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A Mixed-Meta Method Study on the Effect of Constructivist Approach on Retention Scores and Evaluation of Learner Views

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***Abstract*:** The aim of this research is to determine the effect of the constructivist approach on retention scores and to reveal its effectiveness in the learning environment within the framework of participant views. In this context, a mixed-meta method including both a quantitative and qualitative research was conducted. The mixed-meta method can be explained as the use of meta-analysis and meta-thematic analysis together based on document analysis. Within the scope of meta-analysis, studies examining the effect of constructivism on retention scores were evaluated by scanning different databases between the years 2005 and 2021. The data attained from the studies were analysed through the use of CMA program and the effect size value as calculated to be as g = 1.02. On the other hand, in the meta-thematic analysis process, studies containing participant views regarding the use of the constructivist approach in the learning environment were examined according to content analysis and some themes and codes were created. Requirements for a constructivist learning environment, the cognitive and affective effectiveness of the relevant approach, and the problems encountered in practice have emerged. As a result of the meta-analysis, it was appeared that the effect of the constructivist approach on the retention scores of the learners was high and positive. Accordingly, it can be inferred that the constructivist approach is quite effective on the retention scores of learners. As a result of the meta-thematic analysis, it was come out that the related approach facilitated the learning by supporting the learners in the cognitive and affective dimensions in the learning process. In addition, it has been determined that many aspects such as materials, technological support, physical condition of the learning environment, class size are required in the learning process. Considering the participant views, it was stated that in some instances, problems such as time, material, teacher training, and learner motivation could be encountered. When all the results are evaluated in general, it is appeared that if appropriate environment and conditions are provided, the constructivist approach is effective on the retention of learning and in creating positive learning environments.
Keywords: retention, mixed-meta method, learning environment, constructivist approach.

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Introduction

Knowledge has gradually increased from the very beginning of human existence to the present day. People has absorbed the information almost like a rolling magnet collects iron dust, and eventually brought the information universe into existence today. The inconceivable multiplicity and diversity in the knowledge universe necessitated selectivity in learning. The questions of what, when, why and how much I will learn have caused people to need new ideas on this subject. These ideas were needed not only to learn but also to teach knowledge, and thus many new approaches were put forward for education in every period. Constructivist approach is one of these views and it has been one of the guides that lead current people in the information traffic that changes every minute.

An approach in which the teacher is only the instructor and the student is the learner, which has been put forward to ensure learning, cannot meet the needs of today's world. Now both the student and the teacher are learners. This situation necessitated the redefinition of teacher-centred education models and the roles of students in the classroom. As a result of these developments, the philosophies on which education is fed have also been updated and have taken an approach in which the individual takes action to learn. There are those who evaluated the philosophy of constructivism from its own perspective over time, in accordance with its nature, and there were also those who stated that it opened new avenues in terms of education. According to Demirel (2004) constructivism, which first developed in the form of understanding how people learn knowledge, started to focus on how the learner constructs what they learn over time. This has changed the role of related approach from being a theory of teaching to a theory of learning and knowledge, because knowledge has now turned into being grounded and constructed. Hanley stated that the thing learned at school should be used by students in business life and in crisis situations. A teacher who gives only knowledge and a teaching based only the textbook has not been able to raise an individual who criticizes, thinks, interprets, and gives meaning to what is learned. In that case, he says, it is necessary to take a classroom from the teacher centre and place it in the student centre (cited in Arslan, 2007). In a constructivist classroom, with metacognitive activities, the student advances his knowledge by adding new information on top of his own knowledge, produces new solutions to problems with his own perspective that is, the student educates himself.

In this new contemporary education model, the student will actively research, associate his old knowledge with his new learning, and construct what he has learned on top of what he knows. This synthesis will also reveal new information with the knowledge he has obtained. What does the teacher think about this educational approach of the new world? According to ÖYGM, teacher should know how to take into account the stages of learning, the effect of the level of development of the student on learning, and the different developmental qualities in his teaching. It should use processes related to different types of learning and teaching ways that will enable students to learn. It should determine the ways to be run in order to improve the work and learning skills of the student and to motivate him. They should know how to use services and resources to meet different and student-specific learning needs. They should be able to use the social or cultural experiences of the student to make teaching effective. Teacher should know that personal differences, internal and external motivation, learning by working routines are important in permanent and meaningful learning and should strive to create learning that fits students (Özdemir & Köksal, 2015). Constructivism in learning is a learner-centred approach. Each individual re-interprets the information he/she encounters through previous skills, knowledge and experience, and creates the information in his/her own mind. Constructivism is the reinterpretation and structuring of previous knowledge in the light of new experiences (Özel & Bayındır, 2008). The teacher gives the students complex tasks and problems and directs them to a mental interaction. The teacher also enables students to question, ask themselves questions, reflect on what they have done and evaluate their knowledge. As a result, the process is better understood by the students

and new skills are acquired and students become decision-makers (Güneş 2007). In this context, the task of the teachers is to guide the students to find the resources to use in their activities while structuring the knowledge. In this context, since the teacher simplifies the learning process, it also enables students to take part in the preparation of these resources (Fer & Cırık, 2007). In short, the duty of the teacher in a constructivist classroom is to guide the formation of learning environments where students can access new information.

Purpose and Importance of Research

In this study, it is aimed to examine the findings in the context of the effectiveness of the constructivist approach in the classroom environment from the perspective of classroom and branch teachers and to reveal the pros and cons of constructivism in the classroom based on these findings. In this study, teachers' opinions based on the experiences and observations of them who work in schools affiliated to the Ministry of National Education are especially included. The study is carried out in order to help teacher training institutions make arrangements in the direction of the result in the training they will give to teacher candidates and to bring new perspectives to the academicians working on education programs in the literature. Conducting the research with the mixed-meta method can contributes to obtaining more comprehensive findings by providing access to both quantitative and qualitative data. At this point, the following sub-objectives were determined in line with the main purpose of the research carried out within the mixed-meta method. In the context of;

- Meta-analysis, the effect of the constructivist approach on retention scores in the learning environment,
- Meta-thematic analysis, by examining the researches including the participant's views based on document analysis;
  - The effect of the constructivist approach applied in the learning environment on cognitive and affective aspects,
  - Requirements for the learning environment and
  - The problems encountered in implementation are aimed to examine.

Method

The present study is presented in the form of meta-analysis and meta-thematic analysis. The related method, which is defined as the mixed-meta method, can be defined as meta-analysis+meta-thematic analysis based on document analysis. In other words, in mixed-meta metod, studies included in the analysis are required to include both qualitative (meta-thematic analysis) and quantitative (meta-analysis) data which have scientific features that have been published or accepted for publication (Batdı, 2021). Mixed-method research, which is created by using qualitative and quantitative techniques together, can strengthen the beneficial aspects of these two techniques (Baki & Gökçek, 2012).

Meta-Analysis Process

Meta-analysis process is a quantitative research process unlike other literature review techniques because it is based on census techniques and numerical data (Kaşarcı, 2013, p.31). This technique deals with the results of previous experimental studies, presents quantitative data for researchers, and provides generalization by combining the results of all the studies (Dinçer, 2015, p.101). In this study, meta-analysis technique was used to compare the effectiveness of constructivism on teachers and students with the traditional method. In order to access and examine the studies on the effectiveness of this approach, a search was made in Turkish with the keywords of "constructivist approach/applications, the effect of constructivist approach on

academic success/retention, constructivism" from the databases of Google Scholar, Dergipark and YÖK Thesis Center. In order to reach related studies, certain included criteria were considered in our study. Therefore, studies carried out on the effect of constructivism on academic achievement, including experimental/semi-experimental pretest-posttest data, and containing statistical data required for analysis were preferred. Moreover, while searching the literature, the studies conducted between the years of 2005 and 2021 was taken into consideration. Thus, inclusion and exclusion criteria were determined. In addition, master's theses and doctoral dissertations written both in Turkish and/or English, were selected. As a result of the search, it was decided to benefit from data of 11 national studies in the meta-analysis.

Meta-Thematic Analysis Process

Meta-thematic analysis can be explained as re-interpreting the findings by examining the qualitative studies based on participant views in the context of a specific subject, re-discovering the codes and themes by arranging them, and accessing general and holistic information by synthesizing all the data in an inductive way (Batdı, 2019). Since the meta-thematic analysis is directly supported by the views of the participants, it can be stated that it is based on secure bases in terms of reliability (Batdı & Anıl, 2021). In the meta-thematic analysis process of this study, it was tried to reach the studies including the participants' views, and as a result of the literature reviews, a total of 4 studies, 2 theses and 2 articles, were reached. These studies were coded as Article 1 (M1), thesis 1 (T1), article 2 (M2) and thesis 2 (T2), and the quotations were taken directly from these studies. By this way, it is aimed to make transparency in the research. In order to ensure reliability in the qualitative study, the codes indicating the participants in the document review were transferred from the aforementioned studies in the same way without changing them. The direct quotations were the expressions which made the qualitative results more reliable. In this study, two-person coding was also used to increase reliability. In order to make the definitions and expressions more understandable, it is thought that two coders can make the coding process by using the same data. By dividing the number of codes that the coders agreed with and the number of codes that they could not agree with, the number of safety among the coders can be revealed. It is recommended that the result be 80% and above (Batdı, 2019). In this qualitative study, Miles & Huberman's (1994) reliability formula was used and the agreement between researchers was found to be 80% for this study.

Results

Meta-Analysis Results

In this part of the research, the results regarding the effect of the use of constructivist approach-based applications on students' retention scores were presented comparing with the traditional teaching method. The effect size value was reached by analyzing the descriptive information of the meta-analysis. In the meta-analysis process, a total of 11 theses in the national field were reached, which gave the arithmetic averages and standard deviations of the relevant application. Considering the total of the studies analyzed, it can be said that the experimental group consisted of 296 participants and the control group consisted of 312 participants.

In the current study, the meta-analysis findings regarding the permanence scores within the scope of the analysis are presented in Table 1. According to FEM, the results showed that the effect size was calculated as g =.93, with a standard error of 0.09 and a 95% confidence interval, with an upper limit of 1.1 and a lower limit of .76. It can be said that the effect of the constructivist approach-based applications on the retention scores is positive with an effect size value of .93 in the FEM.

Table 1
Meta-analysis Results

Test Type	Models	n	g	95% Confidence interval		Heterogeneity		
				Lower	Upper	Q	p	I^2
Retention	**FEM**	11	.93	.76	1.1	42.30	.00	76.36
	REM	11	1.02	.67	1.37			

Since it was seen that the distribution in the study has a heterogeneous structure in Table 1, analyzes were made in accordance with the random effects model. In other words, the use of related applications and teaching without the use of constructivist approach were compared according to the REM. As a result of the calculations, the data of 11 studies in the research were analysed and the effect size was calculated as g =1.02, with a standard error of .18 and a 95% confidence interval, with an upper limit of 1.37 and a lower limit of .67. Accordingly, it was observed that the effect size value was at large size according to the Thalheimer and Cook (2002) classification. This result can be said to have a positive effect on the retention scores of learners.

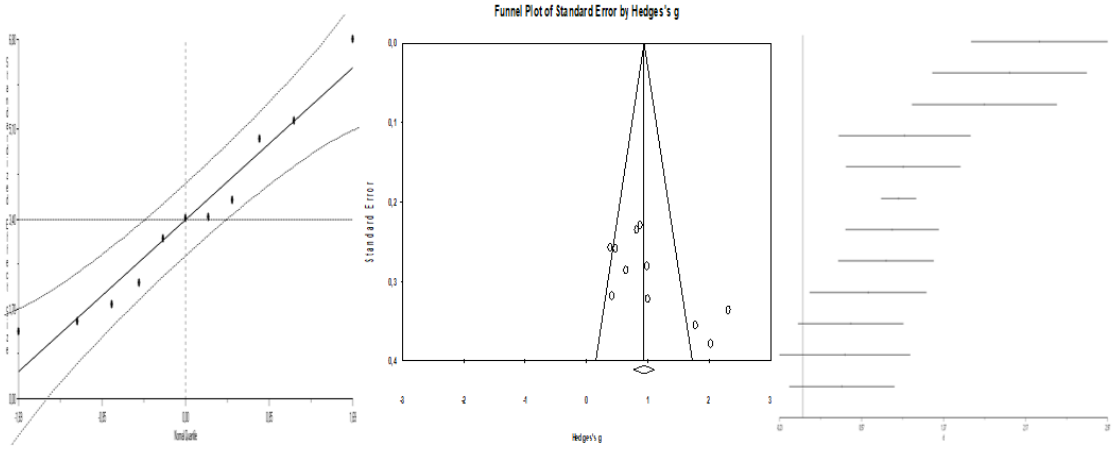

Figure 1. Normal quantile plot, funnel plot and effect size CI plot

In Figure 1, a graphic of the meta-analysis data set related to retention scores are presented. Normal Quantile Plot, Funnel Plot, and Effect Size CI Plot obtained as a result of the meta-analysis show the probability of publication bias. Analysis results indicate that if 502 studies regarding the effect of the constructivist approach on the retention scores are included in the analysis, the significant effect can decrease to zero. However, it has been understood that this attained value (n=502) is a high number in the context of the research considering the number of included studies. Therefore, when the relevant value is examined, it is concluded that there is no effect of publication bias, considering that too many studies are needed. In this case, it can be said that the process of the analysis is reliable. Similarly, when the Normal quantile plot chart is examined, it is seen that the studies included in the analysis are between two lines. This result means that the effect size level distribution of the studies shows reliable intervals (Rosenberg et al., 2000). At the same time, it is seen that the effect size CI plot values are in harmony with the thought. Thus, it can be said that the studies included in the analysis based on constructivism are in the reliable range.

Results of Meta-thematic Analysis

The participant opinions compiled from the included studies in the literature were coded by two researchers, and the extracted codes were combined under the relevant themes. These themes were arranged as "requirements for a constructivist learning, cognitive effectiveness, efficiency regarding the affective variables, and problems of the constructivist approach".

Figure 2**.** Requirements for constructive learning environment

The requirements of a constructivist learning environment in Figure 2 is listed as "facilitating activities, facilitating learning, serving the purpose, supporting the achievements, increasing interest, providing continuity in the course, exhibiting student products, having smart boards, manageable availability, having relevant materials, and a wide size of area". Some expressions referenced in the creation of these codes are as follows: "I attach importance to the classroom organization as purpose of the new student-centred curriculum can be achieved with a classroom organization that facilitates student activities and facilitates learning (T.2-p.108). In the study with the code of M.1-p.8, there is an expression as "Today, the materials (published books, programs supporting the curriculum over the internet) have increased so much that they have made the curriculum successful." As it can be understood from the codes and these statements, a constructivist classroom provides continuity in the course and provides a wide range of movement for education.

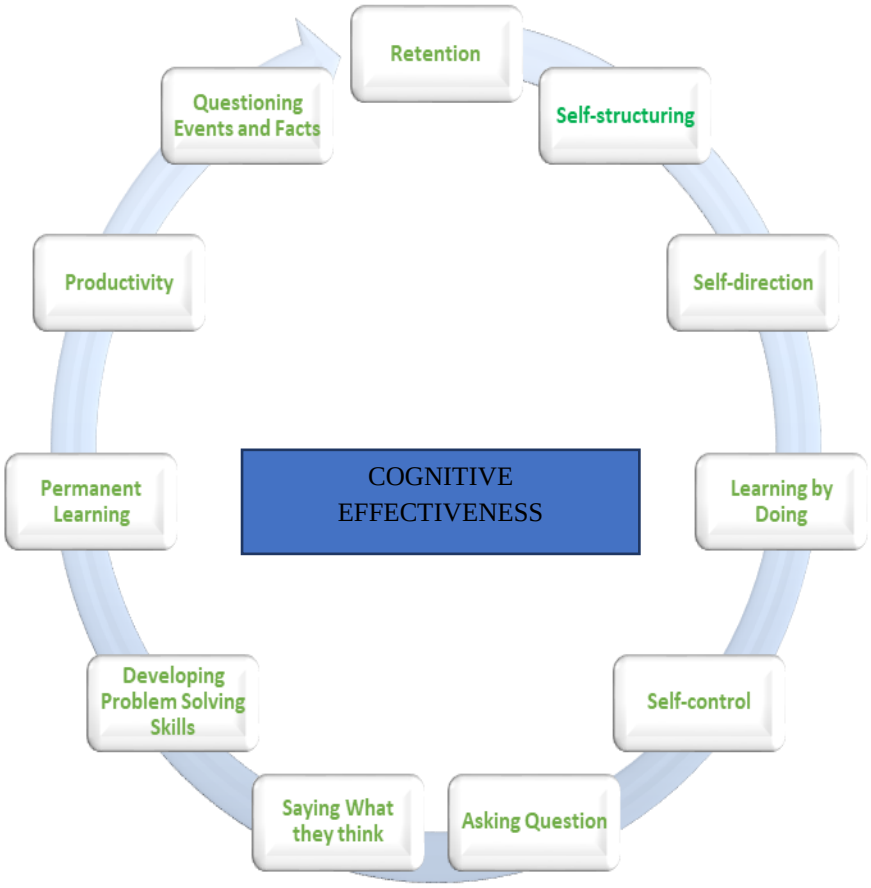

Figure 3. Cognitive effectiveness

When the effect of constructivism in Figure 3 on the cognitive dimension is examined, it has been seen that it contributes to "retention, self-structuring, self-direction, learning by doing, self-control, asking questions, saying what they think, improving problem-solving skills, permanent learning, productivity, questioning events and facts". While making the relevant identification codes, the following expression was referenced from the study coded as M.2-p.229 "…the student constructs his own work, directs it himself. For example, I give him a question, according to that question the child directs his studies. (…) The child is doing a work on his own, based on his own imagination or thoughts. (…) He thinks like today's scientists. He is like little scientists... While I'm constructing it there, I only ask questions to the student, he directs his own work with the questions…" Another expression quoted from the study coded as T.2-p.115 is like that "With this approach, the students desire to ask questions increased. Students can think and say what they think. They ask questions to themselves and find the answers by themselves." As it is understood from these expressions and codes, constructivism has positive effect on students' cognitive development, directs them to question and improves problem-solving skills, creating metacognitive awareness and establishing the retention of information.

Figure 4. Efficiency regarding the affective variables

Considering the affective effectiveness of constructivism in Figure 4, it is seen that they have contributions such as "motivation, curiosity, a democratic environment, respect, freedom, attractiveness, internalization, entertaining, dreaming". Some expressions can be presented as reference expressions which are used while creating the codes. A sample of them can be expressed as "*Exhibiting student products greatly increases the motivation of students*." , "*In order to encourage students to read, I occasionally read interesting passages from books and try to arouse their curiosity*." (T1-p.111 coded study). In addition, in another study encoded as M.2-p. 227, the following expression as *"...I realized that when the student is given responsibility, good things can come out. If applied well, children can both have fun and learn well. What they learn is permanent. I think it is an appropriate way of teaching students (...) this situation also helps the students to be motivated..."* can be presented. With these expressions, it is true to say that constructivism provides a learning that benefits the student in terms of affective development, creates a sense of curiosity in order to construct new information, makes his/her to dream, to express his/her views freely while having these dreams, and to have them fun.

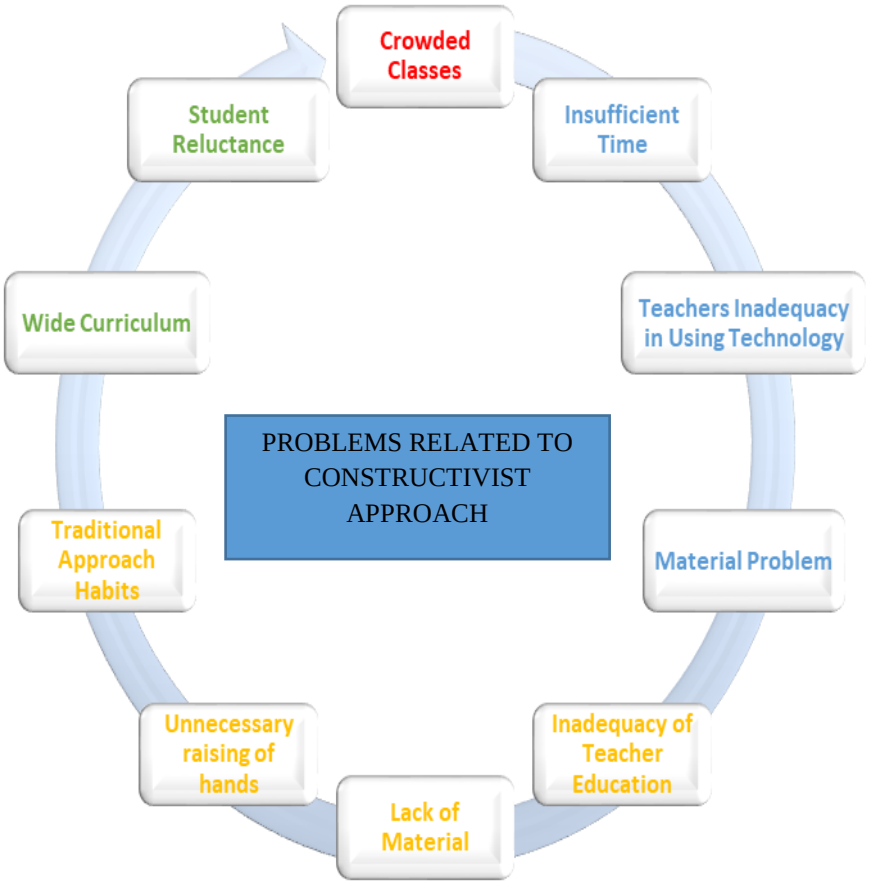

Figure 5. Problems related to constructivist approach

In Figure 5, under the theme of "Problems related to the constructivist approach" certain codes such as "crowded classes, insufficient time, teachers' inadequacy in using technology, material problem, inadequacy of teacher training, lack of material, unnecessary raising of hands, traditional approach habits, wide curriculum, reluctance of students" were created. Some of the participants' opinions, which constitute a reference while creating these codes can be presented as "Crowded classrooms negatively affect in-class activities." (Study coded as T2- p.113). In the M2-p.230 coded study, on the other hand, "...Not. Will I be teaching the curriculum in the three-hour lesson…" and in the study coded as T2- p.116, "One of the biggest problems is the unnecessary raising of hands during the lesson. The constructivist curriculum says to let the students speak; I always try to give a voice. The student can say things that are not relevant. If you don't give a voice, they always raise their hand. If you do the opposite, the important part of the lesson is gone. We also have a noise problem during events. There is unnecessary noise. Distraction of the subject causes the student to be distracted. " the related expressions were taken as references. There is also another reference sample expression from a study coded as M2- p.233 including that "…the readiness level of the students should be good. For example, if the student does not know the basics, you have to explain. (…) Also, students should be psychologically corrected as soon as possible, and if the student comes to school without a book or a pen on the way to school, it won't make any difference what approach you use…" According to the inferences made from the quotations and the extracted codes, it is considered that problems such as crowded classrooms, not being able to promise everyone due to lack of time, and unwillingness of students in the large curriculum disrupt education in a constructivist classroom. It is considered that teachers' inability to break away from traditional education and keep up with innovations is one of the important problems that need to be solved.

Discussion and Conclusion

In this study, it is aimed to determine the effectiveness of the constructivist approach in the classroom. Within this aim, the relevant databases were scanned, the results of meta-analysis and meta-thematic analysis were presented and inferences were made. The inferences were discussed in the results section. When the meta-analysis data regarding the retention in the current study is considered, the effects of constructivist-based applications on different disciplines were investigated in the context of meta-analysis and the results were presented. The effectiveness levels of the related applications showed that the retention scores of the participants have a positive effect (g=1.02). This result indicates that the constructivist theory-based applications applied in the experimental group are more effective than the traditional ones applied in the control group. The related effect size value has a large effect in terms of retention according to Thalheimer and Cook's (2002) level classification. The study entitled as "The effect of a constructivist learning-based curriculum on the reflective thinking and democratic attitudes of teacher candidates" (Kerimgil, 2008), which was not included in the analysis, showed that the relevant applications were found to contribute to continuous and purposeful thinking, open-mindedness, questioning and effective teaching, foresight and sincerity, and the profession. However, similar results were encountered in the results of a thesis by Yenice (2014). He investigated the effect of constructivist approach on academic success and retention scores of the subject of mitosis and meiosis, which was applied in the 8th grade science and technology lesson. As a result, it can be said that the practices based on the constructivist approach have a positive effect on the retention scores of the students, according to most of the studies both included in the analysis and not included.

In the meta-thematic analysis section, the codes were extracted and the themes that combine these codes were created. These themes can be stated as "requirements for a constructivist learning, cognitive effectiveness, efficiency regarding the affective variables, and problems of the constructivist approach". Many codes related to these themes have been reached. When all the findings are examined, it is evaluated that the effectiveness of the constructivist approach has positive results on students in many different ways and the teacher has an important role here. In structured learning, the teacher does not follow the same progression as traditional learning, which gradually increases the complexity of the information to be learned. A teacher who practices constructivism does the opposite. In other words, it activates students and transforms them into individuals who can solve complex learning situations (Selçuklu, 2019). In the study of Ekşi et al. (2018), it is stated that the active role of the student along with all stakeholders in the learning process will increase the effectiveness of learning. It has been concluded that a learning environment is effective if there are plenty of materials to increase the student's interest, the noise level is not disturbing, the activities can be created comfortably with a wide range of motion and if it is equipped with technological opportunities. It can be said that learning environments arranged with rich materials allow teachers and students to practice activity-based practices and provide opportunities for them (Aykan & Tatar, 2017).

In the cognitive development of constructivism, as a result of metacognitive activities such as problem solving and questioning, learning by doing-experience, it is seen that the permanence of knowledge in the student is ensured. It is also evaluated that cognitive awareness such as self-structuring and self-direction increase in students. With constructivist learning, the quality of teaching methods also changes and the student becomes active in the learning activity (Arslan, 2009). It is considered that most of the new teaching models aim at raising active students. When the affective effectiveness of constructivism is evaluated, it is concluded that in a democratic environment, it also supports the student's imagination by arousing curiosity and entertaining. As can be seen, constructivism is interactive and dynamic. This approach contributes

greatly to the student's learning and development in terms of mental skills. With this approach, classroom management is also changing. While each student is learning and developing their skills in the classroom, it is also important to organize the classroom in a way that will enable them to participate in collaborative work. Since constructivism affects all stakeholders, the principles of constructivist education should also be applied to all teachers. In addition, these principles are necessary for the professional development of teachers (Güneş, 2007). In other words, although constructivism seems like a student-centred approach, behind the curtain, the existence of a teacher who knows students' readiness, emotions, outlook on life and many similar academic and personality traits is extremely important in terms of education and the resulting product. In this context, it is thought that it is a good idea to raise the class level together with the students' levels. Because the constant presence of the teacher is very valuable, it allows the student to be closely monitored. In this way, the personality traits of the student can be constantly monitored, the performance status of the branch he/she is studying can be observed meaningfully, and the teacher will be able to shape the teaching in terms of his/her strengths and weaknesses. In this way, apart from the emphasis on individuality in the education model mentioned, it will also be possible to take into account this aspect (Bayraktaroğlu, 2011). Considering the problems of the constructivist approach, it has been seen that the applied approach is not very important for the reluctant student. Another problem is the desire of all students to attend the lesson at the same time and the lack of time for this. The crowdedness of the classroom is one of the problems emphasized in other studies. It has been observed that the number of students in the classroom is one of the most important problems (Ocak & Çimenci Ateş, 2015). Bal (2008) obtained similar data in his study; He stated that the overcrowding of the class size creates a negative effect in the process, however, the inadequacy of the applied course times causes problems in the preparation and implementation of the activities. The findings of Özbay's (2009) study also support the findings of the teacher's inability to break away from tradition in this study. In addition, teachers' inadequacy in using technology and teachers' lack of education are among the main problems. The fact that teachers feel inadequate as a result of not following innovations is also included in the study of Bada and Kırpık (2021), which supports these findings.

Considering all these results, it can be evaluated that in order to make constructivism more widespread in the field of education in today's world and to ensure that the student can comfortably reconstruct the old-new structure in a process, it is necessary to be in a situation that supports the infrastructure in educational institutions. In this context, it is important to establish the physical conditions of the classrooms and the technological materials to be used in order to support constructive education and training for this purpose. In addition, it is considered that providing training on the constructivist approach as a process and in practice for prospective and on-the-job teachers in teacher training institutions and educational institutions can reduce the problems in this regard. It is evaluated that new data can be brought to the literature with this study, which is carried out with the mixed-meta method in terms of the evaluation of learner views on this subject, with the effect of the constructivist approach on the retention scores in learning. In addition, it is thought that new perspectives can be provided for researchers.

References

(Studies included into the meta-thematic analysis)*
*(** Studies included into the meta-analysis)*

**Akın, M. F. (2007). *The effects of a constructive learning approach on learning success in the teaching of identities*. (Unpublished master's thesis). Diyarbakır: Dicle University.

**Andaç, K. (2007). *The effects of constructivist learning approach supported by reviewing strategy on students' attainment and retention of their knowledge about pressure*. (Unpublished master thesis). Diyarbakır: Dicle University.

Arslan, A. (2009). Constructivist learning approach and Turkish language teaching. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 13*(1), 143-154.

Arslan, M. (2007). Constructivist approaches in education. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi 40*(1), 41-61.

Aykan, A., & Tatar, M. (2017). Competency level of secondary school teachers about the constructivist approach. *Journal of Social Sciences of Muş Alparslan University 5*(2), 381-395. https://doi.org/10.18506/anemon.287791

Bada, M., & Kırpık, C. (2021). Self-efficacy perception of social studies teachers about constructivism and their opinion about the factors affecting it. *IBAD Journal of Social Sciences 9*, 462-480.

Baki, A., & Gökçek, T. (2012). A general overview of mixed method researches. *Electronic Journal of Social Sciences 11*(42), 1-21.

Bal, P. (2008). The evaluation of new mathematic curriculum in term of teachers' perspectives. *Ç.Ü. Journal of the Social Sciences Institute 17*(1), 53-68.

Batdı, V. (2019). Meta-thematic analysis. In V. Batdı (Ed.), *Meta-thematic analysis: Sample applications* (pp. 10–76). Anı Publication.

Batdı, V. (2021). The use of technology in language teaching to foreigners: a mixed-meta method. *Milli Eğitim Dergis, 50*(1), 1213-1244. http://dx.doi.org/10.37669/milliegitim.942631

Batdı, V., & Anıl, Ö. (2021). Learning by computer-based education: A meta-thematic analysis. *J. BAUN Inst. Sci. Technol. 23*(1), 111-127.

**Bayrak, N. (2008). *Examining of the effect on students' success, the lasting of data and attitudes science of course software and worksheets developed according to five gradual model of constructivist learning approach.* (Unpublished master thesis). Erzurum: Atatürk University.

Bayraktaroğlu, C. E. (2011). *Constructivist approach in education and a critical view*. (Unpublished master thesis). İstanbul: Maltepe University.

*Çandar, H., & Şahin, A. E. (2013). Teachers' views about effects of constructivist approach on classroom management. *Hacettepe University Journal of Education 44*, 109-119.

**Çiftçi, E. (2010). *The effect of teaching based on constructivist learning approach to student success and attitude in the field of learning geometry in primary education grade 6.* (Unpublished master thesis). Ankara: Gazi University.

Demirel, Ö. (2004). *Curriculum development in education from theory to practice*. Pegem Publication.

Dinçer, S. (2015). Effects of computer-assisted learning on students' achievements in Turkey: A meta-analysis. *Journal of Turkish Science Education 12*(1), 99-118.

Ekşi, H., Ulusoy, M. A., & Toprak, M. (2018). Village stakeholders participation values education: an action research. *The Journal of Humanity and Society, 8*(4), 125-154. http://dx.doi.org/10.12658/M0260

Erdem, E. & Demirel, Ö. (2002). Constructivism in curriculum development. *Journal of Hacettepe University Faculty of Education 23*, 81-87. https://dergipark.org.tr/tr/pub/hunefd/issue/7815/102628

Fer, S. & Cırık İ. (2007). *Constructivist learning, from theory to practice*. Morpa Publication.

Genç Ersoy, B. (2021). The use of educational games in teaching Turkish: A meta-thematic analysis. *Journal of Mother Tongue Education 9*(2), 510-530. https://doi.org/10.16916/aded.887902

Güneş, F. (2007). *Classroom management with a constructivist approach*. Nobel Publication.

**Hançer, A. H. (2005). *An investigation of the effects of computer aided instruction in a constructivist learning environment on learning outcomes in science education.* (Unpublished doctoral dissertation). Ankara: Gazi University.

Kaşarcı, İ. (2013). *The effectiveness of project based learning on students' academic achievements and attitude: A meta-analysis*. (Unpublished master thesis). Eskişehir: Eskişehir Osmangazi University.

*Kaya A. (2008). *A comparison of the classroom management approaches of the class teachers implementing constructivist learning approach and those of the branch teachers not implementing this approach (A case study in Gaziantep)*. (Unpublished doctoral dissertation). Malatya: Inönü University.

**Kerimgil, S. (2008). *The effect of curriculum based upon constructivist learning on pre-service teachers' reflective thinking and democratic attitudes.* (Unpublished master thesis). Elazığ: Fırat University.

**Kızıl Abdullah, Y. (2008). *The effect of constructivist approach on realization of aims of culture of religion and ethics course for primary schools*. (Unpublished doctoral dissertation). Ankara: Ankara University.

**Kirişçioğlu, S. (2007). *The effect of constructivist learning approach based instruction in elementary school seventh (7th) class science lesson "pressure" subject on academic achievement*. (Unpublished master thesis). Denizli: Pamukkale University.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: an expanded sourcebook.* Thousand Oaks, California: Sage.

Ocak, G. (2010). Teacher attitudes towards constructivist learning practices. *Journal of Gazi Education Faculty 30*(3), 835-857.

*Ocak, G., & Çimenci A. F. (2015). Evaluating the applicability of constructivist approach in mathematics classes based on the views of secondary school math's teacher. *International Journal of Field Education 1*(2), 1-23.

Özbay, A. F. (2009). *English teachers' opinions on teaching English upon constructivist approach in English lessons*. (Unpublished master thesis). Afyon: Afyon Kocatepe University.

*Özdemir, İ., & Köksal, N. (2015). Attitudes of elementary school teachers towards constructivism. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi 19*(2), 221-244.

Özel, A., & Bayındır, N. (2008). *Classroom management according to constructivist approach* (1st ed.). Pegem Publication.

**Sakallı, A. F. (2011). *The influence of constructive 5E model about teaching complex numbers subject on students' academic achievement and attitudes.* (Unpublished master thesis). Kahramanmaraş: Kahramanmaraş Sütçü İmam University.

Selçuklu, O. (2019). *Analysis of teachers' constructive learning approaches*. (Unpublished master thesis). Konya: Necmettin Erbakan University.

Thalheimer, W., & Cook, S. (2002). *How to calculate effect sizes from published research articles: A simplified methodology.* Work-Learning Research Publication.

Yenice, E. (2014). *Researching the effect of 7E learning model of consructivist approach on students' academic success on the topic of "Mitosis and Meiosis Division" at 8th grade science and technology class*. (Unpublished master thesis). Kars: Kafkas University.

**Yıldız, M. (2012). *Determining effectiveness of the materials based on consructivist learning in geometrical optic teaching*. (Unpublished master thesis). Trabzon: Karadeniz Technical University.

**Yılmaz Kaya, S. (2008). *The effect of consructivist approach on the success of primary school second level students in science teaching*. (Unpublished master thesis). Konya: Selçuk University.