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The Effect of Mastery Learning Model with Reflective Thinking Activities on Medical Students' Academic Achievement: An Experimental Study

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Abstract

This study aimed to determine the effect of mastery learning model supported with reflective thinking activities on the fifth grade medical students' academic achievement. Mixed methods approach was applied in two samples (n = 64 and n = 6). Quantitative part of the study was based on a pre-test-post-test control group design with an experiment group (32 students) and a control group (32 students) selected among the fifth grade students starting their internship training in Infectious Diseases and Clinical Microbiology Department. Afterwards the qualitative data were collected through semi-structured interviews with six students, selected from the experimental group and the faculty member conducting the study. Findings from the quantitative part indicated that there was a significant difference between post- tests scores of the experiment and control groups favoring the experiment group [$t(62)$= -2,815; p=.007]. Quantitative results revealed positive attitudes toward the applied model in terms of increasing achievement.

Keywords: infectious diseases course, mastery learning, reflective thinking activities, mixed methods

1. Introduction

There are lots of different educational theories which are natural complements to one another to increase quality of instruction in a teaching and learning environment. Since combination of methods can yield benefits greater than using either approach alone, both mastery learning and reflective thinking activities are used together and therefore, they can offer innovative solutions to improve the quality of teaching and learning.

Mastery learning, formulated by Benjamin Bloom (1968) is an approach the basis of which is giving extra time and additional learning opportunities on task per learning to meet individuals' needs to get all students reach high levels. Bloom (1978) emphasized that instruction in mastery learning classrooms should focus on higher level learning goals such as problem solving, analytical skills and creativity, not simply basic skills. Similarly, Guskey (1997) also remarked the effectiveness of mastery learning taking part in recent studies when instruction is based on high level outcomes such as problem solving, drawing inferences, deductive reasoning and creative expression. Therefore, researchers are looking for ways to enhance results further, adding additional elements to the mastery learning process in order to positively contribute to student learning in hopes of attaining even more impressive gains (Bloom 1984a; 1984b; 1988). Although mastery learning has been very successful in producing achievement gains, recently there is a tendency to blend mastery learning with other innovative strategies due to appearing especially promising. According to Arredondo & Block (1990), when well implemented separately, both mastery learning and thinking skills programs appear to improve student learning. Although a great deal has been written about how mastery learning and other strategies might be used together extensively to produce positive learning outcomes (Blessing& Olufunke, 2015; Hevedanlı et al., 2002; Krank & Moon, 2001; Laney et al., 1996; Mevarech 1985; Özder 1996; Slavin 1983), there is the apparent lack of combining mastery learning with reflective thinking activities in the literature review.

In Turkey, students, who have completed a twelve year primary and secondary education and who are in the top 1.5 percent of achievement levels, are accepted to the medical faculties of the state and private universities in accordance with the results of the multiple choice question (MCQ) examinations (YGS and LYS) administered by Student Selection and Placement Center (OSYM) (Kurdak, Altıntaş & Doran, 2008). However, scores required to be accepted to private medical schools are lower compared to their public counterparts. Medical education takes six years, first three years being Pre-clinical years and the latter three being Clinical years. However, this education can extend to 7 years due to the English preparatory program in some medical faculties. Right after graduation, graduates can either work as general practitioners or take another exam called TUS (Medical Specialization Examination) held by OSYM to do residency in

a particular department of a particular hospital. Founded in 1973, at the 50th anniversary of Republic of Turkey, Cumhuriyet University where this study was conducted is a state university established in the Sivas Province of Turkey and has a six year medical education program.

The purpose of this study was to determine the effect of mastery learning model supported with reflective thinking activities such as negotiated learning, reflective discussion, journal writing, asking questions, self-questioning and discussion on the fifth grade medical students' academic achievement. The research hypotheses of the quantitative part of the study were the following: (a) There is a significant difference between pre-test and post- test scores of the experiment group. (b) There is a significant difference between pre-test and post- test scores of the control group. (c) There is a significant difference between post- tests scores of the experiment and control groups, favoring the experiment group.

The qualitative part of the study questions were the following: (a) Do fifth grade medical students show increased achievement on formative and summative tests when they engage in mastery learning model supported with reflective thinking activities? (b) What evidence can be found that mastery learning model supported with reflective thinking activities benefits learning? and (c) What are teacher and student perceptions regarding the impact that mastery learning model supported with reflective thinking activities has had on learning? To better understand the findings, the two studies (quantitative, qualitative) will be presented separately.

2. Method

The study was designed as a mixed-methods approach. Methodologists remarked that by combining quantitative and qualitative research, studies can maximize the strengths of each approach and develop more complete and complementary understandings (Creswell & Plano Clark 2011).

2.1 Quantitative Study

The quantitative phase of the study involved the comparison of students under mastery learning with those under traditional method of instruction. A pretest- post-test control group design was used to measure academic achievement levels of the groups.

2.1.1 Participants

The study was carried out on the 5th grade students studying at Cumhuriyet University Medical Faculty,Turkey. The study group was formed by sixty-four male and female students who attended the Infectious Diseases and Clinical Microbiology course in the spring semester of the 2011-2012 academic year. There were 122 students in the fifth grade of Medical Faculty. These students were divided into six groups (each group consisted of twenty or twenty-one students) for their internship training rotatively in different departments of Cumhuriyet University Hospital. While waiting for the approval of the consent form, two groups which had already completed their internship training at the Department of Infectious Diseases and Clinical Microbiology couldn't be included in the study. After obtaining required permissions in order to perform the study, the remaining four groups were included in the study. The experiment and control groups were selected by using cluster analysis in order to maintain objectivity among the fifth grade students. Cluster analysis is an empirical method of creating homogenous subgroups of individuals from a population (Everitt, Landau, & Leese, 2001). The cluster analysis criteria were as follows: (1) Student Selection Examination (University Entrance Exam) scores of the students. (2) Placement scores of the students for enrolment of the Cumhuriyet University Medical Faculty. (3) Academic achievement averages of the students from the first grade to the fifth grade.

All the data were obtained from their school files as measures of pre-treatment comparability. The criteria for the selection of experiment and control groups are sufficiently objective. After the clustering process was carried out, of the students starting their internship training in Infectious Diseases and Clinical Microbiology department, 32 (16 female, 16 male) were included in the experimental group and another 32 (17 female, 15 male) took place in the control group.

Before the study started, the researcher had a meeting with the faculty member who was willing to carry out the study and explained the concerns of the study as well as what was expected from him while implementing the study. After the faculty member was instructed on what he would do and how he would do it within the time line of the study, lesson plans and activities implemented in the experimental group were prepared together with the faculty member and consulted three faculty members working in different universities before the implementation of the method. As the same teacher taught both experiment and control groups, teacher effect was controlled. In addition, after creating the experiment and control groups, students in the experimental group got information about reflective thinking activities and how to use the activities such as negotiated learning, reflective discussion, journal writing, asking questions, self-questioning and discussion. Since the mean age of the students was between 21 and 26, journal writing was not a desirable activity for them. Therefore, pre-printed forms related to the subject or subjects taught as a learning task or tasks and composed of several questions were given at the end of the instruction and asked them to fill out at home as a

self-assessment report and hand them in again.

2.1.2 Study Conditions

The study conditions were as follows:

(1) The study was conducted in the spring semester of the 2011-2012 academic year.

(2) This study was approved on 13 -12th- 2011by the Medical Faculty Clinical Research Ethics Committee of Cumhuriyet University with the number of 2011/015.

(3) The application was carried out on the subjects titled "Staphylococcal Infections", "Streptococcal Infections", "Malaria", "Pulmonary Tuberculosis", "Crimean-Congo Haemorrhagic Fever" and "Influenza" in Infectious Diseases and Clinical Microbiology course.

(4) The pre-set criterion level of learning was 90%.

2.1.3. Instrument

An achievement test of 29 items that involved the learning tasks "Staphylococcal Infections", "Streptococcal Infections", "Malaria", "Pulmonary Tuberculosis", "Crimean-Congo Haemorrhagic Fever" and "Influenza" was developed and administered as pre-test and post-test to the experiment and control groups. According to specified objectives of the course that the students in both groups were expected to achieve during the study, the test was designed and checked by four faculty members working in Infectious Diseases and Clinical Microbiology Department. A table of specifications was constructed as a planning tool in order to evaluate each item selected for inclusion on a test and modified Bloom et al.'s (1956) taxonomy of the cognitive domain to two levels of cognitive processing: low-level processing (knowledge and understanding) and higher levels of processing (application). Twenty-four items measured lower-level thinking skills (i.e., knowledge and comprehension) and five items measured higher thinking skills (i.e., application).

The tentative form was piloted with eighty-one 6th grade intern medical students studying at Cumhuriyet University Medical Faculty, Turkey. They had already taken Infectious Diseases and Clinical Microbiology course before and were not involved in any part of the study. The main purpose of the pilot study was to decide students' difficulties in understanding the tasks used in the test. All tasks that mapped onto objectives in the test were scored as either 1 or 0 for each correct and incorrect answer respectively. Possible maximum score on the test was 29. The results of the administration were analyzed with the TAP program (the Test Analysis Program) developed by Brooks (2003). Computed of item analysis yielded a Kuder-Richardson (KR-20) reliability coefficient of internal consistency of .65. Chase (1999) has suggested that reliability coefficients should be no lower than .65. Afterwards, the same version of the test was administered to both experiment and control groups as pre- and post-tests respectively.

2.1.4 Procedure

At the beginning of the application, the achievement test was given as the pre-test to the experiment and control groups. The treatment in the experimental group included mastery learning model supported with reflective thinking activities toward lesson plans prepared before and the traditional instruction in the control group was merely teacher oriented and power point presentation based.

The study lasted for three months. The same six subjects were taught in both experiment and control groups by the same faculty member. Each subject as a learning task took an average of two or three hours of instruction. Students were enabled to reflect on their own learning processes to the learning environment through asking questions and participating in reflective class discussions. At the end of each learning task a formative test comprised of 10 items, tapping the objectives for each learning task and lasting ten minutes was given to the students in the experiment group but not to the control group. Feedback and corrective procedures were carried out in the experiment group followed by the parallel forms of the formative tests if students failed to reach the 90% criterion level on the formative test. At the end of the course after instruction was over, the students taking part in experiment and control groups responded once more to the achievement test as a post-treatment measure.

2.1.5 Analysis

To compare the pre and post-treatment measures of both groups, dependent and independent groups t-tests were used. For the analysis of each hypothesis, t-tests as well as the Kolmogorov-Smirnov tests comparing the two groups on the achievement test were utilized**.** P-values that were ≤ 0.05 were considered to be significant in the study.

2.1.6 Results

Although the groups were randomly assigned as an experiment and control, to ensure that there were no significant differences between the two groups in terms of pre-test scores, "Independent Groups t-Test" was used as shown in Table

1. No significant differences between the two groups in terms of pre-test scores of the achievement test were found [t (62) = .630, p > .05].

Table 1. The Independent Groups t-Test Results of the Pre-test Scores of the Experiment and Control Groups

Groups	N	Mean	SD	df	Lev. Test	Significance Level	t	Significance Level
Experiment	32	13.28	3.90					
Control	32	12.66	4.04	62	.005	.944	.630	.531
Total	64							

p>.05

As Table 1 indicates, the results of the Levene's test (f=.005, P=.944>.05) showed that the variances between the two groups were not significantly different and thus, homogeneity of variances was assumed. Therefore, the results of independent groups t-test (P=.531>.05) indicated that the groups were not different from one another at the beginning of the study.

In order to compare pre-test - post-test scores of the experiment group and control group respectively , the Kolmogorov-Simirnov test was used to find out whether the data were suitable for normal distribution (see Table 2).

Table 2. The Kolmogorov-Simirnov Normality Test Results of the Two Groups

Groups	Measurement	n	mean	SD	K-S	P
Experiment	pre-test	32	13.28	3.90	.434	.992
	post-test	32	24.47	2.91	1.117	.165
Control	pre-test	32	12.66	4.04	.541	.931
	post-test	32	22.53	2.59	.628	.825

P>0.05

As seen in Table 2, the measurements showed normal distribution in both groups [pre-test experiment (K=.434; p=.992>.05); post-test experiment (K= 1.117, p=.165>.05) and pre-test control (K=.541; p=.931>.05); post-test control (K= .628, p=.825>.05)]. Therefore, dependent groups t-test was used to compare the pre and post-test scores of the experiment and control groups respectively (See Table3).

Table 3. Dependent Groups t- Test Results of the Two Groups

Groups	Measurement	n	mean	SD	r	t	P
Experiment	pre-test	32	13.28	3.90	.330	-15.744*	.000
	post-test	32	24.47	2.91			
Control	pre-test	32	12.65	4.04	.354	-14.116*	.000
	post-test	32	22.53	2.59			

*p<.05

Table 3 shows that there is a significant difference between the pre-test (mean =13.28) and post-test (mean =24.47) scores of the experiment [t(31)= -15.744, p=.000<.05] and the pre-test (mean =12.65) and post-test (mean =22.53) scores of the control [t(31)= -14.116, p=.000<.05] groups in favor of the post-test scores. The results indicated that both groups improved their post-test scores. Therefore, the first two hypotheses were clearly confirmed.

In order to compare the post-test scores of both groups, first Levene's Test was conducted and homogeneity of variances was assumed (f=.711, P=.402>.05). Then independent t-test was utilized.

Table 4. The Independent t-Test Results of the Post-test Scores of the Experiment and Control groups

Groups	N	Mean	SD	df	Lev. Test	Significance Level	t	Significance Level
Experiment	32	24.47	2.91					
Control	32	22.53	2.59	62	.711	.402	. -2.815*	.007
Total	64							

*p<.05

Table 4 indicated that there was a significant difference between the post-test scores of both groups [t(62)= - 2.815; p=.007 <.05], favoring the experiment group (mean = 24.47). In the light of the evidence, the third hypothesis was confirmed.

2.2 Qualitative Study

Phenomenological research design, one of the qualitative research techniques, was used in the present study. According to Creswell (1998), in a phenomenological design, "human experience is examined by obtaining detailed descriptions of the individuals being studied and by seeking to understand the experiences as they were lived" (p. 54).

2.2.1 Participants

In phenomenological design, one of the quite suitable analysis techniques for medicine, social psychology and clinical psychology researches, small sample size is preferred (Smith and Eatough, 2007). To this aim, six students (3 female, 3 male) taking part in the experiment group and chosen through criterion-based, purposive sampling procedure (Collins et al., 2006) and also the faculty member working in the Department of Infectious Diseases and Clinical Microbiology and conducting the study were interviewed at the end of the experimental study. According to Patton (1990), purposive sampling method "typically focuses in depth on relatively small samples, even single cases, selected purposefully" (p.169) for the important information (Maxwell, 1997). Criterion measures were willingness as well as high, medium and low success levels which were determined according to post-test scores obtained from the achievement test and the views of the faculty member teaching the six subjects. Participants were also assured that participation was entirely voluntary and confidential and refusal would not have any negative consequences.

2.2.2 Procedure

Open-ended questions were formed as data collection materials. Additionally, in order to be supportive of the interview data and increase the validity of the research, learning journals collected regularly from the students in experimental group every week were utilized as data collection materials as well. The data were collected through semi-structured interviews. During the interviews, each student who participated in the qualitative part of the study was given a code name and requested to answer interview questions in 25 minutes because of constraints on participants' time. At the end of the interviews, participants were asked if they had any other comments or suggestions, not only as a matter of courtesy but also in case they wanted to change or add to an answer.

2.2.3 Data Analysis

All interviews were transcribed verbatim, and checked for accuracy. Then, transcripts gathered from interviews and learning journals were imported into NVivo 8, qualitative analysis software. Content analysis, a widely used qualitative research technique for "making inferences by systematically and objectively identifying special characteristics of messages" (Holsti 1968: 608), was employed. First, categories were identified from the data and then, these emergent categories were used to group and organize codes into meaningful clusters (Patton 1990) representing common ideas or themes (Creswell 2003). Diagrams were created to support visualization and understanding of the relationships between the categories and themes. Last, these categories and core themes were reviewed for accuracy.

2.2.4 Results

Participants explained how and why they felt the application was effective on increasing academic *achievement*. Data analysis established five themes that encapsulated experiences of the participants related to learning model: (1) perceptions regarding the content, (2) appreciated aspects of application, (3) benefits of application, (4) affective states related to application, and (5) solutions versus problems faced students. The loadings of these themes and sub-themes are represented in Table 5 (see Appendix A).

2.2.4.1 Perceptions Regarding the Content

The participants perceived that the application provided a powerful learning opportunity for the students. In addition, they felt the students displayed a progressive understanding and appreciation toward Infectious Diseases and Clinical Microbiology course throughout the study period.

> *"Discussion platform built for our participation prevented us from sleeping during the course and therefore I did not need to study too much at home for the exams" ITW.S4-M/l (Interview/ student no: 4/ Male/ low).*
>
> *"Focusing our attention on images and discussion of case studies helped us for permanent learning… " ITW. S2-F/m (Interview/ student no: 2/ Female/ medium).*
>
> *"..knowledge about what they have already known about the subject and what they will learn was listed on the board. Then, in order to test prerequisite knowledge of the students, a case study or an image related to the subject was presented and without discussing whether the answers were true or false, students were encouraged for comments. The subjects were taught by dividing them into small learning units. For example, general characteristics of bacteria or viruses causing diseases, their infections, patient clinic, diagnosis, treatment and prevention. Active student participation to the lesson was supported through providing reinforcement for correct answers and clues or correction for wrong answers…..Quizzes given at the end of each learning unit helped students increase their academic achievement by providing reinforcement of their learning. " ITW. Tch. (Interview/ teacher).*

2.2.4.2 Appreciated Aspects of Application

All of the participants commented that the application enhanced their understanding of what they have learned through the

process and hence the students saw the application as an opportunity for their development of learning. Supporting quotes are as follows:

"Quizzes given at the end of the course were useful to learn effectively. Besides, instantaneous feedback and corrections without getting marks enabled us to listen stresslessly." ITW.S4-M/l

"Diseases described with figures and cases become more permanent" LJ.S3.Week-2 (Learning Journal/ student no: 3/ Week-2)

"Providing all students with an opportunity to correct mistakes and formulate a response again through clues was effective on learning" ITW.S3-F/l

"Questions asked constantly during the course for our participation did not permit distractions, kept us alert during class time." ITW.S5-M/h

2.2.4.3 Benefits of Application

The predominant emerging theme with high loadings (55) was "benefits of application". When asked about the evidence, participants shared their perspective of what they believed was beneficial for their learning. The diagram of this theme is presented in Figure1.

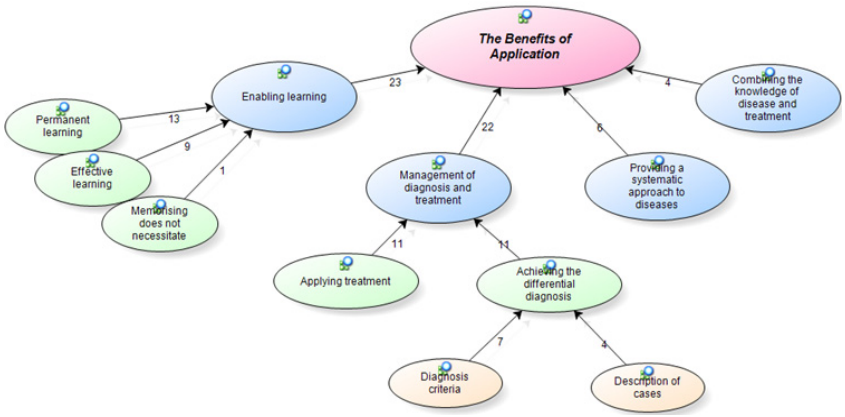

Figure 1. The Model Related to Benefits of Application

Some supporting direct quotations were given below:

"I think we can achieve a differential diagnosis because of the fact that we learned diagnostic criteria and case definitions" ITW.S5-M/h

"… I had the opportunity to combine theoretical knowledge and practice. Furthermore, I learned more detailed information on diagnostic criteria and treatment of some diseases which are endemic in our country like Crimean–Congo Haemorrhagic Fever (CCHF)". ITW.S6-M/m

"Routes of transmission, treatment, causative agents were the subjects I learned effectively" LJ.S5-Week-2

"Formative tests had a positive impact on students' success. They listened to me better during the lessons to answer the questions taking place in formative tests correctly. Since formative tests have improved success, they requested me to encourage other instructors to make quizzes after their courses." ITW.Tch.

"In addition to learning diseases microbiologically, I learned treatment order, what kind of antibiotics I must start for infections or other materials used in treatment or when I must send patients to other hospitals". ITW

2.3.4.4 Affective States Related to Application

The participants' comments showed that they initially felt excited about the use of classroom interactions. Afterwards, these feelings were overwhelmed throughout the study period. Some comments illustrate the applicants' emotional responses to the use of the application:

"At the beginning, I knew that they wanted to be exposed to the application but at the same time they felt really worry if they didn't understand much… but later, I noticed that the level of anxiety in class was much lower, and as a result, the learning retention increased". ITW.Tch.

"The course was as desirable as long as. It did not cause excessive stress on me" ITW.S2-F/h

2.2.4.5 Solutions versus Problems Faced Students

Students described not only problems related to Infectious Diseases and Clinical Microbiology course but also strategies they could use to manage these problems.

"There was some difficulty with epidemiological factors and treatment, or deficiency of knowledge of Microbiology, but they weren't insurmountable problems, they were just one of those things I dealt with and moved on through this course". ITW.S6-M/m

"Because it requires more memorization, I had difficulty to understand characteristics of microorganisms, but the application gave me more confidence to overcome them". ITW.S3-F/l

3. Discussion

The two presented studies comprise a systematic attempt to determine the effect of mastery learning model supported with reflective thinking activities on the fifth grade medical students' academic achievement. The findings of the quantitative study showed that the three- month long treatment generated important improvement in students' achievement as compared to that in the control group, and the difference was significant in favour of the experimental group. Furthermore, the experimental group received higher scores and all of the objectives of instruction were mastered in the criterion level of 90%, compared to students in control group. Qualitative data, on the other hand, illuminated the results of the quantitative part so that the participants displayed positive and agreeable attitudes toward applying mastery learning model supported with reflective thinking activities. To clarify consistency of the two parts of the study, selected aspects of the narratives were used by elaborating individual views on the application. Extensive research evidence shows that using mastery learning can have positive effects on student achievement in learning. Therefore, this study, along with other similar studies, points to positive effects that mastery learning can help students increase learning efforts, and ultimately perform better on academic tasks (Maehr et al., 2002). Several studies (Amiruddin & Zainudin, 2015; Hill- Miller, 2011; Kazu at al., 2005; Kulik & Kulik 1989; Kulik Kulik & Bangert-Drowns 1990; Kurtuldu & Bakıoğlu 2012; Mogen, 2013; Rahmani et al., 2008; Sönmez, 1997; Whiting et al., 1995;) aiming to bring out the effects of mastery learning model on the success of students showed that the achievement level of students under mastery learning method of instruction was significantly higher than students in control groups. Nevertheless in a few studies, students in control classes in a particular subject area achieved higher scores on achievement measures than students in mastery classes (Wire 1979; Wortham 1980; Yıldıran 1977). However, when these results were pooled with results from other subject areas within the same study, the overall effect consistently favored the mastery group (Guskey & Gates 1985). In another study by DeWeese (2012), the effects of mastery learning correctives on academic achievement were investigated and found no differences between individualized corrective group and control group in terms of achievement or student affect toward content or teacher. Besides, one review of the research on mastery learning, contrary to all others, indicated that the process had essentially no effect on student achievement (Slavin 1987) but with a close inspection by scholars and practitioners well-equipped in mastery learning, questionable aspects of this review were elucidated. The positive effects of mastery learning are not restricted only to measures of student achievement. The process also has been shown to provide improvements in students' school attendance rates, their involvement in class lessons, and their attitudes toward learning (Guskey & Pigott, 1988). However, a study by Tse (1983) revealed that the dropout rate of experimental class was higher than that of the control class because of Bloom's mastery learning strategy demanding more from the student. This was reported to be the result of students' having heavy job or family responsibilities, not liking the frequent testing that was the feature of mastery learning or not having extra time or extra effort spent in correctiveness. Besides, integrated models can reveal different outcomes or effects. We basically attempted to create a discussion atmosphere in the present study through associating mastery learning model with one of contemporary models that was similar to the study carried out by Athens (2011). In the study both mastery learning principles and self-directed learning were used together. According to the results of the study, mastery learning principles coupled with modelling in self-direction appeared mutually reinforcing and, yielded dual benefits in concept mastery as well as self-efficacy. Mevarech (1985; 1991) synthesized mastery learning method of instruction with cooperative learning techniques. The results of both studies indicated that students in the cooperative mastery learning condition reached the highest mean in the achievement level. Similarly some researches (Aydın, 1995; Hevedanlı et al., 2002; Krank & Moon 2001; Özder 1996) investigated the effects of cooperative mastery learning method on students' achievements and found that cooperative learning was more efficient with mastery learning on the achievement levels of students.

Results such as these are potentially additive for enhancing improvement and they are exactly what Bloom (1984a) predicted could be probable if strategies focusing on different dimension of teaching and learning process are combined. Although a great deal has been written about how mastery learning and other strategies might be used together, studies about a combination of mastery learning together with reflective thinking activities is not available. Therefore, this

study would be fruitful for future researches to examine how to enhance mastery learning with reflective thinking activities to student achievement.

4. Conclusions

The mixed methods research study set out to examine the effect of mastery learning model supported with reflective thinking activities such as negotiated learning, reflective discussion, journal writing, asking questions, self-questioning and discussion on the fifth grade medical students' academic achievement. The findings indicated that mastery learning model supported with reflective thinking activities had more beneficial effects than the traditional method. Further, our study provided evidence that this model offers rich and deep learning opportunities for students afforded by both mastery learning components and reflective thinking activities. This evidence was cleared by not only quantitative results but also the six qualitative interview participants who gave a deeper look into what experiment students experienced from Infectious Diseases and Clinical Microbiology course. This study also revealed that while picture and case presentations were the most effective, learning journals were the less effective activities for young adult learners. These findings therefore can encourage medical faculty authorities to continue their training and development in the research methodology aspects. Medical schools can also establish a successful interdisciplinary program and therefore communication barriers among disciplines can be overcome to improve students' learning processes.

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Appendix A..

Table 5. The Loadings of Themes and Sub-themes

	Data Sources			
	Interview		Learning Journals	
	Student İnterview	Faculty member interview		# ####7ɪ–°#
PERCEPTIONS REGARDING the CONTENT	29	13	-	42
Pre explanation on what is going to be taught	2	1	-	3
Introduction with figures and case studies	5	1	-	6
Take students opinions on the disease	1	1	-	2
No discussions on opinions	1	1	-	2
Dividing the subjects into small learning units	2	1	-	3
Providing active participation in the lesson	9	5	-	14
* *Reinforcement*	-	1	-	1
* *Clue*	-	1	-	1
* *Correction*	1	1	-	2
* *Classroom discussion*	3	-	-	3
* *Asking questions*	3	1	-	4
* *Repetition of incomprehensible parts*	2	1	-	3
Representation of images and case studies at the end of the course	1	1	-	2
Application of formative tests	6	1	-	7
Handing out the learning journals	2	1	-	3
APPRECIATED ASPECTS of APPLICATION	18	6	9	33
Formative tests	3	1	5	9
Figure / case presentation	3	1	4	8
Active participation	4	1	-	5
Classroom discussion	3	1	-	4
Clue	3	1	-	4
Correction	2	1	-	3
BENEFITS of APPLICATION	22	2	31	55
Enabling Learning	8	2	13	23
**Permanent learning*	6	1	6	13
**Effective learning*	3	1	6	10
Management of diagnosis and treatment	8	-	14	22
**Applying treatment*	4	-	7	11
**Achieving the differential diagnosis*	4	-	7	11
-Diagnosis criteria	3	-	4	7
- *Description of cases*	1	-	3	4
Providing a systematic approach to diseases	3	-	3	6
Combining the knowledge of disease & treatment	3	-	1	4
AFFECTIVE STATES RELATED to APPLICATION	14	3	13	30
Pre-application	8	2	-	10
* *Worry*	4	1	-	5
* *Anxiety*	4	1	-	5
Post-application	6	1	13	20
* *Enjoyable*	2	-	13	15
* *Desirable*	4	1	-	5
SOLUTIONS Versus PROBLEMS FACED STUDENTS	18	2	20	40
Some units need memorizing	9	2	12	23
**Managing treatment*	3	-	-	8
* *Epidemiological factors*	2	1	2	5
**Differential diagnosis*	1	1	2	4
**Complications*	2	-	2	4
* *Characteristics of microorganisms*	1	-	1	2
Practical application insufficiency	6	-	6	12
* *More clinical reinforcement*	4	-	3	7
* More *presentation of images and case studies*	2	-	3	5
Deficiency of the knowledge of Microbiology	3	-	2	5