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# EFFECTIVENESS OF COOPERATIVE MASTERY LEARNING MODEL IN TEACHING SCIENCE TO GRADE 6 STUDENTS

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## Abstract

The main purpose of this study is to investigate the effectiveness of the cooperative mastery learning model in students' achievement in middle school science teaching. This study was conducted by quasi-experimental design. As the instruments for this study, pretest and posttest were used. By using a random sampling method, four high schools from Mandalay and Sagaing Regions were selected. Cooperative mastery learning model was implemented on experimental groups. The control groups were exposed to formal instruction. ANCOVA results showed that there was a significant difference in the overall science achievement between middle school students who receive instruction with cooperative mastery learning model and those who do not receive it. Therefore, the findings of this study proved that students who receive instruction with cooperative mastery learning model were higher than those of students who do not receive it. In addition, it can be suggested that cooperative mastery learning model should be used in science teaching and learning.

**Keywords**: Cooperative learning, mastery, mastery learning, cooperative mastery learning, teaching model

## Introduction

Education provides individuals with the opportunity to improve their lives, become successful members of their communities and actively contribute to the national development. It has innate relationship with the individuals' process of growth. It is a continuous re-organization or re-construction of the individual life experience. It also facilitates learning or the acquisition of knowledge, skills, values, beliefs and habits.

In today's world, science encompasses many ways of gaining information which help individual know themselves and their environment and renew this information frequently. Teaching science individually helps them to learn how adopt and adapt an inclination which enforces them to think objectively and make the right decision confronting different events and situations. This inclination provides a comfortable life for them as well as for their family and their environment.

The new curriculum moves Myanmar teaching away from rote learning and hopes to increase student engagement and performance, but requires teachers to have the capabilities to deliver this. The new curriculum also reflects society's need for citizens capable of learning how to learn, applying critical thinking, communication and creativity and possess a core of knowledge and skills in technical and academic areas (Lall, 2020).

It is necessary for today's students to engage in deeper learning or learning that allows students to take what is learned in one situation, and apply it to new situation. Deeper learning involves the interplay of the cognitive, intrapersonal and interpersonal competencies. Mastery of academic content is basic for higher-order thinking skills and interpersonal and intrapersonal competencies. For concept mastery, teachers give the formative test and certify which students achieve mastery. Students who fall short might work in small groups reviewing troublesome

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material, often with the aid of peer tutors who have mastered the material. Teachers allow students time to work on remedial materials along with homework.

Teachers must give children clear instructions and guidelines and must play an important role as facilitators and supporters during lessons. For this purpose, an instructional procedure whereby learners work together in small groups and are rewarded for their collective accomplishment is cooperative learning. Their usual tasks are to collectively learn or master content the teacher has previously presented or complete a teacher-assigned project as a team.

Therefore, this study is intended to investigate the effectiveness of cooperative mastery learning model in teaching middle school science.

**Purpose of the Study**

The main purpose of this study was to investigate the effectiveness of cooperative mastery learning model in student achievement in middle school science teaching. The specific objectives of the study are as follows:

1. to find out the effectiveness of cooperative mastery learning model in students' achievements in middle school science,
2. to make suggestions for the improvement of teaching middle school science.

**Research Hypotheses**

The research hypotheses are:

1. There is a significant difference in the overall science achievement between middle school students who receive instruction with cooperative mastery learning model and those who do not receive it.
2. There is a significant difference between the science achievement of middle school students who receive instruction with cooperative mastery learning model and those who do not receive it in answering lower level and higher level questions.

**Scope of the Study**

The following points are the scope of the study.

1. This study is geographically restricted to Sagaing Region and Mandalay Region.
2. Participants in this study are Grade 6 students from four selected schools.
3. It is limited to the content area of force, living things, cell and cell structure and reproduction from Grade 6 Science Textbook prescribed by Basic Education Curriculum, Syllabus and Textbook Committee, 2020-2021.

**Definition of Key Terms**

**Cooperative Learning**

Cooperative learning requires pupils to work together in small groups to support each other to improve their own learning and that of others (Jolliffe, 2007).

**Mastery**

Mastery refers to the attainment of a high degree of competence within a particular area (Ambrose, Bridges, DiPietro, Lovett & Norman, 2010).

**Mastery Learning**

Mastery learning is a set of group-based, individualized teaching and learning strategies based on the premise that all students can and will learn what the school have to teach (Anderson, 1975).

**Teaching Model**

A model of teaching is a plan or pattern that can be used to shape curriculums (long-term courses of studies), to design instructional materials, and to guide instruction in the classroom and other settings (Joyce & Weil, 1980).

**Cooperative Mastery Learning (Operational Definition)**

Cooperative mastery learning is an instructional strategy in which learners study cooperatively in small groups where task completion is contingent on mutual cooperation. Then, they are individually tested on the learning followed by learning activities to reach mastery.

## Review of Related Literature

Mastery learning is an educational practice based upon behavioral theory that emphasizes how the environment can be manipulated in order to change behavior in a desirable direction (Cruickshank, Jenkins & Metcalf, 2009). According to Abrami and Chambers (1996, as cited in Killen, 2016), cooperative learning rests on four theoretical perspectives – motivational perspectives, social cohesion perspectives, cognitive developmental perspectives, and cognitive elaborations perspectives. Learning theories that influenced cooperative mastery learning include behaviorist, cognitive and motivational theories.

In behavioral aspects, there are two major assumptions about learning and learners. The first assumption is that learners are not just passive entities who react to environmental stimuli. Learners learn by doing, experiencing, and engaging in trial and error. What has been learned, under what conditions, and the consequences that support or maintain the learned behavior all work together, and must be observable and measurable.

A second assumption is that learning is a change in behavior due to experience and a function of building associations between the occasion on which the behavior occurs and the behavior itself. Learning tasks are ordered logically according to a hierarchy. Learners' performance of tasks is measured which is contingent on successful achievement at each stage (Deubel, 2003).

The cognitive perspectives are often grouped into two trends: the individual cognitive and the sociocultural. The first is in line with the views of epistemology expressed by Piaget. Science teachers who know the structure of intelligence – stages, structures, operations – can facilitate learning. Those who understand Piaget's work may even be able to broaden cognitive development and accelerate it in the transitional phases (Collette & Chiappetta, 1989). From this individual cognitive perspective, cooperative mastery learning will be grown in use and importance in science classrooms.

Vygotsky believes that culture plays an important role in cognitive development, and social interaction is the primary way. Cognitive development occurs through the child's conversations and interactions with others. In cooperative learning, social interaction is important for learning because higher mental functions such as reasoning, comprehension, and critical thinking originate in social interactions and are then appropriated and internalized by individuals (Kivunja, 2015).

Most educators agree that motivating students is one of the critical tasks of teaching. In order to learn, students must be cognitively, emotionally, and behaviorally engaged in productive class activities. Woodruff (1948, as cited in Khin Zaw, 2001a) has stated that the speed of learning depends upon the degree of motivation. Thus, teachers must foster motivation for learning before they can expect students to profit from instruction or from school in general.

Cooperative learning and mastery learning are clearly distinct and focus on different aspects of the teaching and learning process. At the same time, the two strategies share several common premises that contribute to their complementary nature and enhance their mutual implementation.

In implementing mastery learning, teachers regularly check students' learning through some type of formative test. Although this test is often a paper-and-pencil quiz, it may be any mechanism through which teachers and students gain information on learning progress. Mastery learning therefore offers teachers using cooperative learning a systematic feedback and corrective procedure that can bring greater focus to the work of the student teams. With such a procedure, students are likely to spend more of the time they are in teams engaged in purposeful learning activities. Individual accountability is insured as all students strive to attain the mastery standard. Positive interdependence is fostered by offering special rewards to teams that succeed in getting all team members to mastery. The efficiency of the teams' work, as well as the cognitive and communicative functions of the team, is thus enhanced.

Cooperative learning helps teachers in their efforts to implement mastery learning. A difficulty often encountered by teachers attempting to use mastery learning is providing high-quality corrective and enrichment activities. This is particularly challenging in classrooms with heterogeneous students who have diverse learning styles and remedial needs (Mevarech, 1989, as cited in Guskey, 1990).

Learning together in teams also provides important incentives that strengthen motivation and alleviate anxiety. Furthermore, the use of student learning teams serves not only corrective but enrichment purposes as well.

Proposed model, a cooperative mastery learning model, is intended to contribute to teaching of science at the middle school level. This model consists of three main components. They are planning, implementation and assessment phase. Planning phase is the planning and preparation of the instructional procedure. There are two steps in this phase: (a) identifying learning objectives, and (b) preparing instructional procedure. In implementation phase, organizing students into groups, assigning different roles, presenting for attention and motivation, informing learning objectives, eliciting prior knowledge, presenting new materials, providing learning guidance, eliciting and interpreting evidence of learning, identifying the gap, instructional modification based on evidence, corrective activities/ providing feedback, enrichment activities and providing closure are included. The final step of the model is assessment in which assessment and feedback processes are involved.

## Method

### Research Design

The research design used in this study was one of the quasi-experimental designs, non-equivalent control group design.

**Subjects**

By using the simple random sampling method, four schools from Mandalay and Sagaing Regions were selected. The population and sample size of the selected schools are presented in Table 1.

**Table 1 Population and Sample Size**

| Region | Township | School | No. of Population | No. of Sample |
|---|---|---|---|---|
| Sagaing | Sagaing | No. (3) BEHS | 108 | 49 |
| | Depeyin | BEHS, Depeyin | 98 | 49 |
| Mandalay | Amarapura | No. (2) BEHS | 100 | 52 |
| | Tada-U | BEHS, Chaung Khwa | 104 | 55 |

*Note:* BEHS = Basic Education High School

**Instruments**

The instruments were pretest and posttest for this study. These were used after examining the reliability coefficient. A pretest was based on the levels of the cognitive domain (remembering, understanding, and applying). The allocated time for this test is one and a half hours. To measure the effectiveness of the instruction, a posttest was used. It was constructed on the basic levels of Bloom's Taxonomy: remembering, understanding, applying and analyzing items (Revised Bloom Taxonomy). The allocated time for this test is one and a half hours.

**Procedure**

The student from the selected sample schools were randomly assigned to two groups: the experimental group and the control group. This experimental study consists of three phases: pretesting, intervention and posttesting. Before students received any instruction, all participants were administered with the science achievement test (pretest). And then, the experimental group received an instruction by using cooperative mastery learning model and the control group received formal instruction. At the end of the treatment period, all student participants took the science achievement test (posttest).

**Data Analysis**

In this study, the Statistical Package for the Social Sciences (SPSS) version 25 was used in order to analyze quantitative data. The research data was analyzed by inferential statistics: one-way analysis of covariance (ANCOVA) to examine whether there are significant differences between the science achievement of students who receive cooperative mastery learning model and those who do not.

## Findings

This findings of the pretest and posttest questions are presented in this section.

**Findings of Students' Achievement on Posttest**

A one-way analysis of covariance was conducted to compare the effectiveness of two different interventions. The independent variable was the type of intervention (cooperative mastery learning, and formal instruction), and the dependent variable consisted of scores on the posttest administered after the intervention was completed. Participants' scores on the pretest were used as the covariate in this analysis. Table 2 shows the results of analysis of covariance for posttest scores in School 1.

**Table 2 Analysis of Covariance Results for Posttest Scores in School 1**

| Level | Group | *N* | Unadjusted *M* | Adjusted *M* | *MD* | *F* | *p* | Partial Eta Squared |
|---|---|---|---|---|---|---|---|---|
| Remembering | Experimental | 25 | 7.96 | 7.95 | 0.44 | 2.053 | .159 (ns) | .043 |
| | Control | 24 | 7.50 | 7.51 | | | | |
| Understanding | Experimental | 25 | 11.04 | 11.06 | 1.09 | 4.428 | .041* | .088 |
| | Control | 24 | 10.00 | 9.97 | | | | |
| Applying | Experimental | 25 | 7.48 | 7.49 | 1.75 | 9.458 | .004** | .171 |
| | Control | 24 | 5.75 | 5.74 | | | | |
| Analyzing | Experimental | 25 | 5.56 | 5.58 | 2.69 | 19.915 | .000*** | .302 |
| | Control | 24 | 2.92 | 2.89 | | | | |
| Total | Experimental | 25 | 32.56 | 32.62 | 6.35 | 32.805 | .000*** | .416 |
| | Control | 24 | 26.33 | 26.27 | | | | |

*Note.* ns = not significant

**p*<.05. ***p*<.01. ****p*<.001

Bloom’s taxonomy (1956, as cited in Kivunja, 2015) is one of the most widely used classifications of cognitive processes. The cognitive dimension has had the greatest application in education. In 2001, Bloom’s taxonomy was revised. It includes six cognitive levels of hierarchical complexity. The lower cognitive levels were identified as remembering, understanding, and applying. The higher cognitive were called analyzing, evaluating, and creating.

As shown in Table 2, the adjusted mean values of the one-way analysis of covariance for the respective levels of School 1 are presented. According to the results, it was found that there was no significant difference between the experimental group and the control group for the posttest mean scores of remembering level questions. Therefore, it can be interpreted that the formal instruction could improve remembering level questions like cooperative mastery learning model.

For the lower level questions, the posttest mean score of experimental group was significantly higher than those of control group. Therefore, it can be interpreted that the use of cooperative mastery learning model enhanced students’ understanding of science concepts, and the ability of applying the concepts in their problems.

The comparison of the posttest mean score of experimental and control groups showed that there was a significant difference between the achievement of the two groups for higher level questions. Therefore, it can be interpreted that cooperative mastery learning model developed students’ ability to compare and contrast the concepts of the context.

For the overall achievement on the posttest, it was found that there was a significant difference between the experimental and control groups for the posttest mean scores $F$ (l, 46) = 32.805, $p$ = .000, partial eta squared = .416). It can be interpreted that cooperative mastery learning model had a significant effect on the academic achievement of students in school 1.

The mean comparison for posttest scores of the student achievement in school 1 is illustrated in Figure 1.

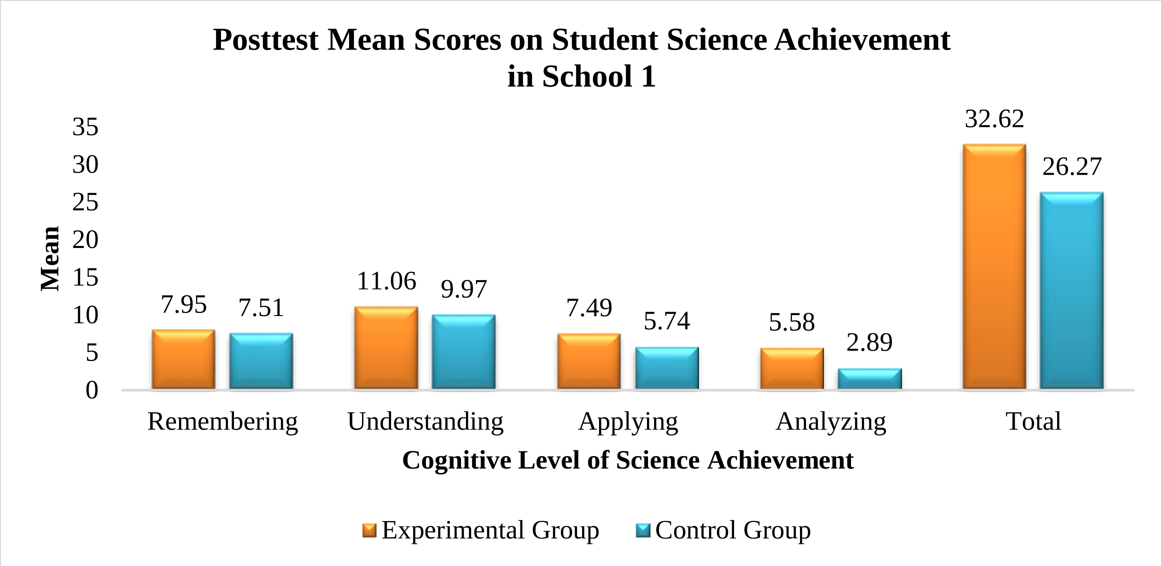


**Figure 1** Comparison of Posttest Mean Scores in School 1

Table 3 shows the analysis of covariance results for student science achievement in posttest in school 2.

**Table 3 Analysis of Covariance Results for Posttest Scores in School 2**

| Level | Group | *N* | Unadjusted *M* | Adjusted *M* | *MD* | *F* | *p* | Partial Eta Squared |
|---|---|---|---|---|---|---|---|---|
| Remembering | Experimental | 24 | 7.62 | 7.63 | 0.31 | 1.163 | .287 (ns) | .025 |
| | Control | 25 | 7.32 | 7.32 | | | | |
| Understanding | Experimental | 24 | 11.67 | 11.66 | 2.26 | 20.762 | .000*** | .311 |
| | Control | 25 | 9.40 | 9.40 | | | | |
| Applying | Experimental | 24 | 7.88 | 7.87 | 2.51 | 32.481 | .000*** | .414 |
| | Control | 25 | 5.36 | 5.36 | | | | |
| Analyzing | Experimental | 24 | 6.13 | 6.12 | 1.94 | 22.682 | .000*** | .330 |
| | Control | 25 | 4.28 | 4.28 | | | | |
| Total | Experimental | 24 | 33.29 | 33.29 | 6.93 | 60.657 | .000*** | .569 |
| | Control | 25 | 26.36 | 26.36 | | | | |

*Note.* ns = not significant

***$p$<.001

As shown in Table 3, the adjusted mean values of the one-way analysis of covariance for the respective levels of school 2 are presented. The results of ANCOVA showed that there was no significant difference between the experimental group and the control group for the posttest mean scores of remembering level questions. Therefore, it can be interpreted that the formal instruction could improve remembering level questions like cooperative mastery learning model.

It can also be interpreted for school 2 that cooperative mastery learning model had a significant effect on students' achievement, particularly at the lower level questions. Because the experimental group perform significantly better than the control groups in answering these questions.

For higher level questions, the posttest mean score of the experimental group was significantly higher than those of control group. Therefore, it can be interpreted that cooperative mastery learning model had a significant effect on students' ability to distinguish science concepts.

In addition, the ANCOVA results revealed a significant difference between the experimental and control groups for the overall achievement at $p < .000$ ($F$ (l, 46) = 60.657, $p$ = .000, partial eta squared = .569). Therefore, it can be interpreted that the use of cooperative mastery learning model had a significant effect on student achievement in school 2.

The mean comparison for posttest scores in school 2 is illustrated in Figure 2.

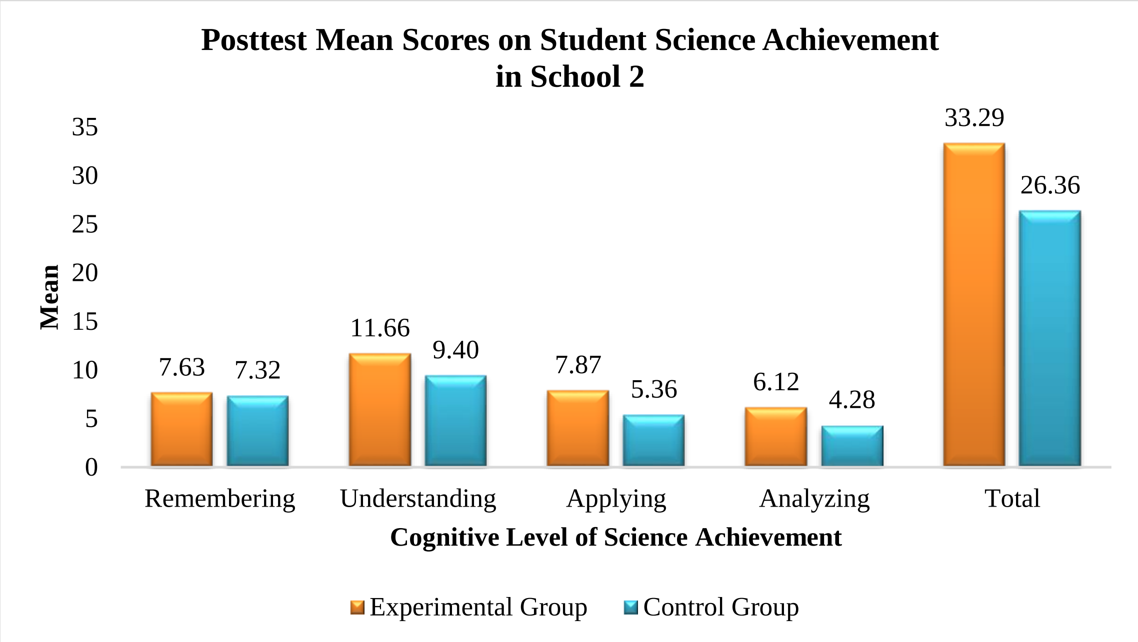


**Figure 2** Comparison of Posttest Mean Scores in School 2

The analysis of covariance results for student science achievement on posttest in school 3 are described in Table 4.

**Table 4 Analysis of Covariance Results for Posttest Scores in School 3**

| Level | Group | *N* | Unadjusted *M* | Adjusted *M* | *MD* | *F* | *p* | Partial Eta Squared |
|---|---|---|---|---|---|---|---|---|
| Remembering | Experimental | 27 | 8.37 | 8.37 | 0.41 | 2.399 | .128 (ns) | .047 |
| | Control | 25 | 7.96 | 7.96 | | | | |
| Understanding | Experimental | 27 | 10.78 | 10.79 | 2.29 | 40.974 | .000*** | .455 |
| | Control | 25 | 8.52 | 8.50 | | | | |
| Applying | Experimental | 27 | 8.85 | 8.83 | 2.37 | 18.702 | .000*** | .276 |
| | Control | 25 | 6.44 | 6.46 | | | | |
| Analyzing | Experimental | 27 | 7.78 | 7.76 | 2.30 | 16.422 | .000*** | .251 |
| | Control | 25 | 5.44 | 5.46 | | | | |
| Total | Experimental | 27 | 36.04 | 36.01 | 7.15 | 25.088 | .000*** | .339 |
| | Control | 25 | 28.84 | 28.86 | | | | |

*Note*. ns = not significant

***$p$<.001

As shown in Table 4, there was no significant difference between experimental group and control group for the posttest mean scores of remembering level questions. Therefore, it can be interpreted that the formal instruction could improve remembering level questions like cooperative mastery learning model.

The results pointed out that the posttest mean score of the experimental group was significantly higher than those of control group for lower level questions. Therefore, it can be interpreted that cooperative mastery learning model enhanced students' understanding of science concepts, and students' ability to use abstractions to describe particular ideas.

ANCOVA results for higher level questions showed that there was statistically significant. Therefore, it can be interpreted that cooperative mastery learning model had a significant effect on the ability of students in detecting how the parts relate to one another and to overall structure in school 3.

As shown in Table 4, it was found that there was a significant difference between the experimental and control groups for the overall achievement at $p < .000$ level, ($F$ (l, 49) = 25.088, $p$ = .000, partial eta squared = .339). Therefore, it can be interpreted that the use of cooperative mastery learning model had a significant effect on student science achievement in school 3.

The mean comparison for posttest scores in school 3 is illustrated in Figure 3.

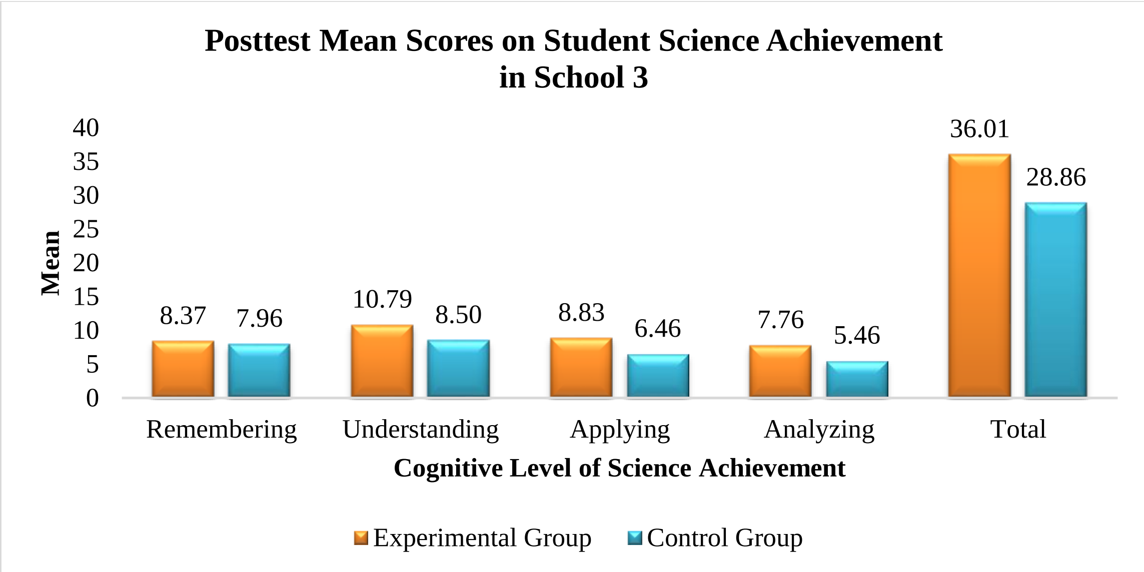


**Figure 3** Comparison of Posttest Mean Scores in School 3

Table 5 shows the analysis of covariance results for student science achievement on posttest in school 4.

**Table 5 Analysis of Covariance Results for Posttest Scores in School 4**

| Level | Group | *N* | Unadjusted *M* | Adjusted *M* | *MD* | *F* | *p* | Partial Eta Squared |
|---|---|---|---|---|---|---|---|---|
| Remembering | Experimental | 27 | 8.33 | 8.34 | -0.04 | .065 | .799 (ns) | .001 |
| | Control | 28 | 8.39 | 8.38 | | | | |
| Understanding | Experimental | 27 | 11.56 | 11.53 | 3.05 | 46.336 | .000*** | .471 |
| | Control | 28 | 8.46 | 8.48 | | | | |
| Applying | Experimental | 27 | 10.19 | 10.18 | 2.75 | 36.191 | .000*** | .410 |
| | Control | 28 | 7.43 | 7.43 | | | | |

| **Level** | **Group** | ***N*** | **Unadjusted *M*** | **Adjusted *M*** | ***MD*** | ***F*** | ***p*** | **Partial Eta Squared** |
|---|---|---|---|---|---|---|---|---|
| Analyzing | Experimental | 27 | 7.22 | 7.21 | 2.03 | 16.508 | .000*** | .241 |
| | Control | 28 | 5.18 | 5.18 | | | | |
| Total | Experimental | 27 | 37.30 | 37.27 | 7.78 | 77.720 | .000*** | .599 |
| | Control | 28 | 29.46 | 29.49 | | | | |

*Note*. ns = not significant

***$p$<.001

As shown in Table 5, the adjusted mean value of the one-way analysis of covariance for the respective levels of school 4 are presented. The results showed that there was no significant difference between the experimental group and the control group for the posttest mean scores of remembering level questions. Therefore, it can be interpreted that the formal instruction could retrieve facts, terms and basic concepts on remembering level questions like cooperative mastery learning model.

However, the posttest mean score of experimental group was significantly higher than those of control group for lower level questions. Therefore, it can be interpreted that cooperative mastery learning model had a significant effect on students' ability to understand facts, ideas and concepts by organizing, comparing, interpreting, giving descriptions, stating the main ideas, and apply acquired knowledge, facts, concepts, techniques and rules in new situations more than those of control group.

There was a significant difference between the posttest mean scores of experimental and control groups for higher level questions. Therefore, it can be interpreted that cooperative mastery learning model had a significant effect on the students' ability to differentiate and organize the facts and concepts in learning science.

The mean comparison for posttest scores in school 4 is illustrated in Figure 4.

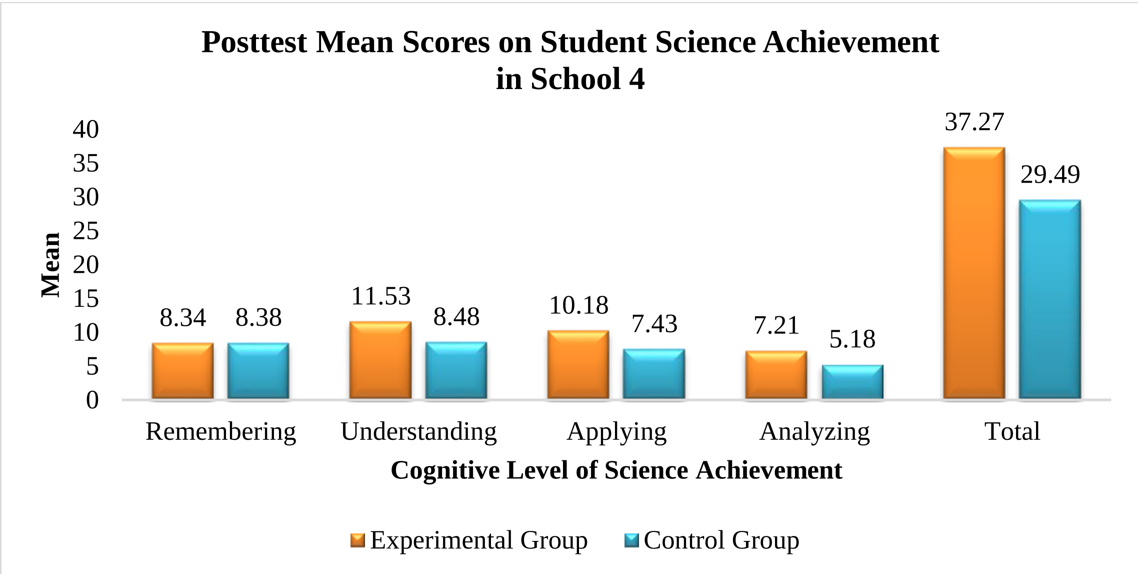


**Figure 4** Comparison of Posttest Mean Scores in School 4

As shown in Table 5, it was found that there was a significant difference between the experimental and control groups for the overall achievement at $p$ < .000 level, ($F$ (l, 52) = 77.720,

$p$ = .000, partial eta squared = .599). Therefore, it can be interpreted that the use of cooperative mastery learning model had a significant effect on student science achievement in school 4.

## Discussion

According to the results from the pretest scores in the selected schools, there was no significant difference between the experimental groups and the control groups. When the pretest scores were considered as a covariate, the one-way analysis of covariance (ANCOVA) results for posttest scores showed that there were no significant differences between the achievement of the experimental groups and the control groups in the remembering level questions in all schools.

However, the results from ANCOVA showed that the experimental groups performed significantly better than the control groups on understanding, applying, and analyzing level questions. Therefore, it can be interpreted that the use of cooperative mastery learning model significantly enhanced the students' science achievement in answering lower level and higher level questions in the selected schools. The result of the study is consistent with other research studies (Keter, Barchok, & Ng'eno, 2014; Altun, 2015; Catherine, WanjaNjagi, & Kamweru, 2021). They showed that students who received cooperative learning, mastery learning and cooperative mastery learning improved overall science achievement than those of the students who did not receive. The result of this study is in accordance with the results of Hussain and Suleman (2016). They found that the students from the experimental group outperformed in the achievement on all levels of cognitive domain: knowledge, comprehension, application, analysis, synthesis, and evaluation. According to the data, this learning model would improve overall science achievement. Therefore, it supports the hypothesis that there is a significant difference in the overall science achievement between middle school students who receive instruction with the cooperative mastery learning model and those who do not receive it.

## Suggestions

**Suggestions for the Middle School Science Teachers:** The effectiveness of cooperative mastery learning largely depends on methodological culture and competencies of teachers. Professional expertise is based on the belief that the performance of a vital function in society requires immense knowledge and specialized skills, which must be acquired through prolonged education and experience (Khin Zaw, 2001b). The teachers encompass the required knowledge for teaching different ages and stages and level–appropriated subject content competency–professional knowledge and understanding. They should know what cooperative learning and mastery learning are and, how to organize the groups and manage them effectively. Moreover, teachers should divide the concepts to be taught into small discrete units and make sure each child master each unit before moving to the next.

**Suggestions for the School Administrators**: One key aspect for pupils to work together cooperatively is to consider the actual physical set-up of the classroom. Well-designed classroom defines learning patterns and supports transitions from one type of activity to another (MacConville & Rae, 2006). Therefore, school administrators should provide a well-designed classroom setting (the right environment) for implementing the cooperative mastery learning model.

## Recommendations

Based on the findings of the study, the following recommendations are made for further researches.

To conduct this study, the sample schools were randomly selected from two regions. Therefore, further study should be carried out in the other states and regions in Myanmar.

The research is administered to Grade 6 students on the content areas: concepts for physics (Force) and biology (Living Things, Cell and Cell Structure, Reproduction). During the short duration, the teachers have to deliver the science concepts as possible as they can. Thus, further studies should be investigated other science concepts.

It is highlighted that concepts in teaching science should be mastered for the improvement and achievement of the receiving the content. Science process skills should be used in taking science activities.

## Conclusion

The main purpose of this study is to investigate the effectiveness of cooperative mastery learning model on student achievement in middle school science teaching. Non-equivalent control group design, one of the quasi-experimental designs, was used in this study. Two research hypotheses were used to investigate the effectiveness of cooperative mastery learning model on student achievement in middle school science teaching. This study showed that the students who received cooperative mastery learning model were significantly better than those who did not receive it in all schools. Thus, this study showed that cooperative mastery learning model could achieve high performance of the students in answering lower and higher level questions.

According to the results of the findings, cooperative mastery learning model is one of the most suitable teaching methods in teaching science at the middle school level. Therefore, it can be concluded that students who receive cooperative mastery learning model had a significant science achievement at the middle school level.

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## References

Altun, S. (2015). The effect of cooperative learning on students' achievement and views on the science and technology course. *International Electronic Journal of Elementary Education, 7* (3), 451-468.

Ambrose, S. A., Bridges, M. W., DiPietro, M., Lovett, M. C. & Norman, M. K., (2010). *How learning works: Seven research-based principles for smart teaching*. USA: Jossey-Bass.

Anderson, L. W. (1975). *Major assumptions of mastery learning*. The annual meeting of the Southeast Psychological Association. Atlanta, Georgia (ERIC Document reproduction Service No. ED150172).

Catherine, K. N., WanjaNjagi, M., & Kamweru, P. K. (2021). Effect of cooperative mastery learning approach on secondary school student's achievement. *IOSR Journal of Research and Method in Education*, *11* (5), 30-37.

Collette, A. T., & Chiappetta, E. L. (1989). *Science instruction in the middle and secondary schools* (2nd ed.). Columbus: Merrill Publishing Company.

Cruickshank, D. R., Jenkins, D. B., & Metcalf, K. K. (2009). *The act of teaching* (5th ed.). New York: Mc Graw Hill.

Deubel, P. (2003). An investigation of behaviorist and cognitive approaches to instructional multimedia design. *Journal of Educational Multimedia and Hypermedia 12* (1), 63-90.

Guskey, T. R. (1990). Cooperative mastery learning strategies. *The Elementary School Journal*, *91* (1), 33-42.

Hussain, I., & Suleman, Q. (2016). Effect of Bloom's mastery learning approach on students' academic achievement in English at secondary level, *Journal of Literature, Language, and Linguistics*, *23*, 35-43.

Jolliffe, W. (2007). *Cooperative learning in the classroom: Putting it into practice*. London: Paul Chapman Publishing.

Joyce, B., & Weil, M. (1980). *Models of teaching* (2nd ed.). New Jersey: Prentice-Hall Inc.

Keter, K. J., Barchok, H. K., & Ng'eno, J. K. (2014). Effects of cooperative mastery learning approach on students' motivation to learn chemistry by gender. *Journal of Education and Science*, *5* (8), 91- 97.

Khin Zaw. (2001a). *Cybernetic analysis of learning theories*. PhD Programme Course Material. Yangon: YIOE.

Khin Zaw. (2001b). *DS6: Theoretical pedagogy (I1): Ethics*. PhD Programme Course Material. Yangon: YIOE.

Killen, R. (2016). *Effective teaching strategies: Lessons from research and practice* (7th ed.) South Melbourne: Cengage Learning Australia.

Kivunja, C. (2015). *Teaching, learning and assessment*. South Melbourne: Oxford University Press.

Lall, M. (2020). *Myanmar's education reforms: A pathway to social justice?* London: UCL Press.

MacConville, R., & Rae, T. (2006). *Teaching peer support for caring and cooperation: A six-step method*. London: Paul Chapman Publishing.