THE EFFECT OF RELIGIOUS CULTURE AND MORAL KNOWLEDGE COURSES BASED ON BRAIN- BASED LEARNING APPROACH ON ACADEMIC SUCCESS AND PERMANENCE

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ABSTRACT

The purpose of this study is to examine the effect of teaching the units of "Belief in Allah" and "Worship in Islam" in Religious Culture and Moral Knowledge course in the 10th grade with lesson plans and activities prepared on the basis of brain-based learning approach on academic achievement and permanence levels of students. Within this framework, the main purpose of this study is to identify to what extent the brain-based learning approach impacts the academic achievement and permanence levels of the students in Religious Culture And Moral Knowledge Course in secondary education.

In the research, the design of pretest posttest control group was applied. Pretest and posttest have been used as data collection tools and after about 21 days, the permanence test has been carried out. Results have been analyzed through SPSS programme. ANOVA and ANCOVA variance analysis has been applied for data analysis. According to the findings of the study, teaching based on the brain-based learning approach has been found to have a meaningful effect in favour of the experimental group on permanence and academic achievement.

Keywords: Brain-based learning, Religious Culture and Moral Education, Religious Education, Religion, Education.

Introduction

Teaching methods and tools bear a lot of significance when it comes to educating individuals who continue learning throughout their lives and who put the acquired knowledge in practice. Although certain targets have been determined according to the skills that our present age require, it is not possible to achieve these targets through traditional methods such as presentation, memorization, repetition and writing (MEB, 2005: 24). This is because traditional teaching methods are centered on the teacher, leaving the student as a passive receptor. Traditional teaching methods that render the teacher as the more active party in the classroom not only hinder the student's capacity to attain higher levels of learning (with the student remaining stuck in the recognition and comprehension steps without being able to achieve the application, analysis, synthesis and evaluation) but also lead to a passive character development (Duruhan, 2004: 3).

The fact that traditional teaching methods have been designed mostly on the basis of theoretical knowledge in a way that allows only a limited amount of skills to develop has brought about the shortage of manpower that has the qualities information society demands. As a result, contemporary student-based teaching methods in which the teacher takes on the role of a guide such as constructivism, student-based learning, active learning, efficient learning, multiple intelligence,

brain-based learning has gradually replaced the raditional understanding of teaching (Alpar &vd, 2007: 21).

As one such contemporary method, brain-based learning is a way of learning in which the student is active and which defends the necessity of accepting the rules as to how the brain functions and the organisation of teaching according to these rules. The main purpose of brain-based learning is not the memorization of knowledge but ensuring that knowledge has been learned in a meaningful and permanent way (Caine&Caine, 2002: 4).

When it comes to teaching religion, Religious Culture And Moral Knowledge Course is a course that aims to inform the students accurately regarding religious, cultural and moral values and to provide the students with the knowledge, behaviour, attitude and values that they need in their individual lives. When we look at the research that focuses on the methods and techniques used in such a significance course, it is seen that the course is mostly taught through traditional methods and techniques such as presentation and repetition (Bilgin & Selçuk, 1997: 118; Selçuk, 2005: 128; Demir, 2008: 72). It appears that the desired efficiency cannot be attained in Religious Culture And Moral Knowledge Course due to reasons such as the teacher taking the main role in learning, teaching tools not being used appropriately, research and analysis not being able to be carried out and the lessons being covered through memorization and transference. Significant problems arise in terms of attaining the goals since experimentation and observation cannot be implemented given the nature, the goals and the structure of the course, making comprehension difficult for students. A hearing-oriented approach is in question in lessons covered through exposition. Consequently, of all the targets stated in the goals, only cognition-based behaviour is acquired by the students in a limited way and it is only this kind of behaviour that is appraised and evaluated. (Aydın, 2005: 54; Doğan & Tosun, 2003: 78).In other words, it can be suggested that traditional teaching methods ignore the brain's natural learning processes and generally encourage the student to memorize. Memorization which implants the ready-made information in memory impairs the reflective and critical skills of current learning approaches (Altaş & Ay, 2007: 173).

In today's globalized world and information society, it is no longer possible for religion to contribute to the moral development of the individual that enables him/her to assign meaning to the world by means of old, traditional understanding of teaching religion. Religious Culture And Moral Knowledge Course is a multi-faceted course that involves teaching of faith, worship and moral values and that includes cognitive, affective and psychomotor learning. Thus, it is crucial that a variety of methods are adopted in teaching Religious Culture And Moral Knowledge (Bilgin & Selçuk, 1997: 117).

Recently, it can be seen that a shift of understanding has taken place in terms of adopting new approaches in teaching religion. When the teaching programs of Religious Culture And Moral Knowledge Courses in primary and secondary schools are analyzed, it appears that the programs no longer include memorization that used to be very significant in the traditional teaching of religion and instead focus on the contemporary approaches such as constructivism, multiple intelligence, student-based learning regarding the education of individuals who can think independently with a critical mind and the ability to choose, who can discover the meaning of life and integrate their mind with their faith (MEB, 2010: 9).

In accordance with the changing program, teachers of Religious Culture And Moral Knowledge Courses are expected to revise their traditional teaching methods and techniques and conduct the lessons by the most appropriate methods considering the individual differences of the students. Individual differences of students are strongly emphasized in today's understanding of education and these differences are thought to affect the learning styles of students. In this regard, brain-based learning is highlighted as a multi-method approach in which the student is constantly

active and learns by seeing, hearing and role-playing. With this in mind, it could be argued that teachers adopting the methods and techniques of brain-based learning which tries to explain how the brain works and how it makes learning easier depending on various factors would be beneficial in achieving the desired efficiency during the lessons. Using the techniques of brain-based learning as opposed to memorization could significantly contribute to meaningful and permanent learning in Religious Culture And Moral Knowledge Courses in which cognitive and affective learning areas are intense. Thus, students would enjoy the lessons, becoming life-long learning individuals, and the professional development of teachers would reap benefits from the process.

1- What is brain-based learning?

Learning, which is generally expressed as the relatively permanent change that occurs as a result of the individual's interactions with his/her environment on a certain level (Senemoğlu, 2012: 4), has been described in different ways by different theories. For instance, Behavioural theorists suggest that learning takes place as a result of the association between the stimulant and the behaviour, and is consolidated by using reward and punishment (Varış, 1998: 24; Özden, 2014: 20). Cognitive theorists emphasize the meaning assigned by the individual onto what takes place in his/her environment during the process of learning (Selçuk, 1997: 93; Özden, 2014: 21). Affective theorists, on the other hand, pay more attention to the problems regarding learning rather than its nature (Çırak, 2007: 258).

Leaning, which has been described as "the permanent changes in the individual's emotions, thoughts, attitudes and behaviour as a result of his/her interactions with his/her environment" (Aydın, 2005: 5) has come to be described differently in the light of new scientific findings. Güneş (2007: 22), for instance, claims that learning is "an active process in which the student forms an association between the already existing knowledge and the new knowledge and integrates them into new meanings," putting forward a description that fits constructivism.

According to the neurophysiological (brain-based) theory, learning is the formation of new dendrite branches and new synapsis (Duman, 2012: 48). Tortora and Grabowski describe learning as the skill of adaptation and change by using the concept of neuralplasticity. According to Durbach, two kinds of changes occur in the brain as a result of learning: the change in the internal structure of neurons, the synapsis in particular, and the increase in the number of synapsis between the neurons (Keleş & Çepni, 2006: 74).

Aligned with these descriptions, in our country, Demirel has described learning as "the consequence of the synaptic changes between the cells" (Demirel, 2007: 240), while Sönmez describes it as "a bio-chemical change that happens as a result of physical stimulants" (Sönmez, 2005: 37).

According to Duman, who is famous for his work on brain-based learning, learning is the neurophysiological change in the brain that occurs as a result of each neuron sending a signal to other neurons, forming biological, physiological, chemical connections between the brain and the body. In this framework, learning is a wholistic activity in which neurons form new pathways as a result of the changes in the physiological and psychological conditions. (Duman, 2012: 64).

It is highly important that the brain is ready for learning, since real learning takes place in the brain. Thus, it is crucial to find out about the structure of the brain, how it works and how learning takes place.

The brain, which is located within the skull, is the most significant organ of the central nervous system with a mass of 1300-1400 grams in adults and with a surface of approximately

2000-2100 cm^2 (Jensen, 2005: 8). Although the brain only makes up for 2% of our body weight, it uses 20% or 25% of the total body energy (Özden, 2014: 40). The nervous system has many types of cells in terms of structural, chemical and functional properties. However, classified generally, there are two types of brain cells, neuron cells and glia cells (Özdemir, 2014: 49; Ersoy & Karal, 2002: 190).

Neurons are nerve cells responsible for learning. Learning takes place in the brain as a result of the movements of these neurons (Wolfe, 2001). This movement starts when the first dendrite is stimulated(Sousa, 2001: 80). The movement between the cells occurs thanks to dendrites and axones (Erlauer, 2003: 11). A connection forms between the nerve cells as a result of the communication between dendrites and axones between the neurons (Valiant, 1996: 3). This is called a synaptic connection. Each new connection formed by the synapses is new learning (Korkmaz &Mahiroğlu, 2007: 97). Each learning causes a change in the brain, since the brain forms new networks by means of each new stimulant, experience and behaviour (Jensen, 2005: 15).

Learning is an electrochemical and active process (Tileston, 2000: 2). New electrical energy generated by the senses reaches thalamus from the middle section of the brain. New data and entries sent by thalamus is distributed simultaneously to the lower parts of the brain in order to be registered. These entries are coded in amygdala and hippocampus as positive, negative or urgent, given meaning and sent to the long term memory for storage. They are recalled as needed, the used information becomes permanent and this situation is called learning(Duman, 2013: 256).

Brain-based learning, theorized by Caine and Caine following the research about the brain, is a learning method that makes connections between neuroscience, neurolinguistics and cognitive psychology. In other words, it is an approach that keeps the student's brain active, encourages the student to think rather than to memorize, stimulates many parts of the brain simultaneously and makes the student curious, innovative and inventive in a setting where he/she is not given the information but is encouraged to receive it him/herself (Polat, 2014: 268).

Brain-based learning is founded on the idea that the rules governing the working of the brain must be accepted and learning must be organized according to these rules (Aparna, 2014: 558). In other words, the aim of this approach is, first and foremost, to ensure that the biological structure and the function of the brain is adopted and the teaching process is structured according to these rules for a meaningful learning and teaching (Caine&Caine, 2002: 4). Covering the lessons with an eye on the structure of the brain is sure to develop the learning skills of the students (Polat, 2014: 268). This approach provides a biological roof for education, teaching and learning and helps to explain the learning behaviour(Spears& Wilson, 2005).

Brain-based learning is more interested in the question "How does the brain work best?" rather than ""What should we teach?." While the goals in traditional teaching methods focus on "the product," in brain-based learning they focus on "the process." In other words, brain-based learning emphasizes "the process" through which the student learns, and how he/she does so (Caine&Caine, 2002; Baş, 2010: 490).

Three interacting stages are at stake in the application of brain-based learning (Baş, 2010: 490). These are "relaxed alertness," "immersion," and "active processing". These stages cannot be delineated from each other since they are integrated and supportive (Duman, 2012: 68).

Relaxed Alertness: Relaxed alertness is a process in which the students are away from stress and fear during learning and feel safe, comfortable and highly motivated. When the individual is comfortable rather than anxious and fearful, the brain becomes willing to learn, since the brain shuts down when we face a problem or receive a threat that triggers despair (Caine&Caine, 2002: 67). In other words, while a normal amount of blood is circulated in the brain

when the individual feels emotionally safe, we can see an increase in the amount of the blood circulated when he/she feels fear and senses threat (Ginnis, 2002: 177). For an effective learning, a setting must be provided that is challenging but not threatening and physically and emotionally secure and motivating (Spear& Wilson, 2005). That is because in an unsafe, stressful environment, one gets defensive, and withdraws and in such individuals, downshifting is observed(Christison, 2002: 5). Thus, it is highly significant to provide a intellectually, emotionally and physically safe environment which is supportive, respectful, accepting, and confirmative in order for the brain and the body to function effectively (Schiller&Willis, 2008**:** 1**;** Prince, 2005).

Immersion: Immersion takes place when the student concentrates on the content that has been introduced. In immersion, the integration of information, skills, attitudes, behaviour, principles, concepts and procedures with stories, novels, legends, anecdotes, scenarios and strong emotional experiences that form the connection and network between these faculties takes the central place (Duman, 2012: 70).

Immersion is the stage in which the students are presented rich experiences. In this stage, the goal is to provide the student with the opportunity to form an imagery in his/her mind based on the connection between the stimulants and real life rather than to transfer the information from the teacher to the student verbally or by writing. Thus, changes take place in the structure and the function of the brain as a result of external experiences as new networks are formed between the neurons. For that reason, a rich, anxiety-free, yet challenging, learning environment must be provided for the students during the immersion stage (Caulfield&et al, 2000: 62)

Active Processing: The integration and the internalization of the learned information individually by the student in a meaningful and conceptually harmonious way is called active processing. (Caine&Caine, 2002: 154). This state ensures that learning is achieved by forming a meaningful structure rather than by memorization. When the individual asks him/herself questions such as “Why have I done this?” “Why have I done this?” “What have I learnt?” and “What does it mean?”, it means that he/she is in the stage of active processing. An example is when the individual who has just learned how to read starts using this information in his/her life (Savaş, 2007: 504). In active processing, the students must work intentionally and with self-awareness in order to integrate and internalize the information in an individually meaningful and conceptually harmonious way (Duman, 2012: 70).

In light of the research carried out on the brain, 12 fundamental principles have been put forward by Caine & Caine with regard to the effect of the brain functions on learning. For a more efficient learning environment, it is crucial that these brain-based principles are known and the curriculum is designed accordingly. These principles guide the way in which brain-based learning approach is applied on the learning process.

1. The brain is a parallel processor.
2. Learning is about the whole physiology.
3. The search for meaning is internal.
4. The search for meaning is formed by patterns.
5. In pattern formation, emotions are highly significant.
6. The parts and the whole of the brain function simultaneously.
7. Learning requires both focused attention and environmental perception.
8. Learning always involves conscious and unconscious processes.
9. We have at least two different kinds of memory.

10. Phenomena and skills are best understood and remembered when they are structred in natural spatial memory.
11. Learning is enriched by constraining and hindered by threatening.
12. Each brain is unique.

2- Brain-Based Learning in Religious Education

Since Religious Culture And Moral Knowledge Course involves abstract subject, it calls for devotion and visuality (Doğan & Tosun, 2003: 158). Thus, it has become necessary for the teachers to adopt appropriate learning strategies and supporting tools in order to attract the students' attention and to achieve effective teaching. Because new student-centered and process-oriented approaches such as constructivism, multiple intelligence, and brain-based learning have been adopted thanks to the revision of Religious Culture And Moral Knowledge Course program in 2010 (MEB, 2010: 9).

In recent times, many advances in biology, neuroscience and brain studies have led to certain changes in the understanding of education. In the light of these advances in social and scientific realms, theologists, philosophers, educators and neuroscientists have faced hundreds of questions regarding the relationship between the religious experience and cognitive neuroscience (Seymour, 2011: 243). To seek for an answer, research on many subjects such as the phenomenon of religion, religiousness, religious experience, the effects of religious experience on the brain, the presence of religious aspects in the brain, the effects that the brain and religion have on one another and whether the information about religious life exist by birth have been carried out by the educators of religion(Seybold, 2005; Jeeves& Brown, 2009; Mcnamara, 2009).

In terms of religious education, while the Western religious educators have started working on the brain and brain-based learning, these studies have been mostly theoretical rather than about the application of brain-based learning on religious education.

In the conference held by Religious Education Association in Toronto in 2011, the main theme was determined as "Brain Matters: Neuroscience, Creativity, and Diversity". The main question of study was "How do brain studies impact the religious practice and the formation of faith?" (Seymour, 2012: 321). Religious educators have shared their research in the conference. For instance, after relaying his personal experiences on the subject, Blevins (2011: 248) mentioned the brain and religious experience, stating the necessity of applying the findings of neuroscience on religious education. Larsen (1993) Flaman (2011), Hogue (2012) and Blevins (2012) have put forward that the brain must be studied carefully, and claimed that thanks to the advances brought about by neuroscience in the discovery of the brain, it could help to find out about religious experience, reaching God and finding the meaning of life. Moreover, they stated the need for cooperation with scientists who work on the brain, and the necessity to use the obtained information on the brain to gain a better understanding of human nature.

The principles and the goals put forward by Caine & Caine's brain-based approach could help to consolidate the learning of the students in Religious Culture And Moral Knowledge Course. For instance, the principle of "Each brain is unique" is related to the individualization of learning (Caine&Caine, 2002; Fogarty, 2009: 26), of taking personal differences into account. We can see that Prophet Mohammad's hadiths "Treat and approach people according to their minds" (Acluni, 2850) and "Tell people about the things they can understand" (Buhari, ilim: 49) focus on the individual differences in learning (Gözütok, 2014: 210; Gudde, 2011: 81).

Moreover, in brain-based learning, it is important to provide the students with enough time for meaningful learning to take place (Jensen, 2008: 218). In teaching procedures of the Prophet's

period, it is understood that meaningful learning was emphasized rather than memorization, and that the Prophet allocated a certain amount of time to his companions for learning (Er, 2013; 131-132)[1]

It could be argued that learning activities that are important for brain-based learning such as music (Prigge, 2002: 237), humour, narratives and games that lead to the increase of dopamine level in the brain and help the student focus on the content (Willis, 2008: 7) were also used as a method during the Prophet's time, albeit in a different way (Er, 2014: 207). Education through music, for instance, can be thought of as education through human voice or natural sounds rather than only as education with musical instruments.

Chanting Quran with a beautiful voice and rhythm can be regarded as the use of music in education during the Prophet's time (Er, 2014: 207). In addition, it is understood that the Prophet used humour and jokes in education (Doğan, 2004: 201; Er, 2014; 165), made use of stories (Özbek, 1994: 188), adopted sketches and graphics (Özbek, 1994: 216; Gudde, 2011: 114), utilized today's multiple intelligence strategies (Kaçaranoğlu, 2016), and employed the learning-by-doing method (Özbek, 1994: 213). All of these methods are found in brain-based approach and its applications. Utilizing these methods would contribute to making religious courses more efficient.

METHOD

Problem Sentence

The main problem of our research is to identify the effect of brain-based teaching of Religious Culture And Moral Knowledge Course on academic success and permanence.

Research Model

This research, which focuses on evaluating the effects of brain-based learning activities on the Religious Culture and Moral Knowledge Course in terms of academic success and permanence, has been designed and carried out according to "pretest – posttest control group model." Two groups (the experimental group and the control group) have been formed by means of randomisation in the pretest – posttest control group design; and measurements have been carried out for both groups before and after the experiment. The symbolic representation of the model is as follows:

In the research, the experimental and control groups have been given an achievement test that consists of the units "Faith in God" and "Worship in Islam" both before and after the experiment.

G_1	R	$O_{1.1}$	X_1	$O_{1.2}$	t	$O_{1.3}$
G_2		$O_{2.1}$	X_2	$O_{2.2}$		$O_{2.3}$

Premises

1) The chosen sample represents the population.

[1] Ibn-i Mesud tells about the procedure that was in effect in the Prophet's time: "When one of us learned 10 verses, he wouldn't move on to the others before we understood their meaning and put them into practice" (Muhammed b. Cerir et-Taberî, Câmiu'l-Beyan fî Te'vîli'l-Kur'ân/Volume 1, page 80). "The Prophet would find appropriate times for us since he worried that we would get tired" (Sahih-i Buhârî, Kitabu'l-İlm, B. 13, Hbr. 12.)

2) The Religious Culture and Moral Knowledge Course has been covered in the experimental group according to the activities based on brain-based learning.
3) The pretest and the posttest scores of the achievement test prepared related to the subject reflect the real achievement levels of the students.
4) The uncontrollable variables in the application stage have affected the students in the experimental and the control groups equally.
5) No interaction has taken place between the students in the experimental and the control groups that would afect the results of the research during the application of the research.

Population and Sample

The population of this research consists of the students of Kilis Şehit Hasan Özüberk Anatolian High School in the Fall Semester of 2014-2015 academic year. The sample consists of 53 students who have been chosen from the 10th grade classes of Kilis Anatolian High School by means of randomisation. The 10/B class (N=26) is the experimental group, while the 10/F (N=27) class is the control group.

The Collection of Data

As a means of collecting data, "The Religious Culture and Moral Knowledge Course 10th Grade Academic Achievement Test" developed by the researcher has been used in order to measure the effects that the activities prepared according to the brain-based learning approach have on permanence and the academic success of the students. The content validity of the test has been heeded as the test was being developed. During the preparation of the achievement test, a pilot test with a total of 33 items has been developed based on the assumption that there could be elimitated items as a result of item analysis. This test was applied on a total of 91 students in the 11th grade.

The Stages of Application

The teaching application realized through the brain-based learning has taken place as follows. First of all, the classroom was maintained according to the appropriate temperature and the oxygen levels in the preparation stage before the lesson since it is important to prepare the environment for education. Next, after the topic and the goals of the lesson was announced by the researcher, a presentation or a video that appeals to multiple senses was shown to the students at the point of attracting their attention in order for them to have a wholistic idea on the subject. A theme related to the topic was given to the students and the content was thematically covered according to that theme. Then, the students in the class were divided into 6 groups based on the positive effects of group interaction on learning. The groups were formed completely heterogenously based on the students' own wishes. The groups were named after Islamic concepts such as ensar and muhajir that evoke cooperation and sharing. The groups were given topics that would interest them and make them take on active roles. They were asked to conduct a study that includes important information and the characteristics the topic, their own analogies and questions about the subject that they are responsible for. During group work and activities, instrumental music and background music was played in the class. The students utilized course books, magazines, encyclopedias, the internet and their teacher as they were preparing their study. Each group then shared their studies with the class, asked questions to the class about their subject and answered the questions asked by the class.

The learned subject was repeated through activities such as games, drama and flashcards, accompanied by music. The students were asked to keep a learning journal to keep track of their own learning, and to write their opinions, emotions and thoughts on The Religious Culture and

Moral Knowledge Course. At the end of the application, the journals were collected and examined. Although the students had been informed to write down their emotions and thoughts on the learning process rather than the summary of the lesson, it was observed that except for a couple of students, they weren't very successful about that since they used the journals to write down lesson notes.

At the immersion stage, colourful documents, posters and flyers were put on the walls fort he students to utilize, and introductory photographs, brochures and other materials were used. Thus, in accordance with the brain-based learning approach, different parts of the students' brain were aimed to be stimulated. The students were asked to bring the materials they prepared about the topic to make the classroom a rich learning environment. The availability of smartboards and the internet and making use of these resources efficiently enabled the formation of a rich learning environment. Moreover, a great deal of care was taken to organize the physical conditions of the classroom according to the needs of the lesson, to ventilate the classroom regularly and to make the students feel away from stress and threat. During the lesson, the students were given the freedom to circulate in the classroom and to interact with their group mates. When a state of distraction was observed, they were given water and at times they were handed out candy and chocolate.

The students in the experimental group participated in the learning process actively and took active roles in group work and other activities. When they faced a problem, they tried to solve it by cooperating with their mates, and when they couldn't tackle with a problem, they asked the teacher's help. The teacher who was present in the experimental group as the researcher took on the roles of organiser and guide. As required by his role as the organiser, he prepared videos and presentations about the units "Faith in God" and "Worship in Islam" for the students, assigned topics that would attract their attention and interest, gave them instructions and motivated them to participate actively in the learning process.

As the researcher was carrying out his role as the organiser, he attempted to make the activities such as games and drama more efficient. The researcher circulated between the groups, at times took part in the learning-teaching activities as a member of the group and tried to make it easier for the students to learn.

While evaluating the students, multiple choice tests, open ended questions, fill in the blanks questions, conceptual maps, drills, project studies and study leaflets were used in order to appraise the learning process, and the students were given frequent feedback to correct their mistakes in an attempt to make the information permanent.

On the other hand, the control group was subjected to a traditional teacher-based learning process in which the students were asked to read, tell and listen to the teacher's explanation about the related material on the The Religious Culture and Moral Knowledge Course books.

The biggest challenge met during the application of brain-based learning approach on the The Religious Culture and Moral Knowledge Course has generally been about time. One-hour lesson period has not been enough for a full implementation of teaching activities for reasons such as not being able to receive the feedback of group discussions and the content of the lesson being too intense. In addition, delays have been observed at carrying out the activities as a result of the administration changing the program due to teacher assignments, common exams and official holidays. Delays have been made up for thanks to extra lessons demanded from the school administration. Another factor that has made the application of brain-based learning difficult has been the lack of a separate classroom that belongs to the The Religious Culture and Moral Knowledge Course since this has caused the preparation stage to take longer due to delays in arranging the class environment and the seating plan for group activities.

The Analysis of the Data

After the measuring tools used for the research have been collected, they have been checked, and the information obtained after checking has been uploaded onto the computer after being registered on information forms. After the pretest and posttest scores of the experimental and control groups have been obtained, the avarage scores of the groups and the standard deviation of the score distribution have been calculated. T-test and Anova and Ancova one-way analysis of varience have been utilized while carrying out the comparison between the groups, and SPSS packaged software (Statistical Package for the Social Sciences) has been used in statistical analysis.

Findings and Comments

1- Findings regarding the Arithmetic Avarage and Standard Deviation Values of the Total Scores received by the Experimental and the Control Groups in The **Religious Culture and Moral Knowledge Course Pretest Posttest and Permanence Tests**

Table 1 displays the the arithmetic avarage and standard deviation values of the total scores that the experimental and the control groups received in the The Religious Culture and Moral Knowledge Course pretest, posttest and the permanence tests.

Table 1 Descriptive statistics of the Total Pretest, Posttest and Permanence Test Scores of the Experimental and Control Groups

GROUPS	TESTS	EXPERIMENTAL		CONTROL	
		$\overline{X}$	SS	$\overline{X}$	SS
TOTAL SCORES	Pretest	12.35	2.58	13.44	1.80
	Posttest	18.92	1.02	14.89	2.78
	Permanence	18.88	1.93	14.63	2.90
Experimental Group N:26 **Control Group N:** 27 **Total N:** 53					

According to the data displayed on the table, a total of 53 students have participated in the research; 26 students in the experimental group and 27 students in the control group. The avarage scores of the pre-application of the Academic Achievement Test shows that the control group has scored an avarage of 13,44, while the experimental group has scored an avarage of 12,35. It appears that the control group has scored an avarage of 14,89, while the experimental group has scored an avarage of 18.92 at the posttest after the implementation of teaching according to the brain-based learning approach. When we look at the avarage scores of the permanence test carried out 21 days later from the application of the posttest, we can see that the control group has scored an avarage of 14,63, while the experimental group has scored an avarage of 18,88.

Table 2 Independent Samples T-Test Results according to the Pretest Scores of the Experimental and Control Groups

Group	N	$\overline{X}$	SS	sd	t	P
Experimental	26	12.35	2.58	51	-1.803	.077
Control	27	13.44	1.80			

Table 2 displays the results of the independent samples T-Test carried out in order to find out whether there has been a difference in the levels of readiness between the experimental and the control groups. According to the table, no meaningful statistical difference has been found between the two groups in terms of the students' success in the Religious Culture and Moral Knowledge Course before the experiment (t= -1.803; p>.05). Thus, it could be suggested that the students had approximately the same amount of knowledge of the units "Faith in God" and "Worship in Islam" at the start of the research. This is an important fact in terms of obtaining objective data from the research.

2-Findings regarding the Total Scores of the Experimental and Control Groups in the Religious Culture and Moral Knowledge Course Posttest

According to the results of ANOVA carried out in order to test the equality of the line of regression trends related to the prediction of the posttest avarage scores based on the pretest academic achievement avarage scores of the experimental and control groups, it has been found that the groupXpretest common effect has not been meaningful on the avarage posttest scores of the students [$F_{(1-49)}$= .035, p>.05]. This finding shows that the line of regresion trends calculated to predict the posttest avarage scores based on the academic achievement posttest avarage scores of the students in the experimental and the control groups have been equal.

The posttest arithmetic avarages as corrected according to the students' academic achievement pretest arithmetic scores and pretest avarage scores have been given in Table 3.

Tablo 3 Descriptive Statistics of the Total Arithmetic Avarages according to the Groups' Academic Achievement Posttest Totals and Corrected Posttest Totals

GROUP	N	Arithmetic Avarage	Corrected Arithmetic Avarage
Experimental	26	18.92	18.93
Control	27	14.89	14.88

As can ben seen in Table 3, the academic achievement test posttest avarage score for the experimental group is 18, 92, and for the control group 14.89. According to this avarage, it could be suggested that the difference is in favour of the experimental group. When the scores of the academic achievement pretest are checked, it appears that there have been changes in the posttest scores. The corrected academic achievement posttest avarage score is calculated to be 18.93 for the experimental group, and 14.88 for the control group. The results of ANCOVA carried out to find out whether the observed difference between the groups in their academic achievement posttest corrected avarage scores is meaningful has been given in Table 4.

As seen in Table 4, there is a meaningful difference in favour of the experimental group [$F_{(1-50)}$=45.136, p<.001] in the academic achievement posttest avarage scores that have been corrected based on the academic achievement pretest avarage scores of the students in the experimental and control groups. This result shows that the teaching applied on the experimental and control groups have different amounts of efficacy. According to this finding, it is understood that the brain-based learning approach has been more successful than traditional teaching in increasing the students' success in the Religious Culture and Moral Knowledge Course. In other words, this result shows that the different teaching methods applied on the experimental and the control groups have

different amounts of efficacy, and the brain-based approach has been more effective than traditional teaching in making the students more successful in the Religious Culture and Moral Knowledge Course.

Table 4 ANCOVA Results of the Groups' Posttest Avarage Scores as Corrected Based on Academic Achievement Pretest Avarage Scores

Varience Source	Sum of Squares	sd	Quadratic Mean	F	P
Pretest	.065	1	.065	.014	.905
Group	204.417	1	204.417	**45.136**	.000
Error	226.448	50	4.53		
Total	442.075	52			

These results may have been obtained thanks to the application of brain-based approach strategies that activate the students' brains more and the design of an environment in which the students learn willingly and by having fun in the activities carried out in the lesson. Thus, it could be suggested that the brain-based approach has a significant effect in improving the students' success in the experimental group. The findings of other researchers support the research findings identified in this study. Regarding the teaching activities based on the brain-based learning appraoch, Caine&Caine (1995), Çengelci (2005), Avcı (2007), Bello (2007), Aydın (2008), Sadık (2013), Eyüp (2013), Esen (2014) have all discovered statistically meaningful differences in favour of the experimental group in the student achievement pretest posttest scores. The results obtained in these studies are in line with the data identified in our own study. The results of the studies demonstrate that teaching according to brain-based approach has greatly contributed to the increase in students' success in the Religious Culture and Moral Knowledge Course. Achievement tests were re-applied 21 days later from the posttest in order to answer the question "Is there a difference in terms of permanence level between the experimental group that has been taught according to the brain-based approach and the control group that has been taught in traditional methods in the Religious Culture and Moral Knowledge Course?"

2- Findings Related to the Permanence Avarage Scores of the Experimental and the Control Groups in Religious Culture and Moral Knowledge Course

According to the results of ANOVA carried out in order to test the equality of the line of regression trends related to the prediction of the total permanence scores based on the posttest academic achievement avarage scores of the experimental and control groups, it has been determined that the groupXposttest common effect has not been meaningful on the avarage permanence points of the students [$F_{(1-49)}$= .071, p>.05]. This finding shows that the line of regression trends calculated to predict the avarage permanence scores based on the academic achievement posttest avarage scores of the students in the experimental and the control groups have been equal.

The students' total academic achievement permanence arithmetic avaragess and total permanence arithmetic avarages corrected according to posttest total scores have been given in Table 5.

As can be seen in Table 5, the academic achievement test permanence total score for the experimental group is 18, 88, and for the control group 14.63. According to this avarage, it could be suggested that the difference is in favour of the experimental group. When the total scores of the groups' academic achievement posttests are checked, it appears that there have been changes in the total permanence scores. The corrected academic achievement permanence total avarage is calculated to be 17.61 for the experimental group, and 15.68 for the control group. The results of ANCOVA carried out to find out whether the observed difference between the groups in their academic achievement permanence total corrected avarage scores is meaningful has been given in Table 6.

Table 5 Descriptive Statistics of the Total Academic Achievement Permanence and the Corrected Total Permanence Arithmetic Avarages

GROUP	N	Arithmetic Avarage	Corrected Arithmetic Avarage
Experimental	26	18.88	17.61
Control	27	14.63	15.86

Table 6 Table 4 ANCOVA Results of the Corrected Permanence Avarage Scores Based on Academic Achievement Posttest Avarage Scores According to Groups

Varience Source	**Sum of Squares**	sd	**Quadratic Mean**	F	P
Posttest	87.345	1	87.345	19.531	.000
Group	20.781	1	20.781	**4.65**	.04
Error	223.605	50	4.472		
Total	550.755	52			

As seen in Table 6, there is a meaningful difference in favour of the experimental group [$F_{(1-50)}$=4.65, p<.05] in the academic achievement permanence total avarage. According to this finding, it is understood that the brain-based learning approach has been more successful than traditional teaching in making the knowledge more permanent in the Religious Culture and Moral Knowledge Course. The findings of other researchers support the research findings identified in this study. Regarding the teaching activities based on the brain-based learning appraoch, Pinkerton (1994), Çengelci (2005), Özden (2005), Hasra (2007), Weimer (2007), Keleş (2007), Baştuğ (2007), Odabaşı (2010), Akyürek (2012) and İnci (2014) have all discovered statistically meaningful differences in favour of the experimental group in terms of the students' permanence test scores. The results obtained in these studies are in line with the data identified in our own study. According to this finding, it is understood that the brain-based learning approach has had a significant impact on the permanence of the knowledge gained in the Religious Culture and Moral Knowledge Course for the experimental group.

Conclusion and Suggestions:

According to the results obtained in this research, brain-based learning has been effective in the Religious Culture and Moral Knowledge Course in terms of increasing the students' academic achievement and making their knowledge more permanent, and it has been noted that brain-based learning had made learning easier and fun.

Following suggestions can be made in the light of the research's findings:

1. Brain-based learning approach can be utilized in the activities to be done in the Secondary School Religious Culture and Moral Knowledge Course in order to increase the students' academic achievement and make learning more permanent.

2. Materials developed for this research on the in-class application of brain-based approach can be used as a sample by other teachers to be applied in Religious Culture and Moral Knowledge Course.

3. Teachers can be provided with an in-service training about brain-based approach so that they can apply this approach on Religious Culture and Moral Knowledge Courses.

4. It should be kept in mind that senses play a big role in learning, and factors that cause threat, fear and stress must be away from the learning environment.

5- Two or more lessons must be devoted weekly to Religious Culture and Moral Knowledge Course, which is currently limited to only one hour in secondary education. Private classrooms must be provided for each different subject whenever it is possible.

6. Supporting the brain-based learning activities with technology will ease the application of the approach and will contribute to learning. For that reason, technological tools such as overhead projectors, slide machines, stereos, digital cameras, smartboards and the internet should be utilized.

7. Following research should be carried out regarding the brain-based learning:

a. The efficacy of brain-based learning should be weighed against traditional teaching in terms of developing the students' thinking and comprehension skills, their attitutes about cooperation and group work and forming emotional patterns about their learning.

b. The effect of the brain-based approach on achievement and permanence levels should be researched in relation to the other topics in Religious Culture and Moral Knowledge Course such as moral education or teaching of values.

c. In Divinity Schools, a research should be carried out in the Special Teaching Methods course offered in the Department of Teaching Religious Culture and Moral Knowledge to find out about the influence of brain-based approach on achievement and permanence levels and on the attitude of teacher candidates.

d. In the Teaching Technologies and Material Development courses offered in the Department of Teaching Religious Culture and Moral Knowledge at Divinity Schools, candidates can be asked to prepare sample lessons based on brain-based learning approach. The opinions of the teachers of the Religious Culture and Moral Knowledge on brain-based learning can be researched.

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