



Teachers' Perceptions about the Relationship between 21st Century Skills and Managing Constructivist Learning Environments

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The purpose of this study is to examine the associations between the perceptions of primary school teachers about their proficiencies in terms of 21st century skills and their perceptions in relation to managing constructivist learning environments by means of structural equation modeling (SEM). The sample of the study included the classroom teachers from the province of Eskişehir. One hundred eighty-four females and 88 male teacher participated to the study. 21st century skills scale and TCLES were used to derive teacher perceptions regarding their proficiencies in 21st century skills and their use of constructivist approaches in the classrooms. The results revealed that 21st century skills were positively related to teachers' perceptions of the constructivist learning environment. Based on these results, a simple implication could be that when the teachers possess strong perceptions in relation to problem solving, critical thinking, cooperation, communication and creativity, they may appear to provide their students with learning environments that are more open to students' inquiry and investigation and that are thus more conducive to positive student attitudes.

Keywords: 21st century skills, constructivism, learning environment, SEM, classroom teachers

INTRODUCTION

There has been a recent emphasis on improving the quality of education over the past decade. In this trend, a fierce debate is taking place about the most important knowledge and skills of 21st century. Global education reform movements goal is preparing students to solve complex problems associated with living in a competitive, technology-intensive world. Twenty-first century learners are digital learners and independent thinkers. They are absorbing the world around themselves by digital computing devices including the cellular phones, iPads, computers and gaming consoles (Palfrey & Gasser, 2008). They have an almost instant access all around the world, communicating with a click of a button (Perry & Stallworth, 2013). These students also have high expectations for speediness (Lemley et al., 2014) and access to information. In order to manage the realities of 21st century, learners require education systems to change their practices. It is

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clear that the goals of education can no longer simply provide basic literacy skills for the students. Education systems should provide higher order thinking skills and competencies for all students. For these reasons, education systems should integrate “21st century skills” into the core curriculum. School systems have to enable students to develop the knowledge, skills and characteristics that will lead them to become personally successful, economically productive, and actively engaged citizens.

Although researchers and educators have come up with many definitions of the 21st century skills, they generally refer to skills required by the learners in order to cope up with the realities and conditions of the 21st century that are different from the previous century in terms of its focus on technology, digital work and more generally on the meaning and application of knowledge. That is, 21st century skills encompass such basic skills as critical thinking, problem solving, creativity, communication, collaboration, innovation, teamwork, decision making, leadership, knowledge application, self-direction and learning how to learn (Partnership for 21st Century Skills, 2009; Organization of Economic Cooperation and Development, 2005; Larson & Miller, 2011).

The framework created by Partnership for 21st century skills (P21, 2009) has been more widely adopted because of its thematic relevancy for the 21st century and well-structured design. In this framework, 21st century skills are identified by three sets of skills: (1) *learning and innovation*, (2) *life and career skills*, and (3) *information, media and technology skills*. The P21 framework defines each skill set with specific key capabilities. *Learning and innovation skills* consist of competencies for engaging in critical thinking and problem solving, communicating, collaborating, and being creative and innovative. These skills focus on creativity, critical thinking, communication and collaboration which are widely known as the 4Cs and these are essential to prepare students for a more complex life and work environments. *Digital literacies* cover the following three components: information, media and technology. Information literacy (IL) has been defined as being “able to recognize when information is needed and having the ability to locate, evaluate, and effectively use the needed information” (American Library Association, 1989, p. 1). Media literacy (ML) refers to the ability to decode, evaluate, analyze, and produce print and electronic media (Aufderheide, 1997). Technology literacy points to the ability to use digital technology, communication tools, and/or networks to access, manage, integrate, evaluate and create information (International ICT Literacy Panel, 2002). Effective citizens and workers of the 21st century must be able to represent a range of skills related to information, media and technology (P21, 2015). *Life and career skills* include capabilities to be flexible and adaptable, have a self-direction, engage in social and cross-cultural interactions, be productive and accountable, and have the potential to manage leadership and responsibilities.

The skills defined above are necessary to ensure the student mastery of 21st century. Curriculum, instruction and learning environments must be aligned to produce a support system that will lead to the 21st century outcomes for today's students. Twenty-first century skills are often generic and tacit in nature and they require distributed learning

(Bransford et al., 2000; Sawyer, 2006). Their development may require an orchestrated and coherent learning environment at curricular levels (Lee et al., 2013)

Teachers Role on 21st Century Skills and Designing Constructivist Learning Environments

Holland (1997) claimed that the environments foster the development of competencies, motivate people to engage in different activities, and reward people for their display of values and attitudes. Environment thus influences personal and professional self perceptions, competencies, attitudes, skills, and values. Constructivism is a popular approach at designing learning environments. Constructivism is a view of learning that students actively construct knowledge and learn based on their interaction with their environments. In constructivist approach, learning is taking place not because of the transference of knowledge from teacher to student via text or a personal knowledge base, but because the students interpret and make sense of their surroundings. In this context the teacher's role is to facilitate activities that will guide the learner into developing meaningful concepts (Peters & Stout 2006). Therefore, the design of learning environment is one of the most important factors to support the constructivist learning. Creating an effective learning environment has become one of the teachers' challenges in helping students engage in and take responsibility for their own learning (National Research Council, 1996). Teachers are key actors who shape students' learning and have a critical role in implementing new approaches to learning. Leithwood et al (2009) confirm that teachers are important school-based factors in impacting student achievement. Hence, the development of education reforms relies heavily on teacher's capacity, perspective, motivation, commitment and their belief systems. Teacher belief systems are the most important factor to adopt constructivist practices (Levin & Nevo, 2009). Beliefs and behaviors work collaboratively (Levitt, 2002) and beliefs have a powerful effect on teacher's classroom practices (Fullan, 2011). As teachers' epistemological beliefs guide their instructional and curricular decision making and their desire to adopt new pedagogies, opportunities to challenge and realign beliefs are critical if constructivist practices are to be adopted (Brand & Moore, 2011).

A constructivist approach to teaching 21st century skills involves new roles and demands on teachers. Teachers should understand the goals of constructivist curriculum, the students in their classrooms, and how to structure the learning environment to meet their needs. The most important way to improve productivity in educational environments based on constructivist approach is to take teachers' personal beliefs and values into account. Since the teacher is a critical component in the teaching and learning processes, identifying teacher perceptions about their own learning environment is necessary to implement the tenets of the constructivist reform movement in the classrooms. Thus, the purpose of this study is to examine the associations between the perceptions of primary school teachers about their proficiencies in terms of 21st century skills and their perceptions in relation to managing constructivist learning environments by using structural equation model.

METHOD

This study was conducted by means of structural equation modeling (SEM) which aims at examining the set of relationships within a set of interacting variables (Nokelainen, 2007). SEM is a comprehensive statistical approach used to test the models in which there are casual (represented with single-headed arrows) and correlational relationships (represented with bi-directional arrows) between clear (observed and measured) and latent (unobserved and unmeasured) variables (Hoyle, 1995). Taking a confirmatory rather than an exploratory approach, SEM introduces the details of the possible relationships among variables (Suhr, 1999). For parameters prediction and determination of model significance in the analysis of structural equation models, the following steps suggested by Eroğlu (2003) were adopted: (1) developing a theoretical model, (2) drawing a path diagram showing the casual relationships for the model developed, (3) transforming the diagram drawn into structural and measurement models, (4) predicting and assessing the structural model, (5) computing the eligibility criteria for the structural model and lastly (6) interpreting the results.

The Sample

The sample of the study included the classroom teachers from the province of Eskişehir. These participant teachers were conveniently sampled from seven primary schools located in Eskişehir. The data were screened for missing values and outliers, and the analyses were performed on the final sample of 233 teachers (184 females and 88 male teacher).

Data Collection Instruments

21st century skills scale

The original scale developed by Anagün et al (2016) aimed to measure teacher candidates' perceptions about 21st century skills. Following the main stages of instrument development (review of literature, composition of the item pool, seeking expert opinions on the draft form of the scale, pilot study and determination of the construct validity), the final form of the 21st century skills was developed. For the analysis of construct validity, the data from a sample of 233 teachers were first subjected to explanatory factor analysis (EFA) and that from another sample of 233 teachers were then subjected to confirmatory factor analysis (CFA). As a result of the exploratory factor analysis, 42 items remained on the draft scale and these items were collected under three factors named as *learning and innovation skills*, *life and career skills*, and *information, media, and technology skills*. Confirmatory factor analysis on the 21st century skills competency scale confirmed the factor structure of 42 items, and this model was found to be theoretically and statistically valid. Accordingly, the validity and reliability analyses on the 21st Century skills scale developed for the prospective teachers showed that the scale had sufficient psychometric properties. The same scale was administered to the teachers in this study and Cronbach Alpha coefficient was found to be .78 on the total scale, which means that the instrument revealed good and acceptable internal consistency reliability with the sample of the study (Spector, 1992; Kline, 1999).

The Constructivist Learning Environment Scale- Teacher Form (TCLES)

CLES as an instrument assessing students and teachers' perceptions about their learning environments. TCLES was developed to better enable teachers and researchers to determine teacher perceptions regarding the use of constructivist approaches in the classrooms. As evidenced by its widespread implementation and established validity in various countries, the CLES teacher form was selected for use in this study with its further ability to characterize specific dimensions of the constructivist classroom. TCLES is a valuable tool for assisting researchers and teachers in assessing the degree to which a classroom's environment is consistent with a constructivist epistemology, as well as for assisting teachers in reflecting on their epistemological assumptions and reshaping their practices. Modifications were performed to make this instrument better suited to assess the teachers' viewpoints. The TCLES was adapted to Turkish by Anagün & Anılan (2013). The validity and reliability analyses of the survey were performed on 449 teachers randomly selected from primary schools in Turkey. The validity of TCLES was examined by means of explanatory and confirmatory factor analyses while the internal consistency of the scales was sought through cronbach alpha coefficient. While the original instrument included 30 items, the results from the factor analyses revealed that the Turkish adaptation of the original survey resulted in six factors and 18 items with internal consistency reliabilities ranging from .50 to .78 which supported the reliability of the instrument.

Procedure

The data for this study have been elicited from the teachers included in the sample by means of the data collection instruments utilized. Prior to data analysis, the following procedures were performed:

- (i) The relationship between the primary school teachers' perceptions regarding 21st century skills and their perceptions of constructivist learning environment was investigated using Pearson product-moment correlation coefficient. SPSS was used for the analyses of correlations.
- (ii) The relationship between the primary school teachers' perceptions regarding 21st century skills and their management of constructivist learning environment was investigated using Path Analysis based on structural equation modelling that is a type of multivariate statistics. The results from the factors of 21st century skills were identified as an exogenous variable while those from the factors of constructivist learning environment treated as an endogenous variable. The independent variable (21st century skills) have direct and indirect effects on the dependent variable (constructivist learning environment).

Data Analysis

Once data collection procedures and the composition of various data files were complete, a variety of analyses were completed. Confirmatory Factor Analysis (CFA) to operationalize the measures, goodness of fit indices for the measurement model, structural equation modeling (SEM), and fit statistics for the structural model to understand linkages among the latent variables using Linear Structural Relations

(LISREL) were included in the analyses. Subsequently, a two-step LISREL (Jöreskog & Sörbom, 1996) approach was used to further simplify and operationalize the measured variables used in developing the SEM and to generate goodness of fit statistics to determine the adequacy of the measurement and structural models. The descriptive statistics pertaining to the perceptions of proficiency in 21st century skills and constructivist learning environment were presented separately for each of sub-scales. Moreover, to see if the total means on the sub-scales significantly differs from the expected mean, one-samples t-test was conducted. As one samples t-test is a parametric test, Skewness and Kurtosis values were examined first to see if the scores on each of the sub-scales showed any violation of normality. Given the Skewness and Kurtosis for normality, the criterion that the obtained values are to be between -1 ve +1 was accepted. Thus, it was observed that the assumption of normality was violated for each sub-scale of the constructivist learning environment and these sub-scales were omitted from the one-sample t-test analysis mentioned above.

Following the above procedures, a measurement model was performed to investigate the associations between 21st century skills and constructivist learning environment. Prior to the testing of the model, the data were examined for multivariate normality and it was found that the assumption of multivariate normality was violated for each of the scales included in the study ($p < .05$). Therefore, for rotation, robust maximum likelihood was preferred instead of the standard maximum likelihood technique.

FINDINGS

The results from the one-sample t-test conducted to see if the total means on the sub-scales significantly differs from the expected mean and those from the descriptives pertaining to the sub-categories of 21st century skills and constructivist learning environment are presented in Table 1.

Table 1
The Results from Descriptives and One-sample t-tests

Scale	N	Minimum	Maximum	\bar{X}	SS	t
21st Century Skills						
Learning and Innovation	233	44	80	65.95	7.98	34.354**
Life and Career	233	54	86	74.23	6.50	47.465**
Information, Media and Technology	233	27	45	39.05	4.54	50.599**
Constructivist Learning Environment						
Student Negotiation	233	7	15	11.78	1.99	21.257**
Shared Control	233	7	15	11.33	1.96	18.076**
Personal Relevance	233	7	15	11.56	1.91	20.478**
Critical Voice	233	7	15	11.80	1.90	22.428**
Uncertainty	233	8	15	11.80	1.93	22.140**
Attitude	233	8	15	11.93	1.86	23.986**

**p < .01

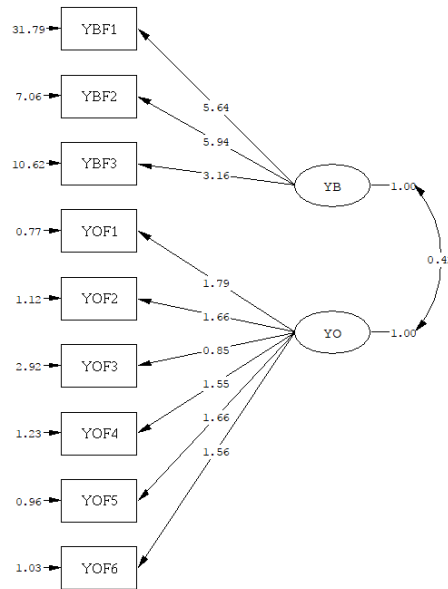
The results from the one-samples t test indicated that the total means on the sub-categories of 21st century skills and constructivist learning environment significantly differed from the expected means ($p < .01$), which means that teachers' perceptions of managing constructivist learning environment are associated with their perceptions regarding their proficiencies in 21st century skills.

A structural equation model was tested to investigate the associations between 21st century skills and constructivist learning environment. Prior to this analysis, data were examined for the assumption of multivariate normality and it was seen that this assumption was violated ($p < .05$). Therefore, asymptotic covariance matrix was obtained and Robust maximum likelihood method was performed for the following analyses. Prior to the testing of the structural equation model, a confirmative factor analysis (CFA) was performed for each scale used in the study. Table 2 shows the fit indices from the CFA.

Table 2
The Fit Indices from the CFA of the Study Instruments

Dimension	χ^2/sd	RMSEA	SRMR	CFI	GFI	AGFI
Acceptable Values	≤ 5	$\leq .080$	$\leq .080$	$\geq .90$	$\geq .90$	$\geq .90$
21 st Century Skills	2.19	.072	.071	.96	.69	.66
Constructivist Learning Environment	2.24	.073	.054	.98	.84	.79

In conclusion, it is seen that the factor structures proposed in the 21st century skills scale and constructivist learning environment scale has been confirmed with the main data from this study. In this sence, the total scores from the three sub-dimensions of the 21st century skills scale and those from the six sub-dimensions of the constructivist learning environment were used to test the measurement model proposed. In the model, the total scores from the sub-scales of the 21st century skills and the constructivist learning environment were treated as observed variables. Accordingly, the tested measurement model is depicted in Figure 1.



Chi-Square=65.87, df=26, P-value=0.00003, RMSEA=0.081

YBF1: Learning and Innovation, YBF2: Life and career, YBF3: Information, media and technology, YOF1: Student Negotiation, YOF2: Shared Control, YOF3: Personal Relevance, YOF4: Critical Voice, YOF5: Scientific uncertainty, YOF6: Attitude

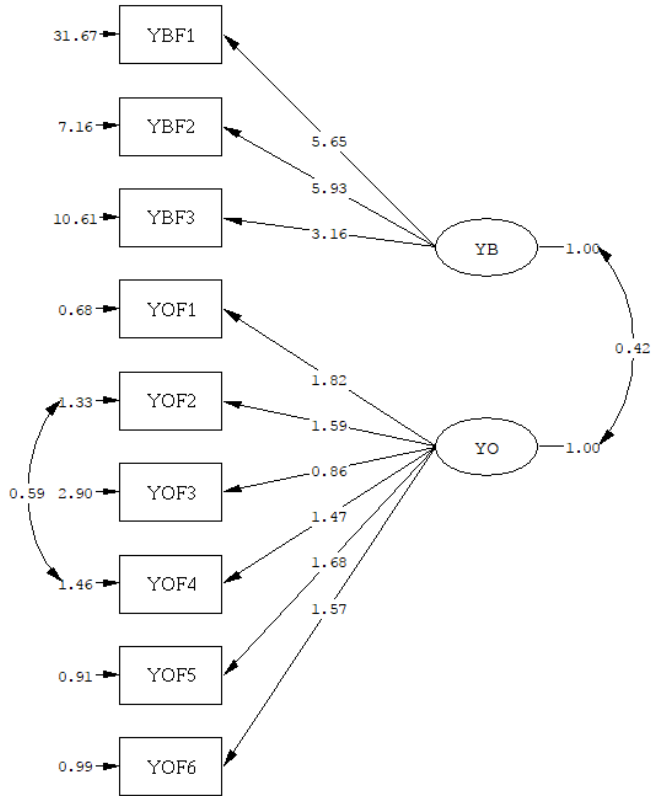
Figure 1
SEM for 21st century skills and constructivist learning environment (first round)

Given the interpretation of the measurement model, in this first round of testing, Root Mean Square Error of Approximation (RMSEA) and Adjusted Goodness of Fit Index (AGFI) revealed no good fit with their unacceptable values (Table 3).

Table 3
The Fit Indices from the Measurement Model (first round)

Dimension	χ^2/sd	RMSEA	SRMR	CFI	GFI	AGFI
Acceptable Values	≤ 5	$\leq .080$	$\leq .080$	$\geq .90$	$\geq .90$	$\geq .90$
Model	2.53	.081	.039	.98	.93	.88

When the modifications were sought, it was seen that the errors included in the sub-scales of critical voice and shared control could be associated with one another. Therefore, based on the assumption that all sub-scales converge to compose the main construct of constructivist learning environment, the errors pertaining to these sub-scales were also associated with one another and the model was tested again (i.e. the second round of testing). This retested measurement model is depicted in Figure 2 and relevant fit indices are shown in Table 4 below.



Chi-Square=37.58, df=25, P-value=0.05080, RMSEA=0.047

Figure 2

The measurement model tested for 21st century skills and constructivist learning environment (second round)

The results shown in Table 4 support a good fit of the variables to the measurement and structural models.

Table 4

Fit indices from the Measurement Model (second round)

Dimension	χ^2/sd	RMSEA	SRMR	CFI	GFI	AGFI
Acceptable Values	≤ 5	$\leq .080$	$\leq .080$	$\geq .90$	$\geq .90$	$\geq .90$
Model	1.50	.047	.035	.99	.96	.94

The path coefficients from the measurement model are given in Table 5.

Tablo 5
Path Coefficients from the Measurement Model

Variables	Standardized Factor Coefficients	Unstandardized Factor Coefficients	SE	t
21st Century Skills				
Learning and Innovation	5.65	.71	.48	11.85**
Life and Career	5.93	.91	.41	14.40**
Information, Media, and Technology	3.16	.70	.28	11.49**
Constructivist Learning Environment				
Student Negotiation	1.82	.91	.09	21.43**
Shared Control	1.59	.81	.10	16.26**
Personal Relevance	0.86	.45	.12	6.97**
Critical Voice	1.47	.77	.10	14.58**
Uncertainty	1.68	.87	.09	19.20**
Attitude	1.57	.84	.09	17.80**

**p < .01

Given the t values in Table 5, all the paramers were significant, $p < .01$. As the measurement model has fit the model, a structural equation model was tested by associating the perceptions of 21st century skills and constructivist learning environment were associated with one another. Moreover, the above structural equation model reveals that student perceptions of Proficiency in 21st century skills accounted for 18 % of the variance in the perceptions of constructivist learning environment and the remaining 82 % of the variance were explained by the other variables.

The relationship between the perceptions regarding 21st century skills and the sub-scales of constructivist learning environment were examined by means of Pearson product-moment correlation coefficient and these coefficients were depicted in Table 6.

Table 6
The Relationship between the Perceptions of 21st Century Skills and the Sub-scales of Constructivist Learning Environment

	Learning and Innovation	Life and Career	Information, Media, and Technology
Student Negotiation	.338**	.348**	.239**
Shared Control	.251**	.303**	.228**
Personal Relevance	.134*	.121	.177**
Critical Voice	.273**	.333**	.256**
Uncertainty	.374**	.327**	.235**
Attitude	.324**	.301**	.232**

*p<.05; **p<.01

When the correlation coefficients between the perceptions of proficiency in 21st century skills and the sub-scales of constructivist learning environment were examined, it was seen that there was a moderate significant relationship between the perceptions of proficiency in 21st century skills and the sub-scales of the constructivist learning environment with the exclusion of personal relevance sub-scale.

DISCUSSION

This study was conducted to investigate the relationship between the primary school teachers' perceptions regarding 21st century skills and their management of constructivist learning environment and it was found that 21st century skills were positively related to teachers' perceptions of the constructivist learning environment. The results revealed a strong relationship between the learning and innovation sub-scale of the 21st century skills and scientific uncertainty, student negotiation and attitude sub-scales of the constructivist learning environment. Based on these results the implication could be that when the teachers possess strong perceptions in relation to problem solving, critical thinking, cooperation, communication and creativity, they may appear to provide their students with learning environments that are more open to students' inquiry and investigation and that are thus more conducive to positive student attitudes.

A constructivist learning environment is the environment where knowledge is constructed by the students themselves (Brumbaugh & Rock, 2006) and the teachers respecting this above claim in their teaching have their students feel themselves respectful and important. Teachers play an important role in helping students gain the 21st century skills as an important component of today's education system. Therefore, teachers themselves should be able to design, apply and evaluate creative ideas, provide learning experiences that will attract students and enhance their learning, enrich their professional experiences and represent good role models as the teachers of the 21st century (Karakas, 2015).

The results of this study could only provide the degree to which the two main constructs, 21st century skills and constructivist learning environment perceptions are associated with one another as reported by the teachers given the correlational design utilized in the study. Hence, it would be impossible to offer any causal associations or cause-effect relationships. In other words, the above results pertaining to the existence of a link between the teachers' perceptions about their proficiencies in terms of 21st century skills and their capability of managing constructivist learning environments may not provide evidence for their real applications or real behaviors in the classrooms. Saydam (2009), for instance, claimed that though teachers hold positive beliefs towards constructivist approach, they could only partly perform it in their classrooms. Similarly, Anagiün et al (2012) reported that teachers are unable to put their positive attitudes towards constructivist approach into practice when it comes to real classroom situations. Therefore, further studies should investigate the teachers' actual performance and find effective ways to develop teachers' constructivist teaching practices.

The results indicated positive associations between the two main constructs investigated in the study with an exception of those between life and career skills dimension of the 21st century skills and scientific uncertainty sub-dimension of the constructivist learning environment. Thus, it could be implied that primary schools' teachers' holding positive perceptions in relation to entrepreneurship, leadership, responsibility and social and intercultural skills may result in their holding more positive perceptions related to almost all dimensions of a constructivist learning environment. The lack of an association between life and career skills and scientific uncertainty dimension may

derive from the fact that teaching careers or further professional lives of the teachers is more related to the social aspects of constructivist learning environment rather than a pure science content. In contrast to the presence of strong links between managing a constructivist learning environment and proficiencies in 21st century skills found in this study, some studies conducted in Turkey have reported that teachers experienced some difficulties in managing constructivist learning environments. For instance, Mutlu & Güler (2017) reported that teachers faced difficulties in performing authentic instruction that is also based upon a constructivist approach in classroom practices and thus that would normally require the management of a constructivist learning environment by the teachers. The teachers included in Mutlu & Güler's (2017) study faced problems in their managing authentic and constructivist learning environment although the researchers included only those teachers who had already reported that they had been performing authentic instruction in their classrooms.

A further implication based upon the above account could be that though teachers have highly positive perceptions related to their proficiencies in 21st century skills, they may experience difficulties in reflecting such perceptions into their practices. Supporting the above justification, the results from this study also revealed that the associations between the teacher perceptions of the 21st century skills and scientific uncertainty sub-dimension of the constructivist learning environment were lower when compared to those found at the moderate levels between 21st century skills and all the remaining sub-dimensions of the constructivist learning environment. This smaller association on the part of the scientific uncertainty sub-dimension could stem from the fact that this dimension is more related to the teachers' actual management or control of the pedagogical tasks in the class and teachers of this study probably had difficulties in providing opportunities for students to experience scientific knowledge at the necessary levels. Moreover, it is a known fact that the effectiveness of the constructivist teaching and learning process is strongly dependent upon the teachers' attitudes (Saban, 2005), beliefs and in-class behaviors (Evrekli et al., 2009). Therefore, more detailed studies that would enable the researchers to investigate the degree to which the perceptions of the teachers' match with their actual performance in the classrooms. In this essence, participant observations of the teachers' classes could be performed to provide a more detailed picture of the research phenomenon investigated, which could also contribute to the triangulation of the data.

Another important result was the existence of weak or moderate associations over and beyond strong associations. This result may be due to the fact that some critical variables that might act as mediator or extraneous variables were not included as variables in the study. Several researchers (Dorman et al., 2006; Mutlu, 2017) also emphasized the importance of inclusion of these critical variables in linking several variables to learning environment perceptions. Therefore, worthy of further investigation would be the inclusion of some other variables such as teacher self-efficacy, teacher epistemological beliefs or some other teacher attitudinal variables when investigating the associations between the two main constructs in question for the purposes of this study.

The results also revealed that there was a moderate relationship between the information, media and technology sub-scale of the 21st century skills and all of the sub-scales of the constructivist learning environment, which would mean that when teachers feel themselves more capable of their 21st century skills, they also feel themselves more capable of managing a constructivist learning environment. From this result, it might be inferred that if a teacher has information, media and technology skills, this teacher may easily manage a constructivist learning environment that would also require his/her ability to help the students construct information for their learning or learn how to construct information by means of locating, evaluating, analyzing, intergating and using the needed information, and as is expected this usually would require the use of digital or media techologies in today's modern life conditions (Kurt et.al, 2013).

Another result based on the descriptive statistics on the information, media and technology sub-scale pertains to the teachers' weak perceptions about their information, media and technology skills. In other words, it was seen that teachers included in this study perceived themselves less than moderate in terms of their competencies in information, media and technology skills. This result aligns with the results from the studies conducted on the project called The Movement to Enhance Opportunities and Improve Technology (shortened as FATİH in Turkish) started in 2010 in Turkey based on teacher perceptions. Several researchers from these studies (Altın & Kalelioğlu, 2015; Çiftçi et al., 2013; Kurt et al., 2013; Pamuk et al., 2013) reported that teachers were lacking the necessary technological skills and they needed some practical and hands-on training to integrate technology in addition to the theory-based in-service training practices.

CONCLUSION

In this research, it was found that 21st century skills were positively related to teachers' perceptions of managing constructivist learning environment. Thus, it could be inferred from the results of this study that when teachers possess positive perceptions about their proficiencies in terms of 21st century skills, they may also make the necessary arrangements in their classrooms so as to contribute to students' cognitive and affective outcomes. Another result from this study showed that each 21 century skill sub-scale excluding life and career skills positively related to each constructivist learning environment sub-scale except for the scientific uncertainty dimension. That is, when teachers possess positive perceptions about their proficiencies in 21st century skills, they may provide a constructivist learning environment by helping their students arrange their own learning, discuss their personal opinions and criticize the teaching styles or strageies used by their teachers. However, teachers' possession of life and career skills as an aspect of 21st century skills is not linked to their management of a constructivist environment where there is a certain degree of scientific uncertainty. The results also showed that most associations were at the weak or moderate levels pointing out the probable effects of some other variables that may influence the results. These influential variables could relate to teachers themselves or other contextual factors. The inclusion of such factors in the research design for further studies may bring about a broader picture of the research phenomenon investigated. Overall, with some minor exceptions

on the subscales, this study connected teachers' perceptions regarding their proficiencies in 21 st century skills and their skills in managing a constructivist environment. Yet, further research is needed to test the presence of such connections and replicate the results with new samples and contexts.

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