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The Multi-complementary Approach to the Effect of Context-Based Learning Practices on Retention

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Abstract

The aim of this study is to examine the effect of the Context-Based Learning (CBL) approach on the permanent learning process according to the Multi-complementary Approach (McA) process. The McA, i) Pre-complementary knowledge: Meta-analysis and meta-thematic analysis, ii) Post-complementary knowledge: Experimental design of pretest, posttest, and retention test application in experimental and control groups, and iii) Complementary knowledge: It is a comprehensive evaluation process on the effect of the CBL approach on retention by combining the results obtained from the analysis of the first two stages. In the study, the methodological process was followed according to the steps of the McA. The literature review based on the document analysis on the effect of the CBL approach on retention and the applications made according to the CBL approach showed that CBL is an effective and meaningful approach to the learning process in various issues such as academic achievement, retention, interest in the course and gaining democratic skills. The complementary results on the effect of CBL on retention show that it is an approach that has the potential to grow as an effective method in the social studies course and encourages its more widespread use in the field of social studies.

Keywords

Context-based learning
Multi-complementary approach
Meta-analysis
Meta-thematic analysis
Social studies
Retention of learning

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Introduction

Science is an effort to recognize the universe in which human beings live, to satisfy their curiosity, and to make sense of it through questions. Just as students realize *how kites fly, how ships float, or how birds hatch from eggs*, they should understand that science is not separate from school and the environment we live in, and they should be able to observe it with concrete experiences (Derman & Senemoğlu, 2019, p. 2). While focusing on bringing students closer to the world of science, Context-Based Learning (CBL) centers on providing opportunities to experience knowledge, creating a focus of interest, and stimulating curiosity (Bulte, Westbroek, de Jong & Pilot, 2006). The CBL approach considers the situations that students encounter in daily life as a method of transferring course content to students (Glynn & Koballa, 2005; Yılmaz, Yıldırım, & İlhan, 2022). In this context, the aim of CBL is to enable students to make sense of knowledge and support them to see knowledge as a need in solving the problems they face in daily life. (Acar & Yaman, 2011). The CBL approach is a learning process that allows students to gain experience by associating the knowledge to be gained with real life (King, 2009b, 2012).

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Students may need a context in order to make sense of the information they learn by connecting it with real life (Yel & Çetin 2023). Context can be thought of as a working environment based on students' real experiences rather than a *'simulation'* (King & Henderson, 2018; Sennett, 2008). In the initial purpose of CBL, the gradual distancing of students from scientific activities, and the inability to relate the subjects to real life are seen as a cause and, accordingly, the gradual decrease in interest and curiosity towards science creates concern as a result (Jenkins & Nelson, 2005; Osborne, Simon, & Collins, 2003). This situation is considered a failure due to the fact that the decrease in interest in science in the upper grades is not sufficiently engaging students in science, especially in the middle grades (Goodrum, Druhan, & Abbs, 2012). International PISA results show that in many countries, students' ability to apply scientific knowledge to real life and develop solutions has stagnated or in some countries has declined compared to previous years, creating a gap between what students are trying to gain in the classroom and the need to connect real life (King & Henderson, 2018). The results based on PISA 2022 data indicate that average performance has declined compared to previous years, especially in mathematics and reading, while results in science remained relatively stable in 2022 (stabilization), but in the long term, reading and science have been declining for some time (OECD, 2023). Today, context-based learning, which is based on the constructivist approach, is followed as a current method in teaching, especially in Western countries such as the USA, the UK, Germany, and the Netherlands and in the education systems of countries such as Australia, New Zealand and Israel (Acar & Yaman, 2011). By its nature, CBL is student-centered and is based on keeping the student active in the learning process. In this respect, it can be said that there are similarities between the context-based learning approach and in-school and out-of-school learning (Barker & Millar, 1999; Mete & Yıldırım, 2016). When going outside the classroom environment in the learning process and establishing a connection between knowledge and real life, student motivation and retention in learning can increase.

Literature Review

In the 1980s, CBL was introduced to the field by educators specialized in the field of Chemistry at the University of York in the UK as life-based teaching (Cabbar & Şenel, 2020; Kortland, 2007; Kutu & Sözbilir, 2011). In Turkey, studies based on the CBL approach started to be pioneered by Sözbilir in 2007 in the field of chemistry. It is known that the origin of the word 'context' mentioned in the CBL approach is used as a verb describing the action of 'context', that is, 'weaving together' in Latin, and it has gained meanings such as consistency, connection and relationship over time (Gilbert, 2006). The context in CBL, which is also referred as life-based learning (Mete & Yıldırım, 2016; Kutu & Sözbilir, 2011) in different sources, refers to the social and cultural environment in a broad sense (Whitelegg & Parry, 1999). The context-based learning approach takes into account that learning is not only an activity that takes place in the brain, it is primarily based on an interactive process, and the context in which learning takes place is formed in a social environment. This understanding is historically based on Vygotsky's sociocultural learning (Caffarella, & Merriam, 1999). In this approach, when the context is considered as a concept, idea, subject or human activity as a culture of the society, it can be said that learning does not take place alone, but as a result of the interaction of the student with the environment, it supports the processes such as making sense of knowledge and finding solutions to problems through questioning and discussion (Choi & Johnson, 2005; Overman, Vermunt, Meijer, Bulte, & Brekelmans, 2014). Therefore, CBL can affect both cognitive and affective domain goals and can reveal students' interests aspirations, and intellectual skills (Bennett, Lubben, & Hogarth, 2007; Broman, Bernholt, & Parchmann, 2018). Research on CBL has shown that it is a motivating and engaging approach for teachers and students compared to traditional methods (Choi & Johnson, 2005; King, 2012). As Whitelegg and Paryy (1999) point out, in order to increase students' interest and enthusiasm in the lesson, it is important to determine the appropriate context and not to neglect the content. Unlike these studies, the question of which contexts can be more effective on students and what the evaluation criteria will be continues (Habig et al., 2018). De Jong (2008), referring to Ramsden's (1997) research results obtained from context-based applications, especially in chemistry, points out that the approach

focuses more on the effects of the approach such as interest, motivation, and attitude, but this will create a limited opinion. As a result, he argues that while the context-based approach contributes positively to students' affective development towards science, there are also aspects that need to be developed in the cognitive domain.

Context-Based Learning Practices at the Secondary School Level

It can be said that there is an increasing belief that increasing students' curiosity about science and developing scientific thinking skills in secondary school years depends on the transformation of school knowledge into functional knowledge, so the interest in the CBL approach is gradually increasing (King & Henderson, 2018). While the idea of developing positive attitudes toward science and scientific learning is becoming more and more important every day, on the other hand, the issue of moving away from science continues in many countries and this situation is met with concern (Osborne et al., 2003; Tytler & Osborne, 2012). When the researches are examined, it is seen that the starting point of CBL applications is in the field of chemistry and it has started to be modeled at higher levels (Broman et al., 2018; Dori, Avargil, Kohen, & Saar, 2018; Habig et al., 2018; Prins, Bulte, & Pilot, 2018). In addition, there are also studies on context-based course applications in chemistry at higher education level (Sevian, Hugi-Cleary, Ngai, Wanjiku, & Baldoria, 2018) or studies on the instructional effects of context-based applications on different age groups (Swirski, Baram-Tsabari, & Yarden, 2018). However, it is seen that more limited studies have been conducted at the middle school level. CBL practices for increasing students' interest and curiosity in science at the middle school level are found in the study of King and Henderson (2018). This shows that especially middle school years are critical years in terms of developing attitudes toward science and that research has the potential to grow at these levels as in other disciplines (King & Henderson, 2018). In the studies conducted in national research area according to the CBL approach, Tulum (2019) prepared educational materials in accordance with the CBL approach in the "light and sound" unit in the 5th grade science and technology course and applied them in the lesson and examined the effect of these materials on students' academic achievement. Accordingly, he obtained results that the applications increased the academic achievement of the students and that they became more enthusiastic towards the science course. Kara (2016) examined the effect of CBL on students' level of associating their knowledge with daily life, their academic achievement, and their attitudes towards science courses in the 5th grade "Change of Matter" unit. She prepared a lesson plan consisting of stories related to daily life according to the 5E learning model in accordance with the CBL approach. In the study, it was concluded that the IST practices applied to the experimental group were more effective in students' academic achievement, their ability to associate knowledge with daily life, and their attitudes towards science course. It was also stated that it increased the positive relationship between students' academic achievement and their ability to relate their knowledge to daily life. In addition, students stated that they found CBL applications fun and understood the lesson better. In İnci's (2019) study, the effect of the interaction of perception of the CBL environment, interest in the lesson, participation in the lesson, and academic motivation on middle school students' achievement in science was investigated. According to the data collected from 572 eight-grade students studying in nine different schools with the perception of CBL environment scale, interest in the course scale, course participation inventory, and academic motivation scale, it was determined that the perception of CBL environment, interest in the course, course participation, and academic motivation of middle school 8th-grade students interacted with each other and with students' science achievement. Arıkan (2021) conducted a study on the effect of the CBL approach on students' academic achievement, financial literacy skills, and retention of learning in Social studies courses. According to the results of the study, a statistically significant difference was found in favor of the experimental group when comparing the post-test scores of the experimental group in the 6th-grade Social Studies production, distribution, and consumption learning area. It was found that the CBL approach had a positive effect on academic achievement, financial literacy skills, and retention of learning. On the other hand, Yel (2022), conducted the implementation process of the CBL approach in the 6th grade social studies course "production, distribution and consumption" learning area with an action research model in his study on CBL processes in social studies course. According to the results

of the study, it was found that the students found the activities carried out in accordance with the CBL approach fun and interesting and that these activities facilitated the learning process and supported permanent learning. In addition, some of the findings also touched on the limitations of CBL and drew attention to the difficulties such as time-consuming practices, and finding and applying relevant contexts. In a study, Yüzbaşıoğlu (2022) examined the effect of context-based comics on students' development with the "Grounded Mental Model" (GMM), that is, the scale of revealing mental models with structured responses, and the opinions of the students and the application teacher about the "Context-Based Comics" (CBC) in the 5th grade science course. According to the results of the study, it was concluded that while the pre-study GMM in the experimental and control groups were mostly in favor of the "Inconsistent Mixed Model" (IMM), after the CBL approach, the GMM situations improved more in the experimental group. Şimşek (2022) aimed to determine the motivation, scientific literacy, attitudes, and concerns of students in the field of STEM (Science, Technology, Engineering, Mathematics), scientific literacy, attitudes and concerns towards science courses, and to examine students' views on these applications by using the REACT (*Relating, Experiencing, Applying, Cooperating, Transferring*) strategy, which is a model of the CBL approach, with STEM. In her study, she used the scientific literacy scale, STEM motivation scale, attitude toward science course, and anxiety scale as data collection tools. In the study, STEM applications with context-based REACT strategy in the experimental-I group, context-based REACT strategy applications in the experimental-II group, and science applications in the control group were followed. As a result of the study, it was determined that in terms of scientific literacy and motivation towards STEM, the experiment-I group was higher than the control groups in which context-based activities were applied and science applications curriculum was carried out. In terms of attitudes towards science and anxiety levels, it was determined that the positive effect rates of the experiment-I and experiment-II groups were similar and they were higher than the control group in which the science applications curriculum was applied.

In summary, when the studies are examined, it is seen that studies have been conducted on the effects of the CBL approach on student achievement, scientific literacy, motivation, attitude, and anxiety level in the field of science.

Learning and Retention in Context-Based Practices

The speed of change in the information world increases the expectations and needs of the learner in the learning process and continues the search for methods for effective and permanent learning. Accordingly, new approaches based on the post-positivist paradigm, learner-centered, constructivist understanding are adopted. CBL is a learning experience based on the environments in which the individual establishes bonds in his/her social and cultural environment and is realized through concrete experiences (Baran & Sözbilir, 2018). When students encounter new information, they try to learn without realizing how to establish a relationship with their previous knowledge, they have difficulty making sense of it, and this may cause them to participate less in the lesson and forget the information faster (Gilbert, 2006). In this case, the learning environment and context can affect learning (Sevian, Hugi-Cleary et al., 2018). Students may want to situate and make sense of the information they are trying to learn in relation to a story or situation they have already acquired. Therefore, context can be used not only to attract students' attention and motivate them toward the lesson, but also when focusing on different concepts, topics, and questions (Broman et al., 2018). Success in CBL applications depends more on the effective and efficient use of materials and classroom practices (Prins et al., 2018). This situation implies that environments that affect the context should be developed in the context-based learning process (Onwu, & Mufundirwa, 2020). More research is needed on the question of how context affects the learning process and the effects of context-based learning on students' learning process in the classroom environment (Sevian, Hugi-Cleary et al., 2018). Therefore, context-based learning can be considered as an approach that enriches our learning processes that affect the learning and retention of knowledge.

When the researches were examined, Baran and Sözbilir (2018) revealed that teaching based on the CBL approach had a significant effect on permanent learning. Choi and Johnson (2005) show that

video-based instruction can be an effective way to attract attention and motivate and increase retention in context-based learning. Dori et al. (2018) revealed in their study that context-based practices contribute to learning by increasing chemistry literacy. Kazeni and Onwu (2013) concluded in their study that CBL is more effective than traditional approaches on student performance except for certain scientific inquiry skills. In addition, on the effect on retention, Kutu and Sözbilir (2011) found that the life-based ARCS (*Attention, Relevance, Confidence, Satisfaction*) model in chemistry teaching contributed positively to permanent learning and motivation in students. In addition, Akdaş (2014), in his study on the effects of the applications carried out according to the life (context) based learning model on students' academic achievement, attitude, and retention in the "human and environment" unit of science and technology course, found that life-based learning activities are an effective approach on permanent learning and support students to gain positive behaviors towards the environment. In summary, it can be said that in national and international research, studies on the effect of context-based learning approaches on retention in learning are limited in fields other than science. This situation shows that there is a need for further research on the applicability of the CBL approach in different fields of science and as a variable affecting retention in learning.

Purpose of the Study

CBL can be explained as a student-centered approach that aims to enable students to understand scientific concepts concretely and to develop their cognitive thinking skills through experiences such as questioning, discussion, and problem-solving in accordance with the constructivist approach (Broman et al., 2018; Gilbert, 2006). When we look at the applications of CBL, it is seen that it has gradually become the center of attention in the field of science as a starting point and is an approach that is discussed in the field with its impact (Bennet et al., 2007; De Jong, 2008). When we look at the teaching outcomes of the context-based approach from the studies, it has been found that it positively affects students' attitude towards the course, increases motivation, improves self-efficacy, encourages individual learning, and contributes to the development of life skills (Baran & Sözbilir, 2018; Deveci & Karteri, 2022; Kazeni & Onwu, 2013). It is known that studies have been carried out in order to make students love science and make scientific concepts understandable, but it is seen that studies on its effects on permanent learning are limited. For this reason, it is aimed to investigate the effect of context-based learning practices on the permanence of learning in order to increase students' interest and curiosity in science at the secondary school level and its growth potential in the field of social studies as in other disciplines. For this purpose, the following questions are expected to be answered in order to determine the effect of context-based practices on retention in terms of social studies education.

- At the-complementary knowledge phase:
  - According to the results of the meta-analysis, what is the overall effect size (g) of CBL practices on academic achievement?
  - Within the scope of the meta-thematic analysis, what are the effects of CBL applications on scientific thinking and negative aspects in terms of the learning environment and what are the suggestions for this approach?
- At the post-complementary knowledge stage:
  - In the context of the experimental process, is there a statistically significant difference in favor of the experimental group in the pre-test, post-test, and retention scores after the application of CBL in social studies education?
  - What are the opinions of the experimental group participants about the activities based on CBL applications in the social studies course?
- At the complementary knowledge stage:
  - Do the findings in the data obtained from the stages of the McA complement each other?
  - What are the recommendations that can be made according to the results obtained?

Method

In this study, a McA was followed methodologically by combining more than one qualitative and quantitative analysis process on the effect of CBL practices on retention. The McA aims to reveal the sub-problems of the research with a holistic interpretation by combining qualitative and quantitative data comprehensively in the research context (Anıl & Batdı, 2022; Batdı, 2016). The methodological structure of a study is shaped according to the mixed method process and the context that constitutes the research (Ivankova & Plano Clark, 2018). Johnson and Onwuegbuzie (2004) interpret the mixed research method as a third wave movement that advocates the practice of multiple approaches with an eclectic approach rather than limiting researchers to a single method (p. 17). The most important reason for the need for mixed methods is that a single qualitative or quantitative research method cannot be sufficient to illuminate the research situation and trends, so the use of both methods together can complement each other (Creswell, 2017; Creswell, Fetters, & Ivankova, 2004). Mixed methods have been defined and explained many times in studies. Almeida (2018) defines it as a method that offers a broad vision to the researcher when research needs to be examined comprehensively. According to Migiro and Magangi (2011), mixed methods are preferred by a researcher after experimental research to see whether the participant's thoughts about the practices and the results obtained are consistent with each other, so it is considered a new movement in research methodology after quantitative and qualitative. Pluye and Hong (2014) *state* that researchers use mixed methods in order not to be bound to a single qualitative or quantitative method and to eliminate limitations, so in recent years, mixed methods can '*combine the power of stories with the power of numbers*'. Tashakkori and Teddlie (2008), on the other hand, argue that in recent years, the research community has been faced with a polarization problem in methodology and that looking at this problem from a broad perspective may be 'the best result of calming research methodology'. Beyond the definitions known as mixed method in the literature, Batdı (2016), on the other hand, expands the mixed method on a new plane and presents a Multi-complementary Approach (McA) by detailing the results obtained from different data sources and presenting these results as a whole by going through various stages. Methodologically, multi-method research can provide more qualified results than single-method research (Johnson & Onwuegbuzie, 2004). Therefore, the aim of this approach is to follow a scientific and at the same time comprehensive way of clarifying the sub-problems of the research.

What is a Multi-complementary Approach?

McA requires explaining the information obtained from different data sources through many stages and interpreting the results as a whole without being bound by the limitations of a single data source (Batdı, 2016). McA is a holistic approach that results from combining information obtained from both qualitative and quantitative data sources with analysis programs (Batdı, Doğan, & Talan, 2021). According to the learning theory of Gestalt, J. Dewey, Piaget, Bruner, and Vygotsky, who are the pioneers of integrative and constructivist educational philosophy, the reinterpretation of knowledge always based on previous knowledge requires a comprehensive view. This requires getting to the root of the research topic, elaborating the research topic with different data, and reorganizing the information (Batdı, 2016). There is a progressive system that ensures the functioning of the holistic approach in itself. McA consists of three parts (Batdı et al., 2021). The first stage, pre-complementary knowledge, is the literature review stage in which the contribution and gain that the subject of the relevant study will provide to the field is determined and missing information is revealed. At this stage, document analysis and studies on CBL practices were examined and the processes based on meta-analysis and meta-thematic analysis were completed. Pre-complementary information was tried to be determined for the final integrative stage. The second stage, post-complementary knowledge, is defined as the knowledge that covers the original studies carried out by the researcher to eliminate the deficiency identified in the first stage. It is stated that it is possible to offer complementary suggestions to the general situation reached by evaluating and interpreting the results obtained from pre-complementary and post-complementary knowledge with the complementary knowledge stage, which is the last stage (Anıl & Batdı, 2022; Batdı, 2016; Batdı et al., 2021). At this point, the idea of obtaining

comprehensive results by conducting qualitative and quantitative methods together in the research process is consistent with the studies of many researchers-authors (Creswell et al., 2004; Ivankova & Plano Clark, 2018; Migiro & Magangi, 2011; Tashakkori & Teddlie, 2010; Terrell, 2012), who are pioneers in mixed method issues, and the relevant studies support the McA.

Pre-complementary Knowledge Stage

As seen in Figure 1, the first stage of CBL is the pre-complementary knowledge stage. At this stage, literature research was conducted and related studies on context-based learning were examined.

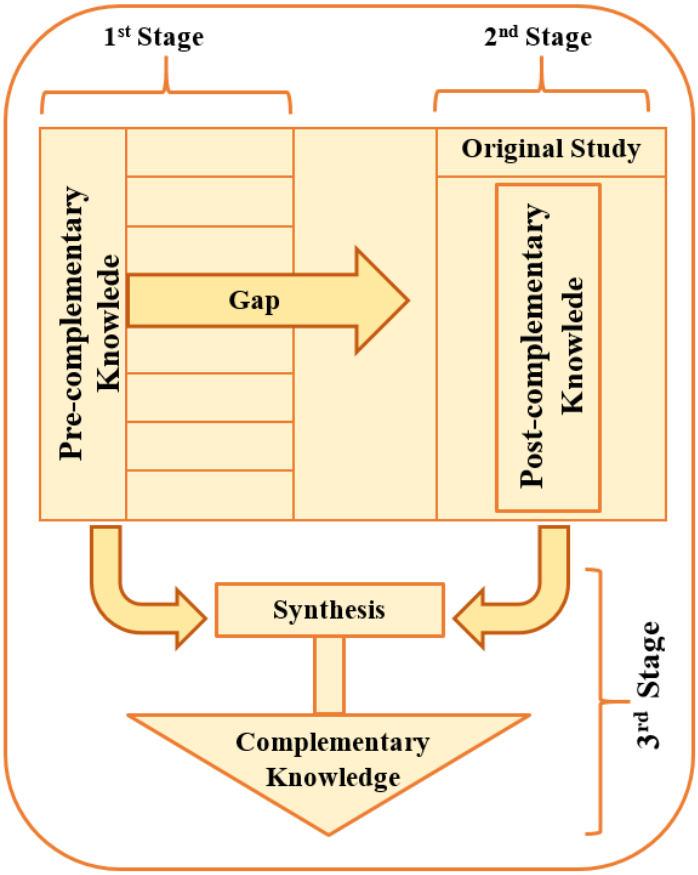


Figure 1. Multi-complementary Approach (McA) (Batdı, 2016)

In the preliminary holistic knowledge phase, the research on context-based learning was reviewed through document review. At this stage, the results that will guide the study were reached through meta-analysis and meta-thematic analysis. A meta-analysis, which was shaped by Glass (1976), is expressed as combining and standardizing the results of different research on a subject and summarizing them with quantitative methods. Meta-analysis is a method that aims to reach more comprehensive and generalizable results by combining the results of studies focused on similar purposes (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz, & Demirel, 2014). The analyses obtained as a result of meta-analysis provide higher-level results in determining the effects compared to individual studies (Jackson & Turner, 2017). The meta-thematic analysis was used as another analysis in the preliminary holistic information stage of the study. Meta-thematic analysis involves the analysis of the findings obtained from qualitative studies that are similar to the relevant research topic and the process of creating themes and codes through document review and textual content (Batdı, 2019). To summarize, the preliminary holistic knowledge stage in EQM includes the process of combining meta-analysis and meta-thematic analysis.

Data Collection Process in the Preliminary Holistic Information Phase

Literature Review and Inclusion Criteria

The CBL applications subject to the research were reviewed by meta-analysis and meta-thematic analysis process. It tried to identify the deficiencies that could give direction to the study in the CBL approach subject to the research. In this research, the relevant studies were accessed from ProQuest Dissertations and Theses (PQDT), Springer LINK, Google Scholar, Ebscohost-Eric, Taylor & Francis Online and ScienceDirect, YÖK National Thesis and Dissertation Center databases. In the research, keywords such as life-based learning, CBL, and effect on retention and achievement were scanned.

Meta-analysis inclusion criteria

The criteria sought in the studies to be included in the research for meta-analysis are as follows:

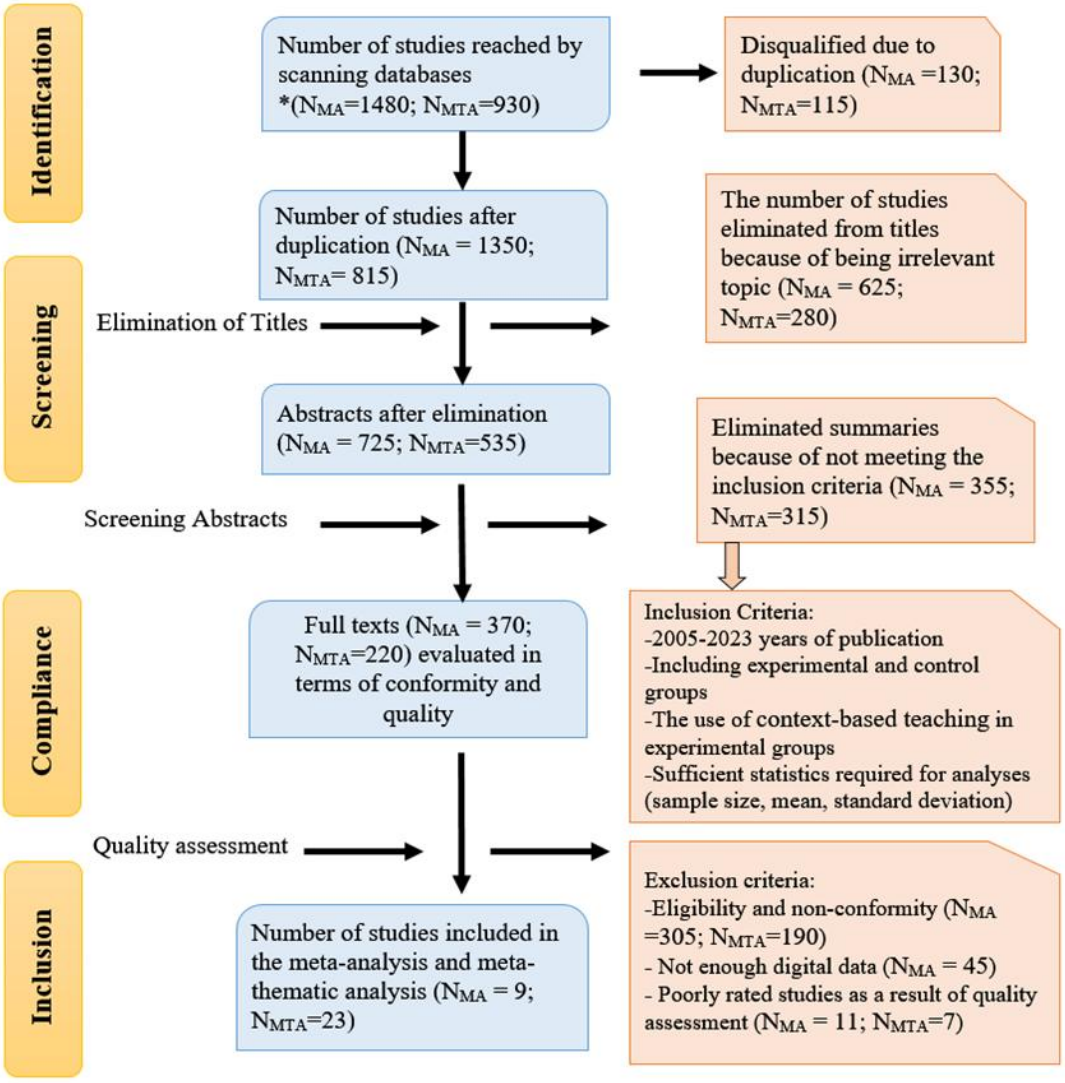
- Carried out between 2005 and 2023;
- Written in the form of articles and thesis research;
- Accessible through the databases mentioned above;
- Examining the studies on the effect of CBL on retention;
- Methodologically, it was conducted as experimental/quasi-experimental in the form of pre-test and post-test;
- Providing the statistical data necessary to calculate effect sizes in meta-analysis [sample size (n), arithmetic mean (X) and standard deviation (sd)]

studies were included in the research

The inclusion criteria for meta-thematic analysis are the following in addition to the first four criteria mentioned above:

- Qualitative studies examining the effectiveness of CBL on retention;
- In studies conducted as qualitative research, studies that included participant views were included in the research

As indicated in Figure 2, 1480 studies were accessed for meta-analysis in the research on CBL. The studies were examined within the scope of quality, scientific competence level, impartiality, systematic and organizational presentation, significance, and originality (Mack, 2012), and 9 of them were included in the analysis. The others were excluded from the scope of the research and were not included in the analysis. The excluded studies were excluded for reasons such as being irrelevant to the topic, not meeting the inclusion criteria, and being included in more than one database. In scientific studies, the quality of the included studies should be evaluated in terms of various criteria (Greenland & O'Rourke, 2001). The list of included studies is presented in Appendix 1. During the meta-thematic analysis process, 930 studies were accessed from the databases mentioned above. In the research, 23 studies conducted between 2005 and 2023 were included. In this context, the PRISMA flow diagram (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group, 2009), which reflects the process of the studies included in the meta-analysis and meta-thematic process at the preliminary holistic information stage, is given in Figure 2.



*Number of studies accessed for meta-analysis (N_{MA}) and meta-thematic analysis (N_{MTA})

Figure 2. Flow diagram for the selection of the studies included in the analysis

Coding

Coding is a reliability study provided by repeating the studies included in the meta-analysis by different people independent of each other (Wilson, 2009). Coding the results of meta-analysis facilitates the analysis process of future studies (Pigott & Polanin, 2020). After the screening process in meta-analysis, the coding process is needed to examine the studies reached and to transform them into a standardized form (Wise & Okey, 1983). The coding form should be comprehensive enough to reflect the content of all included studies but specific enough to reveal their independent differences (Demir & Başol, 2014). In this study, a coding form was created to ensure validity and reliability. This form included a section containing information such as the study code, the name of the study, the name of the author, the year of the study and the period in which it was conducted, the course, level, sample, and the statistical data belonging to this section. In meta-analysis, the agreement value between coders was calculated as .92 according to Miles and Huberman (1994). In the meta-thematic analysis, new themes and codes were created by examining the participant views in the studies included in the research. Codes appropriate to the developed theme title were included in the same title. The consistency of the codes in the meta-thematic analysis process contributes not only to the consistency between theme and code but also to the reliability of the study (Mayring, 2004). Cohen's Kappa value, which is used to calculate the agreement between two coders in the study, should be calculated (Cohen,

1960). Kappa takes values between +1 and -1, and the agreement increases as the value approaches +1. A value of zero (0) indicates a chance fit, while a value approaching -1 indicates poor fit (Fleiss & Cohen, 1973). In this study, a separate fit was calculated for the themes created in the meta-thematic analysis. The values were found to be between .81-.86, indicating that the fit values of the codes were at a very good level. While interpreting the themes and codes in the meta-thematic findings section, direct quotations reflecting the participant's opinion were also included for transparency and reliability. At this point, related studies were coded with numbers, letters and page numbers. For example, in the numerical expression TFO4-s.11, TFO indicates the Taylor & Francis Online database; the number 04 indicates the code given to the studies scanned in order; and "s.11" indicates the page number where the citation was made.

Data analysis

In the pre-complementary knowledge phase of the study, the data obtained from the meta-analysis and meta-thematic analysis processes were transferred to Microsoft Office Excel and Microsoft Office Word programs. The statistics obtained in the meta-analysis process were analyzed using Comprehensive Meta-Analysis (CMA) version 2.0 (Borenstein, Hedges, Higgins, & Rothstein, 2009) and MetaWin version 2.0 statistical programs (Rosenberg, Adams, & Gurevitch, 2000). The effect size was calculated according to Thalheimer and Cook's (2002) classification. MAXQDA-11(www.maxqda.com) program was used to process meta-thematic data obtained through document analysis of qualitative research. The data obtained were combined under themes and codes through content analysis. In the preliminary holistic information phase, both meta-analysis and meta-thematic analysis were conducted together. The details of the meta-analysis process are mentioned below.

Effect Size and Model Selection

Effect size was introduced to the literature by Cohen (1988) and is defined as the frequency of use of a phenomenon. Effect size is a calculation method used to determine the effectiveness of an application and to reveal the size of the difference between two groups (Coe, 2002). Indices showing the effect size value (d or g) provide a correct basis for the interpretation of the study (Demir & Başol, 2014). Hedges (1981) expressed the g value as a standard measure of the average difference between the experimental and control groups in calculating the effect sizes of the applications. In meta-analysis studies, effect size can also be determined by fixed effect model (FEM) or random effects model (REM) (Ried, 2006). Schmidt, Oh, and Hayes (2009) reported that the conditions suitable for FEM are limited. In this study, it was deemed appropriate to use the REM due to the presence of different variables affecting the process such as teaching level, sample size, time allocated to the application, and subject area.

Heterogeneity test

Heterogeneity is a value that shows the differentiation of the results of the studies included in the meta-analysis (Higgins & Thompson, 2002). In order to measure the heterogeneity of the studies included in the meta-analysis, some methods such as Cochran's Q statistic, and Higgins, Thompson, Deeks ve Altman's (2003) I^2 statistic have been developed. The I^2 statistic developed from the Q statistic takes a value between 0 and 1 (0% and 100%) and is a value that is affected by the effect size rather than the number of studies included in the meta-analysis (Schwarzer, Carpenter, & Rücker, 2015). Higgins et al. (2003) categorized I^2 statistical values as 25%, 50%, and 75%. According to this classification, the value obtained was determined as low, medium, and high heterogeneity values, respectively.

Post-complementary Knowledge Stage

The second stage, the final holistic knowledge stage, is defined as the knowledge that covers the original studies conducted by the researcher to overcome the deficiency identified in the first stage (Batdı, 2016). In the last holistic knowledge stage, it was tried to determine how to deal with the applications of CBL according to the studies reached through literature review by meta-analysis and meta-thematic analysis. When national and international studies are examined, it is seen that the applications of the CBL approach have started to be applied in the field of science and mostly at higher

levels. However, in recent years, it has been observed that there is a need to give more space to the application of CBL in order to make students love science at a younger age, increase scientific literacy, and enable students to establish a connection between science and real life. In addition, it has been determined that the studies have mostly focused on the effects of the practices on student achievement, attitude, and motivation, and fewer studies have been conducted on retention. Accordingly, it is believed that conducting studies on the effect of CBL on retention in the field of social studies will enrich the studies in the field. Therefore, in the field of "active citizenship" learning area in the social studies course, CBL applications were used and applied to the experimental group. These applications allowed the analysis of students' achievement and retention results as a result of the experimental process.

Design of the Experimental Process

McA is a mixed-design research approach consisting of more than one stage. The results obtained with data collection tools based on both qualitative and quantitative methods are a prerequisite. According to Migiro and Magangi (2011), the mixed method, which is based on the findings that create prerequisites for each other (Creswell, 2015), is preferred by a researcher after experimental research to see whether the participant's thoughts about the practices and the results obtained are consistent with each other, and therefore, it is considered as a new movement developing after quantitative and qualitative in the research method. In the pre-integrative knowledge stage, meta-analysis and meta-thematic analysis data were analyzed in the studies on CBL practices and the experimental process was directed. In the post-integrative knowledge stage, it was concluded that the studies were mostly concentrated in the field of science, and there was a lack of studies on the effect of context-based practices on retention in the field of social studies. Accordingly, it was decided to conduct an experimental study in order to determine the effect of CBL applications on retention in the field of social studies.

Creating an Experimental Group

In the study, the experimental and control groups were determined according to the analysis of the pre-test results of the achievement test developed. Accordingly, experimental (n=20) and control (n=22) groups were formed from 7th-grade students (n=42) studying in a private school in Gaziantep in the 2022-2023 academic year. Table 1 shows the experimental study. Students were placed in the experimental and control groups according to the analysis obtained from the pretest data. At this point, it was noted that the students in the experimental and control groups were selected through unbiased assignment and that the pretest scores were organized in such a way that they were equal for both groups. In other words, the students in the group were divided into groups by adjusting the pre-test scores to be balanced. Depending on the experimental study, the measurements of the groups before the context-based learning application were applied as a pre-test (Q1-2). Then, in the experimental group of students, CBL applications (X) were applied, while in the control group, methods appropriate to the traditional approach (presentation, lecture, discussion) were applied. After the completion of the CBL applications in the experimental group, the post-test (Q3-4) was applied to both groups and three weeks later, the same measurement tool was applied to both groups as a retention test. Data analysis process of the experimental dimension.

Table 1. Symbolic Representation of the Experimental Study

Neutrality	Groups	Pre-test	Process	Post-test	After a Certain Process	Retention-test
R	E	Q_1	X	Q_3		Q_5
R	C	Q_2		Q_4		

Note. R: Random Assignment of Groups, E: Experimental Group, C: Control Group, X: Independent Variable Level (CBL- Based Practices in Social studies course), $Q_{1\text{-}2}$: Pre-test Application, $Q_{3\text{-}4}$: Post-test Application, Q_5: Experimental Group Retention Test Application

Data Collection Tool: Achievement Test Development

In the experimental study phase, an achievement test was developed to perform pre-test, post-test, and retention measurements of the students. In the achievement test, a specification table was prepared in which the taxonomy-based levels of the questions were determined with the achievements of the 7th-grade "active citizenship" learning area included in the study (Appendix 3). The cognitive levels of the prepared questions were determined in accordance with the Revised Bloom's Taxonomy. The questions consisted of 30 multiple-choice original questions reflecting the content of the learning domain. Two subject area experts and one measurement and evaluation specialist were consulted about the achievement test questions. Necessary corrections were made according to the expert opinions and the questions were finalized. The questions were first administered to 162 students from the upper 8th grade who had studied the same subject in the previous year. According to the data obtained with the Test Analysis Program developed by Brooks and Johanson (2003), the validity and reliability results of the questions were obtained(Appendix 1). According to these results, the discrimination index of the test was .73, the average discriminative power was .43 and the KR-20 coefficient was .85. Accordingly, the KR-20 value is expected to be .80 and above for tests with more than 50 items (Kehoe, 1994). The achievement test developed fort his study has high validity and reliability. According to the item analysis, questions 2, 3, 4, and 11 were removed from the achievement test and the test was finalized.

Processing Time

In the study, different teaching methods were applied in the experimental and control groups. Activities were prepared for the students in the experimental group in accordance with the CBL approach. Weekly lesson plans were prepared in accordance with the context-based approach according to the social studies course curriculum and the acquisitions in the "Active Citizenship" learning area in the 7th grade Ministry of National Education textbook. Before the procedure, the students in the experimental group were informed about the CBL approach and its applications. In the learning area of "Active Citizenship", the topics of "The Adventure of Democracy" in the first week, "Atatürk and Democracy" in the second week, and "The Qualities of the Republic of Turkey" in the third week taught in accordance with the context-based approach.

Week 1. The teacher asked the students about the forms of government applied from the past to the present and revealed their prior learning. A discussion was initiated in the classroom with the question of what could be in the content of the title "The Adventure of Democracy" and student opinions were taken. Then, the students were asked the question, "*If the word adventure had an equivalent in daily life, with which word would you express it*?". Thus, they were asked to realize that democracy has progressed through a development process with the contribution of different societies from the Ancient Greek period to the present day. Students were shown examples that monarchy was the most common form of government in the past, while democratic governments are the most common system today. Students were told that there are countries where some traditions of the monarchical system continue today. For example, the video "Coronation Ceremony in England" was shown in the classroom. After watching the video, the students were allowed to determine that the forms of government have different practices from each other by making comparisons. Sample stories in the textbook were utilized for practices reflecting democratic understanding in Turkish history. After the subject was completed, a chronological map showing the stages of the history of Turkish democracy was prepared and exhibited on the class board.

Week 2. Students were asked the question "What are our national holidays" and their prior learning about our national and democratic values gifted to our nation by Atatürk was revealed. In the "Basic Principles of Democracy" activity, students were asked to explain the meanings of the principles of national sovereignty, equality, freedom, pluralism, and participation with sample applications and visuals. Students presented examples of the principles of democracy that they prepared as group work for their classmates with written texts and visuals. Atatürk's great achievements in the history of Turkish democracy were explained to the students. The story of Satı Çırpan, one of the first female deputies to enter the Grand National Assembly of Turkey as an Memeber of Parliment, was included. The documentary about the opening of the Grand National Assembly of Turkey, one of the greatest living institutions of our democracy and national sovereignty, on April 23, 1920, was shown.

Week 3. The lesson started with the question "*Do you know the first four articles of our Constitution*?". Students were asked to read the first four articles of our constitution in their textbooks. The importance of being a democratic, secular, social, and legal state was emphasized in the topic "The Qualities of the Republic of Turkey". The President of the school council, who was elected by the voting process of the students in our school, and the guidance counselor in charge of the level were invited to our class. In order to revitalize the democratic characteristic, the school council ballot box and the ballots they used were carried to our classroom as educational materials. The guidance counselor and the representative student, who managed the voting process, exchanged ideas with the students about the preparations made before the election process, the election process, and the duties and responsibilities of the representative student after the election. Many examples of democracy as a living concept that we can relate to in real life were shared in the classroom. Examples such as the decisions taken in the family environment, the election of the class president, the determination of the class rules by the class members, and the fact that everyone has the right to education. The students used written and digital resources such as newspapers and magazines to explain the characteristics of the social state brought sample events and visuals to the classroom and shared them in the news corner on the classroom board. In summary, the experimental group students completed the process with the "Active Citizenship" learning domain content, case studies, and stories prepared in accordance with the CBL approach, videos, documentaries, news bulletins, visuals, and contexts in real life such as school assembly.

The lessons in the control group were taught in accordance with the social studies curriculum for three weeks on time and by using the textbook. In terms of lecture methods, the topics "*The Adventure of Democracy, Atatürk and Democracy, and the Qualities of the Republic of Turkey"* were taught using traditional methods such as traditional lectures, PowerPoint presentations, and question and answer.

Thematic Analysis Process

Thematic analysis was conducted to consolidate the quantitative data obtained after the complementary knowledge stage and to obtain more detailed information about CBL. Thematic analysis is an analysis method that allows analyzing the data obtained according to their similarities and reaching themes with the relationships between concepts (Yıldırım & Şimşek, 2013). Semi-structured interview form questions were applied to 20 students in the experimental group according to the maximum diversity sampling method on the effect of the CBL approach on retention and the student outcome in terms of values education in the 2018 Social Studies Curriculum. Maximum variation sampling ai, ms to reveal similar and different aspects that show diversity in the analysis process rather than generalization (Yıldırım & Şimşek, 2013). The questions were prepared by the researchers in accordance with the literature and examined by two academicians in the field of educational programs and two social studies teachers. Necessary corrections were made and the interview form questions were applied to the students. The qualitative data obtained were examined based on the action research process and analyzed in the MAXQDA-11 (www.maxqda.com) package program. In the thematic analysis process, student opinions were transferred through direct quotations, and codes were created. While transferring the thematic codes, the opinions of the participants were quoted verbatim in order to present direct quotations from the students' opinions. In this process, students were coded with abbreviations as (T1, T2). The direct transfer of student views contributed to the qualitative data reliability of the study. In the thematic analysis process, the consistency of the themes and codes reached through student comments and the agreement values between the coders (Cohen Kappa) were found. Kappa value is a value that shows the agreement between observers or data coders in the research process. Agreement value ranges can be expressed as *poor agreement* if the value is .20 or less than .20, *below average agreement, if the* value is between .20-.40, moderate *agreement* if the value is between .41-.60, *good agreement* if the value is between .61-.80, and *very good agreement if the value is* between .81-1.00 (Viera & Garret, 2005). When the agreement values related to the study were examined, the Kappa value for the theme *"The Effect ofCBLon Scientific Thinking" was* .83; "*Negative Thoughts and Suggestions on IST*" was.86; "The *Effect ofCBLon the Learning Process*" was .81 and "The *Effect ofCBLon Affective Skills*" was .86 (Appendix 2). The fact that the value range obtained as a result of the calculations made for each theme is between .81-.86 shows that there is a very good level of agreement.

Complementary Knowledge

The third stage of the McA is the complementary knowledge stage. The complementary knowledge stage can be defined as a process in which a comprehensive perspective on the research is put forward by combining qualitative and quantitative data obtained from the pre-complementary and post-complementary knowledge stages (Batdı, 2016). Methodologically, multi-method research can provide more qualified results than single-method research (Johnson & Onwuegbuzie, 2004). Tashakkori and Creswell (2007) emphasize that combining qualitative and quantitative data with mixed methods research can increase the predictive power of the research. The fact that the data obtained as a result of different methods support each other can increase the credibility of the research (Yıldırım & Şimşek, 2013). In this respect, combining the findings for all the data obtained as a result of examining the effectiveness of CBL-based practices with two qualitative and two quantitative research methods can be mentioned as the most important feature of the holistic knowledge stage in terms of providing comprehensive and deep information.

Findings

In this study, which was conducted according to the McA, the findings were presented under three headings: pre-complementary knowldge findings, post-complementary knowledge findings, and complementary knowledge findings. In the pre-complementary phase, meta-analytic and meta-thematic data based on document analysis were presented. In the post-complementary knowledge stage, quantitative and qualitative data obtained as a result of the experimental applications of CBL were presented. Within the scope of complementary knowledge stage, the findings obtained as a result of the comprehensive evaluation of the findings collected as a result of the first two stages, interpreted in a general framework and with broad perspectives were presented.

Pre-complementary Knowledge Findings

Meta-Analytic Findings Related to CBL Practices

In the pre-complementary knowledge findings section of the study, meta-analytic findings related to CBL practices were included. The meta-analytic findings include homogeneous distribution values, average effect sizes, and confidence intervals according to the effect models of the studies in which the CBL interventions were included. The results of the meta-analysis related to retention are given in Table 2.

Table 2. Analysis Results Related to Retention Scores Included in the Meta-Analysis

Test Type	Model	*k*	*g*	95 % Confidence Interval		Heterogeneity		
				Bottom	Top	Q	*p*	I^2
Persistence	FEM	11	.564	.401	.728	27.785	.002	64.009
	REM	11	.566	.288	.844			

Note. FEM: Fixed Effect Model, REM: Random Effects Model

Table 2 shows that the overall effect size of the CBL approach on retention in the learning process was calculated as .566 according to REM. The fact that this effect size value is in the middle value according to the classification made by Thalheimer and Cook (2002) shows that the effect ofCBLhas a positive effect on retention. In addition, according to this result ($p < .05$), the analysis was statistically significant. This shows that the research data have supportive results in the direction of the effect of the CBL approach on retention. According to the value of 64.009 obtained in this study, the study shows moderate heterogeneity.

Publication Bias and Reliability

In meta-analysis studies, some methods are applied to exclude possible risks in order to perform the analysis effectively. Rosenthal's calculation of error-free *N* value is a method applied for this purpose (Rosenthal, 1979). The *N* value refers to the number of empty, unpublished studies that may invalidate the research when added to the effect value in the meta-analysis (Borenstein, Hedges, Higgins, & Rothstein, 2013). In this study, the safe *N* number is 1,959. According to Rosenthal (1991), in order for the results obtained from the *k* number of studies to be considered invalid, the result of *N*, which shows the number of empty unpublished studies, should give a result of N>5k+10, which shows that it supports the findings obtained from the meta-analysis. When compared with the number of studies included in the meta-analysis, it can be said that the number of safe *N* is high and there is no bias in the study.

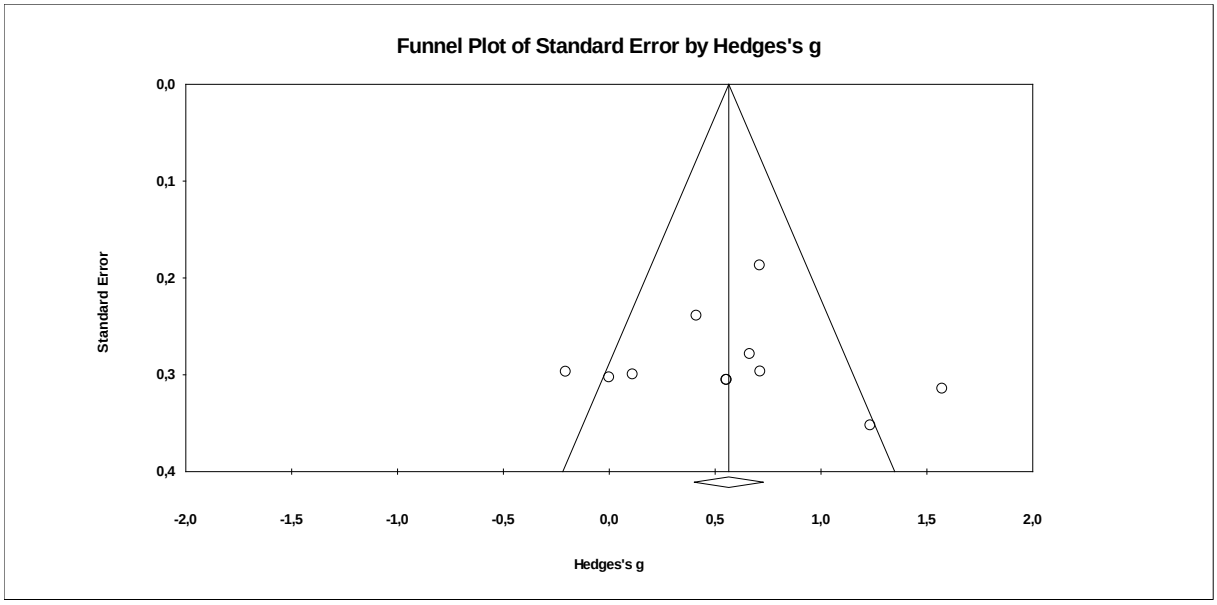


Figure 3. Funnel plot

The funnel plot is used to detect publication bias in meta-analyses (Duval & Tweedie, 2000). In the funnel plot, the x-axis (horizontal) shows the effect size and the y-axis (vertical) shows the sample size, variance, or standard error value. The funnel plot explains the relationship between the effect size of the study and the sample, i.e. the number of studies. In funnel plot representation, as the size of the sample increases, the studies are located in the upper part of the graph close to the average effect size (Sterne & Harbord, 2004). If there is no publication bias in the funnel plot, the graph in Figure 3 will be in the form of an inverted symmetrical funnel (Delgado-Rodriguez, 2001). When Figure 3 is examined, it is seen that the studies are evenly distributed on the right and left sides of the symmetry axis in the middle. This shows that there is no publication bias in the study.

Meta-Thematic Findings Regarding CBL Practices

In this part of the study, the themes and codes obtained from the meta-thematic analysis of qualitative studies on the CBL approach are given. The themes were shown as codes under the title of "scientific thinking, negative aspects, and suggestions". The themes and codes were supported with direct quotations from the participants.

Table 3. The Effect of CBL on Scientific Thinking

Theme- ITS Scientific Thinking	**Codes**
	Supporting scientific research
	Associating concepts
	Analyzing
	Asking a question
	Reasoning
	Problem-solving
	Supporting scientific thinking
	Exploring the nature of science
	Perspective development
	Ability to make a procedure
	Transferring knowledge
	Ensuring retention in learning
	Initiating the thinking process
	Versatile thinking
	Holistic perspective
	Perspective development
	Associating with real life
	Supporting permanent learning
	Keeping up with current information
	Discovering new knowledge
	Gaining experience
	Forecasting
	Developing scientific literacy
	Associating with different disciplines
	Leveraging technology
	Visualizing information
	Improving decision-making skills
	Developing creative thinking
	Eliminating incomplete and incorrect information
	Using language effectively

In Table 3, when the effect of the PST on scientific thinking was examined, codes such as associating the knowledge to be gained with real life, exploring, problem-solving, analyzing, reasoning, looking holistically, and gaining experience were created. As an example of an excerpt from the participants who think positively about the CBL approach, the statement "*I had the opportunity to discover the pollution caused by noise, water, light, and radiation by using measuring devices*" (WOS2-p.16) can be given as an example. Another participant's opinion was expressed by Student E4: "*It was fun to learn genetics using our own experiences. It makes genetics very easy...*" (TFO4-s.11). A participant who expressed an opinion as a contribution to the discovery of new knowledge said, "*Before we measured it, I thought that the television would emit more radiation. However, when I measured it with a radiometer, I realized that this was not the case. On the other hand, I thought that the modem light would not emit much light. When I measured the light with a Luxmeter, I was surprised to find such high values*" (WOS2-p.16). Another participant's opinion, (Student E2): "*I learned science in a different way than we usually do in class. I think I can remember some lessons about 'Mawariro' (beams) for a long time... in the experiments we did, our teacher allowed us to talk among ourselves and answer the worksheets on our own*" (TFO3-p.9). To summarize, it can be said that the practices based on the CBL approach had positive effects on students' scientific thinking processes.

Table 4. Negative Thoughts and Suggestions Regarding CBL

Tema-BTÖ Olumsuz Yönleri	**Codes**
	Reducing class participation
	Not supporting individual work
	Making preparation for central exams more difficult
	Limiting the point of view
	Inefficiency of practices
	Making class domination difficult
	Difficulty conducting experiments at home
	Incompatibility of group members
	Questions are not understandable
	Videos are not understandable
	The pressure of exam anxiety on the student
	Non-compliance with the curriculum
	Student attitude (seeing it as a waste of time)
Tema- BTÖ Öneriler	**Codes**
	Individual differences should be taken into account
	Good task distribution within the group
	Prior knowledge should be reminded
	Sufficient time should be given
	Provide a relevant working environment
	Laboratory practices should be increased
	Opportunity should be given for individual work
	Support centralized exams
	Should be able to express themselves
	Teacher training should be emphasized
	Out-of-school learning spaces should be increased
	Promotional areas should be increased
	Must be suitable for student-level
	It should be supported by curricula

In Table 4, besides the positive effects of CBL practices on the learning process, negative effects such as the inefficiency of the practices, difficulty of the questions, and difficulties in group members' adaptation were also included. A quote supporting the participant's view can be shown as "*The applications were not effective*" (BT30-p.12). According to another participant's opinion, "*The worksheets were boring*" (BT30-p.13). The ideas expressed by the participants against the negativities they experienced within the scope of CBL practices were included in the theme of suggestions. When we look at the suggestions shown in Figure 3, there are opinions such as allowing enough time for study, reminding prior knowledge, supporting by curricula, and increasing out-of-school learning areas. A sample excerpt from the participant views can be stated as "... *CBL is limited only to the classroom, it is necessary to leave the students outside, so first of all, space should be provided and this method should be used by organizing trips for students...*" (BT4-s.10). To summarize, it is thought that CBL approach can be a more effective method if it is supported with out-of-school learning areas.

Post-complementary Knowledge Findings

Comparison of the Groups' Pre-Test, Post-Test, and Retention Test Scores after the Experimental Process

In the first stage of the study, the data based on meta-analysis and meta-thematic analyses in the first stage of the McA and the data of the experimental study and participant opinions, which are complementary to the data, are interpreted in this section under the title of post-integrative findings. The results of the analysis comparing the pretest scores of the experimental and control groups are given in Table 5.

Table 5. Comparison of Pre-Test Scores of Experimental and Control Groups

Test Type	Groups	n	$\bar{X}$	sd	df	Levene		t	*p*
						F	p		
Pre-test	Experimental	18	18.44	4.37	38	.25	.62	.47	.64
	Control	22	17.77	4.51					

In order to determine the significance level of the difference between the pre-test and post-test scores of the groups, an independent sample t-test was conducted. It is stated that in the examination of the normality test of the experimental and control groups, if the group size is less than 50, Shapiro Wilks values can be reached (Büyüköztürk, 2018) and that Levene's test results can be used in testing the homogeneity of group variances (McKillup, 2011). However, it is recommended that it should be used together with other methods in the evaluation of the normality assumption and the results should be evaluated accordingly (Abbot, 2014; McKillup, 2011). The MWU test was applied because the p value was found to be significant in the normality test results (Appendix 4) and Levene's test result for the post-test and retention scores of the achievement test of the experimental and control groups. Accordingly, at the end of the experimental study conducted in the process of the effect of CBL applications on retention, the retention scores obtained by reapplying the achievement test to the experimental and control groups after a period of time after the post-test application are shown in Table 6.

Table 6. Mann Whitney U Test Results for Post-test and Retention Scores of the Achievement Test of Experimental and Control Groups

Test Type	Groups	n	Rank Mean	Rank Sum.	U	p
Post-test	Experimental	18	23.78	428.00	85.00	.01
	Control	19	14.47	275.00		
Persistence	Experimental	18	24.00	432.00	117.00	.04
	Control	21	16.57	348.00		

According to the results of the analysis, while there was no statistically significant difference in the pre-test data (p>.05), there was a statistically significant difference in the post-test [(MWU=85.00; $p<.05$)] and retention scores [(MWU=117.00; $p<.05$)]. In other words, it can be said that the post-test and retention scores were in favor of the experimental group. At the same time, it was determined that the distribution of variances was homogeneous. In addition, the effect size of the experimental study were determined as g=1.08 and g=.63 for the post-test and retention, respectively, and according to Thalheimer and Cook's (2002) classification, these values are considered to be very large and medium-sized. This finding can be interpreted as an effective approach that supports the learning process.

Qualitative Findings After the Experimental Study

In this part of the study, qualitative findings obtained from the students' views on the CBL approach are presented. After the completion of the experimental process, the students' views on the CBL approach were grouped under two themes. These themes were determined as students' views on the learning process and the effect of CBL on affective gains.

Table 7. The Effect of CBL on the Learning Process

Theme- Impact on CBL Learning Process	**Codes**
	Associating concepts
	Associating with real life
	Forecasting
	Contributing to group work
	Collaboration
	Supporting out-of-school learning
	Increasing grip strength
	Analyzing
	Critical thinking
	Apply what they have learned
	Supporting effective learning
	Gaining experience
	Supporting the learning process
	Consolidating knowledge
	Improving decision-making skills
	To be able to develop a perspective
	Versatile thinking
	To be able to apply what they have learned
	Supporting permanent learning
	Supporting visual learning
	Addressing individual learning needs
	Facilitating information recall
	Supporting group work
	Improving reasoning power
	Keeping up with current information
	Acquiring new knowledge
	Ability to transfer knowledge

Opinions on the practices carried out according to the CBL approach were modeled and shown in Table 7 and Table 8. In Table 7, it was seen that codes such as acquiring new knowledge, associating with real life, applying what they learned, collaborating, and supporting the learning process were formed.

According to the codes created according to the related codes, S3 can be given as an example of the effect of the CBL approach on learning as follows*: "It made it easier, the work we did with our school representative, the conversation we had with our guidance teacher and the writing and visualizing in the work we did during the lesson helped me to understand and memorize the unit called "The Adventure of Democracy"." This statement can be given.* As a different participant opinion, S5 said *"Yes, it made it easier and helped me comprehend. For example, when I see a scale, it reminds me of equality, when I see a ballot box, it reminds me of democracy, when I see a state book, it reminds me of the social state, and if there is a photograph with many people, it reminds me of public opinion." He expressed his opinion in this way.*

Table 8. The Effects of CBL Practices on Students' Affective Skills

Theme-ITA Affective Skills	Codes
	Contributing to group work
	Gaining democratic skills
	Gaining positive behavior
	Reducing prejudice
	Empathy
	Developing peer friendship
	Raising awareness about our rights
	Gaining social skills
	Increasing adaptation to school culture
	Supporting school life
	Supporting social life
	Ability to cooperate
	Improving political literacy
	Taking individual differences into account
	Increasing interest in the lesson
	Trust in the course teacher
	Adapting to the learning approach
	Self-expression
	Transforming into a lifestyle
	Supporting social development
	Increasing communication skills
	Developing effective citizenship skills
	Learning to protect their rights

In Table 8, codes such as gaining democratic skills, empathy, increasing adaptation to school culture, taking individual differences into consideration, and developing active citizenship skills were created in terms of the effect of CBL on affective skills. According to the codes obtained from the students' opinions, T1 stated his opinion about the effects of CBL practices on students' affective skills as follows: *"With the activities we did, we learned the development of democracy from the past to the present, we saw its effect on our lives by associating it with real life, and we cooperated while learning the basic principles of democracy in group work with our friends"*, while T9 stated his opinion as follows*: "In the social lesson, we learned to treat each other in a fair, respectful, loving and tolerant way. We learned to treat each other without prejudice. In some activities, we made decisions and criticized by brainstorming"*. As a different participant, S13 said, *"It happened because I learned my rights in a democratic sense thanks to the activities we did in the classroom. I learned to empathize and got rid of my prejudices, and now I realize that I empathize with people in every conversation and I have improved"*. In summary, it was seen that the students expressed positive opinions regarding the achievements of associating the knowledge they learned with daily life, reflecting what they learned to social life, giving importance to democratic values, contributing to group work, and increasing cooperation.

Complementary Knowledge Findings

In the complementary knowledge phase, findings were obtained that combined the data obtained in the pre-holistic and post-holistic knowledge phases. The results of the first phase were that the practices based on the CBL approach were effective in retention. The general effect size of the studies conducted on retention in the CBL approach is g=.566. The fact that this effect size is moderate according to Thalheimer and Cook's (2002) classification shows that the context-based learning approach has a supportive effect on the learning process.

In the pre-complementary knowledge stage, the data obtained from the meta-thematic analysis showed that although there were some limitations in terms of the learning environment and time in the applications based on the CBL approach, it was seen that it positively affected students' scientific thinking processes. Accordingly, it can be said that the meta-thematic results support the meta-analysis findings. From the analysis conducted in the first stage, it was revealed that the activities carried out based on the CBL approach were an effective approach to retention. The second stage of the study was the implementation process in which the experimental application was carried out. The implementation process was completed by teaching the "Adventure of Democracy" topics in the social studies course with the experimental group of students with CBL applications. At this stage, the results obtained from the achievement posttest and retention test revealed a statistically significant difference in favor of the experimental group. In addition, according to the opinions obtained from the qualitative findings at the end of the research, the applications based on the CBL approach revealed that the knowledge was not limited to the classroom and the course and that it supported the process of associating with real life and that this situation made it easier to remember what was learned. To summarize, the findings in the preliminary findings, which were found in the literature, that the positive effects of the CBL on retention and scientific thinking processes are in the same direction as the findings in the post-complementary knowledge phase. The results obtained at both stages are supportive and complementary to each other. Recommendations for the field based on the complementary knowledge stage are given in the following section.

Conclusion and Discussion

The results of our study are presented depending on the three stages of the McA. According to the McA, firstly, in the pre-complementary knowldge stage, meta-analysis and meta-thematic results of the relevant research topic in the field were included, in the second stage, the experimental process and achievement test based on the CBL approach were implemented. In the last stage of the study, the complementary knowledge stage of the research was presented by combining all the analyses obtained, student opinions, and findings about the application. Concluding the results about the effectiveness of the CBL approach on retention according to the stages of the McA is considered important in terms of presenting the study systematically.

Conclusions for the Pre-complementary Knowledge Phase

According to the results of the document review meta-analysis conducted in the literature review of the related research subject to our study; Badeli (2017) showed that CBL applications are an effective approach to students' development of positive attitudes towards science courses and conceptual understanding. Akın Yanmaz (2021) concluded that the guide materials developed according to the REACT strategy in the CBL applications were effective on students' conceptual development on the subject of "Mirrors and Absorption of Light". In his study, Uzun (2013) revealed that in the general physics I laboratory course of the Science Teacher Education Department, CBL applications were an effective approach to pre-service teachers' scientific achievement, scientific skills, motivation, and recall. It was concluded that the CBL approach had a positive effect on the learning process and retention. The average effect size is g=.566. This result shows that the CBL approach is effective in increasing student achievement on retention. Research results that support the relevant findings of this study, in which the effect of CBL on retention was examined, were found. The study conducted by Arıkan and Çakmak (2023) showed that the experimental group of students in which the context-based approach was applied had better results in academic achievement, financial literacy, and retention of learning compared to the control group. Ergün (2018) concluded that the current contexts used in science teaching made a difference in the experimental group of students on permanent learning. Similarly, Ahmad (2016) found that chemistry concepts taught based on context were retained and remembered more by experimental group students.

It was understood that the positive results of the study based on the meta-thematic process were in parallel with the meta-thematic findings included in the study. The codes obtained from the participant's opinions in the qualitative process of the studies reached in the literature review phase

showed that the CBL approach is supportive in gaining scientific thinking skills such as discovering knowledge, transferring it to the current life, critical thinking, associating concepts, reasoning, asking questions and problem-solving. Deveci and Karteri (2022) emphasized that context-based practices develop sensitivity to environmental problems and contribute to environmental literacy skills. Onwu and Mufundirwa (2020) showed that the experimental group, in which context-based practices were carried out, achieved better results than the control group and that the experimental group students were able to communicate openly, understand better, and were motivated to learn thanks to the practices carried out in a safe and interactive classroom environment. In this regard, Kara and Çelikler (2019) stated in their study that students remembered interesting stories and established contexts better and that contexts had an effect on retention. Ulusoy and Önen (2014), on the other hand, concluded in their study that CBL activities not only increase course achievement levels but also increase students' interest and motivation towards the course. However, some codes obtained during the meta-thematic research process reveal that there are some disadvantages to the approach. In their study, Yılmaz et al. (2022) emphasized that context-based practices enrich the teaching process, but contexts for the exam curriculum cannot be established in levels with exam anxiety; this situation reduces the effect and efficiency of teaching for students and teachers. Likewise, the participants also expressed their opinions about the problems that may arise during the implementation such as not being able to allocate more time for central exams, the inability of the members to act jointly in situations requiring group work, and the lack of comprehensibility of the video tools used. Accordingly, Kutu and Sözbilir (2011), Yaman (2009) and De Jong (2008) stated some issues that should be taken into consideration in order to eliminate possible drawbacks in the CBL approach. The most noteworthy suggestions are that the selected contexts should arouse interest and curiosity in accordance with the age period of the students, should be associated with out-of-school learning areas and real life without creating time and curriculum pressure on teachers and students, and the process should be enriched with technology-supported teaching methods. At this point, it is recommended to pay attention to the relevant criteria in the process of successful implementation of CBL.

Conclusions for the Post-complementary Knowledge Stage

In the post-complementary knowledge stage of the research, after the applications based on the CBL approach were completed, there were statistically significant differences in favor of the experimental group in achievement posttest and retention test scores. The second stage of the research shows that at the end of the experimental application, the CBL approach is a more effective approach in the learning process than traditional methods. Studies similar to the results obtained from the experimental study are also found in the literature. It has been observed that the courses based on the CBL approach have more effective results on students' academic achievement than the courses conducted with the current curriculum (Ahmad, 2016; Arıkan & Çakmak, 2023; Ceylan, 2017; Dori et al., 2018; İnci, 2019; Kara, 2016; Stanisavljević, Pejčić, & Stanisavljević, 2016; Tağ, 2019; Tulum, 2019; Yel, 2022). In addition, there are also studies that positively contribute to the retention of practices based on the CBL approach to learning (Akdaş, 2014; Baran & Sözbilir, 2018; Choi & Johnson, 2005; Kutu & Sözbilir, 2011). The experimental result obtained from the post-integrative phase of the study is consistent with the relevant results in the literature and the pre-integrative results of the study, and the results support each other.

In the post-complementary knowledge phase, students' opinions were taken based on thematic analysis after the experimental application. The relevant data were formed from the opinions about the effect of the CBL approach on the learning process and its effect on affective skills. The practices carried out based on the CBL approach showed that the social studies course is closely related to real life in terms of content and can create contexts. According to the thematic area-specific results, it was seen that there are studies in the field in a similar direction in terms of associating knowledge with daily life (Arıkan & Çakmak, 2023; Baran, 2013; Deveci & Karteri, 2022; Genç, 2019; Kazeni & Onwu, 2013; Kutu & Sözbilir, 2011).

Conclusions for the Complementary Knowledge Phase

In the complementary knowledge stage of the McA, it was checked whether the results were consistent with each other by combining the data obtained from the pre-complememntary knowledge and post-complementary knowledge stages. After the completion of the experimental process, the result of the achievement retention test in favor of the experimental group shows that the applications based on the CBL approach are effective in the process of remembering knowledge. This result is supportive of the findings of the pre-complementary knowledge stage. Again, in the pre-complementary knowledge stage, meta-thematic findings emphasized that the applications based on the CBL approach supported scientific thinking skills and were evaluated as an effective approach in making knowledge concrete and associating it with real life. When these results are combined, it can be seen that the findings covered by meta-analysis and the meta-thematic process complement each other. When all the data belonging to the pre-complementary knowledge and post-complementary knowledge stages are interpreted, it is understood that the practices based on the CBL approach have a positive effect on learning and retention.

Limitations

In the research, the study was directed according to the stages of the McA approach. Studies based on meta-analysis and meta-thematic analysis were limited according to specific databases and date ranges. The research was conducted with 7th-grade students in the experimental group in the social studies course. The learning practices and the results obtained were limited to the learning area of "Active Citizenship" and the achievements of the unit "The Adventure of Democracy".

Recommendations

In this study, meta-analysis and meta-thematic analyses were limited to studies obtained from specific databases. The experimental process based on the CBL approach covers the 7th grade of middle school students. The applications to be carried out within the scope of McA can be continued by investigating their effectiveness according to different levels, courses, learning areas, units, and curricula. An interdisciplinary approach and different learning and teaching processes can be included in the implementation of the CBL process. In their study, Arıkan and Çakmak (2023) examined the effect of practices based on CBL on financial literacy skills in the Social Studies curriculum. Yıldırım (2018) examined the effect of STEM applications prepared in accordance with CBL in his study. The effectiveness of the approach on different skill areas in the curriculum can be investigated. The effect of the CBL approach on the classroom, library, garden, and social areas inside the school and natural and historical learning areas outside the school can be re-examined.

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Notes: Studies included in the meta-analysis are indicated with one asterisk (*), while citations to studies included in both the meta-analysis and meta-thematic analysis are indicated with two asterisks (**). Those without an asterisk are the sources used in the study.

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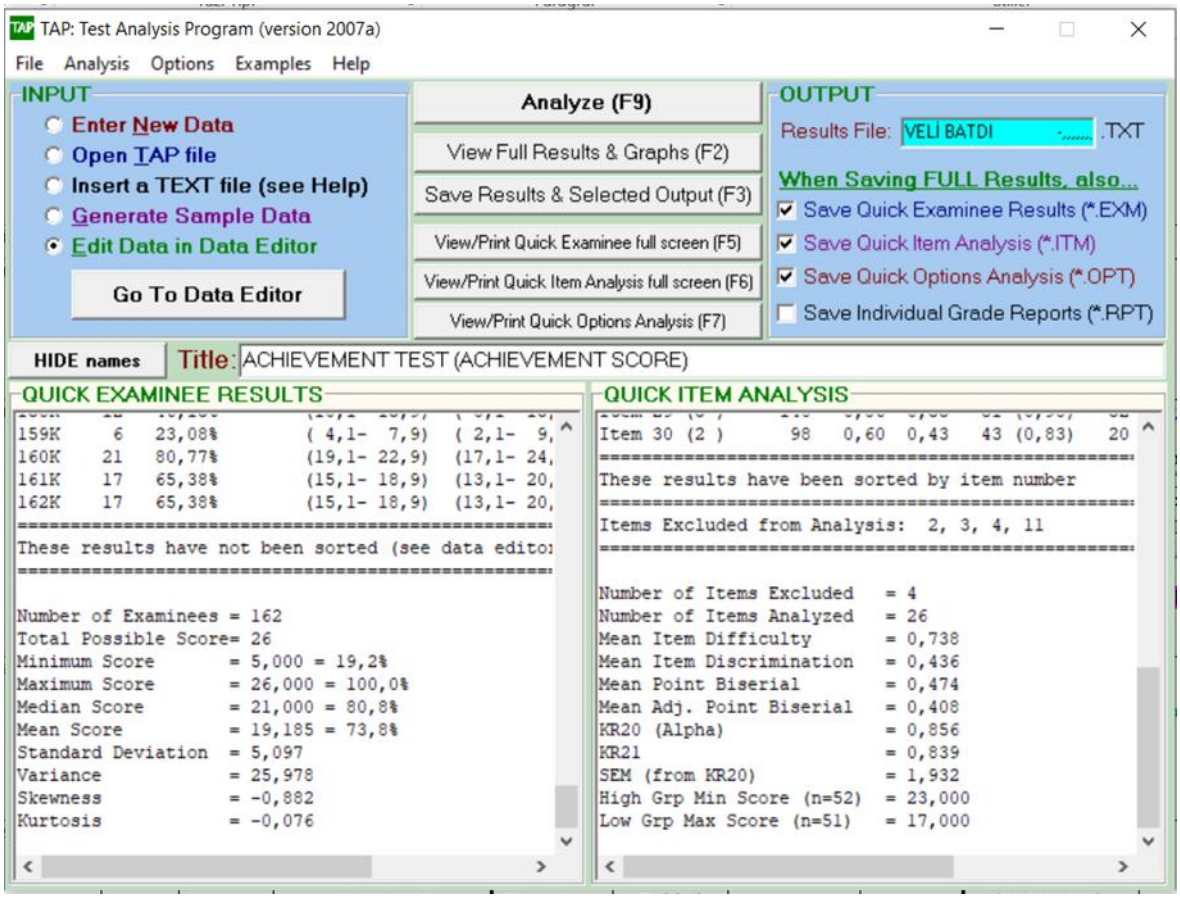
Appendix

Appendix 1. TAP-Achievement Test Item Analysis



Appendix 2. The agreement values related to the study

The Effect of CBL on Scientific Thinking					Negative Thoughts and Suggestions on IST					The Effect of CBL on the Learning Process					The Effect of CBL on Affective Skills				
		K2					K2					K2					K2		
		+	-	Σ			+	-	Σ			+	-	Σ			+	-	Σ
K1	+	30	2	32	K1	+	27	1	28	K1	+	27	2	29	K1	+	23	1	24
	-	3	24	27		-	2	15	17		-	2	14	16		-	1	9	10
	Σ	33	26	59		Σ	29	16	45		Σ	29	16	45		Σ	24	10	34
Kappa:.83, p:.00					Kappa: .86, p:.00					Kappa: .81, p:.00					Kappa:.86, p:.00				

Appendix 3. Specification Table

Acquisitions in the learning area of 'Active Citizenship'	(7.6.1) Explains the emergence of democracy, its developmental stages and the meanings it expresses today (U).	(7.6.2) Explains Atatürk's contribution to the development of Turkish democracy(U).	(7.6.3) Associates the basic qualities of the Republic of Turkey with applications in social life(A).
The Adventure of Democracy	3,15,16,17,19,22,28, 29, 30,31,33		
Atatürk and Democracy		1,4,5,12,13,18,21,24, 25,34	
The Qualities of the Republic of Turkey			2,6,7,8,9,10,11,14,20,23,26, 27, 32

The numbers given in the table refer to the questions. U: Understanding, A: Analyzing

Appendix 4. Normality Test Results for the Post-test and Retention Scores of the Achievement Test of the Experimental and Control Groups

Test Type	Group	Shapiro-Wilk		
		Statistic Value	sd	Significance Level (p)
Post-test	Experimental	.94	18	.31
	Control	.92	19	.12
Persistence	Experimental	.86	18	.01
	Control	.86	21	.01

Appendix 5. Forest plot