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# THE DRILL AND PRACTICE APPLICATION IN TEACHING SCIENCE FOR LOWER SECONDARY STUDENTS

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***Abstract***

*Teaching and learning science at school determine the academic achievement of lower secondary school students. In this study, the lower secondary students are referred to Form One. This study examines the effectiveness of using drill and practicing (DP) method on the performance and understanding of students in Science subjects on the topic "Cell As a Unit Of Life". Most of Form 1 student could not analyse any practical activities to clarify the learning objectives and its' concept. Without knowing the concept, the students memorized the science facts rather than applying meaningful learning. This weakness causes the students to fail to answer examinations questions and affect their performance.Drill and practicing methods was carried out to examine the students' performance and understanding on the topic.A total of 66 students of the Form One comprises of boy and girl students were selected using purposive random sampling. The sample was categorized as moderate student based on the UPSR (Ujian Penilaian Sekolah Rendah) results. Two-group experimental design is used in this study. The form of this study was chosen because it enable the researchers to collect information from two group The students were divided into experimental group (using drill and practice method) and the control group (using conventional method). The quantitative data collected through pretest, posttest and questionnaire were analysed using SPSS and presented as descriptive and inferential statistics.The analysis shows that the experimental group score a mean of 25.41 (SD = 7.04) (M = 25.41, SE = 0.704) while the control group reported a mean of 22.14 (SD=11), (M = 22.14, SE = 0.420).The experimental group also show better understanding on the cell unit (M = 16, SD = 5.66) compare to control group (M = 8, SD = 4.95). The finding indicate that the students who used the DP*

*method in learning Cell unit shows higher performance achievement and understanding compare to the group who use conventional way of learning.Choosing or applying appropriate teaching methods in teaching process in order to achieve educational excellence shows that drilling and training method is effective in teaching and learning among the lower secondary students*

*Keywords: Science Subject, Animal Topic, Drill and Training Method*

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**Introduction**

Teaching and learning science at school are important in determining the academic achievement of lower secondary school students. The Ministry of Education realise that Malaysia is gearing toward achieving "Vision 2020". Mastering in science knowledge among Malaysians needs to be enhanced from time to time to provide the suitable workforce with the development of the nation.

In this study, the lower secondary students are referred to Form One. Since most of the Form One students are those who finish the standard six UPSR (Ujian Penilian Sekolah Rendah), it is a relevant for them to learn science subject as a compulsory subject in secondary school. The Form 1 students needs to be deeply emphasized to develop their knowledge in science subject. A well planned learning activities in science need to implement to all the students in the class to develop critical, analytical and creative thinking skills. The Curriculum of Science at the school level is designed to produce students who are knowledgeable and skilled in science, build thinking skills and enable them to solve problems and make decisions in their daily lives (Ministry of Education Malaysia, 2002).

Gilbert and Watts (1983) indicated that learning science makes the students to participate and practice language in a meaningful contexts. Some Form One students had a perception that learning science would be a difficult as they have to involve in practical and have to change the learning techniques (Kamarudin Hj. Husin,1994). Therefore,to improve student's understanding, teachers' uses a drill and practice (D&P) method to build understanding and to encourage students to become active participation in the activities plan by the science teacher.

Science curriculum for Secondary Schools is designed to produce knowledgeable and skilled students in Science subject. It enable them to solve problems and make decisions in their daily lives (Ministry of Education Malaysia: 2002). Therefore, teachers need to develop strategies using the drill and practicing method to produce excellent students from primary to secondary school.

**Statement of Problem**

In Malaysian Science syllabus, Form 1 students who learn science have to do practical hands on and minds on to understand the science concept. The application for the practical works involved two domains; observation and ideas. In the topic of "Cell As a Unit Of Life", students are required to observe the basic unit of living things as stated in Chapter 2. During the activities, the students have to develop ideas to do practical activities. Most of Form 1 student could not analyse any practical activities to clarify the learning objectives. Before entering Form 1or lower secondary, the students were not taught practical activities in this subject when they were in standard six. Thus, the Form 1 students assume that science is difficult subject. They could not carry out any routine procedures involved in practical activities. Without knowing the concept, the students

memorized the science facts rather than applying meaningful learning.This weakness causes the students to fail to answer examinations questions and affect their performance. Robin and Liesel (2009) explained that conceptual learning, principles, and understanding in Science are not easy to master by students and this makes students less interested and motivated to learn. Ian Abraham (2009) mentioned that students who are not interested in Science will feel that Science is a burdensome subject. He revealed that the science teachers need a different way of teaching and learning science in order.

Hence, the drill and practicing (DP) method is chosen for this study, as it can actively build knowledge based on existing knowledge and students experience. Drilling and practicing is not a new method in classroom.It has been used indirectly in the class by teachers in their teaching. Tica (2004) mentioned that teachers gives exercises and guidance to make student to understand the topic they are teaching. Tica (2004) also revealed that by using drill and practicing, the students will be good in on the subject and improve the way of learning. DP method involve repetition.With repetition, students can gain proficiency in the subject they learn (Syed Agil and Omar, 2007). The science teachers need only to encourage the students to ask and to solve questions they may have while they practical activities. According to Singler and Saam (2006), in the process of constructing students' ideas in their activities, the students will be become interest in their subject. The DP method is chosen for this study to encourage students to be actively build knowledge based on existing knowledge and experience in science subject.

**Study Objectives**

The purpose of this study is to evaluate the effectiveness of DP methods on students' performance on the animal and plant cell topic and identify the students' understanding on the general structure of animal cell and practical observation using DP. This study used two group experimental research design to obtain the result of the following research questions. 1) Is there any significant different in students' performance on the animal and plant cell topic between experimental and control group? 2) Is there any significant different in students' understanding on the general structure of animal cell and practical observation using DP between experimental and control group?

**Theoretical Framework**

According to Joyce (2009) learning and practicing involved identifiable behaviour that explain the behaviour in explicit manner. This is a principles of behaviourism (Teori Thorndike). Learning science using drill and practise develop a positive behaviour.The students will have a learning goal to enable them to plan, design meta cognitive rules in their thinking and learning process. This behavioral model ensure the behaviour modification in the teaching of Science using drill and practice method. Through group discussion and collaboration, learner are trained to develop group management skill such as trust building, leadership and decision making. Learning in group enable student to practice together and motivate them to learn.

**Literature Review**

Luik (2007) justified in her research that drill and practice method in teaching involved simple pair-associate learning to overcome problem. Azizi Yahya and Chu Siew Pang (2010) identifying drilling and practicing method emphasizes repeat activity of the facts or the efficiency gained. The purpose of this drill and practice method is to achieve the degree of mastering the skills of the

students while ensuring their immortality. Doing exercise as frequent as possible helps the student to use a technique of thoughtless repetition and to remember what they have studied (Mohan and Balan, 2005). Although Mohan and Balan (2005) used mind map in their research but they have used drill and practice method make the student become alert about any changes in learning subject.

Amos and Boohan (2002) explained that there are many strategies can be used when the teacher wants to teach science. Student who begin secondary school have already have knowledge and ideas about many aspects of the natural world from their experiences both in primary classes and outside school. This collection of support materials is designed especially for teachers of the early years in secondary school to give guidance using any suitable method such drill and practice (Mohd Najid dan Nor Shafrin, 2008),. Students are likely to use these ideas to help themselves to make sense of their experiences in science lessons. Dooley.et.al. (2014) in their research mentioned that teachers who uphold constructivism beliefs and apply drill and practice method are more likely to detect student alternative conceptions and potentially to do effective teaching strategies. This explains that to solve the problem of students less interested in Science subjects as they cannot relate science knowledge to their lives, should actively participate in learning Science subject by using drill and practicing (Wan Zah Wan Ali, Ramlah Hamzah, Rosini Abu, 2005). This method enable students to understand and master the concepts, principles or procedures that are more effective. Improving weak subject using drill and practicing is suitable because after learning a concept or as practicing, weak students could understand the fact clearly (Zaidun and Haslina, 2000).Therefore, good drills and practicing need to meet the requirement of learning objectives. Teachers can carry out convalescence activities for oral problems such as references to their pupils in the classroom through drills. Drill and practicing is carried out repeatedly in the aspects of oral proficiency to be taught.

**Methodology**

This study was conducted at a School Z in Kulim Kedah. The purpose of this study is to identify the students' understanding on the general structure of animal cell and practical observation using DP and to evaluate the effectiveness of DP methods on students' performance on the animal and plant cell topic. The drilling and practicing method is the independent variable while the students' achievement is the dependent variable. Students are required to observe the basic unit of living things. Pretest, post-test and questionnaire were used as instruments.

A total of 66 students of the Form One comprises of boy and girl students were selected using purposive random sampling. The sample was categorized as moderate student based on the UPSR (Ujian Penilaian Sekolah Rendah) results when they were in standard six. Form One students are selected because they do not face public exams. In addition, at this stage most titles require basic knowledge of science. The total of 33 students from each class will be divided into two groups namely the control group and the experimental group.

Two-group experimental design design is used in this study. The form of this study was chosen because it enable the researchers to collect information from two group (one class as the experimental group that uses drill and practice methodology and the other class as control group studies in conventional way) . In the drill and practicing method, the researchers evaluate the

effectiveness of the students on this learning method and see how far the students understand Science topic and improve their performance in science subjects.

**Research Procedures**

The students' respondents will be asked to complete the information form before the pretest on the first week of teaching the cell unit. The informational form is intended to obtain student views on science subjects. After completing the information form, pretest is given. The pretest answers were analyzed to identify the students' understanding in both group (experimental and control group). In the second week, students in the experimental group will received drill and practicing method in teaching and learning processes while conventional teaching will be used in control groups. Students from both groups will be taught by different teacher. On the third week, students from control and experimental group were given post-test. Although the test was given from the same unit topic, the item created for the post-test was slightly different from the pretest. The post-test was given to identifying if there is any increased understanding based on analytical report through the drill and practicing method presented. The students gave their opinions on learning through the practicing methods through the questionnaires provided.

**Data Analysis**

The quantitative data collected through pretest, posttest and questionnaire were analysed using SPSS version 20 and presented as descriptive and inferential statistics. The number of students who used the drill and practice in science subject were expressed in descriptive statistic score table. The differences of students' performance after using the drill and practice was shown in mean score value. A t-test was applied to investigate whether there are significant differences in their performance. For this purpose, an
alpha value of .05 was used as the significant level.

**Findings**

After the calculating of the pretest and post test score for each participant, independent t-test using *Statistical Package for the Social Science (SPSS)* software was conducted to test the proposed research question. Research question 1: Is there any significant different in students' performance on the animal and plant cell topic between experimental and control group?

For the first research question, data that has been collected through pretest and post-test shows the scoring for both experimental group and control group. Pretest scores were obtained before students were exposed to teaching and learning using drills while post test scores were collected after students engaged in teaching and learning using the drills method for cell unit. The given test is from the same unit topic but there are slight different between the pretest and posttest.

Table 1 shows the pretest analysis of pretest and postal tests for the experimental groups and control groups. There was a difference between the two groups after the pretest. Respondents' decisions increased after being held in the post exams. The findings shows that students students' performance on the animal and plant cell topic between experimental and control group differences in their pretest and post-test score. From Table 1, experimental groups show that the observation can be demonstrated that the achievement of respondents in the experimental group is increasing. The information from the table clearly states that training in the learning process can have a positive effect on the students compared to conventional methods. Table 4.3.3 also shows that

among the studying group, those in experimental group score a mean of 25.41 (SD = 7.04) while the control group reported a mean of 22.14 (SD=11). This shows that drill and training method has help the students to improve their learning achievement in Science compare to the students who do not use drill and training method.

**Table 1: Analysis of Pretest and Post-Test Score on The General Structure of Animal Cell and Practical Observation Topic**

| Scores | Experimental Group | | | | Control Group | | | |
|---|---|---|---|---|---|---|---|---|
| | Pretest | % | Post-test | % | Pretest | % | Post-test | % |
| **0-40** | **6** | **18** | **0** | **0** | **13** | **39** | **13** | **39** |
| **41- 70** | **26** | **79** | **20** | **61** | **17** | **52** | **18** | **54** |
| **71-100** | **1** | **3** | **13** | **39** | **3** | **9** | **2** | **6** |
| | **33** | **100** | **33** | **100** | **33** | **100** | **33** | **100** |

**Table 2: Independent t-Test Result for Research Question 1**

| | **group** | **N** | **Mean** | **Std. Deviation** | **t-value** | **p-value** |
|---|---|---|---|---|---|---|
| Post-test for understanding | Control | 33.000 | 22.14 | 11.26 | 3.683 | 0.000** |
| | Treatment | 33.000 | 25.41 | 7.04 | | |

Note: ** *denotes significance at p < 0.05 level*

Table 2 shows that students in treatment group shows higher performance achievement level (M = 25.41, SE = 0.704) than to those in control group (M = 22.14, SE = 0.420). This difference was significant *t* =3.683, p < .05 which supports RQ1.

**Table 3: Experimental and Control Group Understanding on Cell Unit**

| | **Experimental group** | | | | **Control Group** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Questionnaire (based on likert scale score 4-5)** | **Total score** | **%** | **Min** | **Std dev** | **Total score** | **%** | **Min** | **Std dev** | **p-v** |
| Science questions given are understandable | 75 | 25 | | | 45 | 15 | | | |
| Understand about animal | 94 | 31 | 16 | 5.66 | 82 | 27 | 8 | 4.95 | 0.004** |
| Able to understand the characteristic of nucleus | 64 | 21 | | | 33 | 11 | | | |
| Know the difference of cell wall | 52 | 17 | | | 36 | 11 | | | |

| | | | | |
|---|---|---|---|---|
| Identify multicellular organs | 48 | 16 | 30 | 9 |
| Could explain about unicellular organism | 64 | 21 | 58 | 19 |
| Know the difference of animal kingdom | 94 | 31 | 88 | 29 |
| Understand the difference between Pleurococcus , Euglena, Chlamydomonas and yeast | 52 | 17 | 24 | 8 |

Note: ** *denotes significance at p < 0.05 level*

Table 3 shows that there are eight questionnaires given to the sample. All the question given were to indicate the level of understanding on Cell unit among experimental group and control group. The experimental group show better understanding on the cell unit (M = 16, SD = 5.66) compare to control group (M = 8, SD = 4.95). This difference was significant $t$ =0.004, p < .05 which supports RQ2.

**Discussion**

The finding indicate that the students who used the DP method in learning Cell unit shows higher performance achievement compare to the group who use conventional way of learning. Learning about cell need an understanding.With a limited time of learning (40 minutes of a period) in classroom, students have to know the terms and the application of the cell. The DP method has contribute to the development of students thinking skills and an understanding of cell in animal and plant. Thus, the experimental who engage in collaborative learning and practices could perform well in their posttest. The research finding also proven through pretest and post-test analysis conducted, students performance in cell unit are good and shows improvement after using DP method. This finding is in line with the pre-test and pilot testing did by Muda et.al (2017) using Exploratory Factor Analysis (EFA). The EFA provides multidimensional of measures for teaching and learning performance and the scale alpha coefficient (Cronbach's alpha) in the range of 0.894 to 0.904. Their research also shows that using teaching and learning method proof that students could improve their performance in higher education. Xu Yong et.al (2017) revealed that using suitable project based learning improve native learners. During the test, the teacher made sure there is no impersonation occurred. The difficulty level of the two tests is that almost the questions look similar but it not the same. Based on the total score from the questionnaire given on eight aspect for understanding of the cell unit, the experimental group shows good feedback. For example to understand the difference between Pleurococcus , Euglena, Chlamydomonas and yeast, the experimental group obtain 17% compare to control group which shows only 8%. The DP method has helps the students to understand each term and function of the cell.The student could identify the difference between the cells and enable them answer the posttest better compare to the control group.

**Conclusion**

Choosing or applying appropriate teaching methods in teaching process in order to achieve educational excellence shows that drilling and training method is effective in teaching and

learning. The practice of exercising plays an impressive role in teaching and learning.Based on the data and findings that have been made, it is proofed that the drill and training practice method is a more effective method of teaching and learning than traditional methods. Although respondents consist of gender, family economic status and the achievement of different mid-year exams, these characteristics do not influence the mastery of students when studying this subject.

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