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The Relationship between Flipped Learning Readiness and Metacognitive Self-Regulation in Science Lessons

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The Relationship between Flipped Learning Readiness and Metacognitive Self-Regulation in Science Lessons

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Abstract: This study aims to investigate the potential relationship between flipped learning and learners' self-regulation skills, given that the flipped learning approach requires students to assume greater responsibility for their own learning and engage in higher levels of self-regulated behavior. The research employed a descriptive design within the framework of quantitative methods, specifically utilizing a relational survey model. The study group included 130 middle school students enrolled in two different schools in Erzurum, Turkey, during the 2025-2026 academic year. Analysis of the results revealed no significant gender-based differences in either students' flipped learning readiness or their metacognitive self-regulation skills in the context of science education. Regarding students' access to online resources while preparing for science lessons, findings indicated no variation based on flipped learning readiness levels, although differences emerged in relation to metacognitive self-regulation levels. When students' academic achievement in science was examined alongside their flipped learning readiness and metacognitive self-regulation scores, a moderate yet significant correlation was identified. This correlation was evident between academic success and both variables. Furthermore, a positive and statistically significant relationship was identified between students' flipped learning readiness and their metacognitive self-regulation skills.

Keywords: Flipped learning readiness, Metacognitive self-regulation, Science lesson

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Introduction

The rapid change in information and communication technologies has left its mark on the century we are in and has shown its effect in the field of education as well as in every field. In this direction, the orientation towards approaches and models that can provide the integration of technology, which has become an inevitable part of life, into the field of education has increased. One of the models that provides the opportunity to benefit from technology in the field of education is the flipped learning model (Aslan, 2020; Samaila et al., 2021).

The flipped learning model is named so because it reverses traditional classroom and out-of-class learning activities. In the flipped learning model, the information that will be given to the student in traditional understanding is carried out of the classroom through online videos and the learning process is started before coming to the lesson. Students who come to class by learning the basics try to perform higher-level tasks in the classroom in cooperation with each other, which corresponds to homework in the traditional approach (Bergmann & Sams, 2012; Kaye, 2022; Ranga, 2020; Sohrabi & Iraj, 2016). Therefore, in the flipped learning model, while knowledge transfer is carried out of the classroom, higher-level activities that will increase active learning and social interaction in the classroom environment come to the fore (Abeysekera & Dawson, 2015). In this way, students can perform more active, interactive and collaborative practices in the classroom (Toto & Nguyen, 2009) and internalize the content they will learn with higher-level tasks they take (Crouch & Mazur, 2001; Uddin & McNeill 2024).

In the flipped classroom, students are responsible for their own learning processes and learning speeds (Lai & Hwang, 2016). In this model, since the time spent in the classroom is not used to convey information to students through lessons, other learning activities such as discussion, problem solving, hands-on activities and guidance come to the fore and the teacher can interact with students more effectively in the classroom (Hao, 2016).

The important roles that students take in the flipped learning model, such as planning their time appropriately to comprehend the extracurricular learning content or being responsible for their own learning processes and pace, indicate that students' self-regulation skills are also an important touchstone in this model (Lai & Hwang, 2016; Zhou, 2023). Self-regulated learning consists of three components: cognition, metacognition, and motivation. In the metacognition component, individuals become aware of their knowledge and skills and set their goals accordingly (Zimmerman, 1990). This component is defined as metacognitive self-regulated learning, since metacognitive processes such as creating one's own plan, monitoring, controlling and evaluating oneself are essential in the self-regulated learning process (Banarjee & Kumar, 2014; Lai et al., 2021).

Students with advanced self-regulation skills develop a metacognitive perspective of thinking about what, why and how they learn. In this way, students whose learning behaviors come under their own control become capable of self-regulation (Zimmerman & Moylan, 2009). Therefore, the inability of students with low self-regulation skills to plan their time appropriately to comprehend extracurricular learning content is among the difficulties that may be encountered in the flipped learning model. Conversely, the model will be easier to implement since students with high self-regulation skills will be able to fulfill their responsibilities of adjusting their learning process and speed at a high level (Lai & Hwang, 2016; Sun, et al., 2017). Self-regulation skills, which are related to each other, and the fact that only self-regulation skills are developed in the flipped learning model do not increase the success of the flipped learning model in practice. In addition, learning activities that are well adjusted according to the flipped learning model improve both students' self-efficacy and self-regulation skills (Enfield, 2013; Ng, 2018).

Self-regulation is an important factor for learning success in the flipped learning model. Since students who do not develop self-regulation skills come to the lesson without learning the content effectively, these students will have less interest and participation in classroom high-level activities (Lai & Hwang, 2016). Students with advanced self-regulation skills, on the other hand, will be able to use the materials in the course much more effectively and maximize their learning, as they make better preparations before the lesson (Liu, et al., 2014). In this context, it is very important for students to develop self-regulatory learning strategies so that they can achieve important learning outcomes in the flipped learning environment.

Since the flipped learning model gives students more autonomy in the learning process and increases the need for self-regulation skills at a higher level (He, et al., 2016; Lee & Tsai, 2011; Shih & Huang, 2020), in this study, it was determined whether these two concepts are related to each other. intended to be. In this direction, the research questions are as follows.

1. Do students studying at middle school level differ in their flipped learning mean scores (FL) and their metacognitive self-regulations (MSR) regarding the science course in terms of gender?

2. How do the average scores of FL and MSR change in terms of using the resources that students can access to the internet while studying science?

3. Is there a relationship between students' science course achievement scores, FL and MSR average scores?

4. Is there a relationship between the sub-dimensions of MSR and FL?

Method

Research Model

In this study, a descriptive research model classified under quantitative research approaches was adopted. Within this framework, the relational survey design was employed to explore the association between middle school students' flipped learning and their metacognitive self-regulation in science classes, as well as to identify the extent to which flipped learning predicts metacognitive self-regulation. Relational survey models are considered suitable for investigating the characteristics of a given situation from multiple perspectives (Büyüköztürk, et al., 2010).

Participants

The study sample consisted of 130 students enrolled in two different middle schools located in Erzurum, Turkey, during the 2025-2026 academic year. Participants were selected using the convenience sampling method, which allows researchers to save time, effort, and financial resources while providing practical accessibility to participants (Gürbüz & Şahin, 2015). Of the total participants, 30 students (23.1%) were in the 5th grade, 26 (20%) in the 6th grade, 34 (26.1%) in the 7th grade, and 40 (30.8%) in the 8th grade. Regarding gender distribution, 80 students (61.5%) were female, while 50 (38.5%) were male.

Data Collection Tools

The Flipped Learning Readiness Scale, initially developed by Hao (2016) for middle school students, was later adapted into Turkish by Durak (2017). The instrument includes 26 items distributed across five sub-dimensions: student control and self-directed learning (8 items), technology self-efficacy (9 items), classroom communication self-efficacy (4 items), motivation for learning (3 items), and pre-study (2 items). The internal consistency reliability of the entire scale was reported as .98, while sub-dimension reliability coefficients ranged between .70 and .96 (.94, .96, .90, .82, and .70, respectively). The scale explained 79.3% of the total variance. In terms of construct validity, the fit indices were RMSEA = 0.09, NFI = 0.96, NNFI = 0.96, and CFI = 0.92, all significant at the 0.05 level. Within the scope of the present research, the overall Cronbach's alpha was calculated as .89, indicating high internal consistency.

The Metacognitive Self-Regulation Scale, originally created by Howard et al. (2000) to assess metacognitive awareness and regulation during science and mathematics problem-solving, was adapted into Turkish by Çelik (2017). This instrument consists of five sub-dimensions knowledge, objectivity, problem representation, monitoring, and evaluation and has a reported Cronbach's alpha of .91. The model fit indices were reported as follows: RMSEA = .047, SRMR = .044, GFI = .93, AGFI = .92, CFI = .92, and NNFI = .91, all demonstrating a good model fit.

Before implementation, the items were piloted by adding references to the science course in each statement. The pilot analysis confirmed item compatibility, yielding a Cronbach's alpha of .92. In the current study, the internal consistency coefficient for all items was .95, while the sub-dimensions yielded coefficients of .79 for knowledge, .83 for objectivity, .75 for problem representation, .82 for monitoring, and .84 for evaluation. These findings indicate that the instrument demonstrates strong reliability in assessing metacognitive self-regulation within the context of science education.

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Findings

Normality tests were conducted to determine whether the data obtained from the Flipped Learning Readiness Scale for Middle school Students and the Metacognitive Self-regulation Scale used within the scope of the research showed a normal distribution. If the number of subjects is over 50, it is recommended to use the Kolmogorov-Smirnov test. As a result of Kolmogorov-Smirnov tests, it was determined that $p>.05$. On the other hand, the figure in the detrended graph where the kurtosis and skewness values are +/- 2 is not significant on the zero line. Finally, the data in the histogram graph showed a distribution close to normal. In line with the conditions stated by Pallant (2016), the data show a normal distribution and it is appropriate to perform parametric and correlation analyzes in this regard.

Inferential Statistics

An independent sample t-test was conducted to determine whether the flipped learning average scores of the middle school students and their metacognitive self-regulations regarding the science course differ in terms of gender. The results obtained are summarized in Table 1.

Table 1. Independent Sample t-Test Results in Which the FLR and MSR Scale Mean Scores Were Analyzed in Terms of Gender

	Sex	N	Mean	Standard Deviation	Standard Error	t	p
FLRS	Girl	80	3.85	.63	.07	-.99	.32
	Boy	50	3.96	.51	.07		
MSRS	Girl	80	3.86	.74	.08	.18	.85
	Boy	50	3.84	.67	.09		

Considering the data in the table, both the flipped learning and metacognitive self-regulation of the students in the science lesson do not differ in terms of the gender factor (p>.05).

A one-way ANOVA test was conducted in order to determine how the average scores of FLRS and MSRS changed in terms of using the resources that students can access to the internet while studying the science course. The results obtained as a result of the test are as in Table 2.

Table 2. Change of and MSRS Scores in Terms of Students' Access to Internet Resources While Studying Science Course

Access to Internet Resources	Source of Variance	Sum of Squares	df	Mean of Squares	F	p
FLRS	Between Groups	1.906	2	.953	2.770	.067
	Within Groups	42.658	124	.344		
	Total	44.563	126			
MSRS	Between Groups	4.914	2	2.457	5.115	.007
	Within Groups	59.561	124	.480		
	Total	64.475	126			

Since some students did not respond to the items directed to them in the scale, their forms were excluded from the analysis, and the total sample size was calculated as N = 126. When Table 2 is examined, it was determined that the FLRS average scores did not differ statistically (p>.05) and the MSRS average scores differed (p<.05) according to the factor of students' access to internet resources while studying science. The Bonferroni test was used to determine which groups differed in the mean scores of the MSRS. The findings obtained from the test are as in Table 3.

Table 3. The Results of the Bonferroni Test, in Which the Mean Scores of the MSRS Were Examined in Terms of Their Access to Internet Resources While Studying for the Science Course

Variable	Group		Average Difference	Standard Error	p
MSRS	Rarely	Often	-.36926*	.14360	.034
		Always	-.53311*	.18043	.011
	Often	Rarely	.36926*	.14360	.034
		Always	-.16385	.16276	.948
	Always	Rarely	.53311*	.18043	.011
		Often	.16385	.16276	.948

According to the data in Table 3, in terms of students' access to internet resources while studying science lessons, the mean scores of those who always and frequently apply to these resources are statistically significantly higher than those who rarely apply (p<.05).

Correlation test was conducted to determine the relationship between students' science course achievement scores, FLRS and MSRS average scores. The data obtained from the test are as in Table 4.

Table 4. The Relationship between Science Achievement Scores, FLRS and MSRS Mean Scores

		Science Achievement	FLRS	MSRS
Science Achievement	Pearson Correlation	1		
	p			
FLRS	Pearson Correlation	.365**	1	
	p	.000		
MSRS	Pearson Correlation	.435**	.731**	1
	p	.000	.000	

The reference range on the values is based on Cohen's (1988) standards. Accordingly, the correlation value between .10-.29 indicates a low correlation, between .30-.49 a medium and more than .50 indicate a high correlation. When the findings in Table 4 are examined, it is seen that there is a moderately significant relationship between students' science course success and both FLR and MSR. On the other hand, it was determined that there was a high level of significant relationship between the students' FLRS and MSRS average scores.

Pearson correlation test was used to determine whether there is a relationship between the sub-dimensions of FLR and MSR. The relationship between the mean scores of the sub-dimensions of the scales is summarized in Table 5.

Table 5. The Relationship between the Sub-Dimensions of MSR and FLR

		Information	Objectivity	Problem Representation	Tracking	Evaluation
Student control and self-directed learning	Pearson Correlation	.608**	.662**	.491**	.656**	.617**
	p	.000	.000	.000	.000	.000
Technology self-efficacy	Pearson Correlation	.416**	.468**	.299**	.518**	.463**
	p	.000	.000	.001	.000	.000
Communication self-efficacy in the classroom	Pearson Correlation	.429**	.412**	.348**	.464**	.388**
	p	.000	.000	.000	.000	.000
Motivation for learning	Pearson Correlation	.603**	.583**	.535**	.634**	.561**
	p	.000	.000	.000	.000	.000
Pre-study	Pearson Correlation	.440**	.518**	.305**	.504**	.549**
	p	.000	.000	.000	.000	.000

When examining the relationship between the sub-dimensions of flipped learning readiness and those of metacognitive self-regulation, it was found that student control and self-directed learning were highly correlated with the dimensions of knowledge, objectivity, monitoring, and evaluation; technology self-efficacy was highly correlated with the monitoring dimension; motivation for learning was highly correlated with all sub-dimensions of metacognitive self-regulation; and pre-study was highly correlated with all sub-dimensions of metacognitive self-regulation except for knowledge. Regarding flipped learning, student control and self-directed learning showed a moderate correlation with problem representation; technology self-efficacy was moderately correlated with knowledge, objectivity, and evaluation; classroom communication self-efficacy was moderately correlated with all sub-dimensions of metacognitive self-regulation; and pre-study showed a moderate correlation with knowledge and problem representation. Technology self-efficacy was found to have a weak correlation with problem representation. All identified relationships were positive and statistically significant.

Conclusion and Discussion

The conclusions obtained from the study can be summarized as follows:

- There is no significant gender-based difference between middle school students' flipped learning scores (FLRS) and their metacognitive self-regulation skills (MSRS) related to the science course.
- Students' access to online resources within the scope of the science course does not differ according to their FLRS scores; however, it differs significantly according to their MSRS scores.
- When the findings regarding the relationship between FLRS and MSRS scores are examined, academic achievement is found to have a moderately significant relationship with both variables.
- There is also a positive and significant relationship between FLRS scores and MSRS scores, as well as between the sub-dimensions of these two variables.

When the findings of the study were analyzed, it was found that there were no significant gender-based differences between middle school students' flipped learning readiness (FLRS) scores and their metacognitive self-regulation (MSRS) scores in science courses. In examining students' access to internet resources while studying for science, it was observed that this variable did not vary according to FLRS scores but did differ based on MSRS levels. These results highlight the importance of enhancing students' metacognitive self-regulation

skills when accessing online resources. In other words, learners with higher autonomy tend to approach information searching and resource utilization in a more structured and systematic manner. Thus, it is reasonable to expect a positive relationship between students' ability to access internet resources and their self-regulation skills. Supporting this view, İpek (2019) found that students who used the Education Information Network (EBA) demonstrated higher levels of self-regulation than those who did not, underlining the role of self-regulation in navigating internet-based learning environments. Similarly, previous studies have shown that online or web-based learning environments foster the development of self-regulation skills (Kramarski & Mizrachi, 2006; Winter et al., 2008).

Regarding the relationship between students' academic performance in science and their FLRS and MSRS scores, the findings indicated a moderate yet significant positive correlation between academic achievement and both variables. This suggests that students with higher academic performance also tend to exhibit higher readiness for flipped learning. Consistent with this result, several studies have demonstrated that the flipped learning approach positively influences students' academic achievement (Baepler, et al., 2014; Hung, 2015; McGivney-Burelle & Xue, 2014; Missildine et al., 2013; Turan, 2015; Tune, et al., 2013). Similarly, academically successful students in the present study were also found to have higher metacognitive self-regulation scores. Vauras et al. (2001) noted that students with high expectations of success are better able to regulate and organize their own learning processes. Likewise, in studies comparing academically successful and less successful learners, self-regulated individuals consistently achieved higher academic outcomes. The relationship between metacognitive self-regulation and academic success has been widely documented in the literature (Broadbent & Poon, 2015; İnan, 2013).

Moreover, the analysis revealed a positive and significant relationship between students' FLRS and MSRS scores, as well as among their respective sub-dimensions. This suggests that effective time management and organization in flipped learning environments require strong metacognitive self-regulation abilities. Supporting this, Lai and Hwang (2016) emphasized that self-regulation is a critical determinant of success in flipped learning environments, warning that students lacking these skills are more likely to struggle. Similarly, Jwair (2018) reported that the flipped learning model outperformed traditional teaching methods in fostering self-regulation skills. Numerous other studies have also confirmed that students with well-developed self-regulation abilities can optimize their learning experiences within the flipped learning framework, further highlighting the robust relationship between the two constructs (Enfield, 2013; Lee & Tsai, 2011; Liu, et al., 2014; Ng, 2018; Öztürk, 2018; Shih & Huang, 2020; Sun, et al., 2017).

Recommendations and Limitations

Based on the findings of this study, several recommendations can be made. First, given the positive relationship between FLRS and MSRS, it is recommended that teachers incorporate metacognitive strategies; such as planning, monitoring, and self-evaluation into their instructional practices to strengthen students' self-regulation skills. Additionally, considering that access to online resources differed significantly according to MSRS scores, digital literacy activities should be integrated into science courses to help students evaluate and use reliable online materials more effectively.

In order to enhance the effectiveness of the flipped learning model, teachers may benefit from professional development programs focusing on the design of high-quality instructional videos, preparatory materials, and active learning activities for in-class sessions. Moreover, future research could examine the relationship between FLRS and MSRS across different grade levels, regions, or subject areas to increase the generalizability of the findings. Since the present study employed quantitative methods, further studies using qualitative approaches; such as interviews or observations are recommended to provide a deeper understanding of students' perceptions of flipped learning and metacognitive processes.

The limitations of this study can be summarized as follows. First, the research was conducted only with middle school students, which may limit the generalizability of the findings to other grade levels or school types. Additionally, the study was carried out in schools within a specific city or region, so the results may differ in other regions. The measurement tools used, namely the FLRS and MSRS scales, relied on students' self-reports and may therefore be subject to self-reporting bias. Furthermore, as the study employed a quantitative design, the in-depth experiences and perspectives of students regarding flipped learning and metacognitive processes could not be fully explored. The research was also limited to a specific academic term, which restricts the observation of long-term effects. Finally, factors such as the course content and teacher practices may have influenced students' FLRS and MSRS scores, and these factors were not controlled for.

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Fen Bilimleri Derslerinde Ters Yüz Öğrenmeye Hazır Bulunuşluk ile Üstbilişsel Öz-Düzenleme arasındaki İlişki

Yapılandırılmış Özet

Giriş

Bilgi ve iletişim teknolojilerindeki hızlı değişim, içinde bulunduğumuz çağa damgasını vurmuş ve etkisini yalnızca sosyal, ekonomik ve kültürel alanlarda değil, aynı zamanda eğitim alanında da yoğun bir şekilde göstermiştir. Bu bağlamda, yaşamın kaçınılmaz bir parçası hâline gelen teknolojinin eğitim süreçlerine etkin bir biçimde entegre edilmesini sağlayabilecek yaklaşım ve modellere yönelim giderek artmıştır. Söz konusu entegrasyon, öğrencilerin öğrenme deneyimlerini zenginleştirmek, öğretim süreçlerini daha etkili hâle getirmek ve eğitimde fırsat eşitliğini desteklemek açısından büyük önem taşımaktadır. Bu amaç doğrultusunda, eğitimde teknolojiden yararlanma olanağı sunan modellerden biri olan ters yüz öğrenme (flipped learning) modeli, geleneksel sınıf anlayışını yeniden yapılandırarak öğrenci merkezli ve etkileşim odaklı bir öğrenme ortamı sunmaktadır (Aslan, 2020; Samaila vd., 2021). Bu model, hem sınıf içi hem de sınıf dışı öğrenme süreçlerini optimize ederek öğrenenlerin bilgiye erişimini hızlandırmakta ve daha aktif, iş birliğine dayalı bir öğrenme deneyimi sağlamaktadır.

Ters yüz öğrenme modeli, geleneksel sınıf içi ve sınıf dışı öğrenme etkinliklerinin yer değiştirmesiyle adlandırılmıştır. Bu modelde, geleneksel anlayışta sınıfta öğrenciye sunulan bilgiler, çevrim içi videolar aracılığıyla sınıf dışına taşınmakta ve öğrenme süreci derse gelmeden önce başlamaktadır. Temel bilgileri önceden öğrenerek derse gelen öğrenciler, sınıf ortamında birbirleriyle iş birliği içinde daha üst düzey görevleri yerine getirmeye çalışırlar; bu durum, geleneksel yaklaşımda ödev olarak adlandırılan sürece karşılık gelmektedir (Bergmann & Sams, 2012; Kaye, 2022; Ranga, 2020; Sohrabi & Iraj, 2016). Dolayısıyla ters yüz öğrenme modelinde bilgi aktarımı sınıf dışında gerçekleştirilirken, sınıf içinde aktif öğrenmeyi ve sosyal etkileşimi artırmaya yönelik üst düzey etkinlikler ön plana çıkmaktadır (Abeysekera & Dawson, 2015). Bu sayede öğrenciler, sınıf ortamında daha etkileşimli, işbirlikçi ve aktif öğrenme uygulamaları gerçekleştirebilmekte (Toto & Nguyen, 2009) ve üst düzey görevler aracılığıyla öğrenme içeriklerini daha derinlemesine içselleştirebilmektedir (Crouch & Mazur, 2001; Uddin & McNeill 2024).

Ters yüz öğrenme modelinde öğrencilerin, ders dışı öğrenme içeriklerini kavrayabilmek için zamanlarını uygun biçimde planlamaları ya da kendi öğrenme süreçleri ve hızlarından sorumlu olmaları gibi önemli roller üstlenmeleri, bu modelde öz-düzenleme becerilerinin de kritik bir belirleyici olduğunu göstermektedir (Lai & Hwang, 2016; Zhou, 2023).

Öz-düzenlemeli öğrenme; biliş, üstbiliş ve motivasyon olmak üzere üç bileşenden oluşur. Üstbilişsel bileşen kapsamında bireyler, kendi bilgi ve becerilerinin farkına vararak hedeflerini buna göre belirlerler (Zimmerman, 1990). Bu bileşen, bireyin kendi planını oluşturma, süreci izleme, kontrol etme ve değerlendirme gibi üstbilişsel süreçleri içermesi nedeniyle üstbilişsel öz-düzenlemeli öğrenme olarak tanımlanmaktadır (Banarjee & Kumar, 2014; Lai vd., 2021).

Ters yüz öğrenme modelinde öz-düzenleme, öğrenme başarısını belirleyen önemli bir faktördür. Öz-düzenleme becerilerini geliştirmemiş öğrenciler, ders öncesinde içeriği yeterince etkili biçimde öğrenemediklerinden, sınıf içindeki üst düzey etkinliklere olan ilgileri ve katılımları daha düşük olmaktadır (Lai & Hwang, 2016). Buna karşılık, gelişmiş öz-düzenleme becerilerine sahip öğrenciler, derse daha iyi hazırlık yaparak ders materyallerinden çok daha etkili bir biçimde yararlanabilir ve öğrenme düzeylerini en üst seviyeye çıkarabilirler (Liu vd., 2014). Bu bağlamda, öğrencilerin öz-düzenlemeli öğrenme stratejilerini geliştirmeleri, ters yüz öğrenme ortamında anlamlı öğrenme çıktıları elde edebilmeleri açısından büyük önem taşımaktadır.

Ters yüz öğrenme modeli, öğrencilere öğrenme sürecinde daha fazla özerklik tanıdığı ve öz-düzenleme becerilerine olan gereksinimi artırdığı için (He vd., 2016; Lee & Tsai, 2011; Shih & Huang, 2020), bu çalışmada söz konusu iki kavramın birbiriyle ilişkili olup olmadığı belirlenmek istenmiştir. Bu doğrultuda araştırmanın soruları şu şekildedir:

1. Ortaokul düzeyinde öğrenim gören öğrencilerin fen bilimleri dersine ilişkin Ters Yüz Öğrenme (TYÖ) ve Üstbilişsel Öz-Düzenleme (ÜÖD) ortalama puanları cinsiyete göre farklılık göstermekte midir?

2. Öğrencilerin fen bilimleri dersine çalışırken internete erişim kaynaklarını kullanma durumlarına göre TYÖ ve ÜÖD ortalama puanları nasıl değişmektedir?

3. Öğrencilerin fen bilimleri ders başarısı puanları ile TYÖ ve ÜÖD ortalama puanları arasında anlamlı bir ilişki var mıdır?

4. ÜÖD'nin alt boyutları ile TYÖ arasında anlamlı bir ilişki bulunmakta mıdır?

Yöntem

Araştırmada, nicel araştırma desenlerinden biri olan tarama modeli kullanılmıştır. Bu kapsamda, araştırmada ilişkisel tarama yöntemi tercih edilmiştir. Çalışmada, ortaokul öğrencilerinin fen bilimleri dersine yönelik ters yüz öğrenme ve üstbilişsel öz-düzenleme düzeyleri arasındaki ilişkiyi belirlemek ve ters yüz öğrenmenin üstbilişsel öz-düzenlemeyi ne ölçüde yordadığını ortaya koymak amacıyla ilişkisel tarama yöntemi kullanılmıştır. Tarama mod-

elleri, araştırma konusu olan durumların çeşitli özellikler açısından incelenmesi için uygun yöntemlerden biridir (Büyüköztürk vd., 2010).

Araştırmanın çalışma grubunu, 2025-2026 eğitim-öğretim yılında Türkiye'nin Erzurum ilinde yer alan iki farklı ortaokulda öğrenim gören 130 öğrenci oluşturmaktadır. Katılımcıların belirlenmesinde kolayda örnekleme yöntemi kullanılmıştır. Kolayda örnekleme, araştırmacıya zaman, emek ve maliyet açısından kolaylık ve tasarruf sağlayan bir örnekleme yöntemidir (Gürbüz & Şahin, 2015). Araştırmaya katılan öğrencilerin sınıf düzeylerine ilişkin dağılımı şu şekildedir: 30 öğrenci (%23,1) 5. sınıfta, 26 öğrenci (%20) 6. sınıfta, 34 öğrenci (%26,1) 7. sınıfta ve 40 öğrenci (%30,8) 8. sınıfta öğrenim görmektedir. Cinsiyet değişkeni açısından ise öğrencilerin 80'i (%61,5) kız, 50'si (%38,5) erkektir.

Ters Yüz Öğrenmeye Hazır Bulunuşluk Ölçeği (Ortaokul Öğrencileri İçin): Ortaokul öğrencileri için geliştirilen Ters Yüz Öğrenmeye Hazır Bulunuşluk Ölçeği Hao (2016) tarafından geliştirilmiş, Türkçeye uyarlaması ise Durak (2017) tarafından yapılmıştır. Ölçek toplam 26 maddeden oluşmakta olup beş alt boyut halinde düzenlenmiştir: Öğrenci kontrolü ve öz yönelimli öğrenme (8 madde), teknoloji öz-yeterliği (9 madde), sınıf içi iletişim öz-yeterliği (4 madde), öğrenmeye yönelik motivasyon (3 madde), ön çalışma (2 madde).

Ölçeğin tümü için iç tutarlık katsayısı (Cronbach Alfa) .98 olarak, alt boyutlar için ise .70 ile .96 arasında değişen değerler olarak rapor edilmiştir (birinci boyut için .94, ikinci için .96, üçüncü için .90, dördüncü için .82, beşinci için .70). Ölçek toplam varyansın %79,3'ünü açıklamaktadır. Yapı geçerliği açısından elde edilen uyum indeksleri RMSEA = 0.09, NFI = 0.96, NNFI = 0.96 ve CFI = 0.92 olup, tüm değerler .05 anlamlılık düzeyinde anlamlı bulunmuştur. Bu araştırma kapsamında yapılan analizlerde ölçeğin genel Cronbach Alfa değeri .89 olarak hesaplanmıştır.

Üstbilişsel Öz-Düzenleme Ölçeği: Howard vd. (2000) tarafından fen ve matematik problem çözme sürecinde öğrencilerin üstbilişsel farkındalık ve düzenleme becerilerini ölçmek amacıyla geliştirilen ölçek, Türkçeye Çelik (2017) tarafından uyarlanmıştır. Ölçek; bilgi, nesnellik, problem temsili, izleme ve değerlendirme olmak üzere beş alt boyuttan oluşmaktadır. Ölçeğin Cronbach Alfa iç tutarlık katsayısı .91 olarak belirlenmiştir. Ölçeğe ilişkin uyum indeksleri sırasıyla RMSEA = .047, SRMR = .044, GFI = .93, AGFI = .92, CFI = .92 ve NNFI = .91 olarak rapor edilmiştir.

Bulgular

Araştırma öncesinde ölçek maddelerine fen dersi ile ilgili ifadeler eklenerek pilot uygulama yapılmış, pilot çalışma sonucunda maddelerin uyumlu olduğu ve Cronbach alfa değerinin .92 olduğu belirlenmiştir. Bu araştırmada ölçeğin genel iç tutarlık katsayısı .95 olarak hesaplan-

mıştır. Alt boyutlara ilişkin iç tutarlık katsayıları ise sırasıyla; bilgi için .79, nesnellik için .83, problem temsili için .75, izleme için .82 ve değerlendirme için .84'tür.

Araştırma kapsamında kullanılan Ortaokul Öğrencileri için Ters Yüz Öğrenmeye Hazır Bulunuşluk Ölçeği ve Üstbilişsel Öz-Düzenleme Ölçeği'nden elde edilen verilerin normal dağılım gösterip göstermediğini belirlemek amacıyla normallik testleri yapılmıştır. Yapılan Kolmogorov-Smirnov testi sonucunda $p > .05$ bulunmuştur. Öte yandan, çarpıklık (skewness) ve basıklık (kurtosis) değerlerinin ±2 aralığında olması ve detrended grafikte sıfır çizgisi etrafında anlamlı bir sapma görülmemesi, dağılımın normal olduğunu göstermektedir. Son olarak, histogram grafiği de verilerin normale yakın bir dağılım sergilediğini ortaya koymuştur. Pallant (2016) tarafından belirtilen koşullar doğrultusunda, verilerin normal dağılım gösterdiği ve bu nedenle parametrik (Bağımsız Örneklem t Testi, Tek Yönlü ANOVA testi) ve korelasyon analizlerinin yapılmasının uygun olduğu sonucuna varılmıştır. Yapılan analizlerde ölçeklerden edinilen puanların cinsiyet değişkeni açısından anlamlı bir fark oluşturmadığı, internet kaynaklarına erişim açısından tersyüz öğrenmenin farklılaşmadığı ancak üstbilişsel öz düzenleme becerisi puanlarının farklılaştığı belirlenmiştir. Akademik başarı açısından her iki ölçek puanının anlamlı olarak farklılaştığı ve son olarak belirtilen ölçek puanlarının tamamı arasında ve bu ölçeklerin alt boyutları arasında pozitif yönlü anlamlı ilişkiler belirlenmiştir.

Sonuç ve Tartışma

Araştırmadan elde edilen bulgular incelendiğinde, ortaokul öğrencilerinin Ters Yüz Öğrenme (TYÖ) puanları ile fen bilimleri dersine yönelik Üstbilişsel Öz-Düzenleme (ÜÖD) beceri puanları arasında cinsiyete bağlı anlamlı bir farklılık bulunmadığı belirlenmiştir. Öğrencilerin fen dersi kapsamında internet kaynaklarına erişimleriyle ilgili bulgular incelendiğinde ise, bu bulguların TYÖ puanlarına göre farklılık göstermediği; ancak ÜÖD puanlarına göre anlamlı düzeyde farklılaştığı görülmüştür. Bu sonuçlar doğrultusunda, internet kaynaklarına erişim sürecinde üstbilişsel öz-düzenleme becerilerinin geliştirilmesi gerektiği vurgulanabilir. Başka bir deyişle, özyönelimli öğrenme becerilerine sahip öğrenciler, internet kaynaklarına erişimde daha sistematik ve planlı bir yaklaşım sergilemektedir.

Bu noktada, öğrencilerin internet kaynaklarına erişim becerileri ile öz-düzenleme becerileri arasındaki pozitif ilişki şaşırtıcı değildir. İpek (2019), Eğitim Bilişim Ağı (EBA) kullanan öğrencilerin öz-düzenleme becerilerinin kullanmayanlara göre daha yüksek olduğunu belirlemiş ve internet tabanlı kaynaklara erişimde öz-düzenleme becerilerinin önemini ortaya koymuştur. Benzer şekilde, literatürde internet tabanlı öğrenme ortamlarının öz-düzenleme becerilerini geliştirdiğini gösteren araştırmalar da bulunmaktadır (Kramarski & Mizrachi, 2006; Winter vd., 2008).

Fen bilimleri dersindeki akademik başarı ile TYÖ ve ÜÖD puanları arasındaki ilişkiye yönelik bulgular incelendiğinde, akademik başarının her iki değişkenle de orta düzeyde anlamlı bir ilişki gösterdiği saptanmıştır. Bu bulgular, akademik olarak başarılı öğrencilerin TYÖ puanlarının daha yüksek olduğunu göstermektedir. Literatürde, ters yüz öğrenme modelinin akademik başarıyla ilişkili olduğunu ortaya koyan birçok çalışma mevcuttur (Baepler vd., 2014; Hung, 2015; McGivney-Burelle & Xue, 2014; Missildine vd., 2013; Turan, 2015; Tune vd., 2013). Ayrıca, elde edilen bulgulara göre akademik olarak başarılı öğrencilerin ÜÖD puanlarının da daha yüksek olduğu görülmektedir. Vauras vd. (2001), başarı beklentisi yüksek öğrencilerin öğrenme süreçlerini düzenleme konusunda daha yetkin olduklarını ve öz-düzenlemeye sahip öğrencilerin akademik olarak daha başarılı olduklarını ifade etmiştir. Literatürde de akademik başarı ile üstbilişsel öz-düzenleme arasındaki ilişkiyi destekleyen benzer çalışmalar yer almaktadır (Broadbent & Poon, 2015; İnan, 2013).

Bunlara ek olarak, araştırma bulguları öğrencilerin TYÖ puanları ile ÜÖD puanları arasında, ayrıca bu iki değişkenin alt boyutları arasında da pozitif ve anlamlı bir ilişki olduğunu göstermektedir. Bu bulguya göre, ters yüz öğrenme modelinde ders dışı öğrenme içeriklerinin etkili biçimde anlaşılması için zamanı uygun şekilde planlama süreci, üstbilişsel öz-düzenleme becerilerini gerektirmektedir. Lai ve Hwang (2016), ters yüz öğrenme modelinde öz-düzenleme becerisinin kritik bir faktör olduğunu, bu becerileri geliştiremeyen öğrencilerin modelde başarısız olma eğiliminde olduklarını vurgulamışlardır. Jwair (2018) ise, ters yüz öğrenme modelinin geleneksel öğretim yöntemine kıyasla öz-düzenleme becerilerini geliştirmede çok daha başarılı olduğunu ileri sürmüştür. Literatürdeki çeşitli çalışmalar da öz-düzenleme becerileri gelişmiş öğrencilerin ters yüz öğrenme modelinde öğrenmelerini en üst düzeye çıkarabildiğini ve bu iki değişken arasındaki ilişkinin gücünü desteklemektedir (Enfield, 2013; Lee & Tsai, 2011; Liu vd., 2014; Ng, 2018; Öztürk, 2018; Shih & Huang, 2020; Sun vd., 2017).