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Context-Based Physics Studies: A Thematic Review of the Literature*

Bağlam Temelli Fizik Çalışmaları: Literatürdeki Çalışmaların İçerik Analizi

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ABSTRACT: Context-based approach aims to develop and sustain a sense of wonder and curiosity in young people about the natural world. Students are required to induce meanings by using contexts, thus justifying a "need-to-know" approach to content. Thus, their interest and attitudes towards physics have been increased. The purpose of this paper is to evaluate context-based physics studies accessed in databases by using a previously constructed matrix. Thirty-two context-based physics studies are included in the study and reviewed thematically in accordance with the matrix which examines the papers in terms of their needs, aims, methodologies, findings, general knowledge claims and implications. According to in depth analysis, studies are mostly done in a need to create recognizable contexts that can be interesting for the students and to provide for a real-life scenarios basis for meaningful learning. This review will emphasize the missing parts of the approach, implications and suggestions for future studies. And also, it is thought that this review paper could be helpful for researchers in terms of gathering the context-based physics researches together.

Keywords: context-based approach, physics education, thematic review, science education

ÖZ: Bağlam temelli yaklaşım öğrencide içinde yaşadığı dünya ile ilgili merak ve heyecan uyandırmayı ve bunun devamlı olmasını amaçlar. Öğrenciler seçilen bağlamlar sayesinde, bilme gereksiniminin temel alındığı bir ortamda sadece yaparak yaşayarak öğrenmez, aynı zamanda fizik dersine olan ilgi ve tutumları da olumlu yönde etkilenmiş olur. Bu çalışmanın amacı, veri tabanlarından erişilen, fizik alanında yapılmış olan bağlam temelli çalışmaların daha önceden oluşturulan bir matris yardımıyla içerik analizinin yapılmasıdır. Araştırmaya 32 çalışma dâhil edilmiş olup, bunlar gerekçe, amaç, yöntem, bulgu, sonuç ve önerilerine göre içerik açısından değerlendirilmiştir. Yapılan derinlemesine analiz sonucunda, çalışmaların büyük çoğunluğu öğrenciler için ilginç olabilecek bağlamlar yaratmak ve anlamlı öğrenmeyi sağlamak için gerçek yaşama dayalı senaryolar oluşturmak gerekçesiyle yapılmıştır. Bu araştırma, yaklaşımın eksik noktalarını göstererek gelecek çalışmalar için yapılan önerileri de vurgulamaktadır. Ayrıca fizik alanında yapılmış olan bağlam temelli çalışmaları bir araya getirmesi bakımından diğer araştırmacılar için de faydalı olacağı düşünülmektedir.

Anahtar sözcükler: bağlam temelli yaklaşım, fizik eğitimi, içerik analizi, fen eğitimi

1. INTRODUCTION

Recently, as technological developments have been increasing, people need to have more knowledge and learn the ways of acquisition of knowledge. To follow the technological developments requires being a scientifically literate person. Because of this reason, new reforms are put into practice in all areas as well as in science education and scientific literacy have become a major aim of science education (Kortland, 2010). According to PISA 2000 report, scientific literacy is defined as the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity (OECD, 2003).

Scientific literacy is a major aim in science education, but what approach could be effective at developing scientific literacy? Science educators developed context-based approach to integrate scientific knowledge and real life events, and they designed their curriculums according to the new approach. Context-based approach is presented within projects and studies.

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These projects were first introduced in Australia and New Zeland with VCE (Victorian Certificate of Education) for physics. The other projects are:

- The Salters Approach and SLIP (Supported Learning in Physics Project) in the UK,
- Piko (Physik im Kontext) in Germany,
- ROSE (The Relevance of Science Education) in Finland,
- STEMS (Science, Technology Environment in Modern Society) in Israel,
- PLON (Dutch Physics Curriculum Development Project and NiNa) in the Netherlands.

After the curriculum changes in many countries with above projects, Turkey has also changed the physics curriculum. In schools, physics books based on context-based approach are being used as reference books. The reasons of changing teaching curriculums may be "the failure to make students scientifically literate", "a weak link between science/physics and daily life" (Gilbert, 2006; Pilot and Bulte, 2006), "a negative image of the subject such as difficulty and requirement of mathematics" (Whitelegg and Parry, 1999), and "a decrease in students' motivation around high content overload" (Gilbert, 2006; Demircioğlu, Demircioğlu and Çalık, 2009; Stolk, Bulte, de Jong and Pilot, 2009).

Context-based approach aims to develop and sustain a sense of wonder and curiosity in young people about the natural world (Demircioğlu et al., 2009). At the same time, a context can help students to connect scientific knowledge to real life (Lye, Fry and Hart, 2001). The students are required to induce meanings by using contexts, thus justifying a "need-to-know" approach to content (Yiğit, 2010). Thus, students' interest and positive attitudes towards physics have been increased (Wierstra, 1984; Whitelegg and Edwards, 2001; Lavonen et al., 2005; Rayner, 2005; Basir, Alinaghizadeh and Mohammadpour, 2008; Tekbıyık, 2010; Tekbıyık and Akdeniz, 2010; Yayla, 2010).

There are researches investigating the effects of the context-based learning on students' conceptions of and attitudes towards physics/science (Bennett et al., 2003). But there are only three reviews about context-based and STS courses. The first one of the reviews was conducted by Bennett et al. (2003) and involved 66 studies. The second one was done by Lubben et al. (2005) involving 61 studies. Both reviews focused on the same research question: *"What evidence is there that teaching approaches which emphasize placing science in context and promote links between science, technology and society improve the understanding of science and the attitudes towards science of 11 to 18-year-old pupils, and what are the implications of the evidence for initial teacher training courses?".* Although Bennett et al. (2003) reviewed 66 and Lubben et al. (2005) reviewed 61 studies, both studies analyzed a limited number of studies in depth. While Lubben et al. (2005) included 14 studies in the deeply analysis, Bennett et al. (2003) included only five studies. The third review was conducted by Ültay and Çalık (2011) and involved 34 studies. In the review, Ültay and Çalık (2011) presented a detailed thematic review of context-based chemistry studies in a matrix including the studies' needs, aims, methodologies, general knowledge claims and implications. Because the thematic review is done for context-based chemistry studies, it will be also helpful and informative to analyze the context-based physics studies. Hence, there is obviously a need to undertake a thematic review of context-based studies in physics education focusing on their needs, aims, methodologies, findings, general knowledge claims and implications. Such a review should show what has been accomplished so far, what the practical recommendations they suggested are, and what the effects of context-based approach on teaching and learning are. The main purpose of this paper is to evaluate context-based physics studies by using a previously constructed matrix (Çalık et al., 2005; Ünal et al., 2006; Kurnaz and Çalık; 2009; Ültay and Çalık, 2011). So, our research questions are as in the followings:

1. What are the educational *needs* of context-based physics studies?
2. What are the *aims* of the context-based physics studies?

3. What are the *methodologies* of the context-based physics studies?
4. What are the *findings* of the context-based physics studies?
5. What are the *general knowledge claims* of context-based physics studies?
6. What kinds of *implications* for teaching and learning have been suggested in context-based physics studies?

2. METHOD

While searching for the context-based physics studies, the key words of "context-based", "physics education", and "contextual learning" are entered and searched in the following databases: Academic Search Complete, Education Research Complete, Education Resources Information Center: ERIC, Springer LINK Contemporary, Taylor & Francis Journals, Wiley InterScience Journals, Science Direct Journals, Cambridge Journals Online, Computers & Applied Sciences Complete, PROQUEST Dissertations and Theses Full Text, Emerald Journals, Oxford Journals Online, Canadian Dissertations and Theses Database, Royal Society of Chemistry, Social Science Research Network, ULAKBIM (Turkish National Academic Network and Centre of Information) and Google Scholar.

We accessed 32 studies and analyzed them in the matrix. However, in the literature there may be more studies that have been missed and not included in the review because of key word selection.

3. RESULTS and DISCUSSION

3.1. The Educational Needs of Context-Based Physics Studies

The context-based physics studies are grouped into several categories based on their specific educational needs in Table 1. In this part of the study, we focused on the reasons for doing these studies, which is referred as "needs" here.

Table 1: The Educational Needs of Context-Based Physics Studies

	Needs	Studies	*f*
1.	Recognizable (everyday) contexts are interesting for students and the contexts provide a "real-life scenarios" basis for the physical concepts to be learned.	Whitelegg and Parry, 1999; Whitelegg and Edwards, 2001; George and Lubben, 2002; Park and Lee, 2004; Lavonen, Byman, Juuti, Meisalo and Uitto, 2005; Yam, 2005; Ng and Nguyen, 2006; Taasoobshirazi and Carr, 2008; Değermenci, 2009) Yayla, 2010; Kaltakci and Eryılmaz, 2011; Ültay, 2012..	12
2.	There has been little investigation of the impact of the context-based approach on either teachers' practices or students' experiences of physics.	Wierstra, 1984; Wierstra and Wubbels, 1994; Wilkinson, 1999a; Lye, Fry and Hart, 2002; Vignouli, Hart and Fry, 2002; Enghag, Gustafsson and Jonsson, 2007; Mikelskis-Seifert and Duit, 2009; Tekbıyık, 2010.	8
3.	It is important to determine views of physics teachers who are implementers.	Park and Lee, 2004; Ayvacı, 2010; Balta and Eryılmaz, 2011.	3
4.	Students lack the skills to solve real-life problems. Also, there is a positive correlation between the marks in the TIMSS and PISA examination and the Iranian/Turkish	Duit, Mikelskis-Seifert and Wodzinski, 2007; Basir, Alinaghizadeh and Mohammadpour,	3

	curriculum. The key to the success of PISA and TIMMS programs has proven to be teacher professional development.	2008; Değermenci, 2009.	
5.	Physics education research is showing that programs for physics educators should look different from traditional physics programs designed for other majors. But teachers do not use the new approach and they do not give up using traditional approach.	Tekbıyık, 2010; Ketola, 2011; Saka, 2011.	3
6.	There are few studies about context-based assessments and in spite of continuing studies about using context-based instructions and assessments in physics courses, there is little evidence for the claim that it improves achievement.	Tekbıyık and Akdeniz, 2010; Akpınar and Tan, 2011.	2
7.	Since the 1970s, teaching programs in science, technology and society for science and engineering have faded away at many universities and have been replaced by courses in economic and commercial aspects, or entrepreneurship and/or ethical and philosophical issues.	Jamison and Mejlgaard, 2010.	1
8.	Well-educated students as future citizens are considered to be society's most important resource for shaping our future. There is a general fear that science education, scientific literacy and the public awareness of science do not comply satisfactorily with this transformation process and the needs of an emerging knowledge society.	Euler, 2003.	1
9.	As most states move towards a context-based secondary syllabus, there is a danger that tertiary science teaching will be left behind.	Rayner, 2005.	1
10.	It is important to identify more clearly what constitutes a contextual approach to teaching. In order to do this, a pedagogical model for the contextual approach is proposed.	Wilkinson, 1999b.	1

According to Table 1, most studies are done to provide recognizable contexts which are interesting for students. Recognizable contexts help students to relate the scientific knowledge and everyday phenomena. Therefore, students could learn the subject better because they could find the context interesting (Whitelegg and Parry, 1999; Ng and Nguyen, 2006; Kaltakci and Eryılmaz, 2011) and they could be more motivated. Because these contexts also provide a need-to-know basis and facilitate meaningful learning, it is important to identify more clearly what constitutes a contextual approach to teaching. In order to do this, a pedagogical model for the contextual approach should be proposed for educators to apply it in their classes (Wilkinson, 1999b).

Although context-based approach is increasingly popular, there has been little research on the impact of the context-based approach on either teachers' practices or students' experiences of physics (Wilkinson, 1999a; Lye, Fry and Hart, 2002; Vignouli, Hart and Fry, 2002; Enghag, Gustafsson and Jonsson, 2007; Tekbıyık, 2010). There are eight studies carried out to overcome the lack of research in the field of physics. In addition to students' experiences of context-based physics classes, it is also important to take physics teachers' views who are the real implementers of the new approach (Park and Lee, 2004; Ayvacı, 2010; Balta and Eryılmaz, 2011).

Recently, education systems pay more attention to the results of TIMMS and PISA examinations which are common exams done in most countries. And also, it has been found that there is a positive correlation between the exam results and the curriculum (Basir, Alinaghizadeh and Mohammadpour, 2008; Değermenci, 2009). Because the exams include real-life problems, it

is important to design the curriculum by considering context-driven problems or topics. To make the curriculum involved in the context-based approach, the vital element is "teacher factor". Unless teachers follow the reforms in education, it is difficult to expect teachers to apply context-based approach in their classrooms. In other words, because teachers tend not to use the new approach and not to give up using the traditional approach (Tekbıyık, 2010; Ketola, 2011; Saka, 2011), teachers have to be given in-service education and they should be informed about the reforms, so their professional development should be cared (Duit, Mikelskis-Seifert and Wodzinski, 2007).

TIMMS and PISA exams include real-life problems, so many educators complain about the results of the exams, but still there are few studies concerning context-based assessments (Tekbıyık and Akdeniz, 2010; Akpınar and Tan, 2011). Two of the studies in the review were done to point out this issue and they used context-based problems in their studies.

Although the importance of having scientifically literate citizens is often mentioned in science education papers (Euler, 2003), Jamison and Mejlgaard (2010) claimed that since the 1970s, teaching programs in science, technology and society for science and engineering have faded away at many universities and have been replaced by courses in economic and commercial aspects, or entrepreneurship and/or ethical and philosophical issues.

When the context-based science curriculums are taken into consideration, it is seen that most of them are prepared for secondary school students. There is not yet any program designed for tertiary science teaching and Rayner (2005) points out this issue in his study. So it is important to consider tertiary science education and to form new programs in tertiary level according to context-based approach.

3.2. The Aims of Context-Based Physics Studies

The context-based physics studies are grouped into several categories based on their specific aims in Table 2.

Table 2: The Aims of Context-Based Physics Studies

	Aims	Studies	*f*
1.	To develop teaching materials about physics topics based on the context-based approach suitable for the new physics program and evaluate its effectiveness in students' success.	Wierstra, 1984; Wierstra and Wubbels, 1994; Euler, 2003; Park and Lee, 2004; Rayner, 2005; Enghag, Gustafsson and Jonsson, 2007; Basir, Alinaghizadeh and Mohammadpour, 2008; Değermenci, 2009; Jamison and Mejlgaard, 2010; Tekbıyık, 2010; Yayla, 2010; Kaltakci and Eryılmaz, 2011; Saka, 2011; Ültay, 2012.	14
2.	To determine physics teachers' views and perceptions about context-based approach and to investigate the extent to which physics teachers integrate practical work and context-based approaches into their teaching, and to explore how, what, and why they do it.	Wilkinson, 1999a; Lye et al., 2002; Vignouli et al., 2002; Ng and Nguyen, 2006; Duit et al., 2007; Mikelskis-Seifert and Duit, 2009; Ayvacı, 2010; Balta and Eryılmaz, 2011.	8
3.	To provide a clearer understanding of the contextual approach to teaching physics.	Whitelegg and Parry, 1999; Wilkinson, 1999b; Whitelegg and Edwards, 2001; Yam, 2005; Duit et al., 2007; Taasoobshirazi and Carr, 2008; Ketola, 2011.	7
4.	To compare context-based multiple choice tests with traditional multiple choice tests for measuring students' achievement which are used in the teaching (learning process).	Tekbıyık and Akdeniz, 2010; Akpınar and Tan, 2011.	2

5.	To determine the professional growth of science teachers in Trinidad and Tobago through their involvement in the production of context-based resource materials relevant to the lives of their students during workshop sessions.	George and Lubben, 2002.	1
6.	To investigate Finnish ninth grade secondary school pupil interest in physics in different contexts in connection with the international ROSE project.	Lavonen et al., 2005.	1

According to Table 2, studies are mostly done to develop teaching materials about physics topics based on the context-based approach suitable for the new physics program and evaluate its effectiveness in students' success. It is important because this type of studies present example materials for the new researchers. In addition, studies are also done to determine physics teachers' views and perceptions, and also to discover how they integrate contexts into the topics. Because teachers' roles are different from the traditional approach -they are mentors from now on- it is worthy to learn their views and perceptions about context-based approach. And also for new researchers it is considerably important to give information about the context-based approach and this makes the approach clear, understandable and applicable. So, seven of the studies in the review aimed to clarify this issue. There are two studies having an aim of comparing context-based multiple choice tests with traditional multiple choice tests for measuring students' achievement. Because of the low scores in PISA and TIMMS examinations, countries pay more attention to get higher scores. Getting higher scores in PISA and TIMMS exams is possible with solving real-life problems, so context-based assessment tools are important to practice real-life problems. Apart from these studies, there is one study considering professional growth of teachers and one study discovering students' interest in physics in different contexts in connection with the international ROSE project.

The studies in the review can be grouped as theoretical and empirical studies in Table 3. Theoretical studies introduce or illustrate model teaching designs by arguing for their advantages and discuss and explain the authors' views on the context-based approach. On the other hand, they do not prioritize to present any finding-based evidence. Lubben et al. (2005) used "theoretical studies" for non-empirical papers, thereby, teachers or curriculum developers may subsequently adopt them in practice. Scenario-based studies introduce theoretical ideas and the basic philosophy of the context-based curriculum based on previous empirical backgrounds. But their prior aim is not presenting findings but making comments and giving information by considering the previous empirical researches. Empirical research studies attempt to answer their research questions through findings-based evidence and argue the advantages/disadvantages of the context-based approach by using these findings.

Table 3: The Types of Context-Based Physics Studies in terms of Theoretical or Empirical

	Studies in the Chronological Order	**Theoretical Studies**	**Empirical Studies**
1.	Wierstra, 1984.		✓
2.	Wierstra and Wubbels, 1994.		✓
3.	Whitelegg and Parry, 1999.	✓ (scenario-based)	
4.	Wilkinson, 1999a.		✓
5.	Wilkinson, 1999b.	✓	
6.	Whitelegg and Edwards, 2001.		✓
7.	George and Lubben, 2002.		✓
8.	Lye et al., 2002.		✓
9.	Vignouli et al., 2002.		✓
10.	Euler, 2003.	✓ (scenario-based)	
11.	Park and Lee, 2004.		✓
12.	Lavonen et al., 2005.		✓
13.	Rayner, 2005.		✓

14.	Yam, 2005.		✓	
15.	Ng and Nguyen, 2006.			✓
16.	Duit et al., 2007.			✓
17.	Enghag, Gustafsson and Jonsson, 2007.			✓
18.	Basir, Alinaghizadeh and Mohammadpour, 2008.			✓
19.	Taasoobshirazi and Carr, 2008.		✓	
20.	Değermenci, 2009.			✓
21.	Mikelskis-Seifert and Duit, 2009.			✓
22.	Ayvacı, 2010.			✓
23.	Jamison and Mejlgaard, 2010.	✓ (scenario-based)		
24.	Tekbıyık, 2010.			✓
25.	Tekbıyık and Akdeniz, 2010.			✓
26.	Yayla, 2010.			✓
27.	Akpınar and Tan, 2011.			✓
28.	Balta and Eryılmaz, 2011.			✓
29.	Kaltakci and Eryılmaz, 2011.		✓	
30.	Ketola, 2011.			✓
31.	Saka, 2011.			✓
32.	Ültay, 2012.			✓

According to Table 3, there are 32 studies about context-based physics education, but because twenty-five of them are empirical, their data collection methods are investigated in the following part of the paper.

3.3. The Data Collection Methods of Context-Based Physics Studies

In table 4, data collection tools, data collection techniques, implementers, implementation time, sample groups and the selection of samples are shown. Data collection tools are identified according to what the researchers used in their studies. In this way, interviews, observations, questionnaires, portfolios, open-ended and multiple choice questions are determined and placed in Table 4. Data collection techniques are grouped according to who prepared the data collection tools: researcher or standard. The implementer is identified as a teacher or a researcher. In addition, the selection of samples is grouped as purposely, randomly, volunteered and unspecified for the studies not mentioning the sample selection.

According to Table 4, 10 studies used only one data collection tool. Only six studies used three or more data collection tools. However, using three or more data collection tools is important in terms of data triangulation which facilitates the validation of data through cross verification from more than two sources. And nine studies used two data collection tools. In addition, alternative assessments such as portfolios, journals, performance-based tests are not preferred by the researchers. But authentic assessments provide challenges that reflect the ambiguities of real-life tasks (Herr, Holzer, Martin, Esterle and Sparks, 1995). 11 of the studies mentioned data collection techniques and in seven of them researchers prepared the data collection tools, in two of them standard data collection tools were used and also in two of them both data collection techniques were used. Fifteen of the studies pointed out the implementer such as a researcher or a teacher. In ten studies, researchers were the implementers and in five studies teachers were the implementers.

When we take a look at Table 4 in terms of sample group, it is seen that most studies used high school students and physics teachers as samples. Only three of the studies used university students as samples. It is remarkable because high school students are important in terms of evaluating achievement, and physics teachers are important in terms of taking opinions as implementers of the approach. However, university students or prospective teachers are also

important because it shows whether they learn the approach; believe in the effectiveness of the approach and whether they will use the approach in their classes in future.

It is also noticeable that volunteered sample group was used in only two studies. The rest of them were selected as purposely, randomly or unspecified. But it is important to use volunteers in the researches because it facilitates to see the studies' progress.

Table 4: The Data Collection Methods of Context-Based Physics Studies

Studies in the chronological order	Data Collection Tools						Sample				
			PPS					Sample Selection			
				Q							
	I	O	P	OEQ	LTQ	MCQ	N and Sample Group	Purposely	Randomly	Volunteered	Unspecified
Wierstra, 1984.					✓		398 students				✓
Wierstra and Wubbels, 1994.					✓	✓	564 students	✓			
Wilkinson, 1999a.				✓		✓	100 physics teachers		✓		
Whitelegg and Edwards, 2001.	✓	✓		✓			38 12th grade students and 6 teachers				✓
George and Lubben, 2002.	✓			✓			20 teachers	✓			
Lye et al., 2002.		✓					One physics teacher and 16 11th grade students	✓			
Vignouli et al., 2002.	✓	✓					3 physics teachers and 150 11th and 12th grade students				✓
Park and Lee, 2004.	✓	✓		✓			96 high school students, 36 physics teachers, 9 university physics educators				✓
Lavonen et al., 2005.					✓		3626 9th grade students		✓		
Rayner, 2005.					✓		Almost 100 students	✓			
Ng and Nguyen, 2006.				✓		✓	20 physics teachers	✓			
Duit et al., 2007.	✓		✓		✓		(10 teachers and a science educator)-project group, 63 teachers, 200 students				✓
Enghag, Gustafsson and Jonsson, 2007.	✓						4 university students				✓
Basir, Alinaghizadeh and Mohammadpour, 2008.				✓			230 9th grade students				✓

Değermenci, 2009.	✓	✓					30 9th grade students, one physics teacher					✓
Mikelskis-Seifert and Duit, 2009.	✓				✓		17 sets of physics teachers					✓
Ayvacı, 2010.				✓			20 in-service teachers			✓		
Tekbıyık, 2010.	✓	✓			✓	✓	83 9th grade students and 3 physics teachers					✓
Tekbıyık and Akdeniz, 2010.	✓			✓			30 10th grade students					✓
Yayla, 2010.	✓	✓			✓	✓	15 12th grade students					✓
Akpınar and Tan, 2011.						✓	116 9th grade students					✓
Balta and Eryılmaz, 2011.					✓		100 physics teacher		✓			
Ketola, 2011.	✓		✓	✓			7 physics teacher	✓		✓		
Saka, 2011.	✓					✓	159 9th and 10th grade students					✓
Ültay, 2012.						✓	112 prospective science teachers		✓			

Note: I: Interview (n=13); O: Observation (n=7); PPS: Paper and Pencil Surveys {P: Portfolio (n=2); Q: Questionnaire [OEQ: Open-Ended Questions (n=9); LTQ: Likert Type Questions (n=9); MCQ: Multiple Choice Questions (n=8)]}

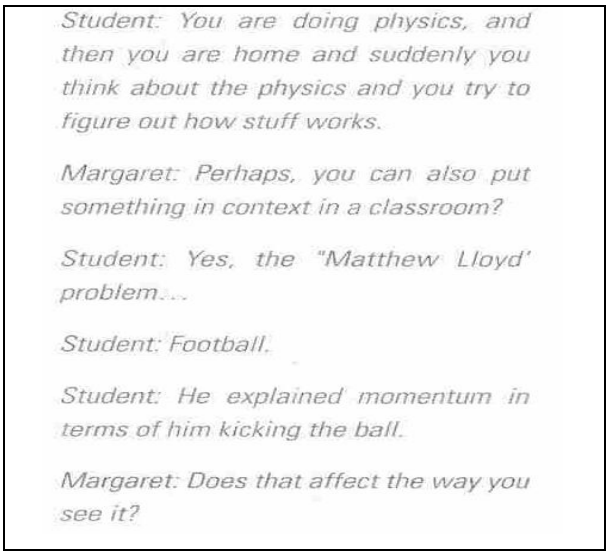
3.4. The Examples of Data Collection Tools

In this part of the study, data collection tools (interviews, observations, questionnaires, portfolios, open-ended questions and multiple choice questions) are discussed and illustrated.

3.4.1. Interview

In the interviews, students or sample groups are supposed to answer the questions carefully that are asked by the interviewer or the researcher. The researcher or the interviewer can add some extra questions or discard some of the questions according to the interview. There are three types of interviews. (1) Structured interview: the interviewer prepares the questions before the interview and he/she does not ask extra questions, strictly bound to the questions prepared before. (2) Semi-structured interview: the interviewer prepares some questions with respect to the interview topic, but he/she can add or discard some questions. (3) Unstructured interview: the interviewer needs only a checklist of topics to be covered during the interview session, and the interview session takes place in a conversation manner.

In this review study, there are 13 studies that used interviews as a data collection tool. An example of unstructured interview from Vignouli et al. (2002) is presented below in Figure 1. Vignouli et al. (2002) used the interview to learn what students thought about the context-based lesson.


Student: You are doing physics, and then you are home and suddenly you think about the physics and you try to figure out how stuff works.

Margaret: Perhaps, you can also put something in context in a classroom?

Student: Yes, the "Matthew Lloyd' problem...

Student: Football.

Student: He explained momentum in terms of him kicking the ball.

Margaret: Does that affect the way you see it?

Figure 1: An Unstructured Interview Example (Vignouli et al., 2002, p. 7)

3.4.2. Observation

In this review study, there are seven studies that used observations as a data collection tool. For example Whitelegg and Edwards (2001) collected data through observation of physics lessons with videotaped classroom-based sessions. Also, Lye et al. (2002) and Vignouli et al. (2002) took field notes by using observation in physics classes.

3.4.3. Paper and Pencil Surveys

3.4.3.1. Questionnaire

According to Table 4, questionnaires are used in three subgroups: Likert type questions, open-ended questions and multiple choice questions.

Likert type questions

There are nine studies that used Likert type questions as can be seen in Table 4. For example Lavonen et al. (2005) used a Likert type questionnaire and in the questionnaire, pupils were asked to state "How interested are you in learning about the following?" Pupils answered by ticking the appropriate box on a four-point Likert scale, the extreme categories being "not interested and very interested". The responses were scored as 1, 2, 3 and 4.

Yayla (2010) used a Likert type questionnaire with 5-point scale to determine students' attitudes towards a context-based physics course. There are three example sentences from the questionnaire:

1. *I like physics.*
2. *I think physics can be taught by linking the knowledge with real life.*
3. *I believe that I will use physics knowledge in many parts of my life.* (p. 84)

Open-ended questions

There are nine studies that used open-ended questions as can be seen in Table 4. Open-ended questions are good indicators to reveal the real opinions of the students or sample groups. George and Lubben (2002) used open-ended questions and participants were asked if they used contextualized science teaching and, if so, to provide examples of how they were able to do this. Ayvacı (2010) also used open-ended questions and he asked teachers "in which subjects do you implement context-based approach and how do you use it?"

Multiple choice questions

There are eight studies that used multiple choice questions as can be seen in Table 4. For example Ültay (2012) used multiple choice questions in a two-tier format to reveal students' alternative conceptions and the reason for choosing the first answer about impulse and momentum. An example question is presented below:

1. *In the case of a bullet's sticking in a wall, impulse equals to momentum.*
   a) *True*
   b) *False*[*]
   The reason of selecting this option;
   a) *Impulse equals to momentum at every condition.*
   b) *Impulse equals to change in momentum.*[*]
   c) *There is only impulse in this case.*
   d) *In this case there is no impulse and momentum, so both are zero.* (p.238)

3.4.3.2. Portfolio

There are only two studies that used portfolio as a data collection tool. Actually, portfolio is an important tool among alternative assessment tools but most studies do not prefer to use it. Portfolio is a file containing students' all work showing their abilities, attainments, and development. For example Ketola (2011) used portfolio because he thought that it would provide more direct evidence of what was actually happening within these classrooms.

3.5. The Findings, General Knowledge Claims and Implications of Context-Based Physics Studies

General knowledge claims obtained from the studies under investigation are grouped into two categories: general knowledge claims about students and about teachers.

3.5.1. The Findings, General Knowledge Claims about Students and Implications of Context-Based Physics Studies

In Table 5, the most important findings, general knowledge claims about students and implications are summarized.

When Table 5 is taken into consideration, it is seen that there are 16 studies discussing the results with respect to the students. Some of the studies found that students' achievement is increased by the contexts (Duit et al., 2007; Basir, Alinaghizadeh and Mohammadpour, 2008; Yayla, 2010; Akpınar and Tan, 2011; Saka, 2011), while some of them found some results of better motivation and interest in physics (Wierstra, 1984; Rayner, 2005; Tekbıyık, 2010). However, there are also some studies which show no difference between students' achievement attained by the contexts and the content (Wierstra and Wubbels, 1994; Park and Lee, 2004; Tekbıyık and Akdeniz, 2010). According to the results and conclusions of the studies, there are no negative results about students' achievement or attitudes but in some studies the results did not show any positive effects on students. This means that context-based approach could not provide a definite solution in education system, but it facilitates their resolution (Campbell and Lubben, 2000).

When the findings of the studies which have some conclusions about students are taken into account, it is possible to say that most of them found statistically different results in favor of the experiment group taught by context-based approach (Whitelegg and Edwards, 2001; Rayner, 2005; Enghag, Gustafsson and Jonsson, 2007; Tekbıyık, 2010; Yayla, 2010; Saka, 2011; Ültay, 2012). But in contrast, some studies found that students in traditional courses learned better than PLON pupils (Wierstra and Wubbels, 1994). However, some studies found no difference between the success and problem-solving performance of context-based classes (Park and Lee, 2004; Tekbıyık and Akdeniz, 2010) and those of control classes (Wierstra, 1984). On the other

hand, while teachers and students found the context-based courses satisfactory (Basir, Alinaghizadeh and Mohammadpour, 2008), some teachers insisted on using traditional activities (Duit et al., 2007).

Table 5: The Findings, General Knowledge Claims about Students and Implications of Context-Based Physics Studies

Studies	Findings	General Knowledge Claims about Students	Implications
Wierstra, 1984.	With regard to the cognitive outcomes, no differences were found in the total test. However, PLON pupils did significantly better on test A (PLON based on PLON exams) and the control group did significantly better on test B (based on traditional physics exams). In both groups it was found that a learning environment with more emphasis on inquiry-learning has a positive influence on the attitude to physics.	In spite of the more positive attitudes of PLON pupils to physics and in spite of the positive correlations between attitude and achievement, there was no evidence of a better achievement by PLON pupils.	Not specified
Wierstra and Wubbels, 1994.	PLON pupils experienced the lessons as significantly more reality- and activity-centered than the control pupils. Scores for PLON pupil appreciation and perceived instructiveness of mechanics lessons were significantly lower than those for pupils on traditional courses.	There appears to be no significant effect of the curriculum on the [cognitive] test scores. In the study about Traffic it has been found that the learning environment was perceived as more reality- and activity-centered in the PLON classes than in the control classes. Despite this difference and the correlations between reality and activity centeredness and the affective outcomes, these outcomes tended to be lower in the PLON than the control classes.	Not specified
Whitelegg and Edwards, 2001.	Several students were quite skeptical at the beginning of their involvement in the project – skeptical of the supported learning approach, rather than the context aspect. However, they were much more positive at the end.	Students generally found the context approach more accessible, interesting and memorable than their previous experiences of physics learning.	Not specified
Park and Lee, 2004.	Using two types of physics problems – everyday contextual problems (E-problems) and decontextualized problems (D-problems) – it was found that even though there was no difference in the actual performance between E-problems and D-problems,	There is no difference between a purely scientific context and everyday context in terms of students' performance in problem-solving.	Teacher reform through in-service training courses is suggested to enhance problem-solving skills of teachers in an everyday context. The results of this study may provide good guidelines for

	subjects predicted that E-problems were more difficult to solve.		developing concrete teaching strategies for teaching and assessing physics in an everyday context.
Lavonen et al., 2005.	Means of all items that belong to school physics context for both girls and boys were under the middle of the scale. The most interesting things (especially for girls) were connected with human beings and the less interesting ones (especially for girls) were related to artefacts and technological processes. Astronomical context was rather interesting for both genders.	Boys and girls as groups have different interests in specific contents and contexts. From the viewpoint of physics teaching and learning, it is important to know how to sustain situational interest long enough to lead to a motivation to study and the activities of studying.	Results of this research do not explain how situational interest develops into a long-standing personal interest. It seems self-evident that teachers must first think how they can "catch" and "hold" situational interest during their physics lessons. One interesting new approach to physics education could be developed by combining technological and human or astronomical contexts.
Rayner, 2005.	The outcomes, both informally, and via questionnaires, have been very positive regarding relevance and the value of what students learn.	Physiotherapy students have been very successful, both in terms of students' perceptions of the course, and also in the depth and relevance of learning outcomes. The level of motivation and students' satisfaction with their achievements are also high.	There is a need to attempt the implementation of context-based curricula in other tertiary courses, since students coming from high schools may soon have the experience of being taught physics in a way that is directly relevant to their lives.
Yam, 2005.	Not specified	Contextual teaching and learning approach is an attempt to make the delivery of education to be more natural, how the brain of the students learn and work in real life by letting students actively participate.	Not specified
Duit et al., 2007.	It is revealed that teachers' views of teaching and learning are fairly in accordance with constructivist ideas but that their self-assessed instructional activities are still rather traditional. However, students' estimations of instruction in one of the sets show that there is a development of instruction towards inquiry-oriented	The piko program leads to a change in instructional practice towards providing better opportunities for students to think and work independently.	For students' achievement, instruction should be linked to the specific contexts.

	activities.		
Enghag, Gustafsson and Jonsson, 2007.	It has been found in this case study that students' personal everyday life experience develops into reasoning skills in physics during group talk.	The educational purpose of using CRPs to encourage the students to discuss physics for understanding is confirmed by this study. The students used the time very efficiently and they went from everyday life experiences towards physics talk.	More in-depth studies of learning processes are needed to investigate if engaging in problem-solving activities leads to enhanced cognition and how this process is executed. This case-study concerned only one CRP and other types of problems may give different results.
Basir, Alinaghizadeh and Mohammadpour, 2008.	The satisfaction level of students and the enthusiasm of teachers about the course were positively correlated to each other. We could see a gradual improvement in the students' ability to deal with those problems.	A guided inquiry-based course 'Physics by photography' could motivate students to learn and increase their ability to solve real-life problems.	This experience of teachers' preparation was a trigger for our next attempt at a better preparation programme for teachers who want to conduct an inquiry-based programme.
Tekbıyık, 2010.	There is a statistical difference between pre and post tests of the achievement test and the attitude test.	Context-based materials increased students' learning and affected students' attitudes positively. Anatolian high school students are the most successful group.	Contexts should be used for students to learn abstract concepts and eliminate misconceptions about energy.
Tekbıyık and Akdeniz, 2010.	There is no statistical difference between context-based and traditional problems test results. Students said that context-based problems were interesting but difficult.	Students' achievement is the same in the context-based and traditional problems. Students concluded that context-based problems were more life-based, attractive and understandable than the traditional ones.	For measuring students' achievement context-based tools should be used in central exams.
Yayla, 2010.	There is a statistical difference between pre and post tests of the achievement test and the attitude test.	Students' conceptual learning is increased by the context-based materials. Also, students' attitudes are affected positively at the end of the intervention.	Contexts should be used for students to interpret daily life events and learn meaningfully. In addition, physics course hours should be increased to perform the activities effectively.
Akpınar and Tan, 2011.	It is revealed that orienteering and formula force and motion tests are statistically different from traditional force and motion test.	Students' achievement is found higher in context-based questions.	For measuring students' achievement, context-based assessment tools should be used.
Saka, 2011.	There is statistical difference between pre and post tests of the achievement test and the attitude test.	It was concluded that REACT, the Content-Based Approach, and Computer-Assisted Learning Method were	Teaching programs should be established and guideline materials should be provided in

		effective in increasing the student success, interest and positive attitude.	order for instructors to properly utilize these resources in their classrooms.
Ültay, 2012.	REACT group's post-test results are higher than the control group's post test results.	Students in REACT group learned concepts better than students in the control group. Context-based science lessons improve students' success and conceptual learning, as well as REACT strategy.	There should be more researches and studies about especially REACT strategy. Some example materials should be presented for new researchers of context-based approach and REACT strategy.

There are studies that suggest using context-based approach (Park and Lee, 2004; Lavonen et al., 2005; Duit et al., 2007; Tekbıyık, 2010; Yayla, 2010) and context-based questions in the exams (Tekbıyık and Akdeniz, 2010; Akpınar and Tan, 2011) because if the topic is taught on a need-to-know basis, then the assessment tool should include real life examples and questions in recognizable contexts. Context-based teaching increases students' motivation and their interest in physics. In addition, using contexts in physics teaching not only eliminates some misconceptions (Tekbıyık, 2010), but also facilitates students' interpretation about daily life events and helps meaningful learning (Yayla, 2010). But still, there is a need for more in-depth studies of learning processes to investigate if engaging in problem-solving activities leads to enhanced cognition (Ültay, 2012) and how this process is executed (Enghag, Gustafsson and Jonsson, 2007). And additionally there is also a need for the implementation of context-based curricula in other tertiary courses (Rayner, 2005) and a need for the preparation of context-based resource materials for teachers to utilize in their classrooms (Saka, 2011).

3.5.2. The Findings, General Knowledge Claims about Teachers and Implications of Context-Based Physics Studies

In Table 6, the most important findings, general knowledge claims about teachers and implications are summarized.

According to Table 6, there are 17 studies presenting results with regard to teachers. Some of them claim that teachers do not have enough knowledge about context-based approach (Değermenci, 2009; Ayvacı, 2010), and so they follow their traditional ways (Wilkinson, 1999a). Some of them claim that teachers follow their old teaching methods because they find the new approach constraining and limiting (Lye et al., 2002), and they need better evidence for contexts' favor (Vignouli et al., 2002). However, Duit et al. (2007) found that "Physics in Context" is useful to foster the development of teachers' content-specific pedagogical knowledge. Also, Ng and Nguyen (2006) concluded positive results for the Vietnamese teachers for both practical work and contextual approaches but they complained about the environment because it does not provide sufficient opportunities to implement the context-based approach. George and Lubben (2002) pointed out that professional growth is determined according to the changes in the nature of the contexts, the role of these contexts in the lesson design, and teachers' perceptions of contextualized teaching.

Although students' achievement and attitudes were positively affected by context-based teaching and they reached a considerable depth of understanding (Lye et al., 2002), some teachers did not have a clear understanding of what is meant by a "context" (Wilkinson, 1999a) and even they could not often discuss in depth with their students the physics concepts or theories associated with everyday life phenomena (Ng and Nguyen, 2006). In addition, some researches revealed that teachers' views of teaching and learning are fairly in accordance with constructivist ideas but that their self-assessed instructional activities are still rather traditional

(Duit et al., 2007). While some teachers complained about the absence of necessary materials to perform context-based activities (Değermenci, 2009), some of them need in-service training for context-based teaching especially for the newly added topics into the physics curriculum in Turkey (Balta and Eryılmaz, 2011).

When we have a look at the implications of the studies, the importance of in-service education for teachers who will implement the context-based approach is again stressed (Değermenci, 2009; Ayvacı, 2010; Balta and Eryılmaz, 2011). Because some teachers found the context-based approach constraining, Lye et al. (2002) suggested providing a balance between freedom and prescription, and challenge, and Vignouli et al. (2002) suggested further investigation to show that context-based approach provides the relevance of the physics course and increases motivation. However, Duit et al. (2007) for students' achievement, instruction should be linked to the specific contexts, and the government should assist teachers to engage students actively in the learning and to develop their skills so that they are able to apply what have been taught to real life situations (Ng and Nguyen, 2006).

Table 6: The Findings, General Knowledge Claims about Teachers and Implications of Context-Based Physics Studies

Studies	Findings	General Knowledge Claims about Teachers	Implications
Whitelegg and Parry, 1999.	Not specified	Context-based learning describes many different approaches, from applications of physics principles introduced in a traditional way after the concepts have been taught, to a more ambitious programme where real-life scenarios, which structure the content of the programme, are investigated and understood in terms of their physics content.	If the context-based programme is to retain its integrity, then it must be a requirement of such a programme that students are able to transfer learning of concepts between contexts; otherwise there will be constraints on the assessment of the programme, as the VCE course found.
Wilkinson, 1999a.	Not all teachers have a clear understanding of what is meant by a 'context' with many thinking it simply refers to the teaching of physics concepts with applications and everyday examples	A number of teachers have difficulty teaching with a context, and many seem to follow their traditional ways.	The research project that this questionnaire forms part of is suggesting the use of the 'contextual approach' to teaching physics.
Wilkinson, 1999b.	Not specified	Contextual approach involves using the context rather than the content (or concepts) to drive the teaching. Teaching contextually is therefore different from teaching concepts first and discussing applications second.	The approach provides a useful method for including materials of science, technology and society in any course.
George and Lubben, 2002.	The use of everyday contexts for materials development in itself causes teachers to reflect on desired teaching outcomes and, thus, helps them to take responsibility for their practice.	Professional growth is indicated by changes in the nature of the contexts chosen as lesson foci, the role of these contexts in the overall lesson design, and teachers' perceptions of contextualized teaching.	Careful research should be done about the implementation of contextualized materials in the classroom so it will indicate further professional development.

		Conflicts between students' cultural and scientific understandings were not addressed by these teachers.	
Lye et al., 2002.	Students engaged in all activities and appreciated the relevance of physics, so they reached a considerable depth of understanding.	The teacher finds VCE as constraining.	There should be a delicate balance between freedom and prescription, and challenge.
Vignouli et al., 2002.	The supposed benefits of a context-based course are very likely not to be achieved for the majority of students in the state.	Contexts will not be supported by teachers unless better evidence is produced in their favor.	Further investigation is suggested to show that context-based approach provides the relevance of the physics course and increases motivation.
Euler, 2003.	Not specified	As physics teachers tend to be strongly subject-oriented, the project philosophy counts on getting the teachers involved and interested in new physics subjects, and to commit themselves to implement these subjects by creating learning environments that do better in activating and stimulating students' learning processes. Thus, "piko" seeks to combine innovative physics with innovative pedagogy.	Not specified
Ng and Nguyen, 2006.	Sixty-five per cent of these teachers provided examples of everyday life phenomena in their teaching most or all of the time. However, they less often discuss in depth with their students the physics concepts or theories associated with these phenomena.	The Vietnamese teachers value the benefits of both practical work and contextual approaches to teaching and learning physics, but the environment that they are in does not provide sufficient opportunities to implement these methods of teaching.	The desire for more student-centered modes of teaching needs to be met with the provision of a number of things by the government to assist teachers to engage students actively in the learning and to develop their skills so that they are able to apply what has been taught to real life situations.
Duit et al., 2007.	It is revealed that teachers' views of teaching and learning are fairly in accordance with constructivist ideas but that their self-assessed instructional activities are still rather traditional. However, students' estimations of instruction in one of the sets show that there is a development of instruction towards inquiry-oriented activities.	Physics in Context is useful to foster the development of teachers' content-specific pedagogical knowledge as well as the development of a new culture of teaching and learning that provides better opportunities for students' learning and that fosters students' interest in physics.	For students' achievement instruction should be linked to the specific contexts.
Taasoobshirazi and Carr,	Not specified	There is insufficient research evidence to support the	Because of the many methodological problems

2008.		recommendation that teachers should use context-based instruction or problems in physics classrooms.	with the existing research, recommendations are made describing the need for more and better designed research.
Değermenci, 2009.	Teachers complained about the absence of necessary materials to perform the context-based teaching activities.	Teachers, students and even parents do not understand and adopt the new teaching approach.	It should be made possible for teachers to share their experiences, and teachers guide books and extra guiding materials should be available.
Mikelskis-Seifert and Duit, 2009.	Teachers are of the opinion that their thinking about instruction and also their instructional behavior developed substantially during participation. However, there are significant differences between the participating sets.	The intensity of coaching and the reduction in the normal teaching load are essential factors for fruitful development. It turns out that the set achieves outstanding measures regarding the development of teachers' beliefs about good instruction and their instructional behavior that enjoys by far the most intensive coaching and reduction in teaching load.	The analysis of video-documented classroom trials of the materials and methods developed has proven to lead attention on the reflection of student learning, so video-analysis should be suggested.
Ayvacı, 2010.	Teachers related context-based approach to daily-life.	Teachers do not have enough knowledge about context-based approach.	In-service education should be provided for teachers.
Jamison and Mejlgaard, 2010.	Not specified	Our experiences in Aalborg show how difficult it is to change the habitual ways of doing things and bring the contexts of science and engineering into the educational process in an integrated way.	Not specified
Balta and Eryılmaz, 2011.	34.75% of the participants need an in-service training course and 60.30% of them don't know anything about the newly added topics. 66.90% of the respondents are appreciating the changes of the newly added topics. And only 11% of them found the changes negative.	The first three topics that respondents need in-service training for are special relativity, plasma state of matter, and adhesion-cohesion-capillarity- surface tension. The first three topics, added to the new curriculum, which were mostly marked as negative attitudes are: radioactive elements, hypothesis and theory, and the formation of the atmosphere.	This study revealed that teachers' in service training needs could be different. Therefore, content of the in- service training should be determined by surveys. Since the teachers have positive feelings towards the curriculum change, the committee developing the new physics curriculum can continue to improve the curriculum.
Kaltakçı and Eryılmaz, 2011.	Not specified	Curriculum developers, textbook writers and physics teachers are presented with a new biological context to teach optics.	Any interested reader can look further into these animal eye types and adapt them to his/her optics teaching.
Ketola, 2011.	The results of this study affirm that graduate programs designed specifically for the development of physics teachers are different.	In conclusion, according to participants' reports, the graduate program investigated modeled four of the five	According to the research, an increased focus on how physics material ties knowledge and skills

	Results showed that participants felt the program placed a higher emphasis on using multiple representations to convey information to students, as well as on teaching translational skills with respect to these representations.	principles proposed by Redish to a great degree, the exception being the individuality principle.	together should be provided in a program designed for physics teachers. Providing teachers with experience in using multiple representations for data and fostering the skills required to translate between these representations should be viewed as central in such programs.

4. CONCLUSION, IMPLICATIONS and RECOMMENDATIONS

In the thematic review of context-based physics studies, thirty-two studies are investigated deeply in terms of their needs, aims, methodologies, findings, general knowledge claims and implications derived from the previously constructed matrix.

According to the in depth analysis, studies are mostly done in a need to create recognizable contexts that can be interesting for the students and to provide a real-life scenarios basis for meaningful learning. But a pedagogical model showing the steps of the implementation for teachers' application does not exist. Therefore, there is a need to suggest a model for teachers and researchers for context-based approach. Thus, it will be more understandable and applicable for implementers of the approach, although Lye et al. (2002) finds it constraining to obey the steps of prescription. However, REACT strategy may be applicable in context-based classes (Saka, 2011, Ültay, 2012), there are a few studies focusing REACT strategy. So, there is a need to carry out studies by using REACT strategy or other strategies which is appropriate for context-based education.

When the aims of the studies in Table 2 are considered, the studies are done to develop teaching materials based on the context-based approach or to determine physics teachers' views and perceptions about context based approach and to investigate the extent to which physics teachers integrate practical work and context-based approaches into their teaching, and to explore how, what, and why they do it. There is only one study concerning professional growth of science teachers. But it is important to take the professional development into account because their involvement in the production of context-based resource materials is needed. Because the teachers are the implementers of the approach, their views, perceptions and involvement should be regarded as important and their professional development should be examined. If needed, in-service education should be given and the results of the education should be discussed.

When data collection tools are considered in Table 4, most studies used one data collection tool, although using more data collection tools increases reliability and validity of the studies. Also, alternative assessment tools such as portfolios and worksheets are not preferred. This can be deduced that the context-based physics studies have a limitation in using alternative measurement and assessment methods. In other words, they tend to track general trends in data collection procedure.

When the physics topics used in the studies are determined, it is seen that "force and motion (Lye et al., 2002; Akpınar and Tan, 2011); sight, light, and sound (Vignouli et al., 2002); energy (Tekbıyık and Akdeniz, 2010; Tekbıyık, 2010); safety for electricity and traffic accidents (Park and Lee, 2004); camera and optics (Basir, Alinaghizadeh and Mohammadpour, 2008); astronomy (Lavonen et al., 2005); temperature and heat energy (Enghag, Gustafsson and Jonsson, 2007); electromagnetic induction (Yayla, 2010); waves (Değermenci, 2009); laboratory

work (Ng and Nguyen, 2006; Whitelegg, 2002); impulse and momentum (Ültay, 2012); and general physics course (Rayner, 2005)" topics are covered on a need-to-know basis. Then it is also suggested that "global warming; air resistance; diffraction; inertia; relativity; projectile motion; etc." should be taught through context-based approach and the results of the researches should be examined and discussed.

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Uzun Özet

Bağlam temelli yaklaşım öğrencide içinde yaşadığı dünya ile ilgili merak ve heyecan uyandırmayı ve bunun devamlı olmasını amaçlar. Bağlam temelli yaklaşım da temelde bu düşünceden yola çıkarak yeni bilgilerle ön bilgilerin ilişkilendirilmesi sürecinde öğrenciye tanıdık bağlamlar sunulmasını öngörür. Öğrenciler seçilen bağlamlar sayesinde, bilme gereksiniminin temel alındığı bir ortamda (need-to-know basis) sadece yaparak yaşayarak öğrenmezler, aynı zamanda fizik dersine olan ilgi ve tutumları da olumlu yönde etkilenmiş olur.

Bu çalışmanın amacı, veritabanlarından erişilen, fizik alanında yapılmış olan bağlam temelli çalışmaların daha önceden oluşturulan bir matris yardımıyla içerik analizinin yapılmasıdır. Araştırmaya 32 çalışma dahil edilmiş olup, bunlar gerekçe, amaç, yöntem, bulgu, sonuç ve önerilerine göre içerik açısından değerlendirilmiştir. Dâhil edilen çalışmalar Academic Search Complete, Education Research Complete, Education Resources Information Center: ERIC, Springer LINK Contemporary, Taylor & Francis Journals, Wiley InterScience Journals, ScienceDirect Journals, Cambridge Journals Online, Computers & Applied Sciences Complete, PROQUEST Dissertations and Theses Full Text, Emerald Journals, Oxford Journals Online, Canadian Dissertations and Theses Database, Royal Society of Chemistry, Social Science Research Network, ULAKBIM (Türkiye-Ulusal Akademik Ağ ve Bilgi Merkezi) ve Google Scholar veri tabanlarına "bağlam temelli", "fizik eğitimi" ve "bağlamsal öğrenme" anahtar sözcükleri girilerek erişilen çalışmalardır. Bu sebeple anahtar sözcük seçiminden dolayı erişilemediği için dahil edilmemiş çalışmalar da olabilir.

Çalışmalar gerekçeleri açısından incelendiğinde, büyük çoğunluğunun öğrenciler için ilginç olabilecek bağlamlar yaratmak ve anlamlı öğrenmeyi sağlamak için gerçek yaşama dayalı senaryolar oluşturmak gerekçesiyle yapıldığı görülmektedir. Diğer yandan, öğrencilerin ve öğretmenlerin bu yaklaşımla ilgili deneyimlerini paylaşan çalışmaların az olması gerekçesiyle yapılan çalışmalar mevcuttur. Bununla beraber, eğitimcilere bu yaklaşımı bir modelle detaylıca tanıtıp, basamak basamak anlatıldığı bir çalışmanın olmaması göze çarparken, Lye vd. (2002) bir modelin basamaklarına uygun olarak ders anlatmanın oldukça sınırlayıcı olduğu düşüncesindedir. Bağlam temelli yaklaşıma göre ders işlenen öğretim ortamlarında REACT stratejisi kullanılabilir ancak bu konuda da oldukça az sayıda çalışma mevcuttur (Örneğin, Saka, 2011; Ültay, 2012). Bu sebeple bağlam temelli yaklaşıma uygun olarak hazırlanan "REACT Stratejisi" veya başka bir modelin uygulandığı çalışmalara ihtiyaç duyulmaktadır.

Çalışmalar amaçları açısından incelendiğinde ise büyük çoğunluğunun bağlam temelli yaklaşıma uygun materyal geliştirmek ve fizik öğretmenlerinin bakış açılarını ve görüşlerini belirlemek amacıyla yapıldığı görülmektedir. Bununla beraber fen eğitimcilerinin mesleki gelişimlerinin ele alındığı bir çalışma mevcuttur. Ancak bu yaklaşımı uygulayacak olan fen eğitimcileri olması bakımından onların mesleki gelişimlerinin de göz önünde bulundurulması son derece önemlidir. Fen eğitimcilerinin bu yaklaşımla ilgili görüşleri, algıları ve mesleki gelişimlerinin incelenmesi yaklaşımın geliştirilmesi ve daha da iyileştirilmesi açısından önemli olduğu gibi faydalı da olacaktır.

Çalışmaların veri toplama araçları incelendiğinde, büyük bir çoğunluğunun sadece bir veri toplama aracı kullandığı görülmektedir. Oysa çalışmaların geçerlik ve güvenirliklerinin artırılması bakımından birden fazla veri toplama aracının kullanılması gerekmektedir. Ayrıca dikkati çeken bir başka nokta da

çalışmalarda tamamlayıcı değerlendirme yöntemlerinden portfolyo ve çalışma yapraklarının fazla tercih edilmemesidir. Çalışmaların çoğunluğu veri toplama konusunda geleneksel yöntemleri tercih etmişlerdir. Bu sebeple de alternatif değerlendirme yöntemlerinin kullanıldığı ve etkilerinin değerlendirildiği çalışmalar da bu açıdan faydalı olacaktır.

Çalışmaların sonuçları öğrenciler ve eğitimciler açısından iki farklı boyutta değerlendirilmiş olup, 16 çalışmada öğrenciler açısından, 17 çalışma da öğretmenler açısından sonuçlar sunmuştur (Bir çalışma hem öğrenciler hem de eğitimciler açısından sonuçlar sunmuştur). Öğrenciler açısından sunulan sonuçlar değerlendirildiğinde, bağlam temelli yaklaşımla öğretim yapılan sınıflardaki öğrenciler, kontrol grubundaki öğrencilere oranla anlamlı derecede başarılı olmuşlardır. Bununla beraber kontrol grubunun daha başarılı olduğu veya bağlam temelli yaklaşımla öğretim yapılan sınıf ile kontrol grubu arasında anlamlı farklılığın olmadığı çalışmalar da mevcuttur. Eğitimciler açısından sunulan sonuçlar değerlendirildiğinde ise öğretmenlerin bu yaklaşım hakkında yeterli bilgiye sahip olmadıkları ve bu sebeple mevcut öğretim yöntemlerine devam ettikleri görülmektedir. Bununla beraber bazı öğretmenler de yeni yaklaşımı sınırlayıcı bulduklarından eski öğretim yöntemine devam ettiklerini belirtmişlerdir. Ancak Duit vd. (2007) ise çalışmasında "Physics in Context" ile öğretmenlerin konu alanı pedagojik bilgilerinin daha da geliştiğini bulmuştur. Ng ve Nguyen (2006) ise bağlamsal yaklaşımın uygulamasıyla ilgili olumlu sonuçlar bulsalar da Vietnam'daki öğretmenlerin büyük bir çoğunluğunun, öğretim ortamının bağlam temelli yaklaşıma uygun olarak ders işlemeye yetersiz olduğunu dile getirdiklerini belirtmişlerdir.

Çalışmalarda kullanılan fizik konuları göz önünde bulundurulduğunda, "kuvvet ve hareket" (Lye vd., 2002; Akpınar ve Tan, 2011); "görme, ışık ve ses" (Vignouli vd., 2002); "enerji" (Tekbıyık ve Akdeniz, 2010; Tekbıyık, 2010); "trafik kazaları ve elektrik çarpmaları için güvenlik" (Park ve Lee, 2004); "kamera ve optik" (Basir, Alinaghizadeh ve Mohammadpour, 2008); "astronomi" (Lavonen vd., 2005); "sıcaklık ve ısı enerjisi" (Enghag, Gustafsson ve Jonsson, 2007); "elektromanyetik indüksiyon" (Yayla, 2010); "dalgalar" (Değermenci, 2009); "laboratuar çalışmaları" (Ng ve Nguyen, 2006; Whitelegg, 2002); "itme ve momentum" (Ültay, 2012); ve "genel fizik dersi" (Rayner, 2005) konuları bağlam temelli yaklaşımla öğrencilere aktarılmıştır. Bu sebeple "küresel ısınma", "hava direnci", "kırınım", "eylemsizlik", "izafiyet teorisi", "atış hareketleri" gibi konuların bağlam temelli yaklaşıma uygun olarak öğretilmesi, etkilerinin incelenmesi ve değerlendirilmesi fizik eğitimi açısından oldukça faydalı olacaktır.

Citation Information

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