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The Effect of Layered Curriculum Supported by Multiple Intelligences on Students' Achievements and Permanence *

Emine Seda Koç [1], Ali E. Şahin [2]

Abstract

The purpose of this research is to investigate the effect of Layered Curriculum Supported by Multiple Intelligences on students' achievements and permanence. The research was conducted in Ankara Altındağ Kaşgarlı Mahmut Primary School on 2011-2012 educational year. The implementation process, which lasted for 4 weeks, was carried out with the theme named "The World of All of Us" in Social Studies lesson at 5th grade. The research was conducted according to the protest-posttest model with control group. Success test and permanence test were used as data collection tools; the permanence test was applied after 28 days from the end of the implementation process. According to the findings, it is concluded that layered curriculum supported by multiple intelligences is more effective than the existing approaches in the curriculum not only in redoubling the academic success but also in eliciting the permanence of the knowledge.

Keywords

Curriculum development
Multiple Intelligences
Theory layered curriculum

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Introduction

The constant change and developments experienced in the world have an impact on technologies used in all aspects of life, the lifestyle of society, and also the required characteristics of individuals. This forces individuals to develop themselves. Like in all fields, the need for development appears in the field of education and this need reflects on the curriculum, which is the basic component of the education system (Tüfekçi, 2005). In order to have curriculums acquire a structure meeting the requirements of the age, curriculum development efforts and the quality of these efforts are of significance.

Curriculum development is a key concept for education and educational institutions to catch up with the developing and progressing world because curriculum development is a process that changes repairs, and rearranges itself, when necessary. Addressing the needs of society and individuals constituting society is the basic condition rendering curriculums functional and this lies at the foundation of this process. A curriculum that cannot address actual needs can undoubtedly not be expected to have continuity. As it can be understood here, curriculum development activities should start with the determination of actual needs, curriculums should be designed in a manner addressing these needs, and they should be developed by taking these needs into consideration (Arslan, 2008).

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[1] Kastamonu University, Faculty of Education, Turkey, esedagun@gmail.com
[2] Hacettepe Üniversitesi, University, Faculty of Education, Turkey, alisahin@hacettepe.edu.tr

Similar expressions were used as justification in the preparation of the revised primary school curriculums and the need to reflect the change and developments experienced in individual, social, and economic fields in the entire world to our education system and curriculums. The curriculum was prepared based on these principles and considering the value of knowledge and existing experiences of the individual and structured in line with an approach supporting and developing the active participation, correct decision making, and problem solving of students, rather than behaviorist approaches.

In the curriculums, it was stated that there was a need to diversify learning-teaching methods and techniques in educational processes and methods and techniques that could be utilized in lessons were explained and example activities were presented. When these presented examples were examined, it can be observed that the constructivist approach was taken into consideration in the structuring of the curriculum and it was supported with the theory of multiple intelligences when its approach was being explained. "Individual differences" is the most important one of the main concepts of the constructivist approach. As the consideration of being supported with multiple intelligences and the principles of the said theory is constituted of individual differences and because it forms the expected differences in the educational processes, it is thought to be correct. Based on this, it can be observed that the theory of multiple intelligences considerably overlaps with the structure of the existing curriculum and its inclusion in educational processes assumes an important role in achieving attainments specified in the curriculum.

The theory of multiple intelligences was developed by the neuropsychology and development specialist Gardner. With his book published in 1983 titled "Frames of Mind," he constituted the foundations of this theory. In this book, Gardner defines intelligence as "the ability to create an effective product or offer a service that is valued in a culture and a set of skills that make it possible for a person to solve problems in life." According to Garder, intelligence is useful in predicting academic achievement, and it is much more than short responses to short questions. Thus, Gardner mentions of various areas of intelligence and states that each individual has different areas of intelligence differently to the traditional definition (Gardner, 1983).

Gardner primarily focuses on seven types of intelligence when explaining his theory. Later on he added "naturalistic intelligence" to these types of intelligences and expressed that there were eight types of intelligence that individuals could possess at varying rates. The types of intelligence forming Gardner's theory are as follows:

1. Verbal-Linguistic Intelligence
2. Logical-Mathematical Intelligence
3. Visual-Spatial Intelligence
4. Bodily-Kinesthetic Intelligence
5. Musical, Rhythmic, and Harmonic Intelligence
6. Interpersonal Intelligence
7. Intrapersonal Intelligence
8. Naturalistic Intelligence

Based on the argument that individuals can have different areas and dimensions of intelligence, individual differences have been focused on in the multiple intelligence theory. By taking various areas of interest and learning of students into consideration, the necessity of enriching learning processes and arranging and using multiple learning environments was expressed. Based on this, it is possible to establish a connection between the theory of multiple intelligences and the layered curriculum approach. Individual differences also constitute the foundation of the layered curriculum and as all individuals are accepted to be unique, there is no single technique, method, and style. Instead of this, the necessity to include various learning environments in learning processes has been emphasized. This frequently expressed view in the theory of multiple intelligences constitutes the main principle of the layered curriculum.

The layered curriculum approach was developed by Nunley in 2003 (Başbay, 2006). In the layered curriculum, learners are presented tasks progressing from simple to complicated, demonstrating a relation of progressivity, and providing the learners the opportunity to select. In this approach, learners are obliged to fulfill the activities expected of them under the tasks they have selected in each layer. Learning is presented with an extensive menu and the active participation of all learners in the process is ensured through the activities.

One of the most important characteristics of the layered curriculum is the flexibility that it provides learners. Learners are able to perform the tasks provided to them, and they are able to convey tasks related to the subject area and relevant to the layer to be studied into the classroom environment, and they are able to receive points by completing thee activities. Within the framework of this understanding, the integration of learners with learning activities and the learnt unit is ensured (Başbay, 2006).

The layered curriculum approach is based on the understanding that each learner's learning style, intelligence dimensions, readiness, and systems of thought are different. Each learner coming into the school environment is unique. Learners have different structures in terms of all their characteristics (Nunley, 2004). The education process is arranged by separation into 3 layers considering these differences of individuals. These layers are:

Layer C: Constructed on basic content and vocabulary. Learners form their basic knowledge in this layer.

Layer B: Implementation and arranging of knowledge learnt in Layer C. Learners perform problem solving and other top level tasks in this layer.

Layer A: Critical thinking, unique ideas or designing products are in this layer. This layer requires the highest level and most complicated thinking (Goad & Kelly, 2002).

The objective n the layered curriculum is enabling that all learners demonstrate high-level thinking skills. On the path from layer C to layer A, the learner is expected to fulfill the task assigned to him/her at his/her own pace. Within this framework, the lack of motivation resulting from individual pace differences or diversions form the process in especially learning activities can be prevented. Within the framework of this understanding, curricular and extracurricular activities are dealt with in the form of three layers as A, B, and C based on the level of difficulty and progressivity. Learners can fulfill various tasks and responsibilities in these layers and they accomplish activities by assuming responsibilities in their areas of interest through multi task preferences (Başbay, 2006).

One of the points that need to be emphasized in the layered curriculum approach is the evaluation layer of this theory. According to this approach, the achievement of learning is essential in the evaluation process rather than the completion of activities. Evaluation is basically performed based on development files and verbal defense, and rubrics are utilized in rendering the process effective. Verbal defense is a frequently used evaluation technique in activity selection and activity evaluation in this approach. The student is asked a few questions on what s/he has learnt once the activity is completed. Verbal defense provides the opportunity to test the knowledge of the student on this issue and it is instrumental in revealing the extent of competence of the student on the subject (Demirel, 2007).

As it can be observed, the individual has been placed in the center of learning in both the theory of multiple intelligences and the layered curriculum. In both approaches, the consideration that individuals are unique and special in learning settings is dominant. Furthermore, the basic objective in the evaluation process in both approaches is the observation and support of the personal development of students. Such evaluation and assessment approaches that have started to appear in a manner parallel to teaching methods starting to be used for the high-level development of mental skills of students are undoubtedly of great significance (Şahin&Gök, 2009). Given these similarities, it is considered that supporting activities to be prepared according to layered curriculum with the theory

of multiple intelligences will be an important attainment for both the student and the process. The formation of an infrastructure within the framework of the common points of these two learning approaches and the construction of a new method covering the evident features of the said approaches on this structure is considered to enable individuals in the learning and teaching process to get acquainted with a new method. Furthermore, when the primary school curriculums prepared by the Ministry of National Education are examined, it can be observed that the content of the theory of multiple intelligences has been included, however, the layered curriculum approach, which was in the educational sciences literature on the dates the curriculum was developed, was not included. Thus, it is anticipated that the study results can form a new alternative for approaches in the curriculum.

Problem Sentence

What is the effect of layered curriculum supported by multiple intelligences on students' achievements and permanence?

Sub Problems

1) is there a significant difference between the mean achievements of the group applied the layered curriculum supported by multiple intelligences and the group applied the learning approaches in the existing curriculum?

2) Is there a significant difference between the mean permanence scores of the group applied the layered curriculum supported by multiple intelligences and the group applied the learning approaches in the existing curriculum?

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Method

Method of the Study

An experimental design with pretest-posttest control groups was applied in the study. This design is frequently used in behavioral sciences and it is a strong design that provides the investigator a high statistical power in relation to testing the effect of the experimental application on the dependant variable and enabling obtained data to be interpreted in a causal context (Büyüköztürk, 2005). The study was conducted with two groups in accordance with the requirement of the experimental design. The experiment and control groups were determined randomly. Prior to application, the social studies achievement test was applied as a pretest to both groups in order to determine the equivalence of the students in terms of preliminary knowledge. As a result of the pretest, it was concluded that the students were equivalent.

Throughout the four-week application, the layered curriculum supported by multiple intelligences was applied to the experimental group, and the content in the teacher's handbook prepared by the Ministry of National Education was applied to the control group. The use of these textbooks prepared by the Ministry of National Education for the social studies course at the school of application was an influential element in the investigator selecting this school during the application. Applications in both groups were performed by the investigator. After the process, the social studies achievement test was applied as a posttest for both groups in order to determine the changes in the academic levels of the students. A permanence test was applied to both groups 28 days after the end of the study in order to measure the permanence of the knowledge acquired by students.

Study Group

Classes 5-B and 5-D studying at the Kaşgarlı Mahmut Primary School in the Altındağ District of Ankara in the 2011-2012 academic year constituted the study group. The achievement test prepared by the investigators was applied as a pretest prior to the application in order to determine whether or not the classes were equal. The t-test results pertaining to the pretest scores achieved by the experiment and control groups in the achievement test have been provided in Table 1.

Table 1. t Test Results Pertaining to the Pretests Averages of the Experiment and Control Groups

Pretest	N	$\overline{X}$	SS	T	p
Experimental group	37	9.92	3.30	0.18	0.86
Control group	34	9.76	3.83		

When data in Table 1 is examined, it can be observed that there is no statistically significant difference between the social studies course pretest scores of students in the experiment and control groups ($t_{(69)}$=0.18; p>0,05). As it can be observed, the pretest average of the groups and the standard deviation values are close to each other. Accordingly, it was concluded that the academic levels of students in both study groups were equal. The experimental and control groups were determined through the random method and as a result of this class 5-B was determined to be the experimental group and class 5-D was determined to be the control group.

Data Collection Process

The process steps in the study conducted with the experimental and control groups within the scope of the "Our World" theme in the social studies course are as follows:

1) The layer, in which attainments determined for the social studies course should be in, were determined by consulting expert opinions and the activities to be applied to the experimental group were prepared by the investigators. The prepared activities were presented to experts for their opinions, and they were finalized by performing necessary revisions. Opinions were received from experts for the achievement test to be used in the process as a pretest, posttest, and permanence test and then improved by the investigators depending on the results of the preliminary trial.

2) Meetings were conducted with the school administration and teachers prior to the study, and they were provided information on the application. After the classes of application were determined, the process was discussed in detail with the teachers of these classes, and planning was completed on the time and dates of the application in a manner preventing the interruption of the course schedules of the classes. Prior to the study to be conducted with the experiment and control groups, the investigators met the students accompanied by their class teachers, as they would be performing the application in person.

3) The first developed achievement test was applied to the classes as a pretest prior to the process. The achievement averages of the classes were compared based on the test results. As no significant difference was observed between them, the classes were randomly designated as the experimental and control groups and the application process was initiated. In order to prevent variables resulting from students from influencing the processes in the applications, lessons were performed by the investigators in both groups and the process continued for 4 weeks.

4) The educational content based on the layered curriculum approach was applied in the experimental group. An application under the teacher's handbook prepared by the Ministry of National Education was performed in the control group.

5) After the applications in the experiment and control groups, the social studies achievement test prepared by the investigators were applied to students in both groups and 28 days after the end of the process, the same test was applied to the experiment and control groups as a permanence test.

Data Collection Instruments

The social studies course achievement test, pretest, posttest, and permanence test prepared by the investigators and finalized in line with expert opinions were utilized in the collection of data required for the study. The purpose of the permanence test is to determine the preliminary knowledge of primary school 5th grade students concerning the theme of "Our World" in the social studies course, observe the achievement after the application, and to measure the permanence of student knowledge 4 weeks after the finalization of the application. The achievement test was prepared as 40 questions at the beginning. In order to determine the reliability of the prepared measurement instrument, it was applied to a total of 142 5th grade students. The test items were analyzed with the ITEMAN for Windows package program after the pilot application and the item difficulty indices and item discrimination indices were calculated and questions with a low ability to measure were omitted from the test. Accordingly, 11 items were omitted from the test in a manner enabling current attainments to be represented and not damaging the content validity of the test and 8 items were revised. The final version of the test to be used as a measurement instrument consisted of 28 items. The KR-20 reliability coefficient of the finally composed test was calculated as 0.84. A reliability coefficient of 0.70 and higher is generally considered to be adequate for the reliability of test scoring (Büyüköztürk, 2005). In conclusion, the reliability of the achievement test prepared for the social studies course was considered to be adequate and the test was applied to the students at the end of the test.

Analysis of Data

The data obtained in the study were analyzed with the t-test for dependent and independent samples. The t-test for independent samples was utilized for the comparison of the pretest, posttest, and permanence test scores obtained by the experimental group applied the layered curriculum supported by multiple intelligences, and the control group applied the content prepared by the Ministry of National Education. The purpose for using the t-test for independent samples was to determine whether or not the differences observed between groups were statistically significant or the difference occurred coincidentally (Büyüköztürk, 2005). The t-test for dependant samples was utilized in the comparison of the mean pretest, posttest, and permanence test scores within each group. The significance level of 0.05 was used in the interpretation of the data.

Results and Discussion

Results Pertaining to the First Sub-Problem

The first sub-problem of the study was determined as "is there a significant difference between the mean achievements of the group applied the layered curriculum supported by multiple intelligences and the group applied the learning approaches in the existing curriculum?"

This sub-problem aims to determine the effect of applications in the experiment and control groups on the academic development of students and compare student achievement. The social studies achievement test prepared by the investigators was applied to the students in the groups at the end of the process, and interpretations were made on the achievement level of students depending on the results of the test. Whether or not there was a significant difference between the social studies achievement pretest and posttest scores of students in the control group was primarily determined with the "t-test for dependant samples" and the results have been provided in Table 2.

Table 2. Results of the t Test Concerning the Pretest and Posttest Scores of the Control Group

Control group	N	$\overline{X}$	SS	T	p
Pretest	34	9.76	3.83	17.99	0.00*
Posttest	34	14.94	3.92		

*p<0,05

When the data in Table 2 is examined it can be observed that the pretest score averages of students in the control group were 9.76, and their posttest scores were 14.94. According to these findings, a statistically significant difference can be observed between the social studies achievement pretest and posttest scores of students in the control group ($t_{(33)}$=17,99; p<0,05).

Whether or not there was a significant difference between the social studies achievement pretest and posttest scores of students in the experimental group was primarily determined with the "t-test for dependant samples" and the results have been provided in Table 3.

Table 3. Results of the t Test Concerning the Pretest and Posttest Scores of the Experimental Group

Experimental Group	N	$\overline{X}$	SS	T	p
Pretest	37	9.92	3.30	19.76	0.00*
Posttest	37	18.43	3.77		

*p<0,05

When Table 3 is examined, it can be observed that mean pretest scores of students in the experimental group was 9.92 and differed as 18.43 in the posttest. It was determined that there was a significant difference as a result of the analysis of the experimental group data ($t^{(36)}$=19,76; p<0,05). This finding reveals that the layered curriculum contributes to enhancing student achievement.

The "t-test for independent samples" was performed in order to determine whether or not there was significant difference between the social studies achievement scores of students in the experimental and control groups as a result of the conducted experimental procedures. The t-test results of the social studies course achievement scores of the experimental and control groups have been provided in Table 4.

Table 4. t Test Results Concerning the Achievement Averages of the Experimental and Control Groups

Achievement	N	$\overline{X}$	SS	T	p
Experimental Group	37	8.51	2.62	6.33	0.00*
Control Group	34	5.18	1.67		

*p<0,05

When the data in Table 4 is examined, it can be observed that there is a statistically significant difference between the social studies course achievement scores of students in the experimental and control groups ($t^{(69)}$=6.33; p<0,05). When the mean achievement scores of the groups are examined, it can be observed that the mean scores of the experimental group ($\overline{X}$ =8.51) is higher than the control group ($\overline{X}$ =5.18). Thus, it can be said that the significant difference in achievement scores is in favor of the experimental group and the academic achievement of the students in the experimental group were higher at the end of the process.

In line with such obtained findings n the study, it will be correct to say that the experimental application, in which the layered curriculum supported by multiple intelligences was applied, was more effective in enhancing academic achievement in the social studies course compared to the existing educational approach. Many factors are considered as the reason for this obtained favorable result. These factors are listed as follows.

- Learning processes cannot be expected to be the same for all students due to cognitive, affective, and psychomotor differences. Thus, it is not possible to mention of a teaching strategy common for each individual. By taking this factor into consideration, educational environments have been rendered comprehensible for each learner with the process applied

in the experimental group and individuals were provided the opportunity to employ the method suiting them. Furthermore, the learning paces of students have been taken into consideration in addition to the individual interests of students in the performance of activities. Learners were provided the opportunity to distance themselves from the concerns of failure and time this way. All these features are considered to render layered curriculum supported by multiple intelligences to be more effective than the current curriculum in enhancing student achievement.

- Motivation of learners in the learning-teaching process, their constant attention to the process, and their interaction with other individuals are among the top factors enhancing achievement. The fact that the activities used in layered curriculum supported by multiple intelligences similarly assisted the motivation of students in the experimental group and increased the participation in the process has been determined by both the observations of the investigators and the opinions of observers concerning the process. It is considered that this positive atmosphere experienced during the process is another reason increasing student achievement.
- Another important factor increasing achievement in learning processes are the reinforcers presented to students throughout the process. During applications in the experimental group, learners were included in the process through activities determined in line with their personal preferences, and they were provided the opportunity of self-recognition, self-assessment, and self-control. In addition to all these attainments, the feeling of succeeding through the experimental process enabling learners to compete with themselves rather than each other can be said to be among reinforcers increasing the academic achievement of students in the experimental group.

Based on all these interpretations on the experimental application process, it is considered that the layered curriculum supported by multiple intelligences freed the teaching process of uniformity, provided students an individualized democratic environment, and included activities enabling the achievement of learning. Due to these specified characteristics, it is considered that the achievements at the end of the process are not coincidental.

Results Pertaining to the Second Sub-Problem

The second sub-problem of the study was determined as "Is there a significant difference between the mean permanence scores of the group applied the layered curriculum supported by multiple intelligences and the group applied the learning approaches in the existing curriculum?"

This sub-problem of the study aims to determine the permanence of academic knowledge, which is an important indicator in determining the effectiveness of learning processes, and make comparisons between the application groups. In line with this, the t-test for independent samples was employed in order to determine whether or not there was a significant difference between the permanence scores of the experiment and control groups after the performed applications, and the obtained results have been provided in Table 5.

Table 5. t Test Results Concerning the Mean Social Studies Permanence Test Scores of Experimental and Control Groups

Achievement	N	$\overline{X}$	SS	T	p
Experimental Group	37	15.76	3.42	5.24	0.00*
Control Group	34	11.73	3.01		

*p<0,05

When Table 5 is examined, it can be observed that the mean test permanence scores obtained by students in the experimental group in the test applied 28 days after the study was 15.76, and this was 11.73 for the control group. As a result of the conducted statistical analyses, it was concluded that there was a significant difference between the social studies permanence test scores of the students in

the groups ($t^{(69)}$=5.24; p<0,05). According to this finding, it can be said that the layered curriculum supported by multiple intelligences applied in the experimental group was more effective compared to the current approach in ensuring the permanence of academic knowledge attained by students.

Even though various definitions have been made for the concept of learning, the common point in most of these definitions is the expression of "permanent behavior change." Based on this, it can be concluded that the permanence of the change is as important as the behavior changes required for learning to be accomplished in educational processes. Thus, when preparing educational processes it is necessary to prepare the content in a manner enabling permanence for students. Confucius's quote of "I hear and I forget, I see and I remember, I do and I understand" supports this view.

In addition to increasing academic achievement, the applications in the experimental group have ensured the permanence of knowledge attained by students. The arrangement of activities in the process in a manner enabling the active participation of students and enabling them to use various senses when performing these activities can be perceived to be among the primary reasons for this. The active inclusion of students in the process has enabled them to maintain their attention and concentration to the lesson for a long period of time and engage in in-class interaction. Due to all these expressed features, it is considered that the layered curriculum supported by multiple intelligences enabled students in the experimental group to acquire more experience, and the permanence of their knowledge was ensured through these experiences.

Conclusion

1) After the experimental applications, it was observed that the mean achievement of the experimental group applied to the layered curriculum supported by multiple intelligences was higher than that of the control group. Based on this, it was concluded that the said method was more effective in increasing academic achievement compared to the learning approaches in the current curriculum.

2) According to the permanence test results, it was observed that the permanence scores of students in the experimental group applied the layered curriculum supported by of multiple intelligences were higher than that of the control group. According to this finding, it was observed that the layered curriculum supported by multiple intelligences is more effective in ensuring the permanence of academic knowledge of students in the experimental group compared to the control group.

Suggestions

1) The layered curriculum has a structure in parallel to that of the constructivist approach. However, it is not included in the structure of current curriculums. It can be included in educational circumstances in curriculums and textbooks to be prepared, and this method can be utilized in achieving attainments desired at the end of educational processes.

2) The layered curriculum can be utilized in enhancing the permanence of academic knowledge of learners, particularly in verbal courses, in which permanence is lower. Furthermore, the said method can be supported with the question and answer technique in order to contribute to students developing creative thinking skills and achieving the objectives of the course. Investigators express the question and answer technique to be an effective method in developing student interaction, thinking, and learning (Şahin ve Bektaş, 2007). In this sense, it is considered that this technique will effectively be used with the method.

3) The layered curriculum supported by multiple intelligences used in this study can be used together with many other methods and techniques in existing learning programs, and learning-teaching processes can be enriched for students.

4) The "verbal defense" evaluation method in the layered curriculum can be included in the existing evaluation methods in current curriculums in order to determine the extent of competence of students in the subject and also improving their verbal expression skills.

5) Teachers can be informed on the layered curriculum and their conscious application of the approach in their lessons can be ensured. Easy, accessible, and operational methods such as sample lesson presentations and/or contents can be benefited from in order to effectively utilize the said approach.

6) By means of e-content, which is one of the most important components of the "FATİH" project and the information technology layers in the curriculums, content to be used in the process are planned to be made compatible with the project structure. These contents to be prepared can be supported with the layered curriculum approach and students can be provided the opportunity to utilize multiple activities presented in an electronic environment, and they can be able to proceed at their individual paces.

7) Experimental studies can be conducted in courses other than social studies in order to determine the effects of the layered curriculum on learning processes. Findings can be reinforced by performing the applications in various levels of education, expanding the study group or the experimental process. Other stakeholders of the curriculum development process can be included in the process of new studies in order to expand the study group.

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