin (2015), Baba-Öztürk and Güral (2016), Bars (2016), Uslu (2016), Bedir (2017), and EfeAyaz (2019) reported that pre-service teachers had high levels of metacognitive awareness. Additionally, the factor with the highest mean score in the 21st century learner skills use scale was the cognitive skills factor, which supports the high level of metacognitive awareness.

The study also examined the pre-service teachers' perception of ETI and revealed that their perception of ETI was at "I agree" level. The findings obtained from this single-factor scale indicate that the participating pre-service teachers' ETI perception was at a high level. The literature supports this result. Karatepe and Akay (2020) examined ETI perceptions of the pre-service teachers studying in the pedagogical formation program and education faculty, and determined that the pre-service teachers' ETI perception was high, with a mean of 4.12. Küçükaydıncı and Gökbulut (2019) and Karalı (2018) also reported that pre-service teachers' levels of ETI were at "I agree level". Çelik and Kalkan (2019) and Eğmir and Çelik (2019) found that pre-service teachers had ETI at a high level.

The study observed a significant, positive, and high-level relationship between the pre-service teachers' levels of 21st century learner skills and metacognitive awareness. Although no studies directly examine the relationship between these variables, some studies examined the relationship between metacognitive awareness and various sets of skills included in the 21st century skills. For instance, Bakioğlu et al. (2015) examined the relationship between pre-service teachers' metacognitive awareness, problem-solving skills, and attitudes towards technologies. They identified a positive and moderate relationship between pre-service teachers' levels of problem-solving skills and metacognitive awareness, and a low-level positive relationship between their levels of attitudes towards technology and metacognitive awareness.

Duman (2018) found a positive and moderate relationship between pre-service teachers' entrepreneurship characteristics and metacognitive awareness. Dikmen and Tuncer (2018) reported positive and high-level relationships between pre-service teachers' information literacy self-efficacy and metacognitive thinking skills. Baba-Öztürk and Güral (2016) identified that pre-service teachers' metacognitive awareness differed significantly in terms of their levels of individual innovativeness, and their metacognitive awareness increased as did their innovativeness level. Erbaş et al. (2018) reported a moderate positive relationship between pre-service teachers' problem-solving skills and metacognitive awareness, and a low-level positive relationship between creativity levels and metacognitive awareness. Gökçek (2019) found a positive, linear, and high-level relationship between life skills and metacognitive awareness. These studies focusing on skills accepted as 21st century skills in the literature support the current results.

21<sup>st</sup> century learner skills and metacognitive awareness overlap in many aspects and support each other. This study also revealed positive and significant relationships between them. In addition, that cognitive skill is a factor of the 21<sup>st</sup> century learner skills use scale and that the pre-service teachers had the highest mean score in this factor also indicate a significant and supportive relationship between 21<sup>st</sup> century learner skills and metacognitive awareness.

This study also revealed a moderate positive relationship between the pre-service teachers' 21<sup>st</sup> century learner skills and ETI. This finding suggests that the pre-service teachers' possessing the 21st century learner skills supports their teacher identity formation in educational processes, and helps them develop a positive professional identity. Besides, it indicates that the pre-service teachers who have developed a teacher identity or who are in the process of establishing a teacher identity possess 21<sup>st</sup> century learner skills and increase their efficiency in educational processes through employing these skills.

Ergür (2010) argued that teachers who are the role models of students should get rid of the traditional teacher archetype of knowledge transmitter, and

assume the different roles, such as an advisor who leads the way for students and provide effective feedback to them, and the role of the source person. To train equipped and professional teachers who possess 21<sup>st</sup> century skills in line with the expectations, pre-service teacher education programs should enable pre-service teachers to reach adequate levels cognitively and affectively, and support their professional identity formation process (Esen, 2019). Örnek (2020) examined professional identity formation in teachers and emphasized that teachers' pre-service education should meet the 21st century skills.

Valli, Perkkilä, and Valli (2014) stated that more opportunities should be offered to pre-service teachers regarding acquiring 21<sup>st</sup> century skills during the pre-service training period. Therefore, we can argue that having a teacher identity that meets contemporary expectations requires possessing 21<sup>st</sup> century skills. Accordingly, the contribution of 21<sup>st</sup> century learner skills to pre-service teachers' development of early teacher identity is undeniable. Yılmaz and Tanrıseven (2019) revealed a moderate positive relationship between pre-service teachers' 21<sup>st</sup> century learner skills and pedagogical knowledge and abilities. They argued that teachers who had higher levels of 21<sup>st</sup> century skills also had higher levels of pedagogical knowledge and abilities. These studies support this result of the study.

Another result of the study demonstrated a positive, significant and moderate relationship between the pre-service teachers' metacognitive awareness and early teacher identity. This result suggests that pre-service teachers' metacognitive awareness supports their professional identity formation in educational processes and contributes to forming a positive professional identity. Brown (2009) also argued that metacognitive development is required for professional identity formation and socialization in the teaching profession.

There are no studies in the literature examining the relationship between pre-service teachers' metacognitive awareness and early teacher identity; however, some studies on related subjects support the current study. Uslu (2016) reported a significant positive relationship between pre-service teachers' metacognitive awareness and their motivation towards the teaching profession. Yavuz (2009)

found a positive and moderate relationship between pre-service teachers' self-efficacy perceptions towards the teaching profession and their metacognitive awareness. Yıldız (2012) concluded that metacognitive strategies increased self-efficacy beliefs regarding the teaching profession.

The study finally revealed that the pre-service teachers' levels of 21<sup>st</sup> century learner skills and metacognitive awareness significantly predicted their perception of ETI. 21<sup>st</sup> century learner skills and metacognitive awareness levels accounted for 29% of the change in pre-service teachers' ETI perceptions. Metacognitive awareness predicted pre-service teachers' ETI perceptions to a greater degree than 21<sup>st</sup> century learner skills.

These results suggest that the pre-service teachers' ETI perceptions are predicted significantly by their 21<sup>st</sup> century learner skills and metacognitive awareness. Accordingly, we can suggest that 21<sup>st</sup> century skills and metacognitive awareness have a positive effect on early teacher identity, and as pre-service teachers' these skills and awareness increase, their ETI perceptions will evolve positively. Bars (2016) found that pre-service teachers' metacognitive awareness and problem-solving skills significantly predicted their levels of teaching profession self-efficacy, and they explained 25% of the total variance.

Dikmen and Tuncer (2018) stated that metacognitive thinking and information literacy self-efficacy explained 4% of the change in attitudes towards the teaching profession. Başpınar (2019) also reported that metacognitive and cognitive flexibility skills were strong predictors of teaching profession competencies. These results in the literature support the current study.

Considering that metacognitive awareness is the most substantial variable predicting pre-service teachers' ETI perceptions, we can argue that metacognitive awareness has more effect on pre-service teachers' forming a more qualified and positive professional identity during the teacher training processes. Additionally, the finding that 21<sup>st</sup> century learner skills and metacognitive awareness concomitantly account for 29% of the variance indicates that there are some other variables explaining the rest of the variance in early teacher

identity perceptions.

Teacher identity that fits the contemporary conditions definitely requires possessing skills of the century we live in and metacognitive awareness. Thus, teachers who do not have these skills and metacognitive awareness are not very likely to equip their students with these skills and awareness. The pre-service teacher training education period has great significance in equipping teachers with the 21st century skills and metacognitive awareness. The education offered to pre-service teachers during their undergraduate education surely helps them form a teacher identity involving these skills and awareness.

According to Friesen and Besley (2013), teacher training programs are in a position to ease or hinder the development of professional identity in personal and social aspects. Bacakoğlu (2018) researched the factors influential in pre-service teachers' formation of teacher identity, and revealed that the most effective factor was their undergraduate education, based on interview data. In this sense, educators in education faculties and curriculum developers have a great responsibility. Curricula and activities in courses should be designed and enacted in a way to ease and gear up pre-service teachers' professional identity formation considering their 21<sup>st</sup> century skills and metacognitive awareness.

The results obtained in the current study contribute to the literature through revealing the relationships and effect roles among these significant concepts. Future studies may use different samples and research methods to clearly understand the nature of these relationships.

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