An Analysis Of The Studies Conducted With Attitude Scales Towards Chemistry Course In Turkey*

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ABSTRACT

The aim of this study is to examine the academic studies in the form of theses, articles and papers in which attitude scales towards chemistry course are used in Turkey. For this purpose, the studies in the literature were conducted with the data obtained from the Higher Education Council Thesis Center, ULAKBIM TR Index, Proquest and Google Scholar databases with the document review technique, one of the qualitative research methods. As a result of the scans conducted within the scope of the research, a total of 92 scientific studies, including theses, articles and papers, were reached. The studies were evaluated in terms of year of publication, type of publication (article, master's thesis, doctoral dissertation, paper), language, research method (qualitative, quantitative, mixed), research design, study group, sample size and method, grade level, field of science, research topic, keywords, research purpose (scale development, review, evaluation), institution (primary, secondary, university), data collection tools, data analysis techniques and chemistry attitude scales used. The data were analyzed by content analysis method. According to the findings of the study, most of the studies were found in thesis type and it was determined that master's thesis studies were predominant especially in 2007, 2011 and 2023. In article studies, a concentration was observed especially in 2011, 2014, 2016 and 2023. While quantitative methods were most commonly preferred in the studies, mixed methods were used less frequently. Sample sizes generally ranged between 0-100 and 100-200, and high school students were the most frequently selected participants as the sample group. It was concluded that most of the studies were conducted in the fields of chemistry education and science. In line with the findings obtained, it is recommended to diversify the studies in which attitude scales towards chemistry course are used and to increase the number of studies examining the attitudes of university students towards chemistry course in different programs.

Keywords: Attitude scale towards chemistry course, academic studies, document analysis technique.

INTRODUCTION

Education is an effective tool that enables individuals to gain knowledge and skills in addition to increasing their physical and mental strength. It also has an important place in helping people succeed in the struggle for life and develop their innate knowledge and skills. Attitudes stand out as one of the important elements in the education process (Kaya & İzci, 2024). Attitudes are also considered to be the most important determinant of human behavior. Attitude is a situation that can cause changes in the behavior of an individual acquired through learning (Kan & Akbaş, 2005). Positive or negative attitudes of individuals are thought to directly affect the learning process and shape their future experiences. Attitudes are formed as a result of the experiences they will have and the information they acquire; therefore, attitudes are acquired later (Oğuz & Yanarateş, 2022). Attitude emerges at a young age. Attitudes acquired at a young age can change in line with the experiences gained over time. This change can be both positive and negative (Çetinkaya & Ayartepe, 2020). The most important issue in developing or changing positive or negative attitudes is undoubtedly education. Developing a positive attitude towards a course includes behaviors such as willingness to participate in the course, satisfaction, accepting it as a value and adopting this value (Özçelik, 1998). Since determining attitudes

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towards a course in advance will have an important place in people's future professional lives, it can be ensured that attitudes towards that course are changed positively (Özçelik, 1992).

Attitudes are influenced by factors such as motivation, self-confidence, interest and engagement in learning. While a positive attitude can increase students' achievement, a negative attitude is thought to negatively affect the learning process. Therefore, it is important for educators to understand students' attitudes and develop various strategies to encourage positive attitudes. Knowing attitudes towards the course in advance can help change negative attitudes. Because negative attitudes can be changed. It can be thought that existing attitudes will play an important role in their future professional lives. For this reason, one of the keys to success in teaching is to include learning and teaching activities aimed at breaking down negative attitudes.

There are many factors affecting attitude such as age, home-school environment, teacher's personality and teaching technique, previous knowledge and experiences, parents' attitudes and behaviors (Oskay et al., 2009). Another important factor determining students' attitudes is gender. While male students prefer to combine objects and create models, participate in active activities and follow science-related news, female students enjoy out-of-class activities and life science activities (Farenga & Joyce, 1997a,b). Individuals are influenced by their environment and this environment plays a major role in providing them with social, cultural and cognitive knowledge. Since students spend most of their time at school, the education they receive at school affects their cognitive, emotional and psychomotor development both directly and indirectly. In addition, the experiences gained in schools are thought to be one of the factors affecting students' attitudes towards lessons (Çetinkaya & Ayartepe, 2020). As there are factors affecting attitudes, attitudes can also act as a factor. Attitudes have a determining effect on school success and university department preferences (Brown et al., 2014). While students are more likely to choose departments related to courses in which they have positive attitudes, they avoid choosing departments related to courses in which they develop negative attitudes (Çetinkaya & Ayartepe, 2020).

Chemistry is a form of research and thinking based on experimental criteria, logical thinking and questioning (Oğuz & Yanarateş, 2022). Chemistry and chemistry education include scientific method steps such as observing, collecting data, forming hypotheses, making predictions, conducting experiments, analyzing data and drawing conclusions to solve a problem (Oğuz & Yanarateş, 2022). Chemistry education is of great importance for students to learn how to access knowledge by exploring, how to restructure what they learn and how to continuously improve themselves (Kaya & Yılmaz, 2016). In chemistry education, it is important for students to develop a positive attitude towards chemistry so that they can better understand the world, ask meaningful questions, conduct experiments by making observations, analyze, be aware of their responsibilities and improve their knowledge (Erökten, 2017). When the researches are examined, it is thought that chemistry is a difficult field (Şahin, 2012). The biggest difficulty in the learning process stems from the fact that students try to learn concepts that contradict the situations they experience in their daily lives. For this reason, students generally perceive chemistry as a theoretical subject and dislike it because it is seen as a difficult science (Şahin, 2012). It is thought that students' learning chemistry by associating it with daily life will positively affect their attitudes towards chemistry course (Kösece, 2020). Students' correct learning of chemistry science contributes to finding different solutions to the problems they encounter. Therefore, it is important to understand attitudes towards chemistry course and to develop these attitudes positively in order to increase students' interest in chemistry course. This is thought to affect success and motivation in the learning process. The aim of the chemistry curriculum should be to provide students with sufficient knowledge and skills in mathematical expressions related to chemistry, basic chemistry terms and applications of these concepts, and to increase their interest in chemistry to ensure their success (Baş et al., 2016).

Attitudes developed towards all courses during the education and training period are very important. According to Nieswandt (2007), attitude towards chemistry course can be explained by whether a person likes chemistry or not. By ensuring that students develop a positive attitude towards chemistry course, their willingness to learn and academic success should be increased (Çetinkaya &

Ayartepe, 2020). The aim of teachers in chemistry education should be not only to transfer chemistry knowledge but also to teach the meaning of chemistry (Vos et al., 2011). While conducting chemistry education, teachers should be aware that chemistry, the teacher, chemistry subjects taught in the lessons, chemistry education research affect students' feelings and thoughts and this has an important effect on chemistry attitude (Cheung, 2009).

The aim of this study is to examine the academic studies in the form of theses and articles in which attitude scales towards chemistry course are used in Turkey according to various criteria. For this purpose, answers to the following questions were sought: The studies that used attitude scales towards chemistry course in Turkey between 2003 and 2024;

1. How is the distribution by years?
2. How is the distribution according to publication types?
3. How is the distribution according to the language of study?
4. How is it according to research method and research design?
5. How is the distribution according to the study group?
6. How is the distribution according to sample size?
7. How is the distribution according to sampling method?
8. How is the distribution according to grade levels?
9. How is the distribution according to fields of science?
10. How is the distribution according to the research topic?
11. How is the distribution according to the purpose?
12. How is the distribution of the studies according to the institution and occupational group?
13. How is the distribution according to data collection tools?
14. How is the distribution according to data analysis techniques?
15. How is the distribution according to keywords?
16. How is the distribution according to chemistry attitude scales?

METHOD

This research is a qualitative study and was conducted using document analysis, one of the qualitative research methods. Document analysis is aimed to analyze the data in a systematic way. Document analysis is the examination of written materials containing information related to the objectives of the study (Yıldırım & Şimşek, 2008). The documents of this study consist of academic studies in which attitude scales towards chemistry course were used in Turkey in line with the objectives of the study.

Sample

The population of the study includes the academic studies conducted in Turkey between 2003 and 2024 using the attitude scale towards chemistry course. The sample consists of postgraduate theses and articles accessed electronically from the Council of Higher Education Thesis Center, ULAKBIM, TR Index, Proquest and Google Scholar databases with the convenience sampling method. Convenience sampling is a method that is characterized by its practicality and convenience for the relevant research while the researcher is conducting the application (Patton, 2014).

Data Collection

In order to collect data in line with the aim of the study, a content analysis form was created by taking into account the year of the research, type of publication, language, research method and design, study group, sample size, sampling method, grade level, field of science, subject of the research, purpose of the research, data collection tools, data analysis techniques, keywords and categories of chemistry attitude scales.

The data in the study consisted of postgraduate theses and articles accessed from the Higher Education Council Thesis Center, ULAKBIM, TR Index, Proquest and Google Scholar databases with

the keywords "attitude towards chemistry course" and "attitude scale towards chemistry course". Within the scope of the study, a total of 57 theses were accessed. However, the full text of six of these theses could not be accessed electronically and were not included in the evaluation. The evaluation included 41 articles, 51 master's and doctoral theses, the full text of which was accessed. According to the data obtained, a total of 92 studies were reached with 41 articles, 27 master's and 24 doctoral thesis studies. The studies on the subject were numbered as Pdf files and saved on the computer. The saved studies were prepared to be analyzed according to the determined criteria. Theses and articles belonging to the research population are given in Appendix.

Data Analysis

The data were analyzed using the content analysis method. Content analysis is a systematic and reproducible method that organizes studies according to certain rules, classifies them under subject headings and transforms them into a format that the reader can easily understand (Yıldırım & Şimşek, 2008). As a result of the content analysis, the studies using attitude scales towards chemistry course in Turkey were evaluated in terms of year of publication, type of publication (article, master's thesis, doctoral dissertation, paper), language, research method (qualitative, quantitative, mixed), research design, study group, sample size and method, grade level, field of science, research topic, keywords, research purpose (scale development, review, evaluation), research institution (primary, secondary, university), data collection tools, data analysis techniques and chemistry attitude scales and frequency and percentage analyses were made.

FINDINGS

In this part of the study, the data obtained from the documents using attitude scales towards chemistry course in Turkey are presented under headings according to the criteria determined criteria.

Table 1. Distribution of Studies by Years and Publication Types

Year	Article		Thesis				Total	
			Master's Degree		PhD			
	f	%	f	%	f	%	f	%
2003	1	1,09		0,00		0,00	1	1,09
2004		0,00	1	1,09		0,00	1	1,09
2005	2	2,17		0,00	1	1,09	3	3,26
2006	1	1,09		0,00		0,00	1	1,09
2007	2	2,17	4	4,35	2	2,17	8	8,70
2008	1	1,09	1	1,09	2	2,17	4	4,35
2009	2	2,17	3	3,26	2	2,17	7	7,61
2010	2	2,17	1	1,09	1	1,09	4	4,35
2011	4	4,35	1	1,09	4	4,35	9	9,78
2012	2	2,17	1	1,09	2	2,17	5	5,43
2013	2	2,17	1	1,09	1	1,09	4	4,35
2014	4	4,35		0,00		0,00	4	4,35
2015	3	3,26	2	2,17	1	1,09	6	6,52
2016	5	5,43		0,00	1	1,09	6	6,52
2017		0,00	2	2,17	1	1,09	3	3,26
2018		0,00	1	1,09	2	2,17	3	3,26
2019		0,00	3	3,26	1	1,09	4	4,35
2020	2	2,17	2	2,17	1	1,09	5	5,43
2021	5	5,43		0,00	1	1,09	6	6,52
2022	2	2,17		0,00		0,00	2	2,17
2023		0,00	4	4,35	1	1,09	5	5,43
2024	1	2,63		0,00		0,00	1	1,09
Total	41	46,11	27	29,35	24	26,09	92	100,00

In Table 1, a total of 41 articles, 27 master's and 24 doctoral thesis studies were found when the studies on attitude scales towards Chemistry course in Turkey between 2003 and 2024 were examined. The highest number of studies were five articles in 2016 and 2021, four master's thesis studies in 2007 and 2023, and four doctoral thesis studies in 2011, and the lowest number of studies were one article in 2003, one master's thesis study in 2004, and one article in 2006 and 2024.

Table 2. Distribution of Studies by Language of Study

Year	Turkish						English						Total	
	Article		Thesis				Article		Thesis					
			Master's Degree		PhD				Master's Degree		PhD			
	f	%	f	%	f	%	f	%	f	%	f	%	f	%
2003	1	1,09		0,00		0,00		0,0		0,00		0,0	1	1,09
2004		0,00	1	1,09		0,00		0,0		0,00		0,0	1	1,09
2005	2	2,17		0,00	1	1,09		0,0		0,00		0,0	3	3,26
2006	1	1,09		0,00		0,00		0,0		0,00		0,0	1	1,09
2007	2	2,17	4	4,35	2	2,17		0,0		0,00		0,0	8	8,70
2008	1	1,09	1	1,09	1	1,09		0,0		0,00	1	1,0	4	4,35
2009	2	2,17	3	3,26	1	1,09		0,0		0,00	1	1,0	7	7,61
2010	1	1,09	1	1,09	1	1,09	1	1,0		0,00		0,0	4	4,35
2011	4	4,35	1	1,09	4	4,35		0,0		0,00		0,0	9	9,78
2012	2	2,17		0,00	2	2,17		0,0	1	1,09		0,0	5	5,43
2013	2	2,17	1	1,09	1	1,09		0,0		0,00		0,0	4	4,35
2014	4	4,35		0,00		0,00		0,0		0,00		0,0	4	4,35
2015	3	3,26	2	2,17	1	1,09		0,0		0,00		0,0	6	6,52
2016	5	5,43		0,00	1	1,09		0,0		0,00		0,0	6	6,52
2017		0,00	2	2,17	1	1,09		0,0		0,00		0,0	3	3,26
2018		0,00	1	1,09	2	2,17		0,0		0,00		0,0	3	3,26
2019		0,00	3	3,26	1	1,09		0,0		0,00		0,0	4	4,35
2020	2	2,17	2	2,17	1	1,09		0,0		0,00		0,0	5	5,43
2021	5	5,43		0,00	1	1,09		0,0		0,00		0,0	6	6,52
2022	2	2,17		0,00		0,00		0,0		0,00		0,0	2	2,17
2023		0,00	4	4,35	1	1,09		0,0		0,00		0,0	5	5,43
2024	1	1,09		0,00		0,00		0,0		0,00		0,0	1	1,09
Tota	4	43,4	26	28,26	2	23,9	1	1,0	1	1,09	2	2,1	9	100,0

When Table 2 is examined, it is seen that the language of 40 articles, 26 master's and 22 doctoral dissertations in the studies using attitude scales towards chemistry course is Turkish. It is seen that the language of a total of four studies, one article, one master's and two doctoral dissertations, is English. When the language of the studies is analyzed, it is found that the most preferred language is Turkish.

Table 3. Distribution of Studies According to Research Method and Design

		Article		Thesis				Total	
				Master's Degree		PhD			
Research Methodology	**Research Design**	**f**	**%**	**f**	**%**	**f**	**%**	**f**	**%**
Quantitative	Scanning	17	18,09	5	5,32	1	1,06	23	24,47
	Experimental	5	5,32	12	12,77	8	8,51	25	26,60
	Quasi-experimental	13	13,83	8	8,51	9	9,57	30	31,91
	Comparative Pattern	1	1,06		0,00		0,00	1	1,06
	Methodological design	2	2,13		0,00		0,00	2	2,13
Qualitative	Case Study	1	1,06		0,00	2	2,13	3	3,19
	Content Analysis		0,00		0,00	1	1,06	1	1,06
	Design Based	1	1,06		0,00		0,00	1	1,06
Mixed	Interlocking pattern		0,00		0,00	2	2,13	2	2,13
	Explanatory pattern		0,00	1	1,06	1	1,06	2	2,13
	Convergent pattern		0,00	1	1,06		0,00	1	1,06
	Variation pattern		0,00		0,00	1	1,06	1	1,06
	Action research	1	1,06		0,00	1	1,06	2	2,13
	Total	41	43,62	27	28,72	26	27,66	94	100,00

According to Table 3, when the research methods and research designs of the studies conducted with attitude scales towards chemistry course are analyzed, it is seen that quantitative research method is used the most with 81 studies and the majority of these studies are articles. However, it is seen that mixed method is used in the second place with eight studies and qualitative method is used in five studies. In terms of research design, it is seen that the quasi-experimental design was used more with 30 studies within the quantitative research method and the comparative design was used with at least one study. Within the qualitative method, case study was used in three studies, and content analysis and design-based design were used in one study each. Within the mixed method, nested design, explanatory design and action research design were used in two studies each, while convergent design and variation design were used in one study each.

Table 4. Distribution of Studies by Study Group and Publication Type

Working Group	Article		Thesis				Total	
			Master's Degree		PhD			
	f	**%**	**f**	**%**	**f**	**%**	**f**	**%**
Primary School Students	1	1,09		0,00		0,00	1	1,09
Secondary school students		0,00	3	3,26		0,00	3	3,26
High School Students	25	27,17	22	23,91	18	19,57	65	70,65
Gifted Students	1	1,09		0,00		0,00	1	1,09
University Students	14	15,22	2	2,17	5	5,43	21	22,83
Chemistry Teachers		0,00		0,00	1	1,09	1	1,09
Total	41	44,57	27	29,35	24	26,09	92	100,00

When the studies are analyzed according to the study group and publication type in Table 4, it is seen that high school students were preferred as the study group in a total of 65 studies. High school students are mostly included as the study group in studies of article type. Primary school students, gifted students and chemistry teachers were used as the study group in at least one study.

Table 5. Distribution of Studies According to Study Group and Sample Size

Working Group – Sample Size	0-100		101-200		201-300		301-400		401-500		501-600		601 and above		Total	
	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Primary School Students		0		0		0		0	1	1,09		0		0	1	1,09
Secondary school students	3	3,26		0		0		0		0		0		0	3	3,26
High School Students	43	46,74	6	6,52	4	4,35	4	4,35		0	2	2,17	5	5,43	64	69,57
Gifted Students	9	9,78	7	7,61		0	1	1,09	3	3,26		0		0	20	21,74
University Students	1	1,09		0		0		0		0		0		0	1	1,09
Chemistry Teachers	2	2,17	1	1,09		0		0		0		0		0	3	3,26
Total	58	63,04	14	15,2	4	4,35	5	5,43	4	4,35	2	2,17	5	5,43	92	100

When Table 5 is examined, it is seen that the sample size in the range of 0-100 is the most preferred range with 58 studies in the studies conducted with attitude scales towards chemistry course. The most studied group in the 0-100 range was high school students. The second most preferred range is 101-200 and there are 14 studies. In this sample size, it was determined that the most studied group was university students. It was seen that the sample size in the 501-600 range was the smallest with two studies and high school students were preferred as the study group in these studies.

Table 6. Distribution of Studies According to Sampling Method

Sampling Method		Article		Thesis				Total	
				Master's Degree		PhD			
		f	%	f	%	f	%	f	%
Random Sampling Method	Random Sample	4	4,35	2	2,17	1	1,09	7	7,61
	Non-Random Sample	1	1,09		0,00		0,00	1	1,09
	Purposive Sampling	4	4,35	1	1,09		0,00	5	5,43
	Random Sample	3	3,26	8	8,70	10	10,87	21	22,83
	Cluster Sample	1	1,09	1	1,09		0,00	2	2,17
	Draw Method		0,00	1	1,09		0,00	1	1,09
Non-Random Sampling Method	Appropriate Sample	2	2,17	3	3,26	4	4,35	9	9,78
	Criterion Sample	1	1,09		0,00		0,00	1	1,09
	Easily Accessible Sample	2	2,17		0,00	2	2,17	4	4,35
	Convenient Sample		0,00	2	2,17		0,00	2	2,17
Not Specified		23	25,00	9	9,78	7	7,61	39	42,39
Total		41	44,57	27	29,35	24	26,09	92	100,00

According to Table 6, when the studies in which attitude scales towards chemistry course were used by taking sampling methods into consideration, it is seen that 23 articles, nine master's and seven doctoral thesis studies did not specify the sampling method. Among the studies in which the sampling method was specified, random sampling method was used in 37 studies, and the most preferred method was random sampling in three articles, eight master's and 10 doctoral dissertations and 21 studies in total. Among the random sampling methods, non-random sampling was used the least in one article and one master's thesis study. Non-random sampling method was used in 16 studies, and it was found that convenience sampling was used in a total of nine studies, with two articles, three master's and four doctoral thesis studies being the most preferred method. It is seen that criterion sampling was used in at least one article within the scope of the non-random sampling method.

Table 7. Distribution of Studies by Grade Level

Class Levels		**Article**		**Thesis**				**Total**	
				Master's Degree		**PhD**			
		f	**%**	**f**	**%**	**f**	**%**	**f**	**%**
Primary School	1-5. Classroom	1	0,95		0,00		0,00	1	0,95
Middle School	6-8. Classroom	1	0,95	3	2,86		0,00	4	3,81
High School	Grade 9	13	12,38	7	6,67	5	4,76	25	23,81
	Grade 10	10	9,52	10	9,52	6	5,71	26	24,76
	Grade 11	5	4,76	4	3,81	6	5,71	15	14,29
	Grade 12	2	1,90		0,00	2	1,90	4	3,81
University	Grade 1	7	6,67	1	0,95	2	1,90	10	9,52
	Grade 2	1	0,95	1	0,95	2	1,90	4	3,81
	Grade 3	1	0,95	1	0,95	1	0,95	3	2,86
	Grade 4	1	0,95	1	0,95		0,00	2	1,90
Not Specified		8	7,62	2	1,90	1	0,95	11	10,48
Total		50	47,62	30	28,57	25	23,81	105	100,00

When Table 7 is examined, it is seen that in 11 types of publications in the studies in which attitude scales towards chemistry course were used, the grade level was not specified. It was found that only one study was conducted at the primary school level in the form of an article and this study was applied on 4th graders. At the secondary school level, it is seen that there is one study in article type and three studies as master's thesis. At the high school level, it is seen that most of the studies at the 9th grade level are of the article type with 13 studies. It is seen that there is at least 12th grade level in the studies conducted at high school level. At the university level, it is seen that it is mostly used in the 1st grade level in seven article types. At the university level, it is seen that the fewest studies were conducted with senior students.

Table 8. Distribution of Studies by Field of Science

Science Area	**Article**		**Thesis**				**Total**	
			Master's Degree		**PhD**			
	f	**%**	**f**	**%**	**f**	**%**	**f**	**%**
Chemistry Education	38	39,18	25	25,77	24	24,74	87	89,69
Science Education	5	5,15	4	4,12		0,00	9	9,28
Turkish Education	1	1,03		0,00		0,00	1	1,03
Total	44	45,36	29	29,90	24	24,74	97	100,00

According to Table 8, when the studies are examined according to the field of science, it is seen that most of the studies were conducted in the field of Chemistry Education, 38 articles, 25 master's theses and 24 doctoral dissertations. It is seen that only one article-type study deals with Turkish Education.

Table 9. Distribution of Studies According to Research Subject

Research Topic	Article		Thesis				Total	
			Master's Degree		PhD			
	f	%	f	%	f	%	f	%
Attitude	35	20,00	18	10,29	12	6,86	65	37,14
Teaching Techniques	12	6,86	16	9,14	22	12,57	50	28,57
Academic Success	11	6,29	15	8,57	15	8,57	41	23,43
Problem Solving Skills	2	1,14	1	0,57		0,00	3	1,71
Multiple Intelligence Areas	2	1,14		0,00		0,00	2	1,14
Motivation	2	1,14	2	1,14	1	0,57	5	2,86
Game Development	1	0,57		0,00		0,00	1	0,57
Learning Strategies	1	0,57		0,00	1	0,57	2	1,14
Teaching Program		0,00		0,00	1	0,57	1	0,57
Academic Self	2	1,14		0,00		0,00	2	1,14
Self-efficacy		0,00	2	1,14		0,00	2	1,14
STEM Activities		0,00	1	0,57		0,00	1	0,57
Total	68	38,86	55	31,43	52	29,71	175	100,00

When Table 9 is examined, it is seen that attitude, teaching techniques and academic achievement are generally addressed in the studies. In the first place, 35 articles, 18 master's and 12 doctoral theses, with a total of 65 studies, addressed the issue of attitude the most. In the second place, a total of 50 studies, including 22 doctoral dissertations, 16 master's theses and 12 articles, were found in which teaching techniques were the subject. In the third place, 11 articles, fifteen studies, and both master's and doctoral thesis studies addressed the issue of academic achievement. It is also seen that there is one study each on curriculum, game development and STEM activities. When the studies were examined, it was determined that the relationship between the subjects analyzed in general was examined and it was seen that there were mostly studies examining the relationship between attitude and academic achievement. When the distribution of the studies conducted with attitude scales towards chemistry course according to the research subject is examined, it is seen that the research subjects are more than the number of studies examined.

Table 10. Distribution of Studies According to Purpose

Purpose of the Study	Article		Thesis				Total	
			Master's Degree		PhD			
	f	%	f	%	f	%	f	%
Review	21	22,58	9	9,68	10	10,75	40	43,01
Determination	3	3,23	1	1,08	5	5,38	9	9,68
Comparison	1	1,08	3	3,23	2	2,15	6	6,45
Research	11	11,83	14	15,05	7	7,53	32	34,41
Scale Development	2	2,15		0,00		0,00	2	2,15
Game Development	1	1,08		0,00		0,00	1	1,08
Evaluation	1	1,08		0,00		0,00	1	1,08
Detection	1	1,08		0,00		0,00	1	1,08
Application		0,00		0,00	1	1,08	1	1,08
Total	41	44,09	27	29,03	25	26,88	93	100

When Table 10 is examined, it is seen that there are a total of 40 studies, 21 articles, nine master's theses and 10 doctoral dissertations, mostly with the purpose of examination. In the second place, there are 11 articles, 14 master's theses and seven doctoral dissertations with a total of 32 studies. It is seen that at least one study was conducted for the purposes of game development, evaluation, identification and implementation.

Table 11. Distribution of Studies According to the Institution and Occupational Group (Primary-Secondary Education-University)

Institution where the research was conducted	Article		Thesis				Total	
			Master's Degree		PhD			
	f	%	f	%	f	%	f	%
Primary education	2	2,17	3	3,26		0,00	5	5,43
Secondary Education	25	27,17	22	23,91	18	19,57	65	70,65
University	14	15,22	2	2,17	5	5,43	21	22,83
Teachers		0,00		0,00	1	1,09	1	1,09
Total	41	44,57	27	29,35	24	26,09	92	100,00

When Table 11 is examined, when the institutions in which the studies were conducted, primary education, secondary education, university and teachers' occupational group are taken into consideration, it is seen that most of the studies were conducted in secondary education, i.e. high schools, in a total of 65 studies with 25 articles, 22 master's and 18 doctoral thesis studies. It was found that only one doctoral thesis was conducted on the professional group of teachers.

Table 12. Distribution of Studies According to Data Collection Tools

Data Collection Tools	Article		Thesis				Total	
			Master's Degree		PhD			
	f	%	f	%	f	%	f	%
Scale	40	19,61	24	11,76	22	10,78	86	42,16
Interview Form		0,00	2	0,98	10	4,90	12	5,88
Observation Form	1	0,49	1	0,49	6	2,94	8	3,92
Video Recording		0,00		0,00	2	0,98	2	0,98
Test	14	6,86	21	10,29	22	10,78	57	27,94
Lecture Notes	2	0,98	3	1,47		0,00	5	2,45
Inventory	3	1,47	3	1,47	1	0,49	7	3,43
Survey	3	1,47	4	1,96	12	5,88	19	9,31
Worksheet	1	0,49		0,00	1	0,49	2	0,98
Interview	2	0,98		0,00	3	1,47	5	2,45
Oral and Written Discussions		0,00		0,00	1	0,49	1	0,49
Total	66	32,35	58	28,43	80	39,22	204	100

According to Table 12, 11 different data collection tools were used in the studies. The most frequently used data collection tool was scale, followed by test and questionnaire. At least oral and written discussions were used as data collection tools in only one doctoral thesis. When analyzed according to the types of studies, it is seen that the highest number of data collection tools were used in doctoral thesis studies with 80. In these studies, scales and tests are mostly preferred.

Table 13. Distribution of Studies According to Data Analysis Techniques

Data Analysis Techniques	Article		Thesis				Total	
			Master's Degree		PhD			
	f	%	f	%	f	%	f	%
Qualitative	1	1,09		0,00		0,00	1	1,09
Quantity	39	42,39	27	29,35	18	19,57	84	91,30
Both		0,00	1	1,09	6	6,52	7	7,61
Total	40	43,48	27	30,43	24	26,09	92	100,00

When the data analysis techniques of the studies are taken into consideration when Table 13 is examined, it is seen that quantitative data analysis technique is the most used data analysis technique with a total of 84 studies with 39 articles, 27 master's theses and 18 doctoral dissertations. It is seen that there are only one article in qualitative data analysis technique, one master's thesis and six doctoral dissertations in which both quantitative and qualitative data analysis were used, making a total of seven studies.

Figure 1. Word Cloud of Key Words of the Studies

A total of 227 keywords were identified in 92 articles in the dataset. The most frequently used keywords are as follows: "Attitude" (n=31), 'Chemistry Education' (n=18), 'Academic Achievement' (n=14), 'Attitude towards Chemistry Course' (n=13), 'Chemistry Teaching' (n=8), 'Motivation' (n=7), 'Achievement' (n=6) and 'Chemistry' (n=6).The word cloud of the keywords of the studies was visualized in different sizes depending on how often they appeared (Figure 1). Figure 1 presents a visualization of the first most frequent attitude words in the database. Although the position of the words in the image does not have a specific meaning, the words shown in a larger font were placed in the center to make them more prominent.

Table 14. Distribution of Studies by Research Types and Chemistry Attitude Scales

Chemistry Attitude Scales	Article		Thesis				Total	
			Master's Degree		PhD			
	f	%	f	%	f	%	f	%
Kan & Akbaş (2005)	10	10,87	4	4,35	5	5,43	19	20,65
Tarhan & Acar (2008)		0,00		0,00	2	2,17	2	2,17
Geban et al. (1994)	8	8,70	8	8,70	3	3,26	19	20,65
İnce Aka (2012)	2	2,17	1	1,09		0,00	3	3,26
Şimşek (2002)	2	2,17		0,00		0,00	2	2,17
Morgil et al. (2002)	1	1,09		0,00		0,00	1	1,09
Pehlivan & Köseoğlu (2011)	1	1,09	1	1,09	1	1,09	3	3,26
Cheung (2009)	2	2,17	3	3,26	1	1,09	6	6,52
Tüysüz & Tatar (2008)	2	2,17		0,00		0,00	2	2,17
Demircioğlu & Vural (2016)	1	1,09		0,00		0,00	1	1,09
Berberoğlu (1993)	3	3,26	1	1,09	1	1,09	5	5,43
Demircioğlu et al.(2005)	1	1,09		0,00		0,00	1	1,09
Hançer et al. (2007)	1	1,09		0,00		0,00	1	1,09
Sarıçayır (2007)		0,00	2	2,17	3	3,26	5	5,43
Bilgi (2010)		0,00		0,00	1	1,09	1	1,09
Tatlı (2011)		0,00		0,00	1	1,09	1	1,09
Aka & Sarıkaya (2014)	1	1,09		0,00		0,00	1	1,09
Demirdağ (2011)		0,00		0,00	1	1,09	1	1,09
Feyzioğlu (2002)		0,00	1	1,09	1	1,09	2	2,17
Akçay et al. (2003)		0,00		0,00	1	1,09	1	1,09
Demirel (2015)		0,00	1	1,09		0,00	1	1,09
Acar (2008)	1	1,09		0,00		0,00	1	1,09
Not specified	5	5,43	5	5,43	3	3,26	13	14,13
Total	41	44,57	27	29,35	24	26,09	92	100

When Table 14 is examined in terms of the attitude scales towards chemistry course used in the studies, it is seen that five articles, five master's and three doctoral thesis studies used chemistry attitude scales, but it is not specified which scale was used. It is seen that the attitude scale towards chemistry course developed by Kan & Akbaş (2005) and the attitude scale towards chemistry course developed by Geban et al. (1994) were used in 19 studies. It is seen that the attitude towards chemistry course scale developed by Kan and Akbaş (2005) was used the most in article type studies.

RESULTS, DISCUSSION, and SUGGESTIONS

In this study, a document analysis was conducted with the theses and articles that used the attitude scale towards chemistry course in the studies published between 2003 and 2024 in Turkey and were included in the Higher Education Council Thesis Center, ULAKBIM, TR Index, Proquest and Google Scholar databases. With this study, it was aimed to provide researchers with awareness about the themes in the studies conducted between 2003 and 2024 and to reveal the trends and deficiencies in the studies conducted in this context. For this purpose, various findings were obtained by evaluating the studies conducted in the last 21 years using the attitude scale towards chemistry course.

When the studies in the scope area of the research are examined, it can be seen from the results that the studies in which attitude scales towards chemistry course were used in Turkey were seen in the studies conducted since 2003. In 2011, it was determined that more attitude scales towards chemistry course were used in the studies conducted in 2011. While it was seen that fewer studies were conducted in the first years, it was found that the number of studies increased gradually. The number of studies conducted according to years varies. It was found that the studies using the attitude scale towards chemistry course were mostly seen in article type, then in master's thesis and finally in doctoral thesis studies.

When the language of the studies analyzed is taken into consideration, it is seen that most of the studies were conducted in Turkish language and the number of English studies is quite low. Since the studies conducted in Turkey are considered, the fact that Turkish language is predominantly used can be considered as an expected result. The fact that the language of a small number of studies in master's and doctoral thesis studies is English can be interpreted as a result of the low number of universities in Turkey that provide education in English in the field of educational sciences (Sevgili, Selvi ve Irmak, 2022).

When the research methods and designs of the studies are examined, it is seen that quantitative research method is preferred in the first place, mixed method in the second place and qualitative research method in the third place. The advantages of generalization, reaching large samples, time and cost for analyzing large data groups with comparable statistical methods (Göktaş et al., 2012) may have caused the quantitative research design to be preferred first by the researchers. In similar studies, mixed research designs are less preferred (Sözbilir et al., 2015). The fact that qualitative research method is less preferred may be due to the nature of the studies examined. In general, reasons such as the small number of individuals in sample groups in qualitative research, the necessity of working with the sample in a one-to-one natural environment, and the need for in-depth research require qualitative research to be less preferred (Sözbilir et al., 2015). As a research design, it is seen that quasi-experimental, experimental and survey designs are mostly used in quantitative research methods. In the literature, there are similar studies that reached similar findings in studies based on content analysis (Çiltaş et al., 2012; Temel et al., 2014). It is seen that there are three case study studies within the qualitative method, two studies each in the nested design, explanatory design and action research design within the mixed method, and one study each in the convergent design and diversification design. It is seen that the research designs analyzed in the study are more than the number of studies examined. The reason for this is that more than one research design was used in some studies.

When we look at the study groups in the analyzed studies, it is seen that high school students are mostly preferred. The reason for concentrating on this group may be due to the fact that basic chemistry education is mainly given in this period. The fact that there is a significant relationship between students' attitude scores towards chemistry course and their academic achievement (Yüksel, & Geban, 2014; Kan, & Akbaş, 2005) can be considered as the reason why high school students are the most preferred group in the studies. Although there is at least one study from primary school students to university students, it is seen that studies have been conducted using the attitude scale towards chemistry course at all levels of education.

In the studies examined, it is seen that the maximum sample size is between 0-100 high school students. The reason why researchers prefer a smaller number of participants can be thought to be that the data can be collected and processed more easily (Hıdıroğlu, 2020).

It was found that the sampling method was not specified in the majority of the studies examined. In the studies in which the sampling method was specified, it was determined that random sampling was the most common random sampling method. The reason why random sampling is preferred is that it increases the possibility of including individuals with different attitudes in the sample since attitudes towards chemistry course are thought to vary from individual to individual (Karasar, 2011; Korkmaz, & Gürel, 2022).

In the studies analyzed, it is seen that there are studies at the high school level at the highest level and at the primary school level at the lowest level. In the studies, it is seen that there are mostly

9th grade students at the high school level and at least 12th grade students. It is thought that the fact that 12th graders are less preferred at the high school level may be due to the fact that the students are university preparatory group. At the university level, it is seen that more studies were conducted with 1st grade students. It is thought that the main reason for conducting more studies with 1st grade students at the university level may be due to the fact that chemistry is the basic course in many programs. When the distribution of the studies conducted with the attitude scales towards chemistry course according to the grade levels is examined, it is seen that the sample groups are more than the number of studies examined. The reason for this is that more than one sample group was used in some studies.

When the analyzed studies were evaluated according to the field of science, it was determined that most of the studies were concentrated in the field of chemistry education. It is seen that the least studies are in the field of Turkish Education. Since the main theme of the studies is attitude towards chemistry course, this result is an expected result.

When the research topic is taken into consideration in the analyzed studies, it is seen that the studies are mostly related to attitude, academic achievement and teaching techniques. In the studies, the relationship between variables was generally investigated. It is seen that most of the studies are aimed at examining the relationship between students' attitudes and academic achievement (Yüksel, & Geban, 2014; Kan, & Akbaş, 2005). It is seen that there are studies on curriculum, game development and STEM activities. When the distribution of the studies conducted with attitude scales towards chemistry course according to the research topic is examined, it is seen that the research topics are more than the number of studies examined. The reason for this is that some studies have more than one research topic.

When the studies are analyzed according to the purpose of the studies, it is seen that the studies conducted to examine the relationship between two different subjects are concentrated. This result is in line with the use of quantitative research method.

When the studies are analyzed according to the institution and occupational group, it is seen that most of the studies were conducted at the secondary education level, i.e. high schools. This result is in parallel with the finding that high school students were preferred the most in the studies analyzed according to the study groups. The reason for the preference of high schools can be considered as the fact that basic chemistry education is mainly given in this period and there is a significant relationship between students' attitude scores towards chemistry course and their academic achievement (Yüksel, & Geban, 2014; Kan, & Akbaş, 2005).

It is seen that more than ten different data collection tools were used in the studies analyzed. It was determined that attitude scales, achievement tests and questionnaires were mostly preferred as data collection tools. It can be shown that researchers mainly use quantitative research methods in their studies (Temel et al., 2014). When the studies are examined, it is seen that the total number of data collection tools is higher than the total number of studies reached. The reason for this is that more than one data collection tool was used in the studies.

When the analyzed studies were examined according to data analysis techniques, it was seen that quantitative data analysis techniques were used quite a lot. This finding is consistent with the finding on research methods in the distribution of studies according to research method and design. When the keywords of the analyzed studies were taken into consideration, it was determined that some words were seen in more than one study. The most frequently used words were attitude, chemistry education, academic achievement, attitude towards chemistry course, chemistry teaching, motivation, achievement, chemistry. When the keywords of the analyzed studies are taken into consideration, it can be inferred that the studies conducted with attitude scales towards chemistry course are studies to examine the relationship between academic achievement and motivation and attitude towards chemistry course.

When the attitude scales towards chemistry course used in the studies were analyzed, it was seen that the attitude scales towards chemistry course developed by Kan & Akbaş (2005) and Geban et al., (1994) were used more than the others.

The main suggestions that can be expressed in the light of the findings of this study are as follows:

1. It can be ensured that the studies in which attitude scales towards chemistry course are used can be diversified and can be the subject of more research in thesis studies.
2. It can be suggested to increase the number of studies examining the attitudes of university students towards chemistry course in different programs.
3. Studies can be conducted in different fields of science. For example, there may be studies examining the attitudes of students in the field of mathematics education towards chemistry course.
4. Studies examining teachers' attitudes towards chemistry course can also be conducted.

Declarations

Conflict of Interest

No potential conflicts of interest were disclosed by the author(s) with respect to the research, authorship, or publication of this article.

Ethics Approval

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Research and Publication Ethics Statement

Hereby, we as the authors consciously assure that for the manuscript "***An Analysis Of The Studies Conducted With Attitude Scales Towards Chemistry Course In Turkey***" the following is fulfilled:

- This material is the authors' own original work, which has not been previously published elsewhere.
- The paper reflects the authors' own research and analysis in a truthful and complete manner.
- The results are appropriately placed in the context of prior and existing research.
- All sources used are properly disclosed.

Contribution Rates of Authors to the Article

The authors provide equal contribution to this work.

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Appendix

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