

An Exploratory Comparison of Traditional Classroom Instruction and Anchored Instruction with Secondary School Students: Turkish Experience

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Received 19 July 2014; accepted 16 November 2014

The purpose of this study was to investigate the impact of anchored instruction on the students in secondary school math studies classrooms. This study adopted a quasi-experimental design. This research involved both quantitative and qualitative methods to investigate the effects of anchored instruction on students' academical achievement, permanence and perceptions about anchored instruction method. Tests used were; before performing the unit pre-test, after completing the unit post-test and to determine the permanence of the information that has been learned permanence-test. Overall, the findings suggest that the students in the experimental group were more successful than students who were taught traditional method in control group. In addition, content analysis results showed that this method was fun and effective for learning.

Keywords: Academic achievement, anchored instruction, mathematics, science.

INTRODUCTION

Extending the notion of video-based instruction with an emphasis on interactive processing of information is a model called anchored instruction. The method of anchored instruction, which came up in literature in the end of the 1920s, defends the idea that with the use of the traditional instruction method, information and skills provided to students can neither be implemented in real life nor be of assistance to the solutions of different problems. Gersten (1998) describes the anchored instruction method as "learning by experience." The anchored instruction method is similar to case-based learning, but the anchors provided in the anchored instruction method help students

discuss and research rather than read and watch (Cognition and Technology Group at Vanderbilt [CTGV], 1996). In addition to that, the anchored instruction method shows similarities in some ways to problem-based learning. In problem-based learning, a real problem is created in the class with the help of written scenarios, stories, video recorders and tape recorders. However in the anchored instruction method, all the information needed for solving the problem is anchored. This way limited time and the source are managed ideally (Brien, 2000).

The original research which lead to the concept of anchored instruction is rooted in a concept called situated learning or situated cognition (CTGV, 1996). Situated learning involves a unique perspective on the classroom learning process. The situated learning model draws from the concept of learning as a process which exists, always, within a social, cultural context—a process which cannot occur without common experience or relationship of knowledge of discrete skills to problem-solving opportunities or everyday situations (McLellan, 1996). A major component of

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doi: 10.12973/eurasia.2014.1171a

State of the literature

- Anchored instruction is a major research area related to improving learning by providing common or shared experiences, anchors (often video-based anchors) from which students can draw for future learning.
- Anchored stories use embedded data. Anchored instruction method has been used with positive results to promote content understanding in studies.
- This method has been used to examine gains in achievement in mathematics for students in general and teaching students and professionals about assistive technology.
- In the studies where fifth and sixth grade students were chosen as participants, this teaching method was proved to improve academic success in terms of performance in mathematics class.

Contribution of this paper to the literature

- This study is carried out with the goal of determining the influence of anchored instruction on student achievement.
- Anchored instruction appears to have a somewhat limited but positive research base thus far. However, to this point no experimental attempt has used this approach, to help students develop learning.
- As a result, researches in anchored instruction suggests a promising foundation for teaching content to students with learning disabilities and instructional strategies to teachers.
- This study made a connection between these two lines of research with relatively positive implications.

situated learning theory is the concept of cognitive apprenticeship. The idea of cognitive apprenticeship relates to the need to educate students regarding authentic practices through activity and social interaction (Brown, Collins, & Duguid, 1989). In effect, this theory suggests that the experience of learning in a classroom should be comparable to the experience of learning a trade through apprenticeship—a process that strongly emphasizes modeling of target behaviors followed by social interaction. The experience of the student should focus on exposure to the ideal model of a particular skill or concept and an attempt to pick up the key components adding them to their repertoire. One cannot simply tell students how to do something, but rather, the student must have an exposure to the concept as an ideal model (Tripp, 1996). The work of

CTGV in anchored instruction has maintained a strong emphasis on modeling to students (Brien, 2000).

Anchored instruction is a major research area related to improving learning by providing common or shared experiences, anchors (often video-based anchors) from which students can draw for future learning. Anchored instruction is not necessarily limited to the used of video-based anchors and can be conceptualized many unique ways. Hypermedia instruction, for example could be another implementation of anchored instruction assuming it offered students opportunities to learn by connecting with *real life* situations (Ferretti & Okolo, 1996). Anchored stories are produced with anchored data. To create an anchored story, steps required in the solution of a problem are included in definitions, then these solutions are included in the story. The concept of anchored instruction has arisen largely from the research of CTGV. This concept is strongly linked to the idea that prior knowledge and social experience strongly influence the ability of students to experience success in classroom activities (Salinger, 2003). The video examples of various concepts provide an *anchor* for students' knowledge. CTGV has developed a problem solving series called "Jasper Woodbury" for the students of middle-school mathematics classes. The Jasper series provides a sample of anchored learning and problem-based learning (Bransford, 2001).

Anchored instruction method has been used with positive results to promote content understanding in social studies (Glaser, Rieth, Kinzer, Prestidge & Peter, 1999; Okolo, Ferretti & MacArthur, 2002) and English language arts (Rieth et al., 2003) and to develop proficiency with mathematics (Bottge, Heinrichs, Chan, Mehta & Watson, 2003). The concept has been used to examine gains in achievement in mathematics for students in general (Shyu, 2000) and teaching students and professionals about assistive technology (Blackhurst & Morse, 1996). In the studies where the anchored instruction method is applied on fifth and sixth grade students, it is observed that their academic success improved in terms of their mathematics classes. Nevertheless, CTGV states that students might encounter difficulties because at first they make a lot of effort to solve this kind of problems.

Anchored instruction appears to have a somewhat limited but positive research base thus far. However, to this point no experimental attempt has used this approach, to help students develop learning. In this context, the purpose of this study was to investigate the impact of anchored instruction on the students in secondary school math studies classrooms. The overarching research questions are as follows:

- *Is there a meaningful difference between the success of experiment group taught through anchored instruction method and the control group taught through traditional teaching method?*

Table 1. Sample distribution

Group	Gender	f
Experimental	Male	19
	Female	13
Control	Male	20
	Female	14
Total	Male	39
	Female	27

- *Is there a meaningful difference between the pre-test and post-test success states of experiment and control groups?*
- *Is there a meaningful difference between the total permanence points of experiment and control groups?*
- *What are the perceptions of students related to anchored instruction method as a means for implementing the strategy in their class?*

METHOD

Participants

This study adopted a quasi-experimental design. The participants were two whole classes of sixth grade (secondary school) students in Istanbul-Turkey, and were distributed into experimental and control groups. Secondary education refers to classes 5-8. In choosing the participants for the research, the criteria of being able to represent crowded classes and children of families with a low socio-economic status in Turkey were taken into consideration. The experiment group consisted of 32 students while the control group consisted of 34. These students were separated according to pretest-posttest results. (In the present situation, pretest was applied to five classes, and the two classes with the closest average constituted the control and experiment groups of the research.)

This score were assessed prior to the teaching intervention and independent samples t tests indicated that there were no statistically significant differences between the two groups of students. Table 1 shows some information about study group.

RESEARCH DESIGN

The teaching method experiment in this study was initiated and performed with equivalent pretest–post-test group design as a quasi-experiment. This research involved both quantitative and qualitative methods to investigate the effects of anchored instruction on students' academical achievement, permanence and their perceptions about this instructional method. Anchored instruction method was applied to the treatment group, while the standard teaching method was applied to the

control group following the traditional teacher-centred approach; the role instructor mainly lectures the textbook content. Both groups were taught by the same instructor who taught to a schedule of six 40-minute periods per week for 2 weeks, covering the same content, and all students completed the same preand post-tests.

Regarding the development of video (anchor), the literature supports the use of video as a tool for learning, particularly as a form of anchored instruction, in which the video serves as a support to traditional instruction (Glaser, Rieth, Kinzer, Colburn et al., 1999; Kinzer et al., 1994; Rieth et al., 2003; Shyu, 2000). For this research, video was created in a DVD format. Included in the DVD was a full-length video demonstrating actual classroom implementation of Cluster Unit in a math studies classroom as a means of examining expository, supplementary texts. Video which used in this research is called “Taraftar” (The fan). In this video, football supporter groups located in various local team and then uniting under the national team (all set operations -difference, union, intersection vb.) This anchor is about 12 minutes long. The DVD format allowed the teacher and students to stop, play, replay, pause, read captioning, read or reread inserted text. Interspersed throughout the classroom footage are PowerPoint inserts with narration explaining the video content and guiding questions to alert the viewer to key points. Finally for treatment, teacher was given a detailed lesson plan for implementing anchored instruction method.

DATA COLLECTION TOOLS

During data collection, all participants were told that the questions asked in this study were not evaluative and that their responses to the research instruments would be used only for academic purposes and be kept confidential. In this purpose, two tools were used:

Achievement Test (AT). To assess students' achievements in the experimental and control groups, AT was developed by researchers and two math science instructors. The developed AT was based on Republic of Turkey Ministry of National Education (MNE) course objectives. At first the success test was prepared using 25 multiple choice questions with 4 choices. Three

experts in the domain controlled the content validity. These experts analyzed each question in terms of level of difficulty and overall objectives of mathematics classes. No question was eliminated in the process. Only 4 of them were revised. Before starting the experimental process, the revised and finalized success test was applied to three classes other than the experiment group. After the test specimen analysis, two questions were determined to be too easy, and these two questions were revised. The credibility rate that was calculated by using the KR-20 formula came out to be 0,86 for the applied pretest and 0,82 for the posttest. Finally, each test had two parts composed of 25 multiple-choice test items. Each correct answer was worth 1 point, and each incorrect answer was 0 point.

Observation Form. An observation form was conducted to gather information regarding participant perceptions and attitudes towards anchored instruction method. The form comprised 3 attitude and perception statements which are open-ended questions regarding learning experiences.

DATA GATHERING AND ANALYSIS

Quantitative and qualitative analyses were conducted following data collection. Both methods had the same duration (six hours), and were delivered by the same tutor. The experiment continued for two weeks. As previously indicated, the two groups did not differ in mathematics (unit clusters) success at the pre-test level; thus a t test was used to compare them at post-test to demonstrate whether the experimental group had improved significantly when compared with the control group. Descriptive statistics were applied to the personal items. The qualitative analysis of student responses to the open-ended survey questions provided an

opportunity for extended data. Regarding student perceptions of anchored instruction method, responses from the open-ended questions were first categorized using three codes based on whether they related more to the concerns or to the advantages of anchored instruction method and then were further divided into different categories. The content analysis of learner transcripts complemented the quantitative analysis of learner perceptions and attitudes. Reliability was defined as the level of inter-judge agreement when all experts were classified by three judges (Kassarjian, 1977). The researchers checked the coding credibility of the data with the help of two science experts who were also graduate students at the time. This assessment method achieved an inter-judge reliability of .92.

FINDINGS

In this part of the research, the findings regarding the effectiveness or ineffectiveness of the anchored instruction method in terms of academic success in mathematics classes were included. Statistical information was explained in tables.

As seen in Table 2, the average of pretest scores of the academic success test was 35,7 for the students in the experiment group and 35,1 for the students in the control group. As a result of the performed t-test, it was determined that there was not a significant difference between these two averages ($p > 0,05$). According to this, it can be assessed that the academic successes of students in these two groups were matching in terms of pretest scores and preliminary information efficiency before starting the test.

As seen in Table 3, the average of posttest scores of the academic success test was 75,4 for the students in the experiment group and 64,1 for the students in the

Table 2. Significance of difference between the mean scores of experimental group and control group on pre-test

Group	N	Mean	SD	t	p
Experimental	32	35,7	4,8	0,25	0,756
Control	34	35,1	6,5		

Table 3. Significance of difference between the mean scores of experimental group and control group on post-test

Group	N	X	SD	t	p
Experimental	32	75,4	13,4	2,45	0,006
Control	34	64,1	14,5		

Table 4. Significance of difference between the mean scores of experiment group and control group on permanence-test

Group	N	X	SD	t	p
Experimental	32	72,8	17,4	2,75	0,019
Control	34	58,0	16,5		

control group. A significant difference in terms of academic successes of the experiment and control groups was ascertained according to the calculated t-test value indicating credibility rate of %95 ($p < 0,05$). This can be interpreted as the existence of a significant difference in success levels in favor of the experiment group, to which the anchored instruction method was applied. According to these results, it can be stated that the anchored instruction method applied to the experiment group is more efficient in terms of success levels in mathematics classes than the traditional method applied to the control group.

In Table 4 the average of the permanence test was 72,8 for the experiment group and 58.0 for the control group. This difference was discovered to be successful as a result of the t-test performed. This result can be interpreted as follows: The anchored instruction method is more efficient than the traditional instruction method regarding the permanence of information.

Therefore, Table 5 lists students' perceived advantages in the value-added features of the anchored instruction method. The final subquestion is an attempt to further probe the nature of the impact of anchored instruction at the student level by examining the student perceptions of *how and why* factors. Content analysis was used to find out written responses of experiment group.

Table 5 reflects that respondents' sources of perceptions and views clustered into three general categories. These categories are "fun environment ($f=12$)", "real life ($f=8$)" and "effective method ($f=6$)".

RESULT AND DISCUSSION

In mathematics education, the problem-solving ability is closely related to the connection between knowledge, thinking skills and daily life (Yıldırım & Ersözülü, 2013). However, many studies (Black, 2001; Gall, 1984; Kawanaka & Stigler, 1999; Sahin, 2007) indicate that the questions asked by teachers during the lectures are quite simple (Delice, Aydın & Çevik). In other words, these problems lead to students' failure to establish a relationship between the real life and the problem and result in incapability for thinking deeply.

Technological applications in which the students are efficient and integrated new teaching methods (project based instruction, problem based instruction, group discussion, cooperative learning etc.) need to be addressed, with a view to ensure that students associate knowledge to real life and learn more effectively (Osman & Kaur, 2014). Use of technology together with such methods is a necessary step leading to a more effective learning experience (Alias, DeWith & Siraj,

Table 5. Students' views about anchored instruction method

Categories	f	Sample students' opinions
Fun environment	12	(S.K.) I don't like math class a lot. We always use our textbook. Maybe we were having a few basic activity. But we watched a video and discussed something in last lessons. It was so much fun.
Real life	8	(Y.U) We had fun so much. Video was so interesting. (K.M.) I am a Beşiktaş fanatic. Video was so good. I have learnt cluster through this video.
Effective method	6	(A.E) I hate football. But video was perfect for math. (S.E.) We haven't used projector in our classroom. Also video was so funny. I think I will never forget cluster operations. (T.B) Last lessons was very interesting. Because whole class have learnt clusters.

2014). Results of many researches (Lin, Tsai, Chien, & Chang, 2013; Shieh, Liao, & Hu, 2013; Alshumaimeri & Almasri, 2012; Laborda, 2009; Segers & Verhoeven, 2009; Allan & Street, 2007; Allan & Street, 2007; Chang, Chen & Hsu, 2011; Kleemens, Segers, Droop & Wentink, 2011) support that fact (Alias, DeWitt & Siraj, 2014).

Anchored instruction is a major research area related to improving learning by providing common or shared experiences, anchors (often video-based anchors) from which students can draw for future learning. This study is carried out with the goal of determining the influence of anchored instruction on student achievement. For this purpose, a video film entitled "Taraftar"(The fan), which was developed by the author and two math science instructors, has been used as the anchor in this study. Instruction in the experiment group was carried out with the anchor created with videos prepared by the teacher and researchers including problems and their solutions. In the control group, the same teacher explained the subject of sets using the present books for the lecture and the traditional instruction method. Both methods' effectiveness were studied in terms of academic success and the permanence of the information learned. According to the research results, it is determined that the anchored instruction method is more successful in terms of both information acquisition of the group applied and the permanence of the information.

Anchored instruction method has been used with positive results to promote content understanding in social studies (Glaser, et al., 1999; Okolo et al., 2002) and English language arts (Rieth et al., 2003) and to develop proficiency with mathematics (Bottge et al., 2003).The concept has been used to examine gains in achievement in mathematics for students in general (Shyu, 2000) and teaching students and professionals about assistive technology (Blackhurst & Morse, 1996; Brien, 2000).

In his research, Liang (2009) carried out an empirical study in order to evaluate the effect of anchored instruction on learning basketball by students. Within the framework of the study, when compared to the traditional instruction method, the anchored instruction method proved to have more positive effects basically on (1) teaching the rules of the game and meeting the social development requirements, (2) the physical performance of the game, in accordance with its rules, (3) raising interest on learning, and (4) students' exercising their self-learning ability, interpersonal communication skills and cooperative practices.

In a research by Li (2012) analyzing the influence of anchored instruction method in English writing lecture at high school level, in comparison to the traditional instruction method, the anchored instruction method proved to be more effective in ensuring more academic

writing and achieving tasks with less spelling errors, creating a more positive learning environment, developing self-confidence for the students and establishing a more independent working environment. In a study by Song (2012), researching the effect of anchored instruction method in teaching chemistry, it was determined that use of this method increased significantly not only the success of students, but also the interest of students in learning, as well as their success levels in practices together with the theoretical lectures.

In another study, Shi (2007) researched the effect of anchored instruction method in comparison with the traditional instruction method for teaching problem-solving. In the research, it was determined that the students were engaged in a positive attitude against anchored instruction method and that anchored instruction method proved to be much more effective on their learning activity.

Thomas (2008) compared empirically the effect of teacher-centered direct expression method, analogue video method and multimedia anchored instruction method on the learning, beliefs and skills of prospective teachers. As a result of the research, the anchored instruction method proved to be more effective than the other two methods in terms of knowledge acquisition.

Langone, Malone, Stecker and Greene (1998) examined the impact of anchored instruction on the knowledge of educators. They found that the anchored instruction format was at least equal if not better than a traditional approach to instruction. Langone, Malone and Clinton (1999) reported a similar investigation looking at the comparison between anchored versus nonanchored instruction for the learning of pre-service special educators. Results favored the anchored instruction group for long-term permanence of information. Glaser, et al., (1999) assessed the impact of anchored instruction on student-teacher interactions. The authors found that student-teacher interactions increased and that not only did teachers ask more high-level questions, but students also responded in turn. Teachers in the study reported that following use of anchored instruction, students who typically experienced academic struggles and exhibited poor behavior improved achievement showing greater attention and participation. Additionally, teachers reported less time addressing issues of classroom management. Xin and Rieth (2001) examined the effects of using video for increasing vocabulary acquisition and reading comprehension skills for students with learning disabilities in 4th, 5th, and 6th grade. Results indicated that students' vocabulary acquisition scores were significantly higher in the groups who viewed video. Rieth, et al., (2003) observed implementation of anchored instruction in two ninthgrade language arts

classes with emphasis on student and teacher behaviors including student participation in classroom activities. Rieth, et al., (2003) observed classrooms and interviewed teachers following the anchored instruction intervention. In this case, the film *To Kill a Mockingbird* was again used as a source of video anchors. Results indicated that anchored instruction had favorable outcomes for the high school students in the study including those with high incidence disabilities. Among the positive outcomes of the anchored instruction intervention were increased use of high level questioning by the teacher, improved participation and questioning by students, and generally a more interactive classroom. Bottge, et al., (2003) studied the effects of videobased anchored instruction on the ability of 8th grade students to solve computation and word problems. Results suggested that performance for both groups was improved during anchored instruction when compared to baseline performance.

In this study, in the experimental group, teaching activity was performed through a bond established by means of videos where problems and solutions to the same problems are included, which were prepared by the teacher and the researchers. In the control group, on the other hand, the subject of sets were taught by the same teacher through existing lecture books, by using the traditional method. Both methods were researched in terms of academic success and effectiveness for the permanence of the learned knowledge. According to the research results, the group subject to the anchored instruction method proved to be more successful in terms of both knowledge acquisition and permanence of the knowledge.

The result obtained from the above-mentioned studies, conducted on various fields and various age groups, indicating that the anchored instruction method is particularly effective on learning is coherent with the result attained in this study. This situation shows that, if designed properly, this method can apply for many fields and every age group. However, low number of studies conducted on anchored instruction method in Turkey is an indicator of the need for more experimental evidence for our country.

As a result, researches in anchored instruction suggests a promising foundation for teaching content to students with learning disabilities and instructional strategies to teachers. This study made a connection between these two lines of research with relatively positive implications. The continued proliferation of visual images in the form of video-based models represents a positive step in increasing available resources to students and teachers in need of assistance to alter or enhance their current practice ultimately improving outcomes for students with learning disabilities.

The views regarding the lectures of the students to whom the anchored instruction method was applied were collected to support the quantitative findings. Students stated that this method affected positively their perceptions related to mathematics. In the light of this research's results, the researcher and implementer suggest:

More diversified researches are carried out domestically, with respect to the conformity of such method with Turkish culture. Being subject to a slight number of researches, this method will gain empirical validity.

Effects of the anchored instruction method and traditional video-based instruction method need to be studied comparatively.

Proper software need to be determined for the teachers to create the videos they will use as bonds for an effective anchored instruction method and manuals for the same software should be prepared and distributed to the teachers. Furthermore, such software should also be introduced at the faculties prior to the service.

Appearance of the effect of the anchored instruction method on permanence even in such a short-term research indicates that the use of this method is easy, important and necessary in the Mathematics Lectures. When it is empirically proved that this method is also effective in the studies to be carried out afterwards, the entire Turkish education culture should be adapted.

1. *In in-service education, content update should be performed with the anchored instruction method, in terms of providing students with information and skills.*

2. *The effects of using this method on students in different classes and levels should be studied in terms of generalizing the results.*

3. *Support should be provided to teachers for them to produce additional class materials, and educational materials should be prepared and distributed.*

4. *The teachers that use different teaching methods and succeed in this should be supported.*

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