A Content Analysis of the Articles on Metacognition in Education in Turkey

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Abstract

The aim of this research is to review the researches, which have been conducted on metacognition in education in our country and published as articles in terms of the field, topic, study group/sample, applied method, data collection tools, data analysis methods and publication languages. In the research, designed with descriptive content analysis method, all the 136 studies were reviewed stated in 112 journals. The following results were reached with the analyses. The number of studies-carried focusing on metacognition in the area of education- demonstrated a rapid increase especially in the last five years except for the year 2013. Almost in half of the studies, the researchers mainly focused on general features, such as the participants' awareness on metacognition or a particular side of metacognition, strategies, levels of use apart from a specific area. Orderly, Turkish, Mathematics, Science and Technology were among the most specific study areas. The variables, which may have effect on a metacognitive feature, and the relationship with a metacognitive feature and other various features were the most studied topics. A great number of the researches were carried out with pre-service teachers. There were almost no encountered study with high school students and teachers. No researches- with post-graduate students, administrators, and parents- have been encountered, either. As the researches were carried out generally with a quantitative approach and descriptively, mainly quantitative data collection tools were used. Mostly the hypothesis tests and relational tests were applied during the analysis process. The majority of the studies were published in Turkish.

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Introduction

Though the recognition and the first application of metacognition dates back to 557 B.C. (Dunlosky & Metcalfe, 2008), it can be claimed that the most significant researches and developments have been limited in the recent forty years. The concept of metacognition, which was defined as "metamemory" by Flavell (p. 232), and in a wide range as "metacognition" in 1979, made it one of the most discussed and investigated concepts in these years and later (Veenman, 2006). That is, in addition that the metacognition was one of the two most discussed topics in 1980s (the other is problem solving) (Schoenfeld, 1992), it is still popular nowadays. It was tried to explain the question "Then, what makes the metacognition such significant?" with the following definitions.

The metacognition –in general sense- is described as the knowledge of cognition. The knowledge of cognition that the individuals have to carry out definite intentions and their actions to arrange cognitions form two main factors (Flavell, 1976; Garofalo & Lester, 1985; Lester, Garofalo, & Kroll, 1989; Veenman, 2006). It was claimed that the individual, task and strategy variables, and the interaction among these variables have significant roles on the formation of metacognitive knowledge (Flavell, 1979; Veenman, 2005). Flavell (1979) described these variables as; "*The category of individual consists of everything about the beliefs related to how you acknowledge your and other people's nature within the scope of cognitive processes. The category of task demonstrates the knowledge, which the individuals have about nature of the event s/he come across, and the necessities of the definite work (task). The category of strategy is about the possible strategies related to what sorts of cognitive attempts can be effective in reaching which of the sub-targets and targets".* The individuals' being aware of what they know, the metacognitive knowledge, and their awareness of when and how they will apply this knowledge are related to the metacognitive skills including the actions of observation and arrangement (Depaepe, Corte, & Verschaffel, 2010; Özcan, 2015; Schoenfeld, 1987). Veenman (1998) named the questions of those who have metacognitive skills as WWW&H principle (What to do, When, Why and How). These sorts of reflective questions have a significant role enabling the individuals to observe and evaluate their steps in the process with different ways (Kramarski, Weisse, & Kololshi-Minsker, 2010). As the metacognition affects the gaining, making sense and applying the learned item (Garofalo & Lester, 1985; Schoenfeld, 1985), several researches have put forth that the metacogniton is a most crucial milestone variable estimating the learning performance (Veenman, 2006). Moreover, the lack of metacognitive skills was claimed to be one of the most significant factors of some students' failure in specific courses (Kroll & Miller, 1993; Wilson, 1999; Yang & Lee, 2013; Wilson, 1999).

After the discovery of the effects of metacognition in learning environments, providing the metacognition to the learners and its teaching also became an important agenda. It was determined that the metacognition training increased learning achievement in an extremely large number of students specifically for the students with academically low success levels (Veenman, Elshout, & Busato, 1994). For a successful metacognition education, it was claimed that the metacognitive training should be integrated to the relevant topic to be taught; the learners should be informed about the benefits of using metacognitive strategies and the application of metacognitive strategies should be guaranteed with a long-term training are necessary (Veenman, Van Hout-Wolters, & Afflerbach, 2006). Moreover, related to the teaching of the metacognition skills four approaches were expressed as: direct teaching, teaching of it in courses with configuring, teaching of it with various strategies and techniques by experts, teaching with cooperative learning techniques (Paris & Winograd, 1990). Garofalo & Lester (1985) also claimed that the metacognition education should be investigated with a special field, applied with systematic and organised situations, and teachers had crucial roles in this education process.

Another crucial side of the metacognition training is the topic of evaluating metacognition. But, it is extremely hard to evaluate metacognition because of various reasons such as: "that the metacognition has a complex form itself, cannot be directly observed, the possibility of confusing the verbal ability and the working memory capacity and that the present evaluation methods mainly focus on a narrow context consisting of only the education at school (Lai, 2011). Another reason of this difficulty originates from the difficulties in discrimination between the cognitive and metacognitive activities. For instance, if the re-reading of a part in a passage by a person came into appearance when s/he made the decision that s/he had not understood by him/herself, this is a metacognitive activity not

cognitive (Meijer, Veenman, & Van Hout-Wolters, 2006). Furthermore, in spite of the difficulties encountered related to the metacognition field, the literature points out two headings as on-line and off-line about the methods, which can be applied to measure the metacognition. On-line measuring techniques consist of data collection tools focusing on the individuals, who wanted to tell-mention their thoughts, while they are working on a task (Banner & Mengelkamp, 2008; Jacobse & Harskamp, 2012; Veenman, 2005). Think-aloud protocols, interviews, observations are among some of the examples of these sorts of measuring tools. Off-line measuring methods come to appearance during focusing on the data gathered as a result of the individuals making self-report about themselves before and after a learning task (Jacobse & Harskamp, 2012). Specifically, the questionnaires are the most significant off-line measuring tools (Efklides, 2008). It was pointed out that the metacognition measured clarified 37% of the learning variance during a learning task (Veenman et al., 2006) yet, it was stressed that the metacognition might have inaudible or invisible sides originated from the reasons for internalization of some cognitive actions of metacognition (Veenman, 2006). So, in addition that it is hard to measure the metacognition in general, it is thought that it will be effective to place both on-line and off-line data collection tools during the measuring activities for more reliable measuring and evaluation results. Several data collection tools, which are both on-line (Desoete, Roeyers, Buysse, & De Clercq, 2002; O'Neil Jr & Abedi, 1996; Pintrich & De Groot, 1990; Schraw & Dennison, 1994) and off-line (Çakıroğlu & Ataman, 2008; Demirel, 1995; Sperling, Howard, Miller, & Murphy, 2002) to measure the metacognition are being encountered in the literature.

The metacognition have been investigated with several ways since 1997 until today using various terms (Çakıroğlu, 2007; Çiçekçioğlu, 2003; Demirel, 2001; Demirel & Turan, 2010; Demirsöz, 2010; Duru, 2007; Erden & Akman, 1997; Erdoğan, 2007; Olgun, 2006; Okur, 2008; Özcan, 2007; Özkan & Bümen, 2014; Özsoy, 2006; Topçu, 2005; Senemoğlu, 1998; Yabaş, 2008; Yıldız, 2008). Moreover, some review studies have been encountered within the scope of metacognition such as: introducing the metacognition theoretically (for instance metacognition: Özsoy, 2008), metacognition and a definite field (for instance metacognition and science teaching: Yıldız & Ergin, 2007), development of metacognition (for instance metacognitive awareness and its development: Demirsöz, 2014), educational applications of metacognition (for instance metacognition and teaching based on metacognition: Doğan, 2013). In these review studies, some samples were given from the studies, about the mentioned topic, carried out in Turkey and around the world mostly giving information about the metacognition and the teaching based on metacognition and the approaches in learning the metacognition strategies. In other words, as the purpose of these studies are taken into consideration, it can be expressed as trying to present the sub- concepts and topics of the metacognition after discussing the metacognition concept in general. That is, the metacognition concept has almost twenty years of history in our country and forty years of history in the world. Therefore, it can be expressed that the studies carried out in this literature is thought to be significant in terms of uncovering the existing form and gaps stated in this period of time. Because, with this form handled as a result of the diagnosis process, the researchers, who study and want to study on the topic of metacognition, will get quicker and detailed ideas related to the topic. So, in the studies on metacognition, it is significant to know which fields are studied at first, which topics, with whom, and which methods are applied, which data collection techniques are used to collect the data and which data collection tools are used to analyse them in terms of the total agreement and quality of the source applied during the meta-cognitive studies. Therefore, it is necessary to research these criteria. However, no content analysis handling the metacognition in this was encountered during the carried researches. The research was conducted from this point and it is thought to be useful in terms of the mentioned side. With this purpose, the aim of the research is to investigate the studies, which have been carried out in the field of education focusing on the metacognition in our country and published as articles, in terms of field, topic, study group/sampling, applied method, data collection tools and data analysis techniques considering the order of a research in design and publishing process. According to this purpose; the following research questions were asked:

1. What is the distribution of the number of the studies carried out in education in Turkey and published in educational magazines in Turkey as articles focused of metacognition in years?

2. What is the distribution of the studies carried out in education in Turkey and published in educational magazines in Turkey as articles focused on metacognition according to their fields?

3. What is the distribution of the studies carried out in education in Turkey and published in educational magazines in Turkey as articles focused on metacognition according to their topics?

4. What is the distribution of the studies carried out in education in Turkey and published in educational magazines in Turkey as articles focused on metacognition according to their methods?

5. What is the distribution of the studies carried out in education in Turkey and published in educational magazines in Turkey as articles focused on metacognition according to their study groups?

6. What is the distribution of the studies carried out in education in Turkey and published in educational magazines in Turkey as articles focused on metacognition according to their data collection tools?

7. What is the distribution of the studies carried out in education in Turkey and published in educational magazines in Turkey as articles focused on metacognition according to their data analysis methods?

8. What is the distribution of the studies carried out in education in Turkey and published in educational magazines in Turkey as articles focused on metacognition according to their language?

Method

The basic aim of this research was to make a detailed investigation about the tendencies of the metacognition studies on education in our country. With this purpose, the research was designed with a descriptive content analysis, which was one of the content analysis methods and defined as "handling the studies carried out on a definite topic and evaluating the results of the researches with a descriptive dimension" (Çalık & Sözbilir, 2014). By means of descriptive content analysis, studies on an area are examined; organized and so general trends in the area are determined (Selçuk, Palancı, Kandemir, & Dündar, 2014).

Data Collection

This process was carried out in three stages as determining the journals, gathering the articles, and classifying the gathered articles. The steps in each stage can be summarised as follows:

Determining the Journals: In this stage, it was aimed to reach all the journals, which were in our country and placed the studies on education. With this purpose, primarily the journals of the 27 faculties of education in our country and 75 educational journals published by public/private organizations or researchers in our country were reviewed. Moreover, it was noticed that there were studies on metacognition in journals of social sciences among the reviewed articles. 10 journals on social sciences, which included at least a metacognition article, were also included in the research. There are two fundamental reasons applying only the articles during the research process. The first is; because of almost all of the postgraduate theses or vast majority of the researches presented as papers are published by the researchers as articles, they are able to overcome the possible problems as the repetitive analysis of the same studies. The second is to draw boundaries clearly considering the feasibility of the research. In the process, all volumes among 112 journals, which can be reached through the internet, were investigated. An important restriction was that not all the volumes of some of the journals could be reached through the internet.

Gathering the Articles: In determining the articles to be analysed, some different terms such as: the metacognition which is used as synonyms with metacognition in our country, cognitive awareness, executive cognition are taken as a base in heading of the publication, abstract and key words. In addition, 15 studies, which were carried out by foreign researchers with foreign samples, were ignored even if they were published in these journals. At the end of the process, totally 136 studies was reached.

Classifying the Articles: The 136 articles were classified according to the years at the end of the process and data were prepared to be analysed.

Data Analysis

Data were analysed using descriptive analysis, in which the conceptual form is previously determined (Yıldırım & Şimşek, 2008, p. 224). The analysis process was completed according to the chart shown in Figure 1 and prepared considering the data analysis pattern used by Sözbilir, Güler, and Çiltaş (2012).
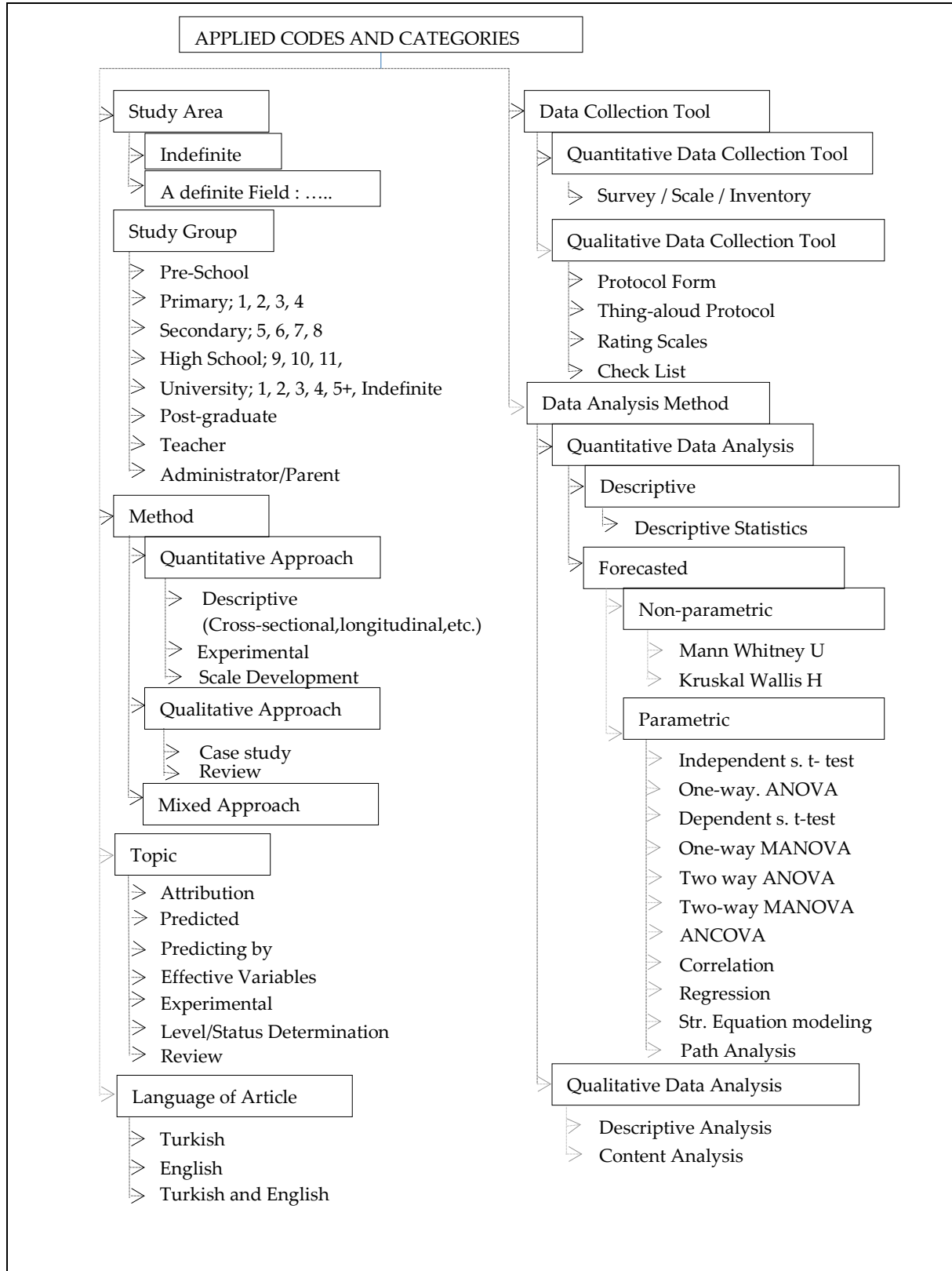

Figure 1. The Codes and Categories Used in Data Analysis

The analysis process was completed with the agreement, co-operation simultaneous studies of the two researchers. The following points were taken into consideration during the analysis process:

- During the coding according to the *study field*, it was considered whether the relevant study based on a definite field or not. The researches, which <u>are</u>(were) not related to a <u>special</u>(specific) field but carried out according to the general features, were considered within the scope of not specific to a certain area category. For instance; while the Z58 coded research, which investigated the effect of the metacognitive strategy training on mathematical problem solving achievement, was placed under the heading of *mathematic*, the Z7 coded research, which investigated the metacognitive awareness of secondary school pre-service mathematics teachers was evaluated within the scope of *not specific to a certain area* as it handled a general fact related to the pre-service mathematics teachers.

- During the coding according to the *study group*; the class level was prepared considering the new education system (4+4+4). Although the studies carried out before the relevant system change express the fifth grade in primary school, the study group in this research was coded as fifth grade in secondary school.

- During the coding according to the *applied method*, the method was taken as the researcher claimed if s/he did. If s/he did not claim, the researchers decided the method to be used considering the whole of the study. Furthermore, as in the example of Çetinkaya and Erktin (2002), both the scale was developed and the practise was carried out with this scale in some other researches. These researches were evaluated in the category of empirical researches.

- During the coding according to the *topics*; as the qualitative studies were mainly related to the determining level and as this category was used commonly in qualitative and quantitative studies, any qualitative-quantitative discrimination was not taken into consideration in the research. While the coding was carried out, it was considered that the frequency values under each category expressed bilateral associations, procedures, effects of variables, which were taken into account, etc. For example; in Z22 coded research, the metacognitive awareness levels of the participants were associated with their problem solving perceptions in daily life, needs of thinking and general IQ levels. During the analysis of this research, a frequency was given to each bilateral association. During the coding; data collection tools, which are used for the researches, were taken as the base. The researches carried out with the same tools were classified under the same headings. For instance; among the studies using the same scale, while Z11 used the term metacognitive belief, Z25 and Z72 used the term of metacognitive awareness. As the purpose of the development of the scale was to measure the metacognitive awareness, the topics of all the three studies were coded as metacognitive awareness.

- During the coding according to the *tools applied in the data collection process*; the tools which are used for only one feature related to the metacognition, were taken into consideration during the classification.

- During the coding according to the *data analysis methods*; the analyses, which are only related to the measuring for metacognition, were taken into consideration. For example, within the scope of the Z41 coded research, the effects of teaching learning strategies on the academic achievements of the secondary school 8th grade students in English course, their attitudes towards the lesson and their metacognitive awareness levels were investigated. Within the scope of this research, the analyses related to the academic achievement and attitudes towards the lesson were ignored and only the analyses related to the metacognitive awareness levels were used as data analysis method.

The frequency and percentile values of codes stated under the categories determined as a result of the analysis were calculated and the gathered findings were indicated using the tables and graphs.

Results

The findings gathered within the scope of the research were shown below in order.

The Findings Related to the First Sub-problem; what is the distribution of the number of the studies carried out in education in Turkey and published as articles focused of metacognition in years?

The findings related to the distribution of 136 studies according to the years are indicated in Figure 2.
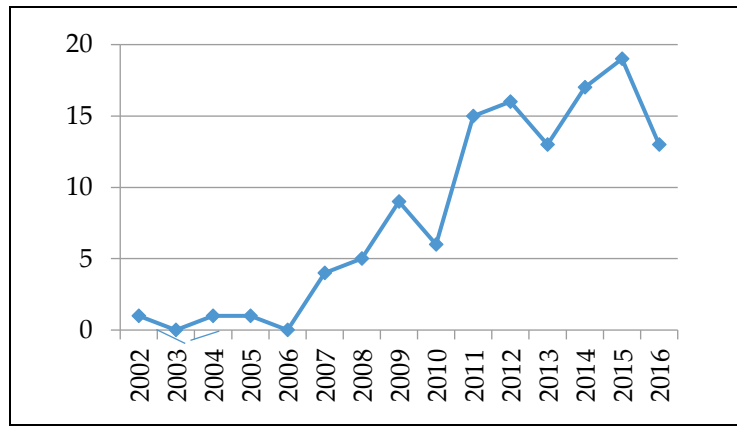

Figure 2. Distribution of the Studies by Years

The first reached study, which focused on the metacognition in education in our country, was published by Çetinkaya and Ertkin in 2002. As it is presented in Figure 2, it was determined that this tendency, which showed the first considerable increase in 2007, also increased a great deal in 2011 and this continued to increase except 2010, 2013 and 2016.

The Findings Related to the Second Sub-problem; what is the distribution of the studies carried out in education in Turkey and published as articles focused on metacognition according to their fields?

When the 136 studies were analysed according to their fields, it was noticed that they were grouped under 14 categories as: not related to a particular field, Turkish, mathematics, science and technology, English, chemistry, information technology, instructional design, program development, physics, biology, music, sport and primary school teacher training department. The findings related to the distribution according to these categories are indicated in Figure 3.
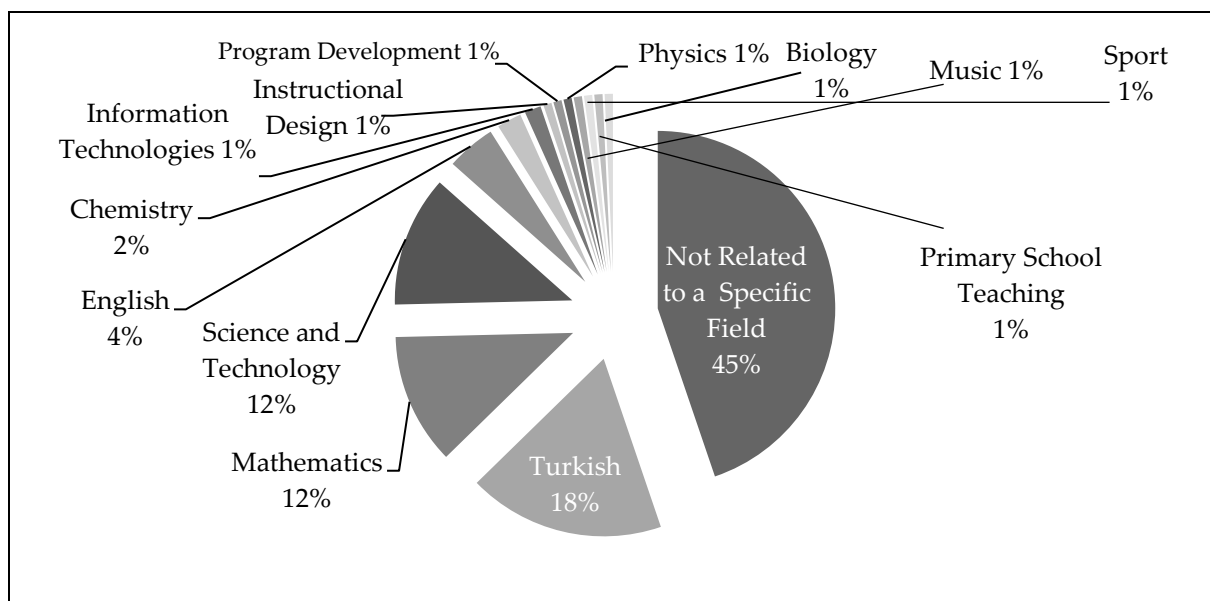

Figure 3. The Distribution of the Reviewed Studies According to Their Fields

As it is indicated in Figure 3, 45% of the reviewed studies were not related to a specific field. As a specific field, the studies were carried out mainly with (18%) Turkish, (12%) Mathematics, (12%) Science and Technology as special field in order. A great deal of the studies carried out within the scope of Turkish lesson (about 80%) was related to the metacognition of reading and comprehension. Among the reviewed studies, scales were developed for metacognition in 12% (16 studies) of the reviewed studies, review studies were carried out in 9% of them (12 studies). The studies, which were carried out within the scope of special education consisted of 2% (3 studies) of the studies for metacognition.

The Findings Related to the Third Sub-problem what is the distribution of the studies carried out in education in Turkey and published as articles focused on metacognition according to their study groups?

The researches carried out with metacognitive features were analysed descriptively based on eight categories as: *association, prediction, by the predicted, effective variables, experimental, level / status determination and review*. To reflect the aims of the researchers as good as possible, the terms they used were tried to be presented as they were in the findings.

A metacognitive feature was connected with a different feature in 29 (or in a part) of the reviewed studies (about 25%). The findings related to these within the scope of association category were indicated in Table 1.

Table 1. The Features Associated with a Metacognitive Feature in the Reviewed Studies

Metacognitive awareness levels	ASSOCIATION FOCUSED RESEARCHES	Metacognitive learning /self-arrangement strategies
→ *epistemological beliefs (4)*		→ *problem solving skills (2)*
→ *academic achievement (4)*		→ *mathematical reasoning skills (1)*
→ *perceptions of problem solving skills (3)*		→ *teacher efficacy (1)*
→ *general IQ (2)*		→ *self-efficacy (1)*
→ *locus of control (2)*		→ *academic achievement (1)*
→ *self-ass. perc. for teach. social sciences (1)*		
→ *prob.sol.perceptions in daily life (1)*		**Metacognitive skills**
→ *need of thinking (1)*		→ *amademic achievement (1)*
→ *learning perf.from the passage (1)*		→ *thinking styles (1)*
→ *motivation (1)*		→ *self-afficacy in sci. research (1)*
→ *attitude towards chemistry (1)*		→ *critical thinking (1)*
→ *mathematical literacy self-efficacy (1)*		→ *self-regulation (1)*
→ *socio-economic status (1)*		→ *Motivation(1)*
→ *math anxiety (1)*		**Reading strategies, metacog. awarenesses**
→ *reading comprehension level (1)*		→ *Reading trends (1)*
→ *self-esteem / coping styles in making decision (1)*		→ *Attitudes toward reading (1)*
→ *study habits (1)*		→ *Level of understanding and recall (1)*
→ *attitude towards study (1)*		→ *Academic achievement (1)*
→ *student autonomy (1)*		
→ *self-arrangement (1)*		
→ *gender (1)*		
→ *parental education status (1)*		

As it is indicated in Table 1, metacognitive awareness was associated with 23 features; metacognitive skills with 6 features; metacognitive learning/self-arrangement strategies with 5; and reading strategies metacognitive awarenesses with 4 features. When the associated features are considered, it is noticed that the most associated features are; academic achievement (8), problem solving (6; daily/mathematics) self-efficacy (6; general/teacher/making sci. researches/ mathematical literacy), epistemological beliefs (4) and attitude (3; to chemistry/study/reading).

Within the scope (or in a part) of 21 (18%) of the reviewed studies, a different feature of a metacognitive feature, the situation of predicting alone or with a different feature were analysed. The findings related to these studies included in the category of prediction are indicated in Figure 4.
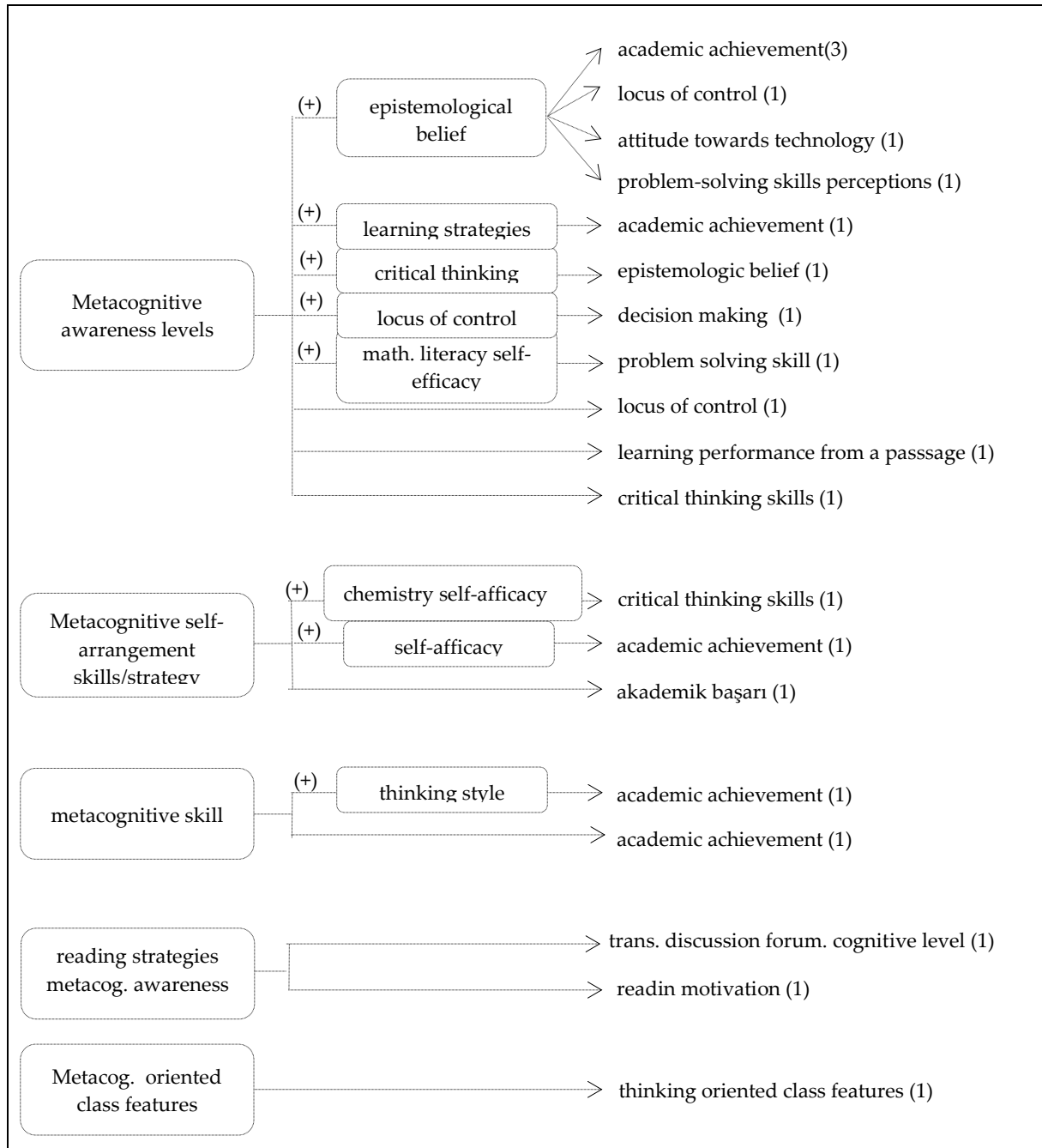

Figure 4. The Features in Which the Prediction Case of a Metacognitive Feature

As it is indicated in Figure 4, the situation of a feature related to a metacognition alone or with different variables (totally 8), thus; totally 10 prediction of situation with different variables were investigated. Mostly the situation of prediction of metacognitive awareness on other features was investigated. Academic achievement was the most predicted feature (8). Metacognitive awareness and epistemological belief were used in 6 studies together and the situation of predicting academic achievement of these two was the most investigated situation with 3 frequencies.

Within the scope of 7 (about 6%) of the reviewed studies (or in a part), the situation in which a feature predicted a metacognitive feature alone or with a different feature was investigated. The findings related to these studies within the scope of the category of being predicted are indicated in Figure 5.
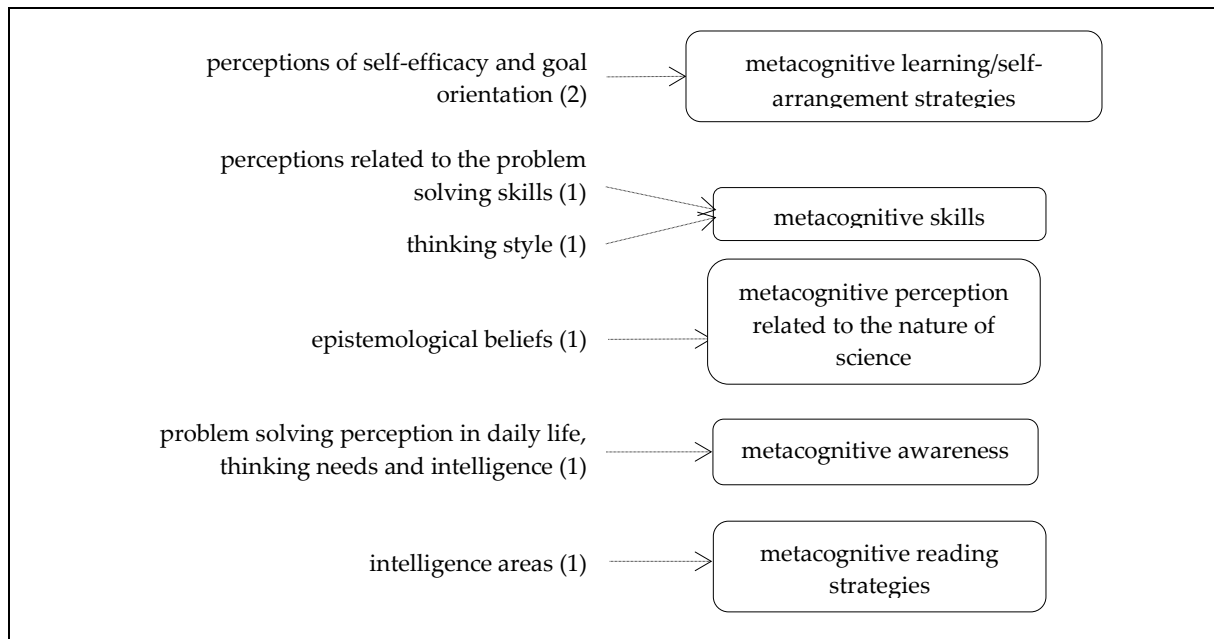

Figure 5. The Features Predicting a Metacognitive Feature in the Reviewed Studies

As it is indicated in Figure 5, problem-solving perception is the variable whose situation of prediction was mostly investigated with 2 frequencies. In this aspect, the metacognitive awareness and metacognitive learning/ self-arrangement strategies with 2 frequencies were handled more compared with other metacognitive features.

Within the scope of the 37 (about 31%) of the reviewed studies (or in a part), it was investigated whether the demographical variables were effective on a metacognitive feature or not. The findings related to these studies within the scope of the effective variables category are indicated in Figure 6.
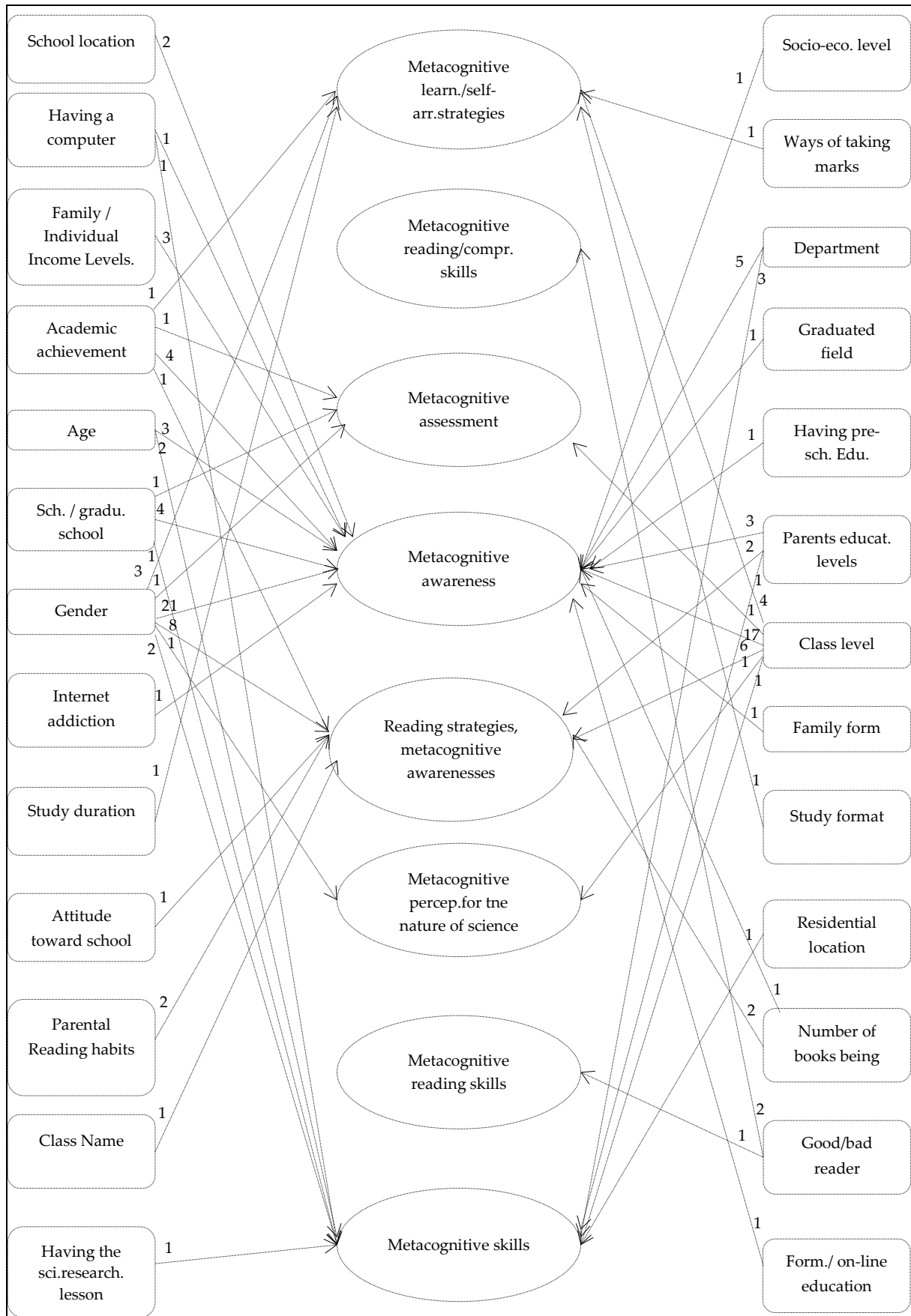
Sch. / grad. school: school or gradated school; Family/Individual Income Lev.: The income level of the individual or his/her family; number of books being read: The number of book which were read in the last six month/a year; Form/online education: The status of Formal or On-line Education

Figure 6. The Variables, Whose Effect on a Metacognitive Feature, Were Considered

As it is indicated in Figure 6, it was investigated whether 24 different variables had affects on seven features as: metacognitive awareness related to the metacognition, metacognitive learning/ self-arrangement strategies, metacognitive awarenesses of reading strategies, metacognitive reading comprehension strategies, metacognitive reading skills, metacognitive strategy, metacognitive perceptions related to the nature of science and metacognitive skill. Mostly metacognitive awareness was considered within the scope of these researches and investigated whether 18 different variables had effect on the relevant awareness level or not.

The most applied ones among the variables were gender (36) and class level (30). Respectively, academic achievement (7), the education department (8) and family education level (6) followed. The variables as the situation of having the scientific research techniques lesson or the classroom were used only in one research.

Within the scope of 28 studies (about 24%) among the reviewed studies (or in a part), it was tried to determine a level/situation of a metacognitive feature. The findings related to the studies consisted of the category of determining level/ statuses are indicated in Table 2.

Table 2. Metacognitive Features Whose Level / Status were Investigated Among the Reviewed Studies

Level/status determined feature	ƒ
Metacognitive awareness levels	12
Metacognitive learning/self-arrangement strategies	4
Reading strategies metacognitive awareness levels	4
Metacognitive reading comprehension strategies	2
Levels of using metacognitive strategies during studying	1
Using metacognitive strategies	1
Metacognitive reading skills	1
Using metacognitive strategies (Cognitive coaching by teachers)	1
Metacognitive reading comprehension awareness	1
Metacognitive perceptions about the nature of science	1
Metacognitive behaviours in problem solving process	1
The behaviours of secondary school mathematics teachers to actuate the metacognition of their students in problem solving status	1
Necessary knowledge and skills of pre-service primary school teachers for metacognitive teaching	1
The benefit of metacognitive behaviours in problem solving/ exercising (science and techn.)	1
Comparing the on-line and off-line methods used in measuring the metacognition	1

As it is indicated in Table 2, the metacognitive awareness level was tried to determine with 12 frequencies most by the researchers. This was followed orderly by metacognitive learning/self-arrangement strategies with 4 frequencies, reading strategies metacognitive awareness levels with 4 frequencies and metacognitive reading comprehension strategies with 2 frequencies. The remaining level related to the 11 metacognitive features was used as a topic by a research for each.

20 (about 17%) of the reviewed researches were experimental and a metacognitive feature was used as dependent variable in 12 of these researches and independent variable for 8. In these studies, which were in experimental category, the findings related to the fact of a metacognitive feature are a dependent and independent variable are indicated in Figure 7 and Figure 8, in order.
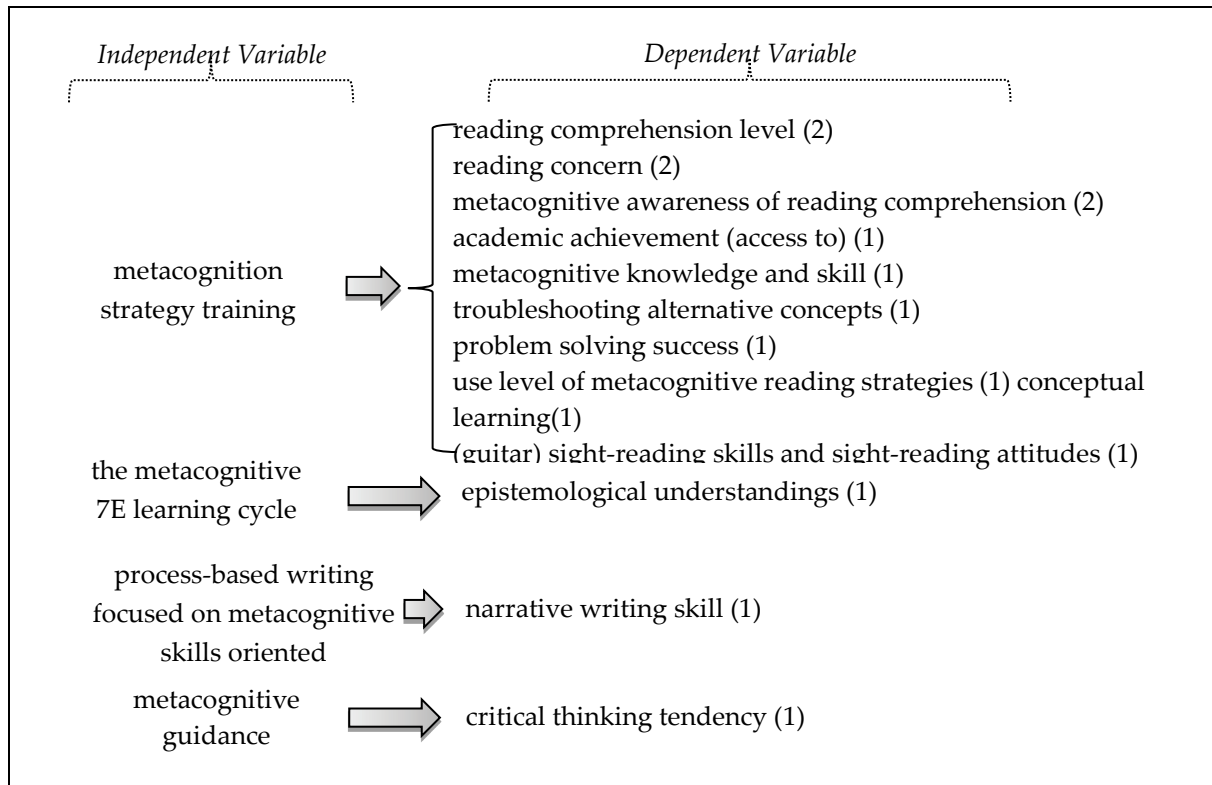
Figure 7. Metacognitive Independent Variables

As it is indicated in Figure 7, metacognitive strategy training, metacognitive 7E learning cycle, process-based writing focused on metacognitive skills oriented and metacognitive guidance and come to appearance as independent variables in experimental studies. It is seen that these studies mostly focused on reading topic in Turkish with 7 frequencies.
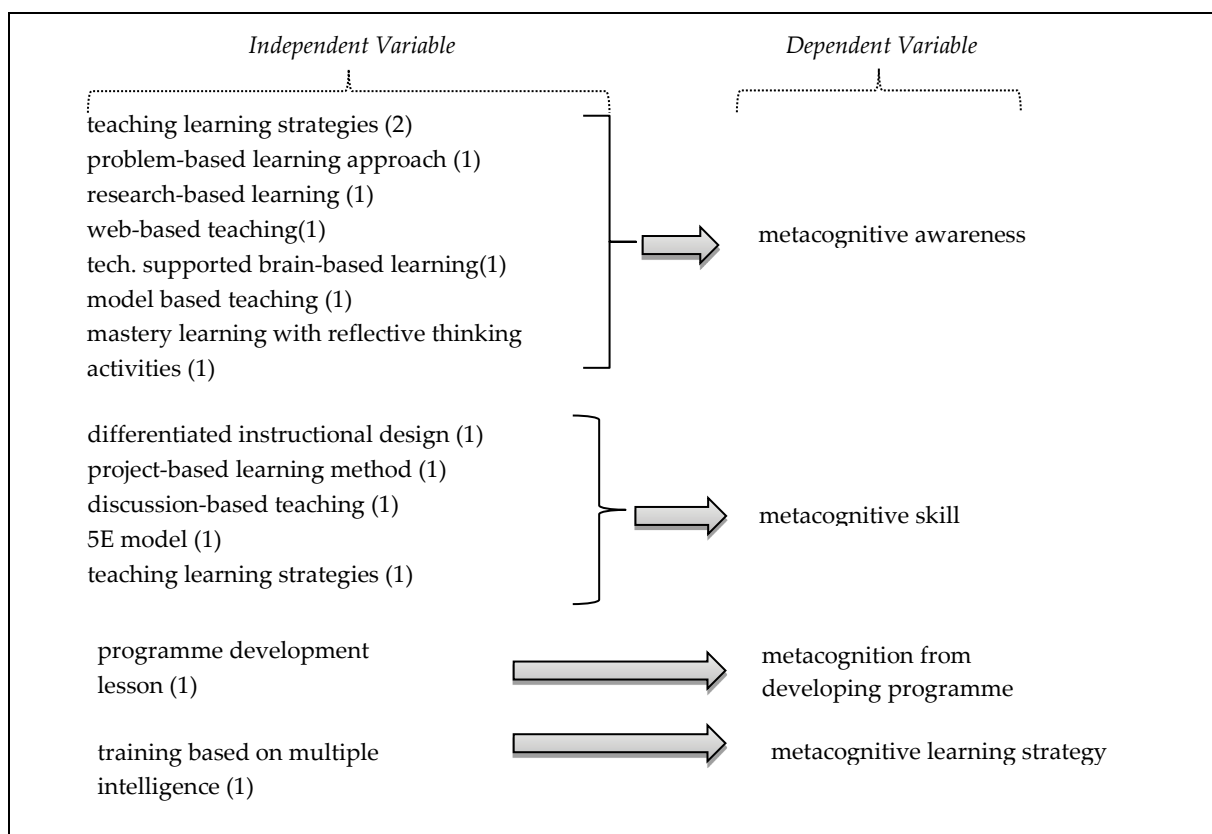

Figure 8. Metacognitive Dependent Variables

As it is indicated in Figure 8, we encountered with metacognitive awareness, metacognitive skill, metacognition related to the programme development and metacognitive learning strategies as dependent variables in experimental studies. In these studies, we come across with metacognitive awareness with 8 frequencies and metacognitive skill with 5 frequencies. The most used independent variable is teaching learning strategies with 3 frequencies.

12 (about 9%) of the reviewed studies were review studies. In 7 of the 12 studies, discussing the metacognition concept theoretically, the concept was tried to describe with the examples in our country and around the world and recommendations were given for its development. The metacognition term was defined in other three of reviewed studies in terms of science education, teaching foreign language and teaching Turkish and recommendations were given related to its use in relevant teaching process. The basic principles of teaching with cognitive coaching were presented in a review study focusing on the applications including cognitive awareness, cognitive awareness strategies, cognitive For the arrangement process of learning experience management approach put forth by the researcher, metacognitive arrangement concepts were applied and an applicable approach/ tool set was constituted for the conceptual form and metacognitive arrangement processes with the help of the learning experience management within the scope of another study.

The Findings related to the Fourth Sub-problem; what is the distribution of the studies carried out in education in Turkey and published as articles focused on metacognition according to their data collection tools?
The descriptive analysis results related to the methods applied in the reviewed researches are indicated in Figure 9.
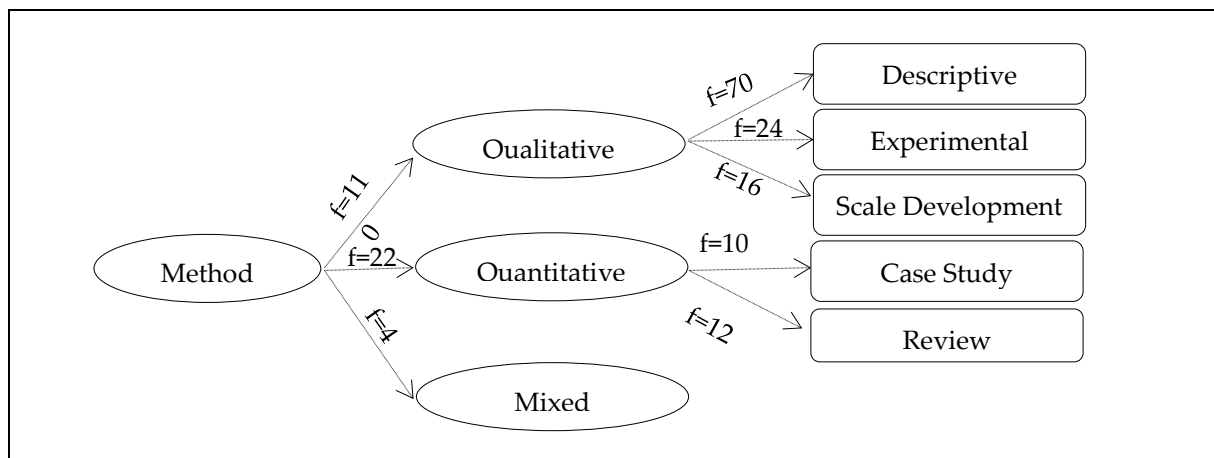
Figure 9. Distribution of the Studies According to the Method

As it is indicated in Figure 9, 80% of the studies have empirical characteristics. 12% of them can be improved and 9% are in review type. Furthermore, about 81% of the studies are designed as qualitative, 16% are quantitative, and 3% are mixed. A large amount of the qualitative studies, about 65% are descriptive.

The Findings Related to the Fifth Sub-problem; what is the distribution of the studies carried out in education in Turkey and published as articles focused on metacognition according to their data analysis methods?
Descriptive analysis results related to the study group in reviewed studies are indicated in Table 3.

Table 3. Distribution of Reviewed Studies According to the Study Groups

∑f	2	10				72					2				124						0	3	0
f	2	1	1	2	6	17	20	19	15	1	-	1	1	-	29	26	26	26	3	14	-	3	-
School Level	Pre-school	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8.t h Grade	unknown	9th Grade	10th Grade	11.th Grade	12h Grade	1st Grade	2nd Grade	3rd Grade	4th Grade	5th+Grades.	unknown	Post-graduate	Teacher	Admin./parent
		Primary				Secondary					High				University								

As it is indicated in Table 3, it is seen that the studies on metacognition were mainly carried out at secondary school and university level. In addition, 86% of the studies especially carried out with university students were carried out with the pre-service teachers who were under education in faculties of education. The number of the studies carried out at primary school level was minimum and the studies with them were mainly with 4th grade students. The studies at high school level were very few with two frequencies. Teachers were included only three studies, on the other hand; no studies occurred with postgraduate students, administrators, and parents.

The Findings Related to the Sixth Sub-problem; what is the distribution of the studies carried out in education in Turkey and published as articles focused on metacognition according to their language?

The data collection tools used in reviewed studies were analysed descriptively as qualitative and quantitative. The findings are indicated orderly in Table 4 and Table 5.

Table 4. Qualitative Data Collection Tools Used in Reviewed Studies

Developed the Scale	Scale Name	Adapted the Scale	f
Schraw & Dennison, 1994	*Metacognitive Awareness Inventory*	Akın, Abacı, & Çetin, 2007	17
		Original Form was used	2
		Sungur & Şenler, 2009	1
		Özsoy, Çakıroğlu, Kuruyer, & Özsoy, 2010	1
		Yıldız, 2010	1
Pintrich, Smith, Garcia, & McKeachie 1991	*Motivated Strategies for Learning Questinnaire*	Sungur, 2004 Üredi, 2005	3
		Altun & Erden, 2006	2
		Büyüköztürk, Akgün, Özkahveci, & Demirel, 2004	1
		Karadeniz, Büyüköztürk, Akgün, Kılıç-Çakmak, & Demirel, 2008	1
Sperling, Howard, Miller, & Murphy, 2002	*Metacognitive Awareness Inventory*	Karakelle & Saraç, 2007	5
		Yilmaz-Tuzun, & Topcu, 2007	1
		Aydın & Ubuz, 2010	1
Mokhtari & Reichard, 2002	*Metacognitive Awareness of Reading Strategies*	Öztürk, 2012	4
		Original Form was used	2
		Başaran, 2013	1
Çetinkaya & Erktin, 2002	*Bilişüstü Strateji Envanteri*	Çetinkaya & Erktin, 2002 Yıldız, Akpınar, & Ergin, 2006	3
Başbay, 2008	*Üstbiliş Farkındalık Ölçeği*		1

Wells & Cartwright-Hatton, 2004	*Metacognitions Questionnaire*	Tosun & Irak, 2008	3
Namlu, 2004	Biliş ötesi Öğrenme Stratejileri Ölçeği		4
Yurdakul, 2004	*Bilişötesi Farkındalık Ölçeği*		3
Demir, 2013	*Bilişsel Farkındalık Ölçeği*		2
Karatay, 2011	*Okuma Stratejileri Bilişsel Farkındalık Ölçeği*		2
Kouider & Sheorey, 2002	Survey of Reading Strategies	Original Form was used	1
Mok, Fan & Sun-Keung, 2007	*Motivational, Cognitive, and Metacognitive Competence Scale*	Aktamış & Uça, 2010	1
Demir & Bal, 2011	*Bilişsel Koçluk Anketi*		1
Çakıroğlu & Ataman, 2008	*Üstbilişsel Okuduğunu Anlama Farkındalığı Ölçeği*		1
Tuncer & Kaysi, 2013	*Üstbiliş Düşünme Becerileri Ölçeği*		1
Peters, 2007	*The Scale of Metacognitive Perceptions About The Nature of Science*	Yenice, 2014	1
Gündoğan Çögenli & Güven, 2014	*Bilişüstü Öğrenme Stratejileri Belirleme Ölçeği*		1
Altındağ & Senemoğlu, 2013	*Yürütücü Biliş Becerileri Ölçeği*		1
Cooper, Urena & Stevens, 2008	*Metacognition Skills Scale*	Tüysüz, Karakuyu ve Bilgin,2008	5
Taraban, Kerr & Rynearson, 2004	*Metacognitive Reading Strategies Questionnaire*	Çöğmen, 2008	2
Thomas, 2003	*The Metacognitive Orientation Learning Environment Scale–Science*	Yıldız ve Ergin, 2007	2
Desoete, Roeyers & Buysse, 2001	*Metacognitive Skills and Knowledge Assessment*	Özsoy, 2007	2
Kaplan & Duran, 2016	*Matematiksel Üstbiliş Farkındalık Envanteri*		1
Yeşilyurt, 2013	*Program Geliştirmeye İlişkin Bilişsel Farkındalık Ölçeği*		1
Yıldız, Akpınar, Tatar and Ergin (2009)	*Bilişüstü Ölçeği*		2
Duman (2013)	*Üstbilişsel Farkındalık Ölçeği*		1
Turan (2009)	*Üstbiliş Ölçeği*		1

* The scale names in this table were presented in their original forms with which they were prepared.

As it is indicated in Table 4, it can be seen that 28 different qualitative measuring tools are used in the reviewed studies (questionnaire/inventory/scale). The researchers developed 16 of these tools and 11 of them were scales developed by foreigners and adapted to Turkish. Same measuring tool was adapted Turkish by different researchers. The scale whose name was *Survey of Reading Strategies* developed by Mokhtari and Sheorey (2002) was used in a study with its original form. Moreover, these two scales adapted to Turkish was applied by the researchers in 3 studies as its original form.

The oldest measuring tool used in Turkey in the field of metacognition was *Biliş üstü Strateji Envanteri*, which was developed by Çetinkaya and Erktin (2002). The newest one was *Matematiksel Üstbiliş Farkındalık Envanteri* developed by Kaplan and Duran (2016).

The scale called as *Metacognitive Awareness Inventory* developed by Schraw and Dennison (1994) is mostly used scale in the field of metacognition in Turkey. The most used form (17) of this scale is the form adapted by Akın, Abacı, and Çetin (2007). The scales: *Motivated Strategies for Learning Questionnaire* developed by Pintrich et al. (1991), the *Metacognitive Awareness Inventory* developed by Sperling et al. (2002), the *Metacognitive Awareness of Reading Strategies* developed by Mokhtari and Reichard (2002) are other mostly used measuring tools with 8, 7 and 7 frequencies in order.

The quantitative data collection tools, which were used in the study are indicated in Table 5.

Table 5. The Qualitative Data Collection Tools Used in the Reviewed Studies

Data Collection Tool		f
Interview Form	Structured	7
	Semi-structured	4
Thing-aloud Protocol		5
Rating Scales		2
Check List		1
Observation Form		1
Total		20

As the Table 5 is analysed, it can be seen that the most used quantitative data collection forms (11) were the interview forms. 7 of them were structured and 4 of them semi-structured. All these interview forms were developed by the researchers, it was applied to the relevant literature during the development process.

The most used qualitative data collection tool (5) after the interview forms were the think-aloud protocols. These protocols were used during the problem solving and reading a passage tasks. In addition, the rating scales (2), checklists (1) and observation forms were among the used data collection tools.

Quantitative and qualitative data collection tools were used together in 3 researches. One of these researches was designed as experimental; the other two were as relational scanning.

The Findings related to the Seventh Sub-problem what is the distribution of the studies carried out in education in Turkey and published as articles focused on metacognition according to their data analysis methods

In terms of the data analysis methods used in the reviewed studies; data were analysed descriptively based on the categories as qualitative (descriptive analysis, content analysis) and quantitative (descriptive, forecast (parametric, non-parametric). The findings are indicated in Figure 10.
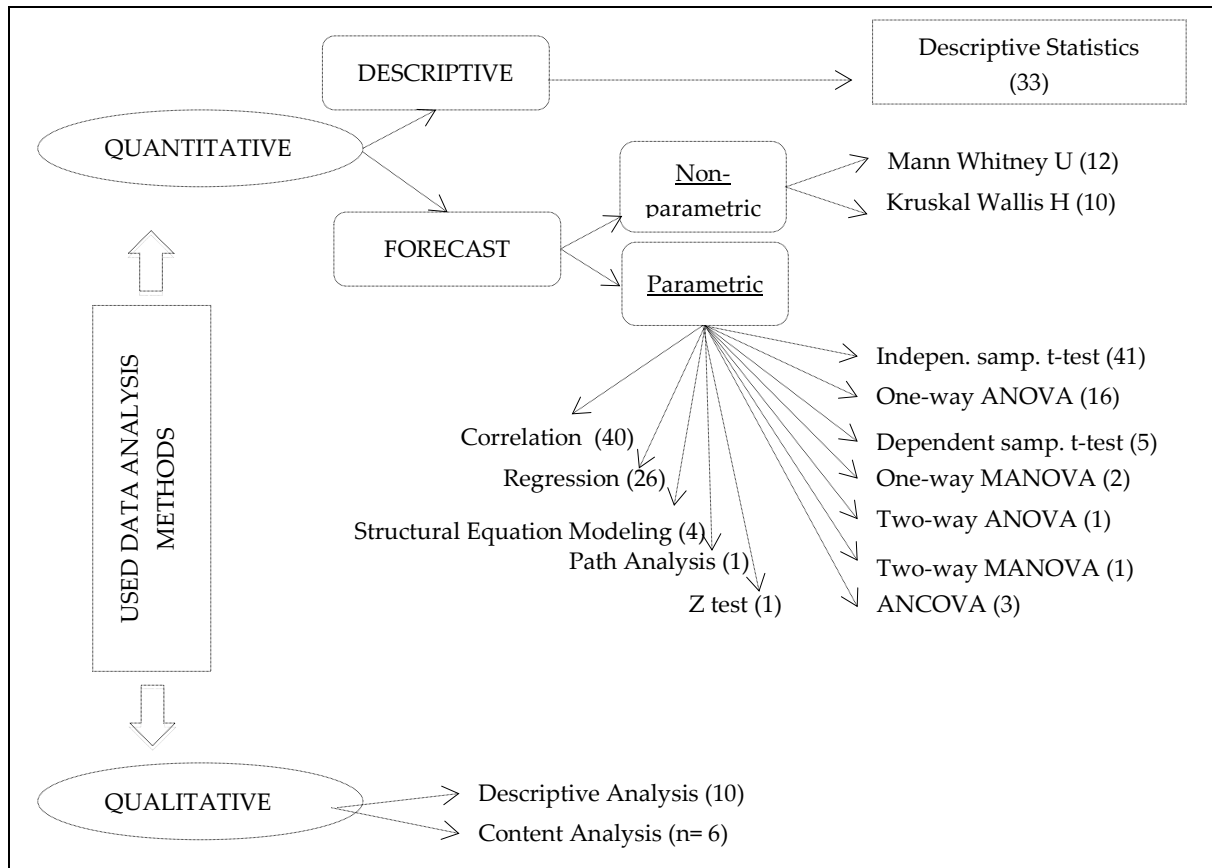
Figure 10. Data Analysis Methods Used in the Reviewed Studies

As it was presented within the context of the third sub-problem, a great number of the researches were designed as quantitative. As a natural consequence of this case, quantitative data analysis methods were mainly used in data analysis as it is indicated in Figure 10.

It can be claimed that mainly the forecasted methods are used among the quantitative data analysis methods. The most used methods were independent sampling t-test (40) and correlation (36) the descriptive statistics were used in 33 studies. The Mann Whitney U and Kruskal Wallis H tests, which are among the non-parametric tests, were used in respectively 12 and 10 researches. If we should summarize, it can be said that hypothesis tests were used at firstly, the tests in which the relations were investigated, were used secondly and descriptive test were used finally. In the analysis of qualitative data, the descriptive analysis method was used in 10 studies and content analysis in 6.

The Findings Related to the Eighth Sub-problem: what is the distribution of the studies carried out in education in Turkey and published as articles focused on metacognition according to their language?

In terms of the language, the studies in metacognition were analysed in three categories descriptively based on Turkish, English, Turkish and English. The findings are indicated in Figure 11.
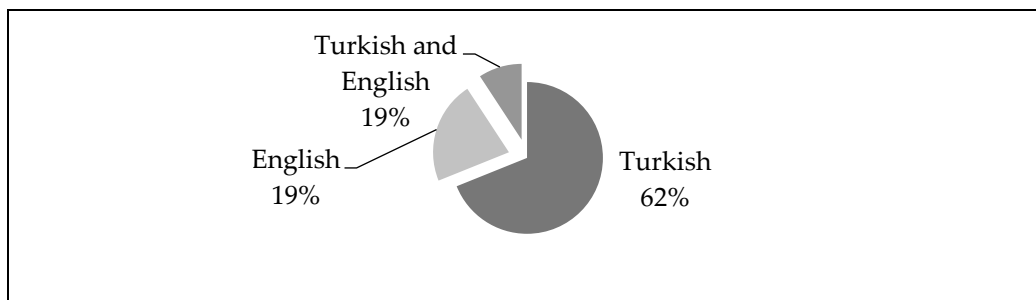

Figure 11. Distribution of Reviewed Studies According to their Language in Publishing

As it is indicated in Figure 11, 62% of the relevant studies were published in Turkish, 19% in English and 19% in both languages as Turkish and English.

Conclusion and Discussion

These following results were reached within the context of this study, which aimed to review the conducted and published studies related to metacognition in Turkey in detail in terms of their study groups, methods, topics, data collection tools, data analysis methods and languages.

The beginning of the studies based on metacognition in Turkey dates back to 2002. It is noticed that the number of these studies increased gradually and showed a rapid increase in the last five years except the years 2010, 2013 and 2016. As the positive effects of the effective use of the metacognition on the learning environments were taken into consideration, the increase in the number of the studies was an expected increase. The first study year of this concept, which was described first in the late of 1970s, in 2002 is a date which should be thought as late. This case may be the result of an epistemological hindrance from the misunderstanding of the concept in relation to the nature of this concept. Because, there are still many problems stated in the literature related to the conceptualization of this concept (Akpunar, 2011; Desoete & Özsoy, 2009; Doğan, 2013). Moreover, the inability to reach consensus on the Turkish equivalents of the concept used for the English (Özsoy, 2008) can be shown as another reason for the encountered delay in the study of metacognition.

As the reached studies are handled in terms of the fields, it can be said that about in half of the them focuses on general features such as awarenesses, strategies, levels of use of the participants a particular aspect of metacognition or metacognition, regardless of the specific area. We can express this result with these words for a clear vision: in some of these researches, the "general metacognitive awarenesses" of the participants were measured, and the measured awarenesses were associated with different characteristics, such as the overall achievement of students. However, even in such an association of research, considering the relationship between metacognitive awareness in mathematics and mathematical achievement may be a more reliable measure of quality. Because, the concept of metacognition is a concept especially related to the literature (domain-specific context) (Lester et al., 1989) Akpunar (2011) stated that- instead of direct application of the concept of metacognition,- the content should be investigated in a more detailed and inter-disciplinary approach with the contribution of all relevant disciplines such as philosophy, psychology and educational sciences, anthropology and neuroscience. Among the studies on a single field; that is, in studies based on a specific field, the most studied field is Turkish. Almost all of the studies carried in this field were about reading. Mathematics, Science and Technology are other fields, which came after Turkish. English, Chemistry, ICT, Teaching Pattern, Program Development, Biology, and Social Sciences were among other studies even if they were few.

The topics in the carried studies on metacognition were mainly on *association*, *prediction*, *by predicted*, *effective variables*, *experimental*, *level/case determination*, *and review*. The results of these topics are shown below.

- Mostly the variables, which can be effective on a metacognitive feature, were considered among these studies. Mostly metacognitive awareness was considered as a metacognitive feature and gender and class level as a variable. The effect of academic achievement on almost all the features was also investigated even they were fewer.
- In addition, in the studies: association, prediction and predicted by, it was noticed that metacognitive awareness came into existence. The most associated features with a metacognitive feature were determined to be problem solving, academic achievement, self-efficacy, epistemological belief and attitude.

- The case of metacognitive feature prediction in academic achievement was frequently discussed. It was dealt with the awareness and epistemological belief together in the prediction studies and generally, the case of prediction of these two in academic achievement was investigated in the relevant studies.

- In the studies of level determination, the most focused feature was the metacognitive awareness level. Metacognitive learning/ self-arrangement strategies, reading strategies metacognitive awareness levels and metacognitive reading comprehension strategies followed it orderly.

- In almost all of the experimental studies in which a metacognitive feature was used as an independent variable, the effects of metacognitive strategy training were investigated. It was determined that these studies were mainly focused on Turkish field and the features related to reading such as; the level of reading comprehension, reading concern as dependent variable.

- In the experimental studies, which a metacognitive feature was used as dependent variable, mostly reading strategies teaching was used as independent variable. In these studies, which consisted of 11 different independent variables, mostly metacognitive awareness and metacognitive skill were used as dependent variable.

- Most of the review studies were used as specific fields mostly; but in one part of them the metacognition concept related to teaching a metacognition was used as conceptually and some recommendations, which would contribute the use and development of this concept during the teaching process, were given.

As most of the researches were empirical, the review studies and the studies related to scale development also existed. Most of the empirical researches were designed with a quantitative approach. Most of these researches were in the characteristics of a certain level, relation or effect oriented descriptive researches. The remaining studies were experimental and scale development researches in which a fact related to metacognition dealt with both dependent and independent variable. The fact that data collection tools related to metacognition was developed intensively on the questionnaire may lead to the quantitative work in general. Akpunar (2011) determined that most of the studies on metacognition carried out as experimental and was focused on the effects of metacognition on learning and academic achievement. The differences between these two results are due to the differences in the studied studies. In qualitative researches, specifically it was dealt with the features related to reading with protocols and observation in detail; reviews were carried in other studies within this context.

The researches were mostly carried out in university level and the majority of these researches consisted of pre-service teachers. The secondary schools came next. When the development levels of the students considered, it can be claimed that the low rate of researches carried with pre-school and primary school levels was normal. However, it can be claimed as an interesting result that the researches in high school level were few. While there are only two studies related to the teachers; on the other hand, there are no research with post-graduate students and administrator/parent. It is claimed by Senemoğlu (2007, p. 337) that "0-5 age children never use their metacognitive strategies and at the same time they cannot be taught, between the ages 6-9; it can be used but cannot be produced, after the years 10-11; the suitable strategies are used automatically". In addition, it is claimed to be an expected case that the metacognition develops with ages and this development is also related to the cognitive development apart from age factor (Schneider & Lockl, 2002; Veenman et al., 2006; Veenman & Spaans, 2005). However, the unpredictable point is that high school students have very few studies in the study group. As it is considered that teachers have significant roles in teaching metacognition (Artzt & Armour-Thomas, 1998; Demirsöz, 2014; Lester et al., 1989; Spruce & Bol, 2015), the lack of studies with teachers can be regarded as deficiency.

As it was mentioned before, metacognitive awareness is the most stressed point in the researches. As a natural consequence of this case, mostly used tools are related to measure this feature. *Metacognitive Awareness Inventory*, which was developed by Schraw and Dennison (1994) and adapted

into Turkish within the scope of four different researches, is the most applied tool. Doğan (2013) also states that it is one of the most used questionnaires even in abroad. The second one on learning strategies is the *Motivated Strategies for Learning Questionnaire*, which was developed Pintrich et al. (1991) and adapted into Turkish within the scope of five different researches. Thus, totally 25 scales, which consist of 11 developed by foreign researchers and adapted into Turkish, 13 developed by Turkish researcher and 1 with original form, were applied. It was stated that a lot of tools were developed to measure the metacognition by Özsoy (2008), but applying such a lot of different methods and scales to measure the metacognitive knowledge and skills often makes it so difficult to compare the results of the studies. When these scales analysed, it was determined that those, who used the same measurement tool, made different naming related to the features. Mostly the protocol form was used among the qualitative data collection tools. Most of these forms were structured. The think-aloud forms come next. These measurement tools may also be used during metacognitive activities and may be preferred for their ability to observe unobservable metacognitive behaviours. As it is analysed in general, it was determined that off-line measurements were preferred more especially by using questionnaires. Again, this may be due to the metacognitive measurements usually made before or after the activity, not during the metacognitive activities. In the evaluation related to the studies carried out in abroad, Pintrich (2002) claimed that off-line techniques placed more in measuring the metacognition. This case can interrupt the detailed measurement of the metacognition (Desoete, 2008; Saraç & Karakelle, 2012). Because, it is hard to say that the questionnaires are adequate tools to measure the meacognition alone (Cromley & Azevedo, 2011; Jacobse & Harskamp, 2012; McNamara, 2011). But, during the case of using the scales, they expressed that it would be more suitable to use the multi-dimensional scales (Garner & Alexander, 1989). As an example for these scales, Özsoy (2008) suggested the *MSA'98: Inventory of Metacognitive Skills and Knowledge*, which was developed by, Desoete et al. (2002) recognised as reference in several researches or its computer-based version EPA2000 (Desoete, Roeyers, & De Clercq, 2002), to the relevant researchers.

As a result of designing most of the researches with a quantitative approach, most of the data analysis methods are quantitative. As mostly the variables, which can be effective on a metacognitive feature, were investigated in these researches, it was determined that the hypothesis tests, which are among the predictive tests, were used. Among the parametrical tests; the independent sampling t-test and one-way variance analysis (ANOVA) were applied, among the non-parametrical tests; Mann Whitney U and Kruskal Wallis H were used most. The reason why the independent sampling t-test and ANOVA were used most originated from that the gender and class level variables were among the most used variables. While the correlation analysis was used in relational researches most, in the researches related to prediction, regression was preferred instead of structural equation modelling.

While 7 of 10 studies being reached were Turkish, about 2 of 10 were written in English. The rest 1of 10 were published both in Turkish and English. This result can be considered as an expected result as the journals in Turkey were investigated totally.

Briefly, the results reached in this study are as follows. The concept of metacognition was used in the literature with various names and this case can be interpreted that there are misconceptions related to the concept in our country. In addition, it was noticed that the researchers, who used the same measuring tools, might use different naming as in the example of awareness and belief. Most of the studies carried on the field of metacognition were designed with a quantitative approach. So, the quantitative data collection tools, especially the questionnaires, were preferred and as a result of this, the metacognition was measured as off-line in relevant studies. The number of studies, in which qualitative and quantitative data collection tools are used together, was very few. The sampling of the studies carried out on metacognition were: in the level post-graduate, administrator and parent level;

no participants; pre-school, high school level and teachers were very few and in primary school level was extremely few. The researchers mostly developed the measuring tools in qualitative researches. This case may hinder the researchers to present a common form in measuring the metacognition. Considering the data analysis methods used in the researches, the variables, which might be effective, were investigated one by one or the association/prediction works were carried out with one or two variables. This situation has a characteristic to interrupt to handle the complicated structure of metacognition with a holistic perspective. Considering these results, the following recommendations are thought to contribute to the literature.

- The misconception in the metacognition field in the literature of our country may constitute difficulties especially in terms of new researchers. Thus, the studies related to make common concepts as dominant may contribute to create a common perception related to this field.
- The adoption of mixed methods in the possible studies on the field of metacognition, therefore using various types of data collection tools, especially using on-line and off-line tools together will be possible to measure the metacognition more comprehensively.
- Constituting common measuring tools, which have the validity and reliability among the qualitative data collection tools, may create a collaborative use for the researches designed with this style. This may give way to such researches.
- In the metacognition studies, which will be designed within the purpose of effect and association, the effects and associations may help to develop more realistic models with simultaneous use of a lot of variables and considering the nomological network form of metacognition with a holistic approach.

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Appendix 1. Reviewed Articles

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