



Investigating the Mediation Effect of 21st Century Skills between Teachers' Decision Making Styles and Professional Autonomy*


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Abstract

This correlational research design study aims to examine the mediation role of 21st century skill between teachers' decision making styles and their professional autonomy, based on the theoretical framework. The population of this study consists of 910 teachers working in the Nazilli district of Aydın province in the 2021-2022 academic year. In the study, the maximum diversity sampling method was used and responses were received from 435 teachers through 'Personal Information Form', 'Multidimensional 21st Century Skills Scale', 'Teacher Autonomy Scale' and 'Decision Making Styles Scale'. Inferential statistical calculations were made and construct validity and mediation tests were conducted. As a result, it was seen that the direct effect of teachers' decision making styles on their professional autonomy was 0.55; when 21st century skills were included in the model as a mediation variable, this effect decreased to 0.40 and this value was still statistically significant. In this respect, it was determined that there was a partial mediation role between teachers' 21st century skills, decision making styles, and professional autonomy. In addition, the Sobel Z test was applied to examine the mediation role and it was determined that the mediation effect was statistically significant ($z=3.91$; $p<.05$). In light of these findings, the fact that the effect of decision making style decreased after 21st century skills were added to the model, but this effect was still significant, showed that 21st century skills were a partial mediation variable in this relationship. Teachers with the high 21st century skill were found to be able to act professionally autonomous enough in decision making situations. It is expected that determining the direction and roles of the relationship between these variables and presenting them as a model will contribute to the literature, serve as a source for teachers and researchers, and provide inspiration for new studies.

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INTRODUCTION

The world is rapidly changing, creating to new situations in all areas of life. As a result of the reflections of these changes in science, education has been also evolving according to the needs (Alkiş, 2020). The skills that individuals need to acquire from these developments have been also diversifying. With the cumulative and innovative advancement of education, skills suitable for the 21st century have been emerging, creating a new need (Kırgız, 2019). Ekici et al. (2017) listed the most common skills among the 19 skills that will be necessary for this era as problem solving, communication, collaboration, creativity and innovation, critical thinking, decision making, information, technology, media literacy, responsibility, leadership, productivity, flexibility and adaptability, entrepreneurship.

According to the Partnership for 21st Century Skills, these skills consist of learning and innovation; information, media, and technology; life and career (P21, 2019). Learning and innovation skills encompass creativity and innovation, critical thinking and problem solving, communication and collaboration; they are defined as the ability to analyze and separate information, draw conclusions, interpret results, generate products, and adapt to teamwork and work-life. Information, media, and technology skills involve effectively using information, media, and technology and analyzing and evaluating the information; they include skills in information literacy, media literacy, and ICT (Information, Communication, and Technology) literacy. Life and career skills encompass flexibility and adaptability to excel in the globally competitive business world, coping with the complexities of life and work, and building a career by utilizing effective communication skills; they include skills in flexibility and adaptability, initiative and self-direction, social and cross-cultural interaction, productivity and accountability, and leadership and responsibility (P21, 2019). Çevik and Şentürk (2019) compiled the categories from institutions, organizations, and individuals (APEC, 2008; ATC 21, 2015; ISTE, 2007; AASL, 2009; Hixson, Ravitz & Whisman, 2012; Johnson, 2009; National Research Council, 2011; NCREL, 2003; OECD, 2018; P21, 2019; Wagner, 2012) and examined the multidimensional 21st century skills for young adult groups as 'information and technology literacy', 'critical thinking and problem-solving', 'entrepreneurship and innovation', 'social responsibility and leadership skills', 'career awareness'. According to Çevik and Şentürk (2019), these skills encompass learning and renewal, critical thinking and creative problem-solving, communication and collaboration, information, media and technology literacy, social responsibility, intercultural awareness, effective decision making, self-management, entrepreneurship and change-transformation leadership, and career awareness skills.

The goal of the 21st century education is to raise generations, acquiring complex problem solving, effective communication, critical thinking, collaboration, and the ability to compete on an international scale while forming their own national identity and consciousness (GDoTT, 2017). At this point, the alignment of teachers, being the conveyors of these skills, with 21st century skills become crucial. It is expected that teachers should possess the skills, desired to be developed in students and society as a whole (Voogt et al., 2013). Therefore, there is a need for teachers, embracing 21st century skills and making efforts to transfer them to students (Yavuz, Özkara & Yıldız, 2015). Reports as 'Contemporary Teacher Profile Needed by the Turkish Education System as We Enter the 21st Century' (DoERD, 2001), 'MoTNE 21st Century Student Profile' (DoERD, 2011), and '21st Century Skills and the Quality of Education Meeting Series' (TIBA [Turkish Industrialists' and Businessmen's Association], 2012), as well as organizations as the P21 Framework, OECD, ATC21S, NETS/ISTE, highlight certain skills (Dede, 2009; Voogt & Roblin, 2010). Among these notable skills are life and career, ways of thinking, professional autonomy, and decision making skills. The WEF (2016) reported on skills, workforce, and employment strategies in 'The Future of Jobs'. They identified the top 10 skills comparatively for 2015-2020, with critical thinking and decision making skills included in each year (Soffel, 2016). Particularly in today's fast-paced environment, where quick and effective decisions need to be made, the abundance of information makes the decision making process challenging in finding qualitative

information among quantitative data (Çelik, 2021). Therefore, the decision making skill, included in the scope of 21st century skills, holds an important position among the skills individuals need to acquire (AACU, 2007; ISTE, 2007).

In the 21st century, the quantity and quality of decisions by teachers, taking on a fundamental role in educational practices (Sünbül, 2011), vary based on individual characteristics and skills, social and cultural factors, values, and the type of problem situation (Çolakkadioğlu & Güçray, 2007). The experience of different processes in the same decision situations is explained by decision making styles (Nutt, 1990). Decision making styles are defined as the predisposition or habit of providing similar responses to a problem rather than being a personality trait (Scott & Bruce, 1995). Styles, arising from personal differences, cannot be categorized as good or bad; individuals tend to adopt the style that best suits their qualities at certain times or situations (Dinçer & Saracaloğlu, 2011).

Scott and Bruce (1995) define five styles of decision making 'rational decision making style', 'intuitive decision making style', 'dependent decision making style', 'avoidant decision making style', and 'spontaneous decision making style'. The rational decision making style involves a careful approach where the decision making process is logically conducted. The intuitive decision making style encompasses the use of emotions and instincts by the decision maker to reach a decision. The dependent decision making style is characterized by decision makers being influenced by guidance and advice from trusted individuals. The avoidant decision making style involves decision makers trying to avoid taking responsibility by distancing themselves from the decision. The spontaneous decision making style entails decision makers making decisions based on the current situation, choosing a solution option they feel close to, and making the decision suddenly and effortlessly (Scott & Bruce, 1995).

Understanding the world today, the role of teachers has shifted towards being individuals, creating their own materials, methods, classroom activities, and handle every aspect related to teaching, rather than just accepting and implementing predetermined content, curriculum, and methods set by others (Nunan, 2004). The changing role of teachers evokes the concept of 'autonomy'. Teacher autonomy, to define the scope of teachers' authority in the education system (Öztürk, 2011), is considered one of the factors determining the quality of education in PISA studies by OECD (Ayril et al., 2014) and has gained considerable attention in recent international conferences and researches (Ramos, 2006). Teacher autonomy encompasses the preparation and implementation of curriculum, the selection of textbooks, and the monitoring of these processes (Çolak, 2016). Furthermore, autonomy is associated with the organization of work environments, participation in management processes, and decision making authority related to these matters (Ayril et al., 2014). Underlying the display of autonomous behaviours by a teacher is their competence and genuine dedication to the profession. The professional autonomy of a teacher, which distinguishes them in terms of being 'assigned' or 'dedicated', lies in their willingness to take a stand for the quality of education and the success of their students. The teacher's dedicated commitment to their profession brings them closer to professionalism (Erol, 2022).

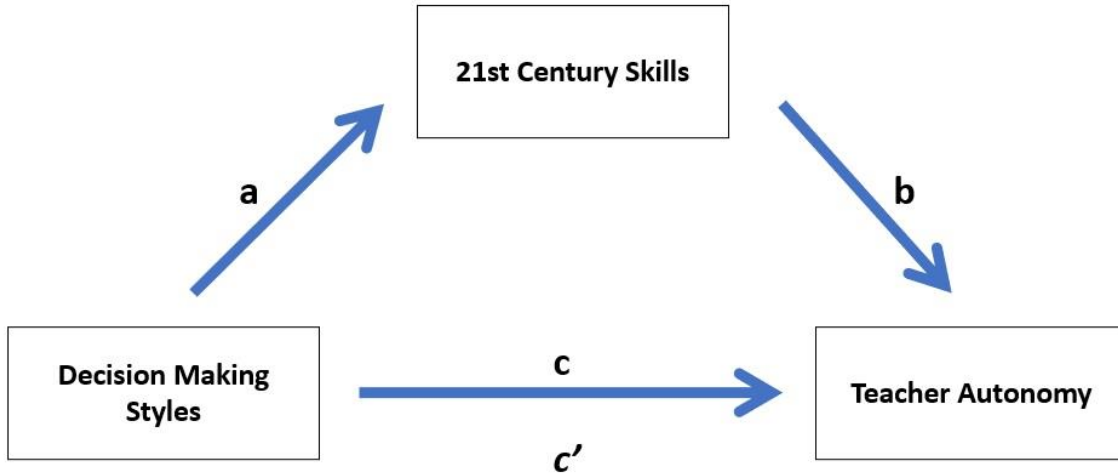
Çolak (2016) categorizes teacher autonomy into four groups 'curriculum autonomy', 'teaching process autonomy', 'professional communication autonomy', and 'professional development autonomy'. Curriculum autonomy encompasses making decisions to meet student needs and stimulate their interest by balancing the preparation of content, complying with the standard structure, expanding and deepening the program (Ormond, 2017). Teaching process autonomy includes making independent decisions regarding feedback, assessments, grading, rewards, books, materials, contents, assignments, time management, methods and techniques, communication language, and classroom and disciplinary rules (Çolak, 2016; Oberfield, 2016). Professional communication autonomy refers to the freedom of teachers in their dialogues with colleagues, students, parents, and administrators (MoTNE, 2015). Professional development autonomy entails

teachers making autonomous decisions to participate in in-service training, scientific activities, and activities aimed at self-improvement (Üzüm, 2014).

The general framework and rationale of the study revolve around establishing a relationship between teachers' decision making skills, which are considered 21st century skills, and professional autonomy, which is also recognized as a 21st century skill. Based on the statements and findings in the literature, it can be inferred that decision making styles predict professional autonomy and 21st century skills. Therefore, it is deemed appropriate to define the ways in which decision making styles and 21st century skills impact teachers' autonomy. Theoretical studies by Ayril et al. (2014), Bieg, Backes, and Mittag (2011), Crawford (2001), Çelik (2016), Çolak (2016), Ertürk (2020), O'Hara (2006), Ormond (2017), Rudolph (2006), and Üzüm (2014) support the prevailing view that decision making skills have an impact on teacher autonomy as a whole. Considering that one of the variables in the study, teacher autonomy, conceptually encompasses the decision making process in its definitions and sub-dimensions, it is anticipated that a path from decision making styles influenced by 21st century skills to teacher autonomy can be identified. Furthermore, previous research in the field has identified 21st century skills as a variable that also influences teacher autonomy. Consequently, in this study, decision making styles are considered the independent variable, teacher autonomy the dependent variable, and 21st century skills the mediating variable, and the theoretical structure of the research is defined (Figure 1). Exploring the relationships between decision making styles, teacher autonomy, and 21st century skills is of great importance for teachers to fulfill their professional roles. Examining the direct and indirect relationships between these variables will determine the extent to which decision making styles and 21st century skills affect the concept of teacher autonomy.

There are studies, examining the direct impact of decision making styles on teacher autonomy in the literature (Bozkurt & Kara, 2022; Ertürk, 2020; Maviş-Sevim, 2020; Öztürk, 2011; Ulaş & Aksu, 2015). However, there is a lack of research findings on how decision making styles, through 21st century skills, affect teacher autonomy. National and international reports as PISA, OECD, and DoERD emphasize the importance of teachers' 21st century skills. This necessitates the identification of teachers' 21st century skills, the development of these skills, and the creation of a model, influencing the development of 21st century skills. In line with the decision making skills among these skills, it is anticipated that this research on how teachers' decision making styles change to what extent with the development of 21st century skills and subsequently teacher autonomy would contribute to the field of teacher education by providing valuable insights and sources. It is expected that further research on the direct and indirect relationships between decision making styles, 21st century skills, and teacher autonomy will provide more evidence in the literature and create opportunities for the establishment of new theoretical models involving similar or different variables that influence the development of 21st century skills.

This study aims to test the indirect effect of teachers' decision making styles on their professional autonomy and the mediating role of 21st century skill, based on a theoretical framework. Due to the multidimensional nature of the measurement tools, both direct and indirect effects, along with the sub-dimensions of the scales, have been examined. The theoretical model, shown in Figure 1, depicts the direct relationships between variables through paths a, b, and c; the indirect relationship between variables by c' . (Aksu, 2012).

Figure 1. Theoretical Model of Variables

According to Baron and Kenny (1986), to establish the mediating effect of '21st century skills' when examining the prediction of 'professional autonomy' as the dependent variable by the independent variable of 'decision making styles', four conditions must be met (Baron & Kenny, 1986, as cited in Şimşek, 2020). In line with this, the hypotheses of the study are formulated as follows:

H1: There is a significant and positive relationship between teachers' decision making styles and teachers' professional autonomy.

H2: There is a significant and positive relationship between teachers' decision making styles and teachers' 21st century skills.

H3: There is a significant and positive relationship between teachers' 21st century skills and teachers' professional autonomy.

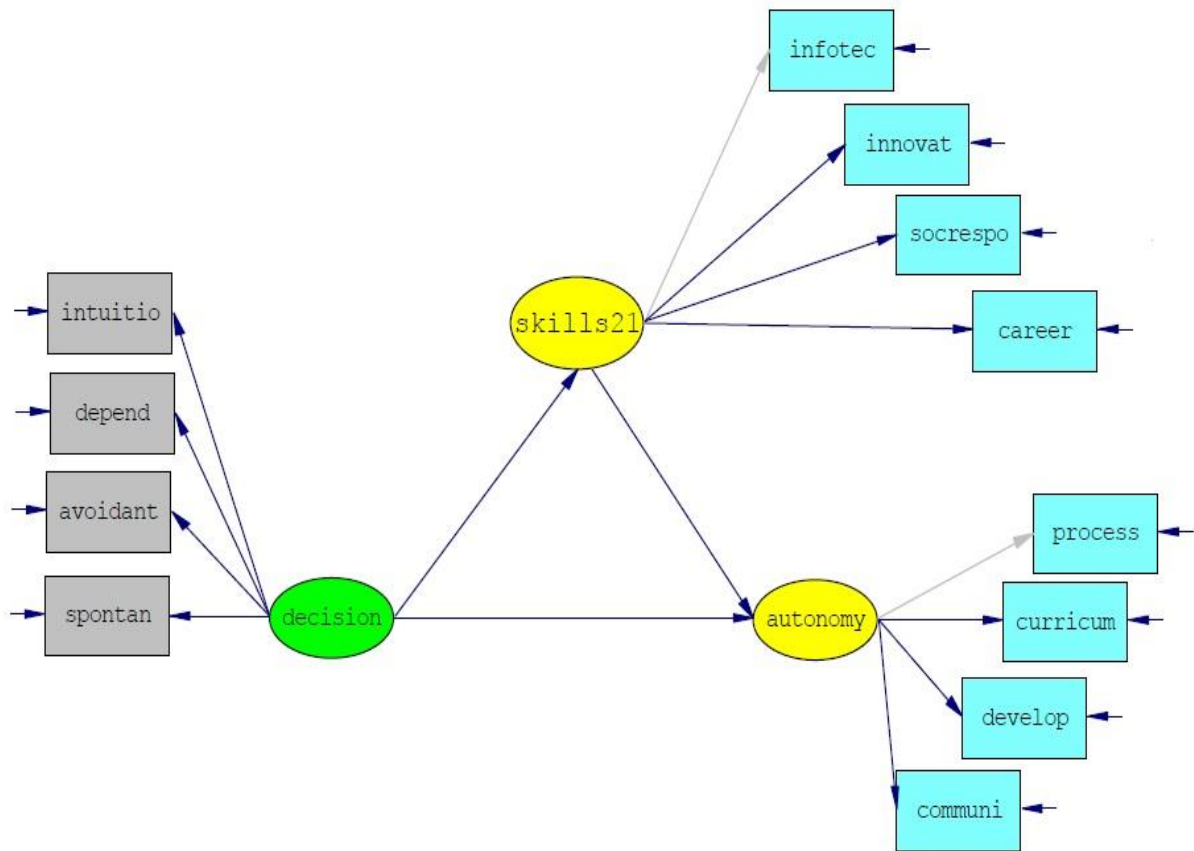
H4: There is a mediation effect of teachers' 21st century skills between teachers' decision making styles, and teachers' professional autonomy.

METHOD

RESEARCH DESIGN

The research was based on the correlational research design. The correlational research design is defined as a research model that aims to determine the existence and/or degree of change between two or more variables (Karasar, 2019). In the correlational research, it is tried to reveal whether there is a type of relationship, which type of relationship there is, or at what level there is a relationship (Büyüköztürk et al., 2018). In this respect, the theoretical model, developed for the description of the direct relationships between teachers' 21st century skills, decision making styles, and professional autonomy and the mediation role of 21st century skills in the direction of professional autonomy of teachers' decision making styles, was tested. In the basic mediation model, the variable called the mediator variable is a part of the cause and effect relationship that affects the relationship between the dependent and independent variables (MacKinnon, Fairchild & Fritz, 2010). The model created based on the theoretical framework is shown in Figure 2.

Figure 2. Theoretical Model of the Effect of Decision Making Styles and 21st Century Skills on Teachers' Professional Autonomy



POPULATION AND SAMPLE

The study population consists of approximately 910 teachers working in different school types in Nazilli district of Aydın province during the 2021-2022 academic year. In the research, the maximum diversity sampling method was used as a purposive sampling technique. The maximum diversity sampling method is defined as the identification of events and phenomena within the population that contain similarities and differences, which are assumed to exist, and conducting the study on the identified specific cases (Büyüköztürk, Çokluk & Köklü, 2014). Considering that the diversity in the sample would arise from the variables of school type and branch, teachers working in different branches at the elementary school, middle school, and high school were reached. The distribution of teachers according to branches and school types is shown in Table 1. The sample size was determined using the sample size table. It is stated that the study population of 750 people can represent 254 people at $\alpha=0.05$ significance and a %5 confidence level (Can, 2014). In this context, feedback was obtained from 435 voluntary teachers. In terms of research ethics, teachers were not asked to provide identifying information.

Table 1. Demographic Characteristics of Teachers

<i>Variables</i>	<i>Groups</i>	<i>N</i>	<i>%</i>
Gender	Male	191	43,9
	Female	244	56,1
Age	20–30	104	23,8
	31–40	204	46,8
	41–50	101	23,4
	51 and more	26	6
Professional Seniority	0–5	78	17,9
	6–10	127	29,2
	11–15	107	24,6
	16–20	63	14,5
	21 and more	60	13,8
School Type	Primary School	79	18,2
	Secondary School	171	39,3
	High School	185	42,5
Branch	Numerical Field Teachers	122	28,04
	Equal Field Teachers	111	25,52
	Verbal Field Teachers	140	32,19
	Foreign Language Field Teachers	62	14,25
	Total	435	100

DATA COLLECTION INSTRUMENTS

PERSONAL INFORMATION FORM

The personal information form, including questions about gender, age, professional seniority, school type, and branch, was prepared by the researchers.

MULTIDIMENSIONAL 21ST CENTURY SKILLS SCALE (MDCSS)

The scale, developed by Çevik and Şentürk (2019), consists of 41 items and five dimensions as a 5-point Likert scale. In this scale, items 1.-15. are used for information and technology literacy, items 16.-21. for critical thinking and problem-solving, items 22.-31. for entrepreneurship and innovation, items 32.-35. for social responsibility and leadership, and items 36.-41. for career consciousness. Çevik and Şentürk (2019) determined the reliability coefficients of the original scale as 0.84 for information and technology literacy, 0.79 for critical thinking and problem-solving, 0.76 for entrepreneurship and innovation, 0.73 for social responsibility and leadership skills, 0.75 for career consciousness, and 0.86 for the total scale. The validity and reliability studies of the measurement tool were conducted on a study group consisting of 660 high school, associate degree, and undergraduate students in the 15-25 age group. The correlation coefficients of the items ranged between 0.32 and 0.87. The Chi-square (χ^2) value was found to be 2014.17, and the standard deviation (SD) value was 774.

Confirmatory factor analysis (CFA) was conducted using the Lisrel 8.80 software package to establish the construct validity, and as a result, seven items were removed from the scale. Modification was made between items 1.-3., 9.-10., 17.-18., and 39.-40. to achieve acceptable fit values and ensure construct validity. In order to establish construct validity, each sub-dimension should include a minimum of three items to represent the respective dimension (Büyüköztürk, 2011; Kline, 2000). After the removal of items, it was observed that the sub-dimensions still consisted of more than three items. The amount of explained variance and Cronbach's Alpha coefficients in the original study were found to be similar to those in this study. The Cronbach's Alpha reliability coefficients of this study were determined as 0.89 for information and technology literacy, 0.84 for critical thinking and problem-solving, 0.88 for entrepreneurship and innovation, 0.66 for social responsibility and leadership, 0.76 for career consciousness, and 0.88 for the total scale. Similar results were obtained in terms of the

same structure and reliability levels even after removing the items from the measurement tool. Therefore, it is believed that the removal of items did not have any negative impact on the psychometric properties of the measurement tool. Various studies (Canpolat, 2021; Engin & Korucuk, 2021; Geçgel et al., 2022; Güllü & Akçay, 2022; Varki, 2020) have confirmed that the scale has high reliability and validity coefficients. Furthermore, the scale was chosen due to its parallelism with the main skills that teachers should possess according to MoTNE (2005), as critical thinking, creative thinking, communication, problem-solving, research, use of information technologies, and entrepreneurship, as well as its compilation of prominent skills highlighted in the literature. In this context, the subdimensions used in the study were preferred as indicators of 21st century skills for teachers.

DECISION MAKING STYLES SCALE (DMSS)

The scale, developed by Scott and Bruce (1995), consists of 25 items as a 5-point Likert-type. It was adapted into Turkish by Taşdelen (2002). The scale includes items 1.-5. for rational decision making, items 6.-10. for intuitive decision making, items 11.-15. for dependent decision making, items 16.-20. for avoidant decision making, and items 21.-25. for spontaneous decision making style. Taşdelen (2002) calculated the reliability coefficients of the original scale as 0.76 for rational decision-making style, 0.78 for intuitive decision making, 0.76 for dependent decision making, 0.79 for avoidant decision making, 0.79 for spontaneous decision making, and 0.74 for the total scale. Scott and Bruce (1995) and Taşdelen (2002) found internal consistency coefficients for the sub-dimensions ranging between $\alpha = 0.79-0.94$ and $\alpha = 0.74-0.89$, respectively. The original study was conducted on 451 students in the fourth grade of the Faculty of Education at Pamukkale University during the 2001-2002 academic year.

After CFA for construct validity, one item was removed from the scale. Modification was made between items 2.-3., 6.-7., and 16.-17. to achieve acceptable fit indices and ensure construct validity. The removal of one item did not decrease the number of items below three for each sub-dimension, thereby maintaining the requirement of having at least three items for construct validity (Büyüköztürk, 2011; Kline, 2000). Additionally, the Cronbach's alpha coefficients from both studies were parallel. In this study, the Cronbach's alpha reliability coefficients were determined as 0.86 for rational decision making, 0.87 for intuitive decision making, 0.88 for dependent decision making, 0.92 for avoidant decision making, 0.83 for spontaneous decision making, and 0.88 for the total scale. Despite the removal of an item, the structure and reliability were maintained at the same level, indicating that the psychometric properties of the measurement tool were not compromised. The reason for choosing the decision making styles scale classified by Scott and Bruce (1995) is due to its psychometric properties. Various studies (Akdeniz & Korkmaz, 2023; Çar et al. 2023; İme, Kalı-Soyer & Keskinoglu, 2020; Pesen & Epçaçan, 2021; Sakallı, 2019) have confirmed the high reliability and validity coefficients of the scale.

TEACHER AUTONOMY SCALE (TAS)

The measurement tool, developed by Çolak and Altinkurt (2017), is a 5-point Likert scale consisting of 17 items and four dimensions. The items 1., 3., 4., 9., 10., and 11. represent teaching autonomy; items 2., 5., 6., 7., and 8. represent curriculum autonomy; items 12.-14. represent professional development autonomy, and items 15.-17. represent professional communication autonomy. The original scale's reliability coefficients were found to be 0.77 for teaching autonomy, 0.80 for curriculum autonomy, 0.75 for professional development autonomy, 0.80 for professional communication autonomy, and 0.87 for the total scale. The research was conducted on 434 teachers working in public and private preschool, primary, middle, and high schools in the central and district regions of Muğla province during the 2015-2016 academic year. According to the factor analysis of the scale, the KMO value was 0.87, and the Bartlett's Test of Sphericity was significant [$\chi^2 = 1945.74$; $p = .00$].

To achieve acceptable fit values, modifications were made between items 1.-3., 2.-5., 3.-4., 10.-11., and 16.-17., ensuring construct validity. The Cronbach's alpha reliability coefficients of this study were found to be 0.80 for teaching autonomy, 0.80 for curriculum autonomy, 0.70 for professional development autonomy, 0.72 for professional communication autonomy, and 0.88 for the total scale. The high validity and reliability coefficients in different studies (Bozkurt & Kara, 2022; Çolak et al., 2023; Demir, 2023; Esen, 2023; Yolcu & Selvitopu, 2022) have been determining factors in choosing the scale.

DATA ANALYSIS

The scales were implemented via Google Forms as part of the Covid-19 measures. The data from 435 teachers was transferred to "IBM SPSS Statistics 25" and "Lisrel 8.80". Average scores for each scale's sub-dimensions were obtained, and the analyses were conducted based on the average scores for the sub-dimensions.

To determine the normality assumption of each scale's data, the Kolmogorov-Smirnov and Shapiro-Wilk tests were used. Additionally, graphical methods such as histogram plots and box plots were examined. The skewness and kurtosis coefficients were found to be within the range of -1 and +1, the measures of central tendency (mean, mode, and median) were close to each other, and the points on the Q-Q plots did not deviate from the lines. Based on these observations, it was concluded that the results obtained from the scales followed a normal distribution (Nunnally & Bernstein, 1994). To determine the linearity relationship between variables, scatter plots were evaluated. When the results from pairwise scatter plots for each variable were considered as a whole, a linear relationship between the variables was identified. The Levene test for homogeneity of variances did not yield statistically significant results, indicating that the assumption of homogeneity of variances was met. The assumptions of multicollinearity and autocorrelation, which are relevant to regression analysis, were examined using the Durbin-Watson coefficient and variance inflation factor. The Durbin-Watson coefficients were within the range of 1.5 and 2.5, the inflation amount of variance was below 5, and the tolerance value was above 0.2. Therefore, it was concluded that all the necessary assumptions for regression analysis were met (Tabachnick & Fidell, 2013).

In the first stage, CFA were conducted using Lisrel 8.80 to assess the construct validity of the scales. As a result of these analyses, 7 items from the MDCSS and one item from the DMSS were removed because they fell below the critical value of 1.96 (Şimşek, 2020). No items were removed from the TAS. The remaining items were adjusted to achieve acceptable goodness-of-fit values based on standardized criteria. In this context, after the modifications, related values for the MDCSS were obtained as 3.30 for the χ^2/df ; 0.82 for GFI; 0.79 for AGFI; 0.95 for CFI; 0.93 for NFI; 0.95 for IFI; and 0.073 for RMSEA. Related values for the DMSS were obtained as 2.47 for χ^2/df ; 0.90 for GFI; 0.87 for AGFI; 0.97 for CFI; 0.95 for NFI; 0.97 for IFI and 0.058 for RMSEA. Related values for the TAS were obtained as 3.68 for χ^2/df ; 0.90 for GFI; 0.86 for AGFI; 0.96 for CFI; 0.94 for NFI; 0.96 for IFI and 0.079 for RMSEA. The results of the research model's fit values, along with the excellent and acceptable fit values according to RMSEA, NFI, CFI, IFI, and GFI indicating that the model fit has been achieved (Karagöz, 2019), can be seen in Table 2.

Table 2. The Goodness of Fit Values of the Scales at the End of Confirmatory Factor Analysis with Perfect and Acceptable Fit Criteria

Fit Indexes	Excellent Fit Criteria	Acceptable Fit Criteria	MDCSS	DMSS	TAS
¹ CMIN/DF<5	$0 \leq \chi^2 /sd \leq 2$	$2 \leq \chi^2 /sd \leq 3$	3,30	2,47	3,68
² AGFI>0,80	$.90 \leq AGFI \leq 1.00$	$.85 \leq AGFI \leq .90$	0,79	0,87	0,86
³ GFI>0,85	$.95 \leq GFI \leq 1.00$	$.90 \leq GFI \leq .95$	0,82	0,90	0,90
³ CFI>0,90	$.95 \leq CFI \leq 1.00$	$.90 \leq CFI \leq .95$	0,95	0,97	0,96
³ NFI>0,90	$.95 \leq NFI \leq 1.00$	$.90 \leq NFI \leq .95$	0,93	0,95	0,94
³ IFI>0,90	$.95 \leq IFI \leq 1.00$	$.90 \leq IFI \leq .95$	0,95	0,97	0,96
⁴ RMSEA< 0,08	$.00 \leq RMSEA \leq .05$	$.05 \leq RMSEA \leq .08$	0,073	0,058	0,079

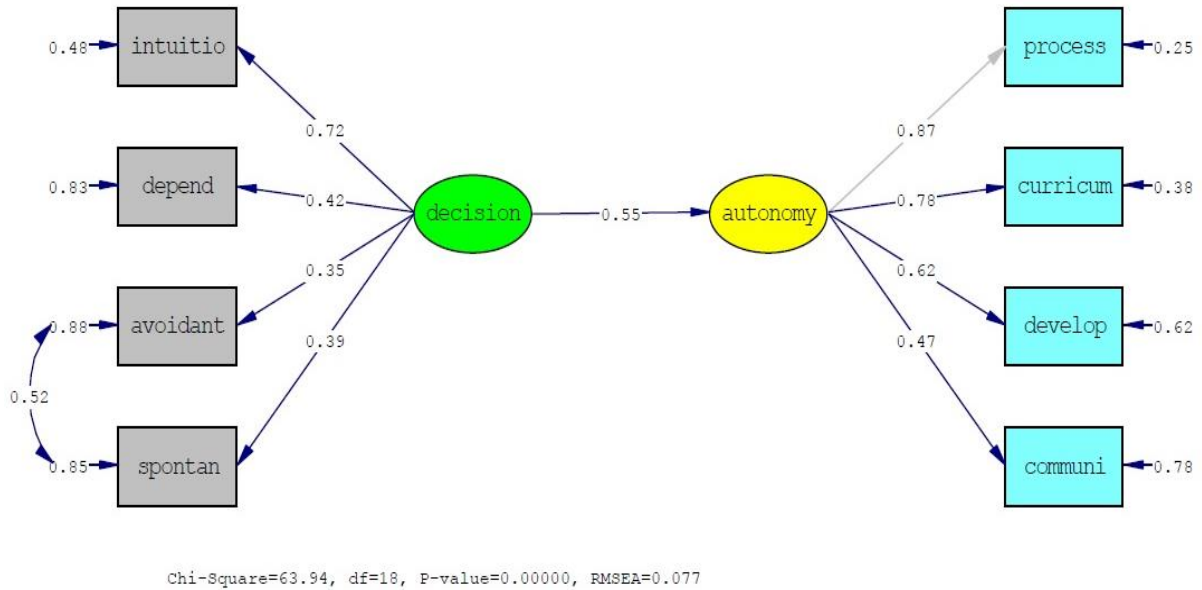
¹(Kline, 2011), ²(Schermelleh-Engel & Moosbrugger, 2003), ³(Baumgartner & Homburg, 1996; Bentler, 1980; Bentler & Bonett, 1980; Marsh et al., 2006), ⁴(Browne & Cudeck, 1993)

In the second stage, the three-step path analysis by Baron and Kenny (1986) was used to test the theoretical model. In this analysis, the independent variable should have an effect on the dependent variable and the mediating variable. When the mediating variable is included in the path analysis along with the independent variable, it is expected that the effect of the independent variable on the dependent variable will decrease while the significant effect of the mediating variable on the dependent variable will persist (Avcı & Turunç, 2012). A decrease in the coefficient of the independent variable in the analysis indicates partial mediation, while the complete elimination of this relationship indicates full mediation (Ari, Bal & Bal, 2010). To statistically explain these relationships, the significance of the z-value in the Sobel test needs to be examined (Gücel, 2013). In this context, the Sobel test was used to confirm the mediation in the model. All measurements were interpreted using the significance level of 0.05, for educational researches.

FINDINGS

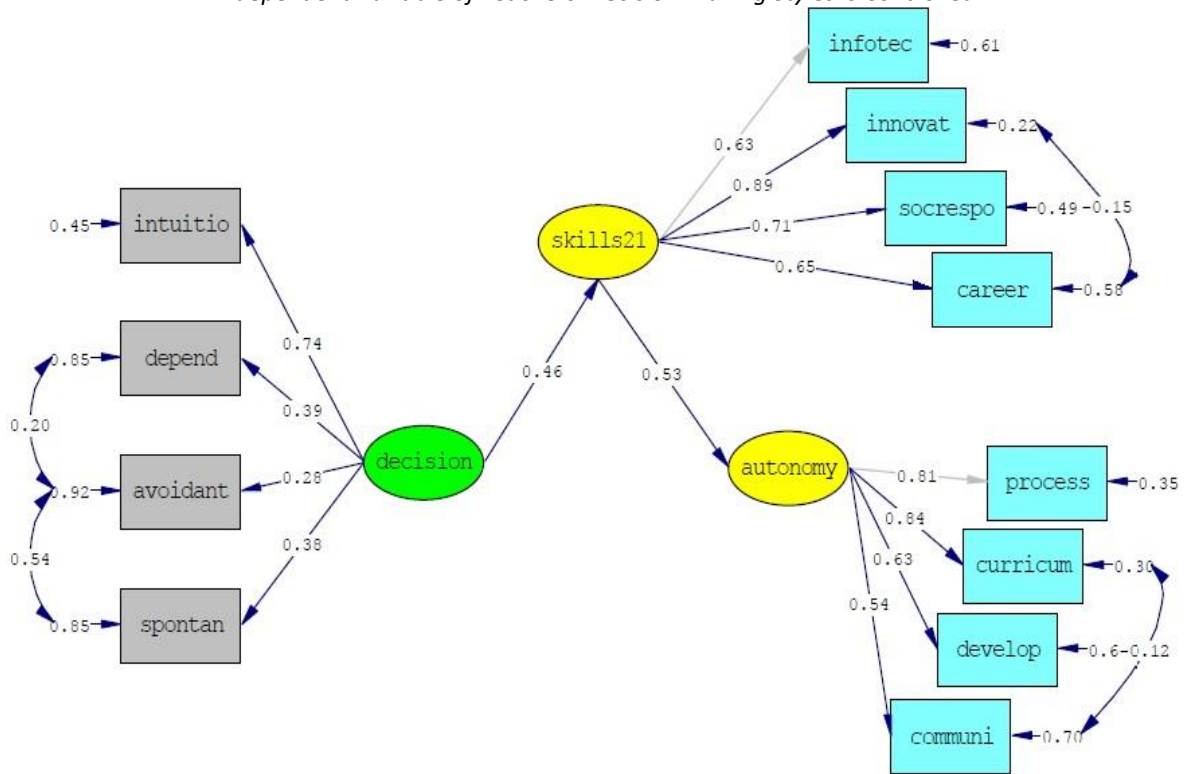
In the first stage, when examining the relationship between teachers' decision making styles and professional autonomy in the sub-dimensions; the rational decision making style sub-dimension was removed from the analysis because it fell below the critical t-value of 1.96 (Şimşek, 2020). Then, when examining the χ^2/df value, if it is less than 5, it is considered an acceptable value, but if it is less than 3, it is considered a good value (Klem, 2000). An RMSEA of 0.08 or lower is considered an acceptable fit of error estimate (Heubeck & Neill, 2000; Thompson, 2000). Modification was made on the model between the avoidance and spontaneous decision making styles, and it was observed that the model had a χ^2/df value of 3.55 (63.94/18), and an RMSEA value of 0.077, which is less than 0.80. Additionally, the AGFI of the model was determined as 0.93, NFI as 0.95, and CFI as 0.96. Therefore, the relationship between teachers' decision making styles and professional autonomy was found to be statistically significant with a value of 0.55.

Figure 3. The Relationship between Teachers' Decision Making Styles and Professional Autonomy



In the second stage, when evaluating the relationships between teachers' decision making styles and 21st century skills, as well as 21st century skills and professional autonomy in the sub-dimensions; critical thinking and problem-solving skills and rational decision making style were removed from the model because they fell below the critical t-value of 1.96 (Şimşek, 2020). Modifications were made between dependent and avoidance decision making styles, between avoidance and spontaneous decision making styles, between entrepreneurship and innovation and career consciousness skills, and between curriculum and professional communication autonomies for the fit values. As a result, it was observed that the model had a χ^2/df value of 3.60, and an RMSEA value of 0.078, which is less than 0.80 (given in Figure 4). Additionally, the AGFI of the model was 0.90, NFI 0.93, and CFI 0.95. According to the results, there is a statistically significant relationship between teachers' decision making styles and 21st century skills with a value of 0.46, and when controlling for the effect of the decision making styles as an independent variable, there is a significant relationship between 21st century skills and professional autonomy with a value of 0.53.

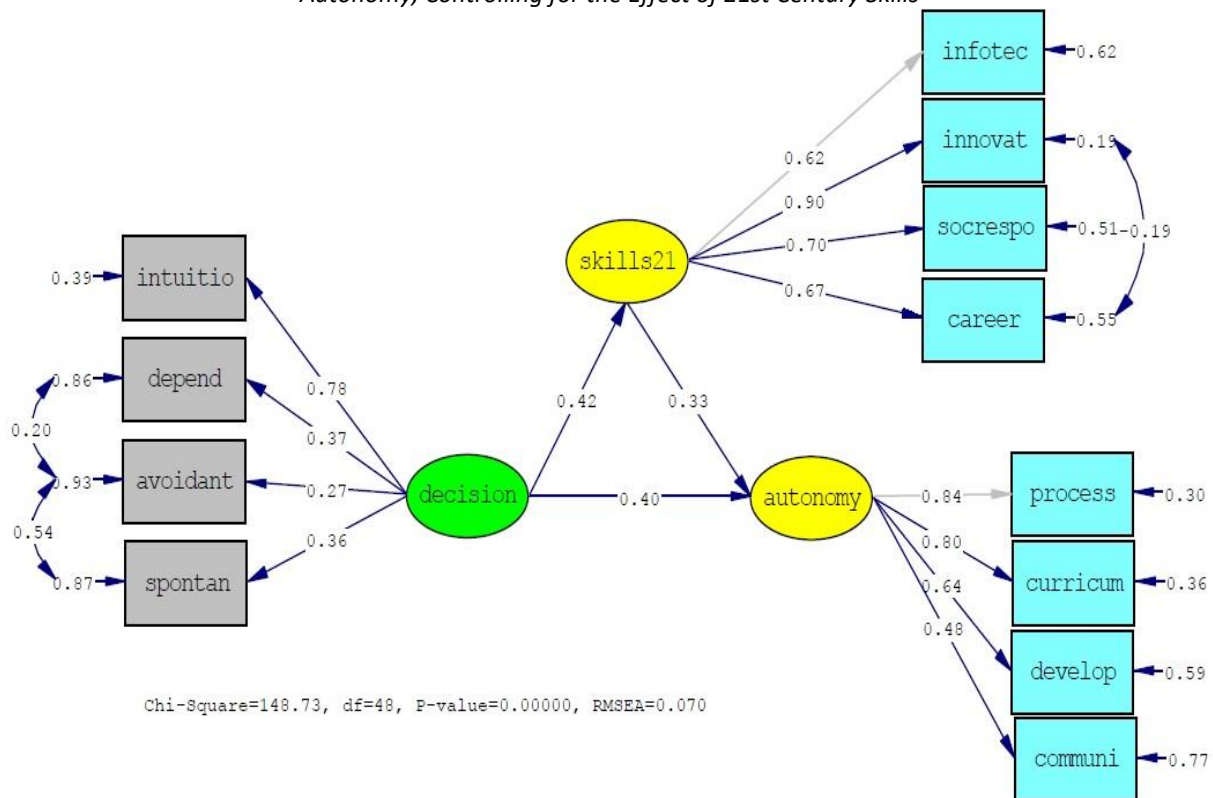
Figure 4. The Relationship between 21st Century Skills and Professional Autonomy when the Effect of the Independent Variable of Teachers' Decision Making Styles is Controlled



Chi-Square=173.23, df=48, P-value=0.00000, RMSEA=0.078

In the final stage, when evaluating the relationships between teachers' decision making styles and 21st century skills, as well as 21st century skills and professional autonomy, and decision making styles and professional autonomy in the sub-dimensions; critical thinking and problem-solving skills and rational decision making style were removed from the model because they fell below the critical t-value of 1.96 (Şimşek, 2020). Modifications were made between dependent and avoidance decision making styles, between avoidance and spontaneous decision making styles, and between entrepreneurship and innovation and career consciousness skills for the fit values. As a result, it was observed that the model had a χ^2/df value of 3.61 (173.23/48), and an RMSEA value of 0.070, which is less than 0.80 (given in Figure 5). Additionally, the AGFI of the model was as 0.90, NFI as 0.93, and CFI as 0.95. Therefore, there is a statistically significant relationship between teachers' decision making styles and 21st century skills with a value of 0.42, when controlling for the effect of decision making styles as an independent variable. There is also a significant relationship between 21st century skills and professional autonomy with a value of 0.33, and when controlling for the effect of 21st century skills, there is a relationship of 0.40 between decision making styles and professional autonomy.

Figure 5. The Theoretical Model of the Relationship between Decision Making Styles and Professional Autonomy, Controlling for the Effect of 21st Century Skills



When the model data fit is examined, it was seen that the χ^2/df value of the model was 2.97 (142.81/48), and the RMSEA value of 0.070, which was less than 0,08. In addition, the AGFI of the model was 0.91, the NFI 0.94 and the CFI 0.96. When the obtained fit statistics were evaluated as a whole, it was concluded that the model data fit was achieved. The total effect of teachers' decision making styles on their professional autonomy is found to be 0.55, and when 21st century skills are included in the model, this effect decreases to 0.40, which is still significant. In the literature, it is stated that if the relationship between variable X (decision making styles) and variable Y (professional autonomy) shows a decrease when variable M (21st century skills) is included, as long as it is different from zero, it indicates a significant mediating relationship (Preacher & Hayes, 2004; MacKinnon, 2008; Judd & Kenny, 2010; Rucker et al., 2011). In this context, the findings suggest that 21st century skills partially mediate the relationship between teachers' decision making styles and professional autonomy.

The amount of variance (R^2) explained by the model for 21st century skills and decision making styles has been examined. When the direct effect of decision making styles on professional autonomy is examined, it explains %30 of autonomy. When the direct effect of decision making styles on 21st century skills is examined, it explains %21 of 21st century skills. When the direct effect of 21st century skills on professional autonomy is examined, it explains %28 of autonomy. It has been determined that decision making styles and 21st century skills together explain %38 of the total variance in professional autonomy. Therefore, with the model, 21st century skills have increased the proportion of teachers' decision making styles in explaining their professional autonomy. It can be said that 21st century skills account for %38 of the underlying behaviours and reasons in explaining which styles teachers are inclined to in the decision making process regarding their professional autonomy.

Finally, a Sobel test was conducted to demonstrate the significance of the mediating role of 21st century skills in the impact of teachers' decision making styles on their professional autonomy. The Sobel test confirmed the statistical significance of the mediating effect, and the significance of the indirect effect was also supported by the Sobel z-value ($z=3.91$; $p<.05$). In light of these findings, when 21st century skills were added to the model, the influence of decision making style decreased but remained significant, indicating that 21st century skills act as a partial mediating variable.

DISCUSSION, CONCLUSION AND IMPLICATIONS

In this study, a theoretical model was tested regarding the mediating role of teachers' 21st century skills in the relationship between teachers' decision-making styles and professional autonomy. Due to the multidimensional nature of the measurement tools, direct and indirect effects were examined along with the sub-dimensions. The research results indicate that decision making styles have a direct impact on teacher autonomy. Öztürk (2011) stated that it is challenging to establish a universally valid autonomy model worldwide, but autonomy approach cannot exist without the active participation of teachers in decisions related to school management. Öztürk emphasized that teachers should not only be implementers but also decision makers. Ertürk (2020) highlighted the importance of teachers' ability to make important decisions professionally in teacher autonomy. Ertürk defined the authority and desire to make decisions related to job-related behaviours as a precondition for the free use of professional expertise. Kılıç, Bozkurt, and İlhan (2018) concluded in their qualitative paradigm study that teacher autonomy should provide freedom by involving teachers in decision making processes. Ulaş and Aksu (2015) see having a say in school decisions as an element of autonomy. Bozkurt and Kara (2022) found that teachers feel more autonomous in educational processes where they can make direct decisions. Additionally, involving teachers in the decision making processes in schools has been suggested to promote autonomy. The findings of this study are consistent with these studies as they also focus on the influence of decision making behaviours on autonomy.

Maviş-Sevim (2020) aimed to determine teachers' views on their autonomy in decision making processes and their participation in these processes in qualitative research. According to teachers' views, although many teachers feel competent in decision making, they do not have autonomy. When these variables, which are examined as a theoretical model, are addressed in a qualitative study, the finding that decision making behaviour does not lead to autonomy constitutes a contradictory result. The reason of different results from two studies can be explained by school standards. Especially when autonomy is concerned for teachers; school principals and parents play a suppressing role. Additionally, factors that hinder autonomy are associated with centralized programs and exams in some studies (Aksoy & Gözütok, 2017; Glass, 1997; Moomaw, 2005; Ramos, 2006; Yazıcı & Akyol, 2017). These situations may be the reason why autonomy, which should theoretically occur, does not manifest in practice.

According to the research results, decision making styles have a direct impact on teachers' 21st century skills. Belet-Boyacı and Güner-Özer (2019)'s study states that individuals who have 21st century skills and use them as a superior identity have correct decision making mechanisms in order to establish a place and have a say in society. This finding, which suggests that having 21st century skills, influences decision making, is not consistent with the findings of this study. The reason for this discrepancy can be explained by the fact that Belet-Boyacı and Güner-Özer's study was conducted through a literature review, while this study was conducted with data from teachers. At this point, the difference between the studies is not seen as a disadvantage, and it is also considered that there can be a bidirectional relationship between 21st century skills and decision making.

According to the research results, it was found that 21st century skills have a direct impact on teacher autonomy. Koçak and Karatepe (2022) emphasize in their study that there is a positive and

significant relationship between autonomy and 21st century teaching skills. This indicates that as teachers' 21st century teaching skills increase, their level of autonomy may also increase. The 21st century teaching skills scale consists of sub-dimensions such as management, techno-pedagogical, approving, flexible teaching, and productivity skills. Despite their study with a different scale, Koçak and Karatepe obtained similar results. Considering that the two scales may show parallelism in skills such as management, technology, flexibility, and productivity; the findings of their study support this result.

The most significant result of this study is that the mediating role between teachers' 21st century skills and their decision making styles in relation to professional autonomy is statistically significant, and all hypotheses related to mediation have been confirmed. In light of these findings, it was observed that the effect of decision making styles decreases but remains significant after adding 21st century skills to the model, indicating that 21st century skills act as a partial mediating variable in this relationship. This relationship implies that teachers' mastery of 21st century skills in decision making situations related to professional autonomy plays a determining role, and it can be said that a prerequisite for being professionally autonomous as a teacher is the sufficient utilization of 21st century skills in decision making style tendencies. Therefore, rational and logical decisions supported or developed by teachers with 21st century skills indicate the experience of an autonomous process in the areas of the educational process, educational programs, professional development, and communication.

It is an expected finding that decision making styles significantly influence teachers' professional autonomy through 21st century skills. However, no research findings were found in the literature where the direct and indirect effects of these three variables were simultaneously tested. However, according to Gerrig and Zimbardo (2018), the decision making process involves actions such as goal setting, information gathering, option identification, analysis, evaluation, and interpretation. According to Deniz, Çok, and Duyan (2013), autonomy means assuming responsibility for decisions and actions with free will without completely separating from the decisions and behaviours exhibited. At this point, it is believed that decision making is a prerequisite for autonomy based on the definition of autonomy itself. Ramos (2006) explains the development of autonomy behaviours among teachers with the concepts of self-awareness, awareness, problems, participation and collaboration, responsibility, and changing roles. Bozkurt (2018) and Özgüzel (2018) list the 21st century skills that a qualified individual should possess as research, inquiry, creativity, critical and analytical thinking, decision making, and generating solutions to complex situations. In this context, it was anticipated that decision making and autonomy would have similarities within the scope of 21st century skills due to the shared and similar expressions such as research, inquiry, information gathering, analysis, analytical thinking in decision making definitions, and expressions such as decision making, problem-solving, responsibility, collaboration, and participation in autonomy definitions. These similarities support the structure of the theoretical model developed in this study. This situation provides evidence for the necessity of establishing this theoretical model and the effectiveness of the model.

According to the research results, in-service trainings can be provided to support the development of 21st century skills in areas such as knowledge and technology, critical thinking, problem solving, entrepreneurship, innovation, social responsibility, leadership, and career awareness. It is predicted that teachers, who develop in 21st century skill areas, will have a positive influence on their professional autonomy behaviours through rational tendencies in decision making styles. Specifically, identifying strengths and weaknesses within the scope of 21st century skills and focusing on developing weaknesses and channelling strengths into the right areas can be encouraged. Interactive development can be facilitated by creating working groups between teachers with high and low levels of 21st century skills. Training programs suitable for decision making styles can be organized by determining teachers' decision making behaviours, attitudes and styles to enable them to make rational decisions. As a result, teachers' autonomy levels should be determined in terms of the

teaching process, curriculum, professional development, and communication. Factors that hinder autonomy should be identified and eliminated, and teachers' professional autonomy should be supported and enhanced. Furthermore, the relationship between 21st century skills, decision making styles, and autonomy variables can be reflected in pre-service and in-service teacher training programs. Program design and development studies can be conducted to reflect this relationship. Decision making training programs can be created with the help of 21st century skills. The effects can be monitored through quantitative and qualitative research on the implementation of the programs.

Despite the existence of many studies on 21st century skills, decision making styles, and teachers' autonomy, there is a lack of study that addresses these three variables within a single model. Therefore, it is expected that this study will contribute to the literature. To obtain similar or different results on this research topic, the study can be conducted with a different design or sample group. The study is limited to teachers working in schools located in the Nazilli district of Aydın province during the 2021-2022 academic year. Specifically, the obtained data can be complemented and compared with qualitative research on similar topics. Additionally, this study was conducted across all levels and disciplines. Therefore, it is suggested to restructure the research by selecting schools and teachers from different regions, cities, and levels at different times. Particularly, including academics, who play an important role in teacher education in this study, and comparing them with practicing teachers based on this data can yield different results. Moreover, the study conducted with three variables can be carried out with different variables or the model can be retested by adding new variables.

ETHICS

During the 2021-2022 academic year, with the decision numbered E-74083975-605.01-45076192 taken from Aydın Governorate, official permissions and ethical permissions were obtained from the Aydın Directorate of National Education to conduct the research.

AUTHOR CONTRIBUTIONS

All authors have made substantial contributions to the manuscript development and preparation.

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