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Action Research Series

Message from Director

Welcome to the inaugural volume of the action research series of Phnom Penh Teacher Education. It is my great pleasure and honor to celebrate the launch of this volume as a starting point of the research publication at PTEC. Our action research series, which constitutes the first attempt to promote a sharing of knowledge, mainly focuses on teaching and learning in different disciplines as a means to share knowledge with student teachers and teacher educators not only in PTEC but also in other educational institutions.

As a teacher education institution with the vision to become the leading teacher education institution in the 21st century, PTEC aims to promote a research culture to contribute to the quality improvement of teaching and learning within the institution, which is one of our core missions besides the provision of quality teacher education and community service. Notably, raising quality and relevance of teaching and learning through action research has become one of our priorities to ensure quality education for our student teachers. This is also certainly in line with the education reform of the Ministry of Education, Youth and Sport, whereby research has been emphasized in educational institutions to ensure quality education.

I would like to take this opportunity to congratulate the authors on their achievements in the first publication of our action research series. I would like to express my appreciation to the active cooperation and technical support from the Japanese professors and coordinators in the JICA project of Establishing Foundations of Teacher Education College (E-TEC). My sincere thanks will go to the authors, PTEC management team, and Department of Educational Research and Library to make the publication of this series happen.

Last but not least, PTEC is committed to an annual publication of the action research series so that an academic community can be initially created and sustainably developed, as a means to contribute to the quality improvement of education in Cambodia.

Set Seng, Ph.D.
Director
Phnom Penh Teacher Education College

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Using Role Play to Improve Student Teachers' Competence in Speaking English

SREY Soksaphat, SOPHORN Sopheak, and TEP Phirun

Department of Languages and Department of Educational Research and Library

ABSTRACT

This action research was conducted to improve the students' speaking skill, to see whether implementing role-play in teaching is effective. The main problem of this action research is the lack of the competence in speaking of year-one student teachers (F1) of primary education (12+4) at Phnom Penh Teacher Education College (PTEC) in the academic year 2018/2019.

The stages of this action research consist of planning, acting, observing, and reflecting. To collect the data for this research, the writer conducted a class for implementing the technique of role-play with the use of a test. Questionnaires, interviews, and observation were used as the methods of data collection in the study. To see how well the student teachers speak English, using role-play, the writer conducted two cycles of actions, each of which consists of two meetings.

At the end of this research, the result shows that the student teachers have improved their speaking competence after role play has been used among the student teachers. Meanwhile, there are some strengths and weaknesses identified in using the technique. Using role play, the student teachers could build up their motivation and confident in learning speaking, which has also enabled them to improve both their vocabulary and grammatical structure.

According to the results, the writer wants to suggest some ideas to English teachers. Before conducting a speaking class, it is important for the teachers to choose the most suitable way to improve the students' motivation in learning speaking, for it is the key in teaching-learning success. Moreover, it is vital to make an interesting and enjoyable atmosphere in teaching and learning process to improve the students' speaking competence.

I. Introduction

1. Background of Study

The success of learning English is to be able to communicate in English, using both speaking and writing skills. Therefore, it is compulsory for the students of second and foreign language to master their English proficiency. Richards and Rodgers (1990) said, “The mastery of speaking skills in English is a priority for many second and foreign language learners. Learners consequently often evaluate their success in language learning as well as the effectiveness of English course on the basis of how well they feel they have improved in their spoken language proficiency”.

The two common goals of English teachers are to teach the students to be successful in their examination or to teach them to communicate well in English. The target mainly focuses on getting a good result from the writing tests because the measurement of how good the students are with English is determined by the result of their examination. Therefore, speaking skills seem to be of less concern compared with other skills.

In Cambodia, teaching and learning English speaking is very difficult because it is a foreign language. Not only the students but also the teachers have very little chance of practicing English. Usually, we practice speaking English mostly in classrooms and only when the teachers conduct speaking activities for the students. As a result, speaking skill has remained a critical problem for Cambodian students, particularly, the student teachers at PTEC.

Having so many student teachers who still have very low speaking competence, the writer decided to conduct action research in order to implement new techniques to improve student teachers’ motivation and confidence to learn English speaking eagerly.

There are some problems found with teaching and learning speaking such as the cause of their native language on English language, the lack of motivation and confidence in using English language in everyday conversation, and many other factors, namely the students’ interest, materials, and the techniques in teaching.

Role play is a very interesting and important technique in teaching speaking since it provides the students the practice of speaking with authentic situations that they can use the language in different social roles in their everyday conversation. Moreover, the students can

build up their confidence in speaking and use the knowledge they have gained in communication.

Based on the above background of study, the writer is interested in conducting action research in order to improve student teachers' motivation and confidence in speaking English at PTEC and in daily communication. Therefore, the researcher would like to implement the method of role play with the student teachers of Primary Education (class F1) of PTEC academic year 2018/2019.

2. Problem Statements

1. Can implementing Role-Play improve the speaking confidence of student teachers of Primary Education at Phnom Penh Teacher Education College?
2. How effective does Role-Play improve the speaking competence of the student teachers of Primary Education at Phnom Penh Teacher Education College?

3. The Objective of the Research

According to the problem statements above, the researcher has two main objectives to find out:

1. Main Objective

To find out whether using Role-Play in teaching English speaking improves the speaking competence of the student teachers of Primary Education at Phnom Penh Teacher Education College.

2. Specific Objectives:
   a. To find out whether implementing Role-Play improves the speaking competence of the student teachers of Primary Education at Phnom Penh Teacher Education College.
   b. To find out how effective Role-Play improves the speaking competence of the student teachers of Primary Education at Phnom Penh Teacher Education College.

II. Research Methods

The subject of this research was one group of the student teachers (Primary Education). There are four methods used to collect data in this research namely a classroom observation or interview, pre-test and post-test design, and documentation. These were designed in order to find out the effectiveness of Role-Play toward the student teachers' speaking competence in learning English conversation. The procedure of this research included planning, preparation, implanting, observation, and reflection.

III. Finding and Discussion

The findings of the research were based on the results of the data collected from the research methods used in this action research. After conducting a short observation and interview with the student teachers about teaching and learning process of speaking, there were some problems in teaching and learning English speaking. First, the teacher tended to teach text in teaching speaking. Second, the teacher often asked the students to repeat the dialogues in practicing conversation. Third, he often assessed the students by asking them to answer questions related to the written topic.

According to the activities used by the teacher above, there are weaknesses can be found, namely the lack of time for rehearsing, inappropriate assessment to the speaking skill, and loss of the students' interest in learning speaking due to the routine of learning process used by the teacher.

The implementation of the role-play technique in teaching speaking was through two cycles and there are two meetings in each cycle. In the first cycle of action, the writer introduced the student teachers about the objectives of using role-play in teaching speaking in the classroom, and then he started to apply the technique of role-play in teaching speaking for two meetings. In each meeting, the writer used the same procedure which consisted of planning the activities, main activities, and closing the activities. After completing the first cycle, the writer made some changes based on the result of the first cycle. In the second cycle of action, the writer started the class with the introduction of new knowledge and modelling for the students. In this part, the student teachers practiced their speaking through two meetings on two different topics of role-play. By the end of the two cycles of action, the writer can see the development of student teachers' competence in speaking English through the use of role-play in their

learning. The result of the second cycle has shown that the student teacher improved not only their speaking competence but also confidence in speaking as well.

In general, the student teachers' performance improved by using role-play technique based on the score they got during each cycle of action. The method of teaching is really the factor that conditions the result of learning.

IV. Conclusion

Based on the result from each cycle, teaching English speaking using role-play technique to the student teachers of Primary Education at Phnom Penh Teacher Education College was proved effective. The competence, confidence, and motivation of the student teachers were improved from the first cycle to the second cycle of action.

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Study on Effective Teaching Method to Minimize Misconception on the Characteristics of Insects

NAK Pechleakhna, HOUR Khim, and SRUN Sienghour

Department of Sciences

ABSTRACT

This study aims to identify and eliminate student teachers' misunderstanding about insects, and to compare the effectiveness between the Inquiry-Based Learning approach (IBL) and Traditional Method (TM). Forty-eight student teachers of the first-year bachelor's degree program studying in the 2nd semester of academic year 2018-2019 at the Phnom Penh Teacher Education College were selected randomly in this study. The cohorts were categorized similarly into two groups based on their cognitive ability. One group was taught by using TM that is mostly based on reading secondary textbooks, while the other group was taught by using IBL approach. Pre-test was first used to do sampling, and then post-test and questionnaire were administered to compare the effectiveness of the two methods. The misunderstanding about insects was found mainly concerned with the number of legs and body segments. The result of post-test has showed that there was no significant deference between the two groups. Although misunderstanding about the common characteristics of insects remained in each group after they have been taught, the percentage in TM group was found higher than that in IBL group. On the other hand, scientific skills among IBL group were significantly performed better than TM group. The study also found the correlation between misunderstanding and test scores. Therefore, it can be concluded that IBL is one of the most effective teaching methods to minimize misunderstanding about the common characteristic of insects and to improve science learning skills.

I. Introduction

1. Background of the study

Inquiry-based learning (IBL) is a form of active learning that starts by posing problems rather than simply presenting established facts or portraying a smooth path to knowledge. The process is often assisted by a facilitator. Inquirers will identify the research issues and questions to develop their knowledge or solutions. The inquiry-based learning approach/method has been introducing by STEPSAM2 under the JICA project in Cambodia since 2009 and has been later transferred to pre-service and in-service teachers by NIE science trainers. IBL activities begin with a question followed by investigating solutions, creating new knowledge as information is gathered and understood, discussing discoveries and experiences, and reflecting on new-found knowledge (John, 2006). With IBL, it is important for the student to reach his or her own conclusions through the question-and-answer process: the lesson begins with questions rather than answers and places the focus of learning on the student (Goldman et al., 2010). Inquiry-based teaching challenges students to interactively learn about science inside and outside of school, and self-regulate their behaviour and thinking across weeks. Inquiry-based teaching also allows teachers to develop new content knowledge, pedagogical techniques, approaches to assessment, and classroom management strategies.

However, in order for IBL techniques to be effective in classrooms, teachers need adequate professional development in inquiry and technology. These all involve higher-order thinking and require problem solving, which are skills necessary for 21st century learners (British Columbia Ministry of Education, 2013). Due to time constraints and various factors, these ideas often go unshared and remain confined to the individual teacher's classroom. As we have been teaching pre-service teacher training program for many years, we are trying to promote student-centred approach using IBL in our instructions.

However, we have become aware that some student teachers understand the concept of the lessons well while some others still have some misconceptions. For instance, in biology subject, some students misunderstand that small creatures living in the soil are insects such as spider, scorpion, millipede, and pill bug as well. Could IBL be a helpful method to minimize students' misconception compared to traditional teaching method? How is it effective?

To improve our teaching method, we decide to initiate an action research project. The research topic is an effective teaching method to minimize misconception about the characteristics of insects for pre-service lower secondary teachers in TECs. We expected that using IBL leads to minimize misunderstandings after giving a lesson of "Insect Characteristics" and to enhance science process skills much better than using traditional method.

2. Study Objective

This study aims to identify and eliminate student teachers' misunderstanding about the common characteristics of insects, and to compare the effectiveness between the Inquiry-Based Learning approach (IBL) and Traditional Method (TM). We verified the effectiveness of the method by implementing it in PTEC's biology lesson.

II. Research methods

1. Data collection methods

In order to ensure that this study is as rigorous as possible, the data was collected using tools as follows. We first used pre-test (See appendix 1) to test forty-eight student teachers of the first-year bachelor degree program studying in 2nd semester of academic year 2018-2019 at the Phnom Penh Teacher Education College. The pre-test was used to estimate their ideas on the common characteristics of insects and figure out how much their misunderstanding is. The

pre-test contained two parts_ part I had 2 questions while part II had 3 questions. The following questions were in the test.

Pre-test part I:

Q1. Draw the legs of insect on the variety body shapes of insect diagrams.

Q2. Label the body parts of insect.

Pre-test part II:

Q1. Separate some animals (A-R) illustrated in the table as insects and non-insects.

Q2. Choose only 3 insects that mention in the table above, then observe them carefully and fill the data table about their visible characteristics.

Q3. Define the word “Insect”.

After the pre-test was checked, the cohorts were categorized similarly into two groups based on their cognitive ability (pre-test score’s average: 47.29 vs 47.25). Subsequently, we implemented a lesson to verify the effectiveness of the teaching method devised. One group was taught by using TM that mostly based on reading secondary textbooks without any real observation, while the other group was taught using IBL approach by observing the real insects collected from the institute’s garden to examine and identify their common characteristics.

Pre-test was first used to do sampling, and then post-test was administered to collect data to compare the effectiveness of both methods based on points gained in question items completed before and after the practice. Lastly, all the groups completed the questionnaire (See appendix 2) that consists of two parts. Part I is comprised of 24 questions while part II contained 10 questions. Part I was used to collect data related to the satisfaction on teaching method while

part II was used to check the achievement of learning outcome. The questionnaire sought answers to each of the questions using the following five conditions except for part II from question 5 to 10: "1. Not applicable," "2. Not really applicable," "3. Neither applicable," "4. Somewhat applicable," "5. Applicable." For question 5 to 10 in part II are multiple choice to make sure that all the insect characteristics are clearly known.

2. Data Analysis

We analysed data by using SPSS program. In order to compare pre-post-tests' mean score of both groups, we use ANOVA test. Correlation was checked between post-test and questionnaire. Crosstabs was also used to find out the level of misunderstandings after the teaching methods were applied.

III. Results

The first objective of this study was to figure out and eliminate student teachers' misunderstanding about the common characteristics of insects. The results are shown in Figure 1 below.

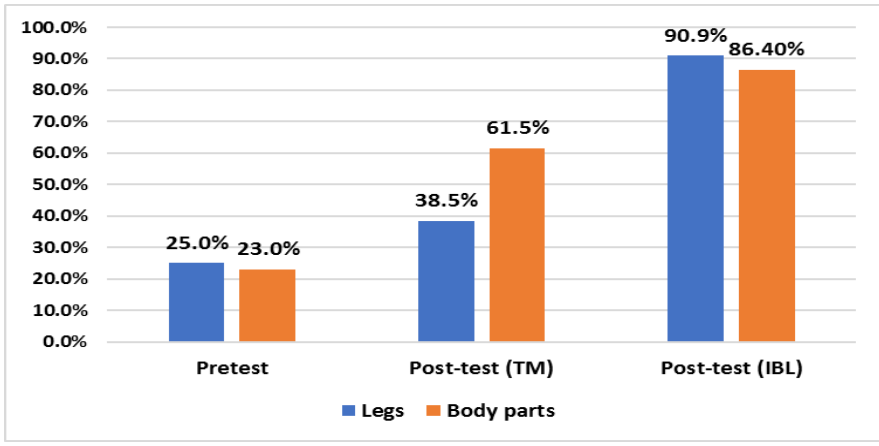
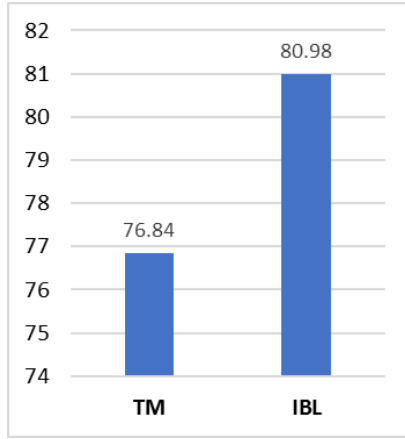


Figure 1: Frequency of correct answer on the common characteristics of insects.

Based on pre-test analysis, in both groups only 25% of students thought that insects have 6 legs while only 23% thought that insect body parts are divided into three parts which are head, thorax, and abdomen. The result showed that there was a high percentage of misunderstanding on the common characteristics of insects, mainly the number of legs and body segments. Although misunderstanding remained in each group, the percentage in TM group was still higher (legs: 61.5% vs 9.1%, body parts: 38.5% vs 13.6%) with less improvement in scientific skills.

The second objective of this study was to compare the effectiveness between the Inquiry-Based Learning approach (IBL) and Traditional Method (TM). The results are shown in Figure 2 below.



**** P>0.05***

Figure 2: Mean of post-test score between TM group and IBL group.

The result showed that there was no significant difference in effectiveness between the two teaching methods (Mean score:76.84 vs 80.98, P>0.05). Besides the analysis of post-test, the result from the questionnaire in Table 1 showed that concept understanding in TM group

was lower than IBL group (Likert scaled: 3.58 vs 4.14, P<0.05). This research also found that the scientific skill improvement in TM group is lower than IBL group (Likert scaled: 3.00 vs 4.36, P<0.001).

Table 1	TM Group	IBL Group	P-Value
Q13 (figure out mistake and misunderstanding)	3.58	4.14	P<0.05
Q16 (the absorption of scientific knowledge)	3.00	4.36	P<0.001

Table1: Questionnaire Analysis on concept understanding and scientific skill improvement

Moreover, the result from questionnaire in Table 2 showed that the satisfaction on teaching methodology in TM group was lower than IBL group (Likert scaled: 3.53 vs 4.13, P<0.001) while the achievement of learning outcome in TM group was also lower than IBL group (Likert scaled: 3.88 vs 4.36, P<0.001). These results showed positive effect on IBL group respectively.

Table 2	TM Group	IBL Group	P-Value
Part I: Satisfaction on teaching methodology	3.53	4.13	P<0.001
Part II: Achievement of learning outcome	3.88	4.36	P<0.05

Table 2: Questionnaire Analysis about Satisfaction on Teaching methodology and Achievement of LO

Figure 3 shows the satisfaction on teaching methodology got from the questionnaires done with both groups. The result depicts teacher students with the IBL methodology application has much higher motivation, more active, and more scientific skill participation compared with TM. More interestingly, IBL could help student teachers to figure out their mistake and misunderstanding on the concept a lot more than TM.

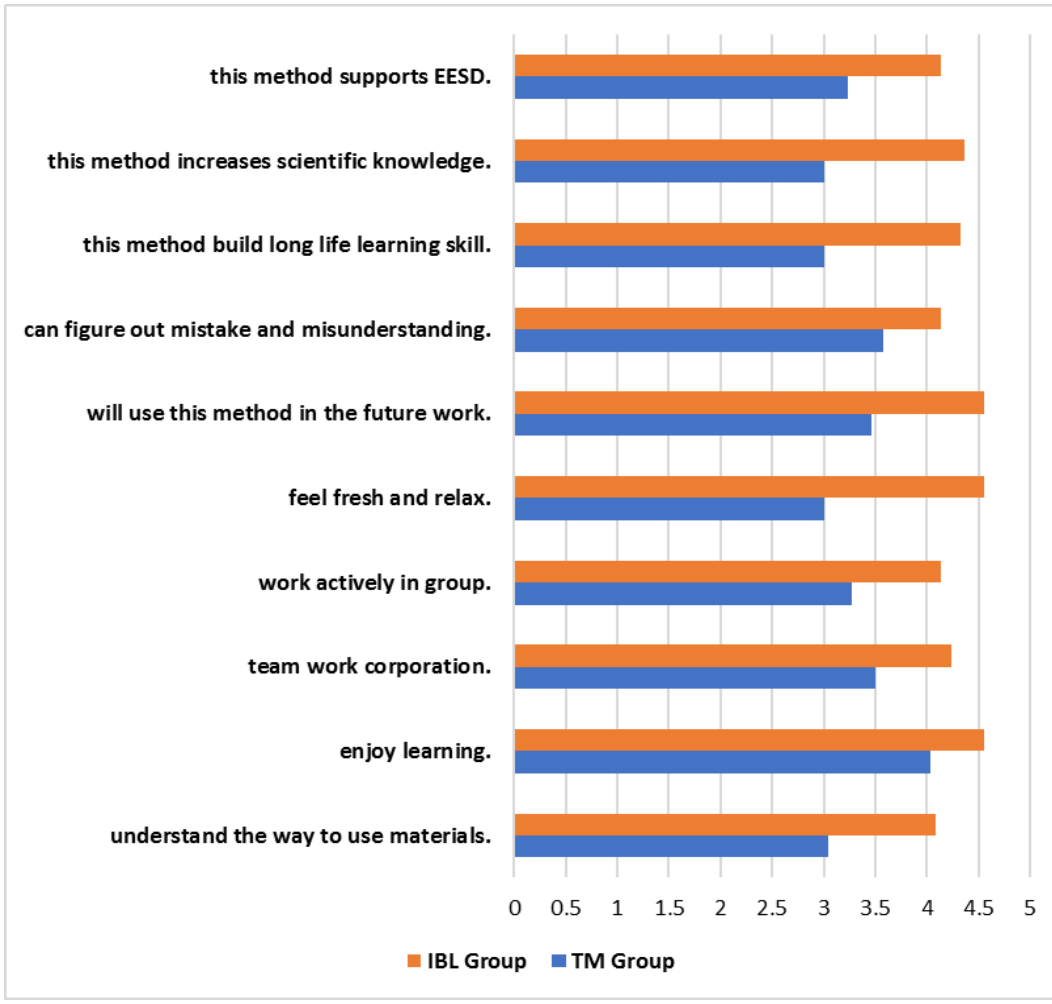


Figure3: Satisfaction on teaching methodology between TM and IBL groups.

Figure 4 illustrates the comparison results of IBL and TM groups in percentage after class conducting on the understanding of the common characteristics of insects.

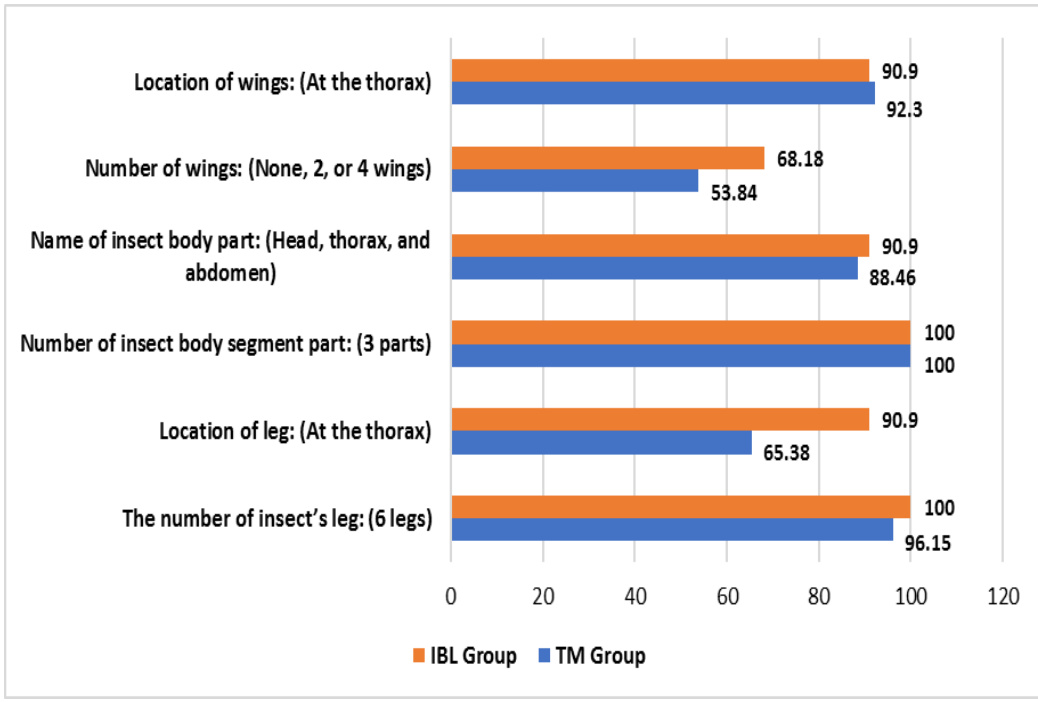


Figure 4: Percentage of correction answer on the common characteristics of insects

From figure 4, the results have shown that both groups were very clear that insect body segment is divided into 3 parts. However, IBL group got higher score on other common characteristics of insects compared with the TM group such as the names of body parts (90.9 vs 88.46), the number of legs (100 vs 96.15), the location of legs (90.9 vs 65.38) on the body part. Therefore, IBL is more effective in the target group.

On the other hand, the analysis on correlation between questionnaire and post-test has confirmed that the students could minimize misunderstanding if they had found their mistake and misunderstanding on the concept ($r = .45$, $P<0.01$) and tended to get better score in post-test ($r = .47$, $P<0.01$). Based on the result, we can conclude that the IBL is one of the most effective teaching methods to minimize misunderstanding on the common characteristic of insects compared to the traditional teaching method. Furthermore, IBL could be used to improve the scientific learning skills.

IV. Discussion and Conclusion

The objectives of this study were to identify student teachers' misunderstanding about the common characteristics of insects; to eliminate misunderstandings by applying proper teaching method; and to evaluate the effectiveness between the Inquiry-Based Learning approach (IBL) and Traditional Method (TM).

Although misunderstanding of the common characteristics of insects, mainly the number of legs and body segments, remained in each group, the percentage in TM group was still higher (legs: 61.5% vs 9.1%, body parts: 38.5% vs 13.6%) with less improvement in scientific skills.

Applying IBL teaching methods with real observation was expected to eliminate student misconception better than the TM. Both methods helped improve students' misunderstanding after teaching, however, there was no significant difference in effectiveness bewteen the two teaching methods (Mean score:76.84 vs 80.98, $P>0.05$). This might happen because the TM also helped students think critically, using textbook through discussion, just without real observation or experiment like the IBL.

The analysis of correlation between questionnaire and post-test revealed that the students could minimize misunderstanding if they had found their mistake and misunderstanding on the concept ($r = .45$, $P<0.01$) and seemed to get better score in post-test ($r = .47$, $P<0.01$). The recent study also proved that the scientific skill improvement in TM group was lower than that in IBL group (Likert scaled: 3.00 vs 4.36, $P<0.001$).

Therefore, it can be concluded that the IBL is one of the most effective teaching methods to minimize misunderstanding on the common characteristics of insects compared to the traditional teaching method. Furthermore, IBL could be used to improve the scientific learning skill.

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Project-Based Learning (PBL) in Improving Students' Learning Outcome on Rock Identification and Classification

KONG Sam Ol, KIM Boryphal, and SRIENG Kimsron

Department of Sciences

ABSTRACT

The concept of identification and classification of rock in Earth Science Subject seems to pose many problems to students like other science subjects. Though, the topic is important for understanding of the basic information in their routine. Project-Based Learning (PBL) technique has been successfully used as an instructional technique in many countries to improve students' academic achievement and positive attitude development among students in science practical in many subjects. Therefore, the study investigated the influence of PBL technique on achievement of student-teachers in identification and classification of rock among student-teachers in Phnom Penh Teacher Education College (PTEC). TIMSS Test for Achievement test and Students' Attitude Questionnaires were designed as studied tools. OQIQI method was used as a material recorded in the period of project implementation. Control and experimental group of students were chosen with the total of 49 students for the first-year student-teachers (24 are from Biology class and 25 are from Physic class). Paired-Samples T-Test was employed in data analysis with SPSS. The study revealed that PBL technique enabled students' improvement in academic achievement as well as developing positive attitude towards identification and classification of rock. The study recommends to the teacher training programs to adopt PBL method among other student-centred instructional techniques for teaching of practical oriented concepts like Identification and Classification of Rock.

I. INTRODUCTION

In the hunt for things happening, science plays a very important role by doing research, experiment, and try again and again (trial and error). The results, sometimes, fails and sometimes succeeds, but those added to human knowledge where the modern world today has been changed largely due to science. Hence, methods of teaching should be considered in applying to classrooms. Project Based Learning (PBL) is one of outstanding methods which is introduced by many educational experts. PBL is based on a systematic teaching technique that is integrated with extended inquiry process, critical thinking, problem solving, team based, and so on which benefit both students and teachers. It is one of the best methods which develop broad learning capabilities among students and it promotes students' interest in science and it can improve students' science content understanding.

PBL method was used to instruct first year student-teachers during the second semester in the concept of identification and classification of rocks. This is a crucial instructional method that promotes student-centred approach where it can minimize teacher telling and maximize student doing in which students have opportunities to do tasks on challenging question and/or problems that make students involved in problem-solving, decision-making, meaning-make, investigative skills, and reflection, that includes teacher facilitation but not direction. Tommas (2000) has mentioned that PBL has varieties of advantages, which makes it outstanding among other methods, for instance learner engagement, cooperative learning skill boosting, academic performance improvement, critical thinking skill development, and the positive relationship enhancement between students and teachers. It is evident that this method is a suitable technique, which can be an instructional model to apply for rock identification and classification, to enable student teachers to gain the 21st century skills and to use it when they become teachers in their community. It would be a real case study for them and attract their

attention to simulate experiences of how to integrate themselves for life skills. Teachers in developed countries have been using PBL to improve students' achievement and to have them prepared for their daily life in society. In Britain, for example, a result of project-based learning implementation method in teaching shows a significant improvement in test scores in science subjects. PBL is a conventional instruction in the United States of America, which was supported by the Buck Institute for Education (B.I.E) in response to school reform where the learners are required to equip themselves with suitable skills in response to economic growth. In Japan and India, project-based learning is also a well-known technique used in classroom. In Cambodia, there tend to be wide gaps between policy and practice. Therefore, classrooms are not given well, using student-centred methods of instruction. Teachers should come up with new teaching methods which emphasize practical activities instead of theoretical strategies. The results can be totally achieved by shifting from teacher-centred to student-centred methods of instruction.

The quality of teaching, the behaviour of teacher when giving their lessons, and the quality of information teachers provide for students are the ways which shows the relationship between students and teachers. The quality of teachers is another issue which could result in low improvement of students' outcome, and a lack of teaching materials can make quality of education downward. SMASSE (2000) reported that inappropriate methods of teaching are the main causes of poor understanding and performance in science subjects. This study, therefore, is to investigate the influence of project-based learning on students' achievement and learning attitude toward academic performance in the concept of identification and classification of rock in Earth Science Subject among student-teachers in Phnom Penh Teacher Education College (PTEC), Phnom Penh, Cambodia.

The study therefore attempted to:

1) Determine statistical difference in academic achievement among students taught the concept of identification and classification of rocks by project-based learning technique and those taught by conventional method.

2) Establish difference in attitude change towards the concept of identification and classification of rocks among students taught using project-based learning technique and those taught by conventional method.

II. METHODOLOGY

The study employed pre-test-post-test design where the students were assigned to two groups – experimental group and control group with the total sample of 50 student-teachers. The control group was taught by using conventional methods as usual. Both the experimental group and control group were instructed by assigned teachers. However, teacher who instructed experimental group conducted the class, using project-based learning method. Student-teachers' instruction was conducted within a period of four weeks.

The sample was chosen from the first-year student-teachers in general science subject: Biology (25 student-teachers) and Physics (25 student-teachers) groups in Phnom Penh Teacher Education College (PTEC).

Kothari (1990) has suggested that specific academic abilities of participants are examined by using achievement tests. Achievement tests were conducted with both experimental and control groups. Moreover, pre-test and post-test were administered to both experimental and control groups in order to compare the differences between the two groups. The pre-test was used to determine the academic ability of learners before being treated with

project base learning technique, while the post-test was used to determine the treatment gain. Attitude Test Questionnaire was used to collect information about the students' attitude towards the concept of identification and classification of Rock when taught using PBL in comparison with their attitude when teaching the concept of identification and classification of Rock using conventional methods of instruction. Both pre-test and post-test were used to ensure distribution in the groups as well as to establish the influence of the technique on learning. TIMSS test for achievement test and Students' Attitude Questionnaires were designed as study tools. OQIQI method was used as a material recorded for both students and teachers during class and project instruction.

The research results of pre-test post-test were organized and data analysis done by both descriptive and inferential statistics using, statistical package for social science (SPSS) program. Kothari (1990) illustrated the concern of raw data and the processes in descriptive statistics. The pre-test post-test data was first analysed using descriptive statistics to obtain mean and standard deviation and then inferential statistics Paired-Sample T-Test was used to determine the significance in difference between experimental and control groups by the t-test. This was done to determine statistical difference in academic achievement among student-teachers taught the concept of identification and classification of Rock by PBL and those taught by the conventional method.

III. RESULT AND DISCUSION

Paired-sample t-test was conducted to see changes of the controlled and experimental conditions. The study results were discussed on the basis of specific study objectives and the questions, "Are significant different results of the achievement tests found between the experimental group and control group?", is the sub-problem. Test for the differences in academic achievement among students taught the concept of identification and classification of

rock by using PBL method and the other taught by using conventional method as usual. To determine whether there are statistically significant differences between the experimental and control groups of the study results in terms of knowledge acquired with respect to the identification and classification of rock lesson. Pre-test mean scores for the experimental group and control group for the student-teachers understanding of the concept of identification and classification of rock before being exposed to the research project were found 31.87 for experimental group and control group was 31.09, respectively as shown in Table 1 which shows a comparison between the mean scores and standard deviations of the Pre-test scores for the experimental and control groups on student-teachers' understanding of the concept of identification and classification of rock before the project implementation.

Table 1. Comparison of the mean scores and standard deviations of the pre-test scores for the experimental and controlled groups.

Group		Mean	N	Std. Deviation
	Controlled	31.09	24	5.18
	Experimental	31.87	24	9.07

The results shown in Table 1 indicate that the mean scores and standard deviations for the experimental and control groups for the two categories of subjects in general science are not much statistically different. This indicates that the first-year student-teachers' performance in preliminary knowledge illustrated the same trend. Results also depict that the overall performance for both groups is below average.

Table 2. Comparison of the pre-test scores for the experimental and controlled groups

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Controlled - Experiment	-.78	10.55	2.20	-5.35	3.78	-.356	22	.73

The Table 2 depicts the comparison between the results of t-test of pre-test results between the control and experimental group. There was no significant difference in the scores for control group (M=31.09, SD=5.18) and experimental group (M=31.87, SD= 9.07) conditions; T (22) = - 0.4, p=0.7 > 0.05.

Table 3. T-Test Result of Controlled Group (Physic in year 1) Students' Pre-Test Achievement Scores and Post-Test Achievement Scores.

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair1	Post-Test – Pre-Test	3.43	4.10	.855	4.66	8.21	7.53	22	.000

The result as shown in the Table 3 illustrates the significant difference in scores for the pre- and post- test of control group was limited since the mean score was small (M=3.43).

Table 4. T-Test Result of Experimental Group (Biology in year 1) Students' Pre-Test Achievement Scores and Post-Test Achievement Scores.

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair1	Post-Test - Pre-Test	16.00	4.75	.97	14.00	18.00	16.52	23	.000

The Paired-sample t-test result reveals a significant difference between the pre-test and post-test of experimental group since the mean scores obtained by the post-test was significantly higher as compared to that by the pre-test. Compared with t-test mean scores, it is realized that the t-value of t (23) =16.52 at $p<0.05$. This confirms that there was a statistically significant difference between the pre-test and post-test of experimental group (Table 4).

Table 5. Comparison of the mean scores and standard deviations of the post-test scores of the experimental and control groups on the achievement tests.

		Mean	N	Std. Deviation
Pair 1	Controlled	34.52	24	11.66
	Experimental	47.40	24	11.19

From Table 5, comparing the means and standard deviations for the two groups of general science in the first-year student-teachers on identification and classification of rock shows a greater difference between the experimental and control groups. Therefore, the effect of Project Based Learning on the students' performance in the Identification and Classification of Rock Achievement Test is evidenced by the high scores in the experimental group.

Table 6. Comparison of the post-test scores for the experimental and controlled groups

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Controlled - Experimental	-12.88	17.23	3.45	-19.99	-5.77	-3.74	24	.001

The result of paired-sample t-test shown in the Table 6 tells a significant difference between the experimental and controlled groups, since the mean scores obtained by the experimental groups was significantly higher as compared to the control group. Comparing paired-sample t-test mean scores, it is realized that the t-value of $t(24) = -3.74$ at $p = 0.001 < 0.05$. This confirms that there was a statistically significant difference between the experimental and controlled groups, in favour of the experimental group.

As shown in the study results, it can be concluded that PBL has great effects on the students' outcome and has positive effects on students' attitudes toward academic study. Thomas (1999) has shown his evidence on PBL implementation, which has increased motivation and retention of content subject and improved students' attitudes toward life-long learning among other benefits. Barron and Darling-Hammond (2008) have found some study results to support their study by showing the integration of PBL in teaching and learning techniques which make science practices in classes have impact on students' progress. These results provide practical signal and foundation for making conclusion that the use of PBL provides higher level of learning as far as Identification and Classification of Rock Concept and related areas are concerned.

To summarize this discussion, a study research conducted by using PBL has reached to the conclusion that the challenges in the implementation of this learning method can be grouped into the following: Learners challenges with time management, lack of basic knowledge and experiences in inquiry processes, data using and making conclusion, learners challenge with time management to operate the project, for example time management (using material in curriculum covered and project parallel with timeline), class management (topics and groups assigned), giving support to learners and assessing the learners' work, and facing with school stem such as tough schedules, lack of support from teachers, school leaders, school administration and lack of using appropriate technological supported materials. To sum up, our current study has reached similar conclusions as the previous studies.

IV. CONCLUSION

From the study results, it can be concluded that the results provide significant evidence that the implementation of PBL have a great impact on higher level of learning and understanding rocks identification and classification, which leads to improving academic performance by increasing motivation and learning attitude. Moreover, this technique is part of crucial student-centred approach, which is recommended by educational experts that can lead teaching procedure to the 21st century skills because it is integrated techniques which can contribute towards the improvement of academic performance and lifelong learning.

Hence, based on the study results, PBL is recommended that lecturers in PTEC adopt it in teaching practices in all subjects, especially science subjects in order to make connection on student-teachers academic achievement in the concept of the subjects. This technique can also give students the opportunities to actively construct their own knowledge which can change their attitude toward complex and abstract concepts positively.

PBL is one of the methods to promote students' awareness to educational, environmental and social problems which are happening around their community. A powerful aspect of PBL is to build students' capacity for skilful work through collaboration, project management, inquiry-based skill, critical thinking, problem solving, and other 21st century skills. It also integrates certain habits of mind, which are vital to life-long learning, success in workplace and personal satisfaction. 1) positive effect on student content knowledge and develop collaborative, critical, problem solving skills, and 2) increase students' attitude toward academic achievement (motivation and encouragement).

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Comparative Method in Identifying Part of Speech in Texts of Khmer Language for Pre-Service Teachers

VEN Sizet and NGUON Sam Ol

Department of Languages

ABSTRACT

The aim of the action research is to help students in learning Khmer grammar which focuses on identifying the parts of speech of words in Khmer language. We do the research on this topic since we see most students cannot clearly identify clearly the types of parts of speech and are unable to analyze words' part of speech in contexts. To solve the problem, we use a comparative method which required us to apply the traditional grammar method and structuralism method to compare the part of speech of words when they stand alone and when they stand in specific contexts.

After the research, we found that students are able to identify parts of speech of words using in texts or in sentences which is proved significant by comparing the pre-test and post-test result, the analysis of students' answers in questionnaire, and lecturer's observation. Students in experimental group are more confident in identifying the part of speech after the comparative method had been applied than the students in control group which we used only traditional method to teach part of speech in Khmer Language. Therefore, the comparative method in teaching part of speech in Khmer language is effective, enabling students to classify the types of words in context confidently, to understand conceptually, and to be inspired and motivated.

I. Introduction

Traditionally teaching Khmer grammar, teachers or lecturers always uses lecturing and explaining. By using the traditional methods, teachers/lecturers thought that they were effective. However, the methods seem to be able to help students to just remember in short term, but not to be able to understand conceptually which they are able to apply in other contexts. If we compare the output of the teaching is not over the second level of Bloom's Taxonomy. Previous materials used in their teaching were just textbooks. In this research we use the comparative method between traditional grammar method and structuralism method which will help language learners to be able to identify the type of part of speech of each word in context.

Khmer Language is a contextual language in which words can change its meaning and part of speech according to the contexts that we use those words. This phenomenon really matters for students or for language learners who want to analyze parts of speech of Khmer words. Traditionally they learn Khmer parts of speech by judging words into any kind of part of speech. So, it seems that words originally have their part of speech before they have been used in contexts. This is the misconception of students and language learners who learn Khmer language that we have to deal with a new teaching method. To solve this problem, we decided to use the comparative method which we compare the part of speech of words when they stand alone and when they are used in contexts by using structuralism, the linguistic theory. The structuralism will uncover the type of each word in any actual context, which lead us to be able to analyze the interaction of each word in those occurrences.

As a lecturer of linguistics at Phnom Penh Teacher Education College (PTEC), I would like to see my students who are pre service teachers well understand Khmer part of speech on not just factual level, but conceptual level, which will enable them to transfer the part of speech

in all kinds of contexts. As they will become teachers at primary schools, they have to be sure about Khmer language and grammar. I want to see them able to analyze the part of speech of words in any contexts correctly and confidently as it is really important to them who are going to teach their students in the future. If they cannot recognize the part of speech of words in context, that means they do not understand the concept of the unit that will lead them to use language and teach their students ineffectively.

II. Literature Review

What brings us to do research on this topic is the problem which has happened to our students and language learners in analyzing the part of speech of words in texts of Khmer language. As we have observed, they have made the same or similar mistakes in judging the types of words. They assume that a word is in a particular part of speech by knowing its meaning – the meaning which usually comes out of a single word. This is the misconception that we have to deal with by implementing the new method in teaching. Teaching grammar effectively, we have to bring grammar to an authentic use, so comparative method is chosen to apply in teaching Khmer part of speech for the primary school pre-service teachers. Comparative method helped students to really see part of speech of each word by comparing its function when it stands alone and when it stands in the context of real language use.

Traditional grammar focuses on the rules of language use which lecturers or teachers usually teach part of speech to students by giving the definitions of those types of words, followed by examples of single words coming along without caring about the change of words' functions in any actual contexts. The method seems to judge words in any types by its own primitive meanings and ignore their changes when they are used in sentences. The traditional method teaching starts from giving the definition of a part of speech to giving examples of

words that are in the type, and then use those words to create sentences following the deductive process.

Traditional grammar method is the method which language teachers usually use to teach grammar especially teaching part of speech. Traditionally the method starts its process in teaching part of speech by giving the definition of any part of speech followed by a list of words which they regard as the type and then use those words to make sentences without minding the changes of its structures and meanings that the interaction can have an effect on the types of part of speech. Nation (2001) identifies many different strategies under the category of decontextualized teaching. The ones that are most commonly applied by the teachers in the language classrooms are teaching from word lists and dictionary use. Word list have by no means any meaningful context. Teachers generally tell learners to memorize the words with the definitions but they don't provide any training on how to do this. According to Prom (2006), traditional grammar is a rule to write and speak accurately. This kind of grammar sets out the principle which requires language users to follow. This grammar relies on meaning to create rules.

While traditional method follows deductive process, the structuralism follows the inductive process which starts with authentic texts followed by structure analysis which enables us to analyze the type of each word by their interaction between each other in sentences that can be showed clearly with diagrams of those sentences' structures. Structuralism relies on linguistics which does not create rules to drag language into it. Structuralism depends on the criteria of morphology, phonology, phonetics, and syntax to analyze the languages that people used. According to Moghaddas (2015), structuralism underlies on the concepts that every system possesses a structure, of which the structure determines the position of every element of a whole, in which structural rules deal more with coexistence than changes. Also, those

structures are the “real things” underlying the surface of meaning. Taking the structuralism’s approach to apply to any problem, it assists students to learn through context. The structural approach views the language as being divided into various components interacting with each other and forming the rules of the language.

Irmawati and Hum (2014) illustrated that structural linguistics has its implication to language teaching; for instance, there is a key concept that must be operated. Language learning must be viewed in one context and background; language forms as sign system. Being one of good methods in teaching language, structuralism model can be applied in teaching language, which as rule, pattern, and system to be followed. Structural linguistics can be used as an alternative method in language teaching.

Barnes (1961) stated that two methods should be used in teaching grammar: teaching meanings of words and drilling a compound construction. In the thesis of “A Comparative of Two Methods of Teaching Grammar”, teaching grammar needs seven steps to emphasize:

1. Grammar must be taught in sequential steps.
2. It must be purposeful in that it must be related to the pupil’s daily use of language
3. It requires effective teaching.
4. A greater number of examples than can be provided in such a text as these are usually needed, for the teaching lessons develop a new topic.
5. The teacher must decide whether to further drill on a particular topic is needed, or the pupils are ready to proceed to the next one.
6. Frequent review and drill lessons are essential in the development of any skill.
7. Review exercises are provided here for the convenience of the teacher. Before they are assigned, review lessons are very necessary.

Collier (1993) said that comparison is the fundamental tool of analysis. It sharpens our power of description, and plays a central role in concept-formation by bringing a focus on suggestive similarities and contrasts among cases. Comparison is routinely used in testing hypotheses and it can contribute to the inductive discovery of new hypotheses and to theory-building.

From these studies, we found that comparative method has power to help students understand grammar well. We use the comparative methods which using two methods together in teaching part of speech in Khmer language i.e., the traditional method which relies on rules or definition of words. And the rules or definition are created by understanding the meaning of each word and the other method is structuralism in which the part of speech of words is defined by the structure of those words in contexts.

III. Action Research Questions

I have been teaching Khmer literature and linguistics for almost 10 years in high school and in Phnom Penh Teacher Education College, I have found that most of students are unable to recognize the part of speech of Khmer words when they are in contexts. According to Nowakk (2014) in linguistics, the comparative method is a technique for studying the development of languages by performing feature-by-feature comparison of two or more languages. Thus, we decide to use the method in teaching grammar of Khmer language whereby we will not compare two languages, but we compare two techniques of teaching grammar at one time which leads students to think more deeply in analyzing the structure of words in forming sentences. Once they understand about the structure of sentences, they can recognize the type of each word that comes together to form a phrase or a sentence.

This has brought us to our action research question of **"How effective is the comparative method to help students identify parts of speech of words in texts?"**

IV. Research Methods

Comparative method in our teaching of Khmer part of speech is to use both of the methods at a time so that we can compare the function of words when they are assumed as any types in traditional grammar and when they are used in any contexts of the structural analysis. Therefore, one word has been raised up two times –one in the traditional grammar in which teacher needs to follow the steps of giving definition of a part of speech, giving word list as example, and use those words to make sentences; and the other one is that the word has to come with the contexts from original texts of authentic language use followed by structuring every word in sentences' diagrams in which we can see the interaction between words in the sentences, which allows us to clearly grasp the meanings and functions of each word from which we can come to the conclusion of the types of the words. From the authentic language use, the analysis reveals that the word that traditional grammar lists as any kind of part of speech has many different parts of speech according to its contexts.

We use mixed method of quantitative and qualitative method to collect and analyze data by using tools such as pre/post-test, questionnaire and observation. To analyze the data we got, we use Excel, SPSS, and inductive analysis.

We conduct our research on two groups of students – experimental group and control group. There are 73 students in experimental group which was divided into 3 classes and 77 students of control group which was divided into 3 classes too. Our research started by conducting pre-test on both groups, followed by teaching experimental group using comparative method and teaching control group using traditional grammar rule. At the end of the course, we conducted post-test and questionnaire on the experimental and control groups. The result of pre/post-test, the answers of students in questionnaire, and the result of the lecturer's own observation are our data for the research.

V. Data analysis

We collected data of the research by using pre-test, post-test, questionnaires and lecturer's observation during teaching by using the comparative method.

Pre/Post-test analysis

Group Statistics

Group		N	Mean	Std. Deviation	Std. Error Mean
Pretest	Experimental	73	12.8082	5.46620	.63977
	Control	77	11.8701	3.51070	.40008
Posttest	Experimental	73	28.0274	5.35146	.62634
	Control	77	23.3896	6.96071	.79325

Descriptive Statistics

Dependent Variable: Post-Test

Group	Mean	Std. Deviation	N
Experimental	28.0274	5.35146	73
Control	23.3896	6.96071	77
Total	25.6467	6.63035	150

Tests of Between-Subjects Effects

Dependent Variable: Post Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4095.750[a]	2	2047.875	122.646	.000	.625
Intercept	3006.447	1	3006.447	180.054	.000	.551
Pre-Test	3289.734	1	3289.734	197.020	.000	.573
Group	499.267	1	499.267	29.901	.000	.169
Error	2454.523	147	16.697			
Total	105213.000	150				
Corrected Total	6550.273	149				

a. R Squared = .625 (Adjusted R Squared = .620)

VI. Result

Research question 1: Is there a significant difference between the achievement levels of the pre-service teachers in the experimental and the control groups?

The means and standard deviations for the pre-test and post-test of **dependent variable** for the experimental and the control groups are given in Table 1. The ANCOVA results for the effect of comparative teaching method on **dependent variable** are presented in Table 2.

Table 1. Means and standard deviations for pre-test and post-test scores of dependent variables

		Pre-test		Post-test	
Groups	N	*M*	*SD*	*M*	*SD*
Experimental	73	12.80	5.46	28.03	5.35
Control	77	11.87	3.51	23.39	6.96

Table 2. ANCOVA results for the effect of comparative teaching method on dependent variable

Source	Df	Mean square	*F*	*p*	Partial μ^2
Correct model	2	2047.875	122.646	.000	.625
Intercept	1	3006.447	180.054	.000	.551
Pre-test	1	3289.734	197.020	.000	.573
Group	1	499.267	29.901	.000	.169
Error	147	16.697			

Note: p < .05; R squared = .625 (Adjusted R squared = .620)

As shown in Table 2, the ANCOVA produced a significant difference between the experimental and the control groups in terms of their learning achievement at the end of the course; F (1, 149) = 29.90, p < .001, Partial μ^2 = .17. However, the effect size is small (Cohen, 1988). The covariate (pretest or prior knowledge) also had a significant effect on learning achievement (posttest); F (1,149) = 197.02, P < .001, Partial μ^2 = .57. In this case, the effect size is medium (Cohen, 1988). The findings suggested that the comparative teaching method in the experimental group was more effective in increasing learning achievement of pre-service student teachers when compared to the traditional teaching method in the control group.

Research question 2: Is there a big difference between confidence interval of pre-service teachers' understanding in learning part of speech?

One-Sample Test

Criteria	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Lecturer and the method	66.385	70	.000	4.25634	4.1277	4.3849
Students' understanding	48.343	70	.000	3.72113	3.5661	3.8762
Students' willingness in learning part of speech	43.955	70	.000	3.61972	3.4548	3.7847
General Objective of Khmer part of speech	39.518	70	.000	3.52958	3.3510	3.7082
Noun	44.756	70	.000	3.93662	3.7803	4.1129
Pronoun	38.899	70	.000	3.69797	3.5072	3.8887
Adjective	44.238	70	.000	3.69254	3.5242	3.8609
Verb	40.83	70	.000	3.68732	3.5064	3.8683
Adverb	39.888	70	.000	3.58451	3.4043	3.7647
Preposition	38.407	70	.000	3.66338	3.4728	3.8540
Conjunction	38.669	70	.000	3.61268	3.4257	3.7996
Interjection	37.38	70	.000	3.85915	3.6524	4.0659

Table3: Confidence interval of pre-service teachers' understanding on part of speech in questionnaire

The table above shows the result of questionnaire collected from the experimental groups We found that the intervals between lower and upper confidence are not much. The lower and upper confident levels are approaching level 4, 'agree'. This means the student

teachers in experimental group are confident about learning of all kinds of parts of speech. The table also showed that the student teachers in the experimental group were satisfied with their lecturer and the new method. They especially could understand and achieve the objective of the lesson with willingness to learn parts of speech.

Verifying the result from the pre/post-test and questionnaire, the observation from the lecturer herself found that the students in the experimental groups were happy to learn with the new method with more confidence to analyze the part of speech and are inspired to practice more by themselves.

VI. Conclusion

According to the research result, we can hypothesize that our pre-service teachers clearly understand the concept of Khmer part of speech which can change or adapt their types depending on contexts. They are more confident in analyzing and correctly analyze most of words in any context by comparing the functions of words when they stand alone and when they are used in specific contexts. Through many activities and practices in both control group and in experimental group, we have found out that the result of experimental group is much better than the control group as in the results of the analysis above.

I concluded that the quantitative and qualitative data showed the power of the comparative method in teaching, which really helps students to understand conceptually on the nature of part of speech of Khmer language. We have found that most of the pre-service teachers can define the part of speech of words in every context by comparing them when they stand alone and when they stand in contexts. No matter how long or short the sentences are, our students still can analyze the functions of those words in which they come to the conclusion of the types of part of speech of those words correctly. This method really helps our students to

earn better grades on their summative assessment and in their performance in the learning process when compared with the traditional method which we used with students in control group and in our teaching of grammar with students so far.

Since comparison is the fundamental tool of analysis, we can say that comparative method works really well in teaching not only part of speech of Khmer language, but also many other subjects. The research gave a great experience to us in teaching Khmer language grammar. Teaching grammar is not just about teaching language rules, but is the teaching of the nature of language that will facilitate learners to understand more about language. Thus, teachers or lecturers need to bring grammar to authentic use of language and introduce students to the analysis of grammatical points. This research really changes the ways we teach grammar since comparative method of structuralism has been proved effective in terms of teaching part of speech. Students learn part of speech best by using words in real dialogues or texts i.e., the context-based grammar teaching.

VII. Future Action and Directions

From the better result of the research, we will continue to utilize the method in our teaching of grammar not just only in Khmer language, but also other languages that will catalyze students to use language appropriately and effectively. However, the method is not fixed or immortal method which is always true and effective forever. As lecturers of linguistics and literature, we will discover more methods to help students learn grammar or language to reach conceptual understanding. For further research and improvement on our teaching, the other great methods in teaching grammar should be discussed to seek better efficacy.

This action research is our first research on the teaching methods and it has changed the way we teach a lot. To see the positive changes of our teaching, we would like to conduct further

research on our teaching of phonetics to the primary school pre-service teachers of year 1 for our next research. The reason which encourages us to research this topic is the problem we have seen with our students in that they are unable to use IPA in writing Khmer words correctly especially with diphthong.

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Elimination the Misunderstanding of Mixed-Number and Product Operation

EK Lim and CHUM Veasna

Department of Mathematics

ABSTRACT

Mixed-Number and Product Operation are the parts of arithmetic in which some students do not understand clearly and some are confused with concept, value number, and conversion and operations notation. To clearly understand students' basic conception and capacity of mixed number and product notation, we conducted a study using pre-test among 24 student teachers of primary education (12+4), class DI, year1, at Phnom Penh Teacher Education College (PTEC). We found that they were able to visualize Mixed-number reasoning and Product Operation property using previous knowledge while the misunderstanding remained. They were confused that the notation of mixed-number and product operation notation are of the same meaning. In order to solve this problem, we chose Inquiry-based learning (IBL) using "Drinking Straw and draw diagram" (concrete and pictorial Method) to support students in the study.

I. Introduction

Some students misunderstand the concept of mixed number and product fraction. Misunderstanding, referring to algebra for example ($2\times x = 2x$, $\frac{1}{2}(a+b) = \frac{(a+b)}{2}$), this notation may imply that students understand $(2\frac{1}{2} = 2\times\frac{1}{2})$. However, when students understand $(2\frac{1}{2} = 2\times\frac{1}{2})$, it will cause a wrong calculation. That is, they confused the notation of mixed-number and product operation. On the other hand, students do not understand mixed number

and conversion related to daily life. For example, 1.25 kg can be written as mixed number $1\frac{1}{4}kg$. When students cannot convert decimal number into fraction, it implies a wrong operation.

Based on the result from our preliminary survey – a pre-test, among 24 students in class D1, year 1 of primary student teachers (12+4) at Phnom Penh Teacher Education College (PTEC). We examined how they visualize mixed-number reasoning and product operation property, using their previous knowledge, but we found that misunderstanding has remained. The result has shown that 68% (16 students/24) can understand mixed number and product fraction while the 32% (8 students) do not understand them.

- **Study objectives /Aims**

- To explore the misconception of mixed number and fraction and with operations
- To find out the effective method to teach student teachers to clearly understand mixed number and operation of mixed number.
- To clarify the misconception of mixed number and fraction in teaching and learning and application.

- **Research Question**

  -What is students' performance knowledge of mixed number and fraction?

  -What is students' error of mixed number and fraction?

  -Why do student teachers misunderstand mixed number and fraction?

- Hypothesis

Inquiry Based Learning (IBL) is a method in student-centred approach. This method can help students learn as individuals or as groups whereby students can learn and explore knowledge throughout experiments and real activities. Thus, IBL will be used in the study to find its effectiveness to help student teachers avoid the misunderstanding about mixed number and fraction.

II. Research Methods

1. Questionnaire Survey

Here are the exercises to survey in order to identify the mistakes that students performed

1 .Convert 1.5 as fraction and mixed number.

2. Calculate $2\frac{1}{2}+1\frac{2}{5}$

3. Calculate $2\times\frac{2}{5}+\frac{5}{6}$

5. Calculate $5\frac{1}{2}-3\frac{1}{4}$.

6. Calculate $10-5\frac{1}{5}$

7. Calculate $2\frac{3}{5}\times5\frac{1}{2}$

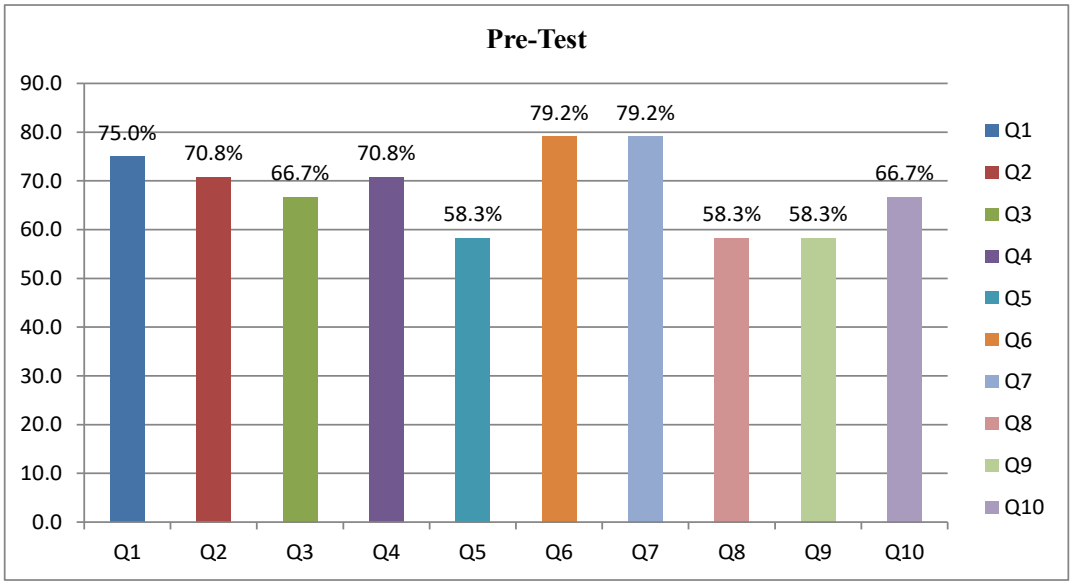
8. Calculate $1\frac{7}{8}\times4\frac{1}{4}$

9. Calculate $3\frac{1}{2}\div\frac{2}{5}$

10. Calculate $8\div2\frac{1}{3}$

Here is the result of survey (Pre-Test)

ID	class	sex	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total score
1	1	1	0	0	1	1	0	1	1	0	0	1	5
2	1	2	1	1	1	0	1	1	1	0	1	0	7
3	1	2	1	1	1	0	0	1	1	1	0	0	6
4	1	1	1	1	1	0	0	1	1	0	0	0	5
5	1	2	0	0	0	0	0	0	0	0	0	0	0
6	1	2	0	0	0	0	0	0	0	1	0	1	2
7	1	2	0	0	1	1	0	0	0	0	0	0	2
8	1	2	0	0.5	0	1	0	0	0	0	0	0	1.5
9	1	1	1	1	1	1	0	1	1	0	0	0	6
10	1	1	1	1	0	0	1	1	1	0	1	1	7
11	1	1	1	0.5	1	1	1	1	1	1	1	1	9.5
12	1	2	1	1	1	1	1	1	1	1	1	1	10
13	1	2	1	1	1	1	1	1	1	1	1	1	10
14	1	1	1	1	1	1	1	1	1	1	1	1	10
15	1	1	1	1	1	0	1	1	1	1	1	1	9
16	1	1	1	1	0	1	1	1	1	1	1	1	9
17	1	1	0	0	0	1	0	0	0	0	0	0	1
18	1	2	1	1	1	1	1	1	1	1	1	1	10
19	1	2	1	1	1	1	1	1	1	1	1	1	10
20	1	1	1	0	1	1	1	1	1	1	1	1	9
21	1	2	1	1	1	1	1	1	1	0	1	1	9
22	1	2	1	1	0	1	1	1	1	1	1	1	9
23	1	2	1	1	1	1	0	1	1	1	0	1	8
24	1	1	1	1	0	1	1	1	1	1	1	1	9
			18	17	16	17	14	19	19	14	14	16	6.83
			75.0	70.8	66.7	70.8	58.3	79.2	79.2	58.3	58.3	66.7	68

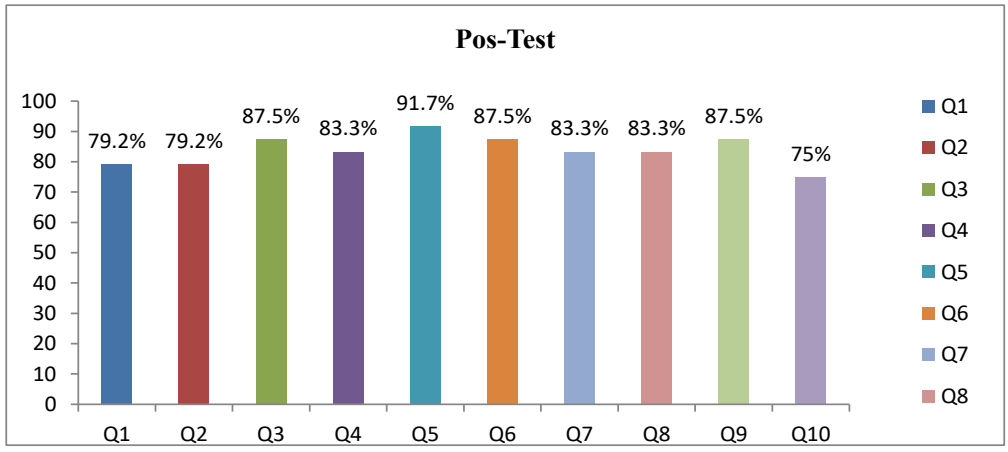


After we conducted survey (Pre-test), we categorized students' mistakes and then we considered the method and resource to help students eliminate the mistakes. IBL method was then used as a hypothesis to conduct teaching in this study to find out its effectiveness.

2. Lesson Observation

To observe the progress of students' knowledge, we gave student the same exercises to do. Here is the result of survey (Post-test)

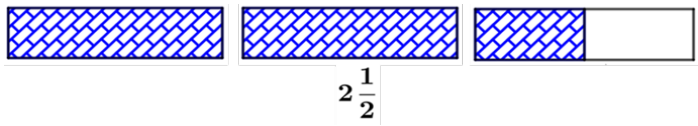
DI	class	sex	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total Score
1	1	2	1	1	1	1	1	1	1	1	1	1	10
2	1	2	1	1	1	1	1	1	1	1	1	1	10
3	1	2	1	1	1	1	1	1	1	1	1	1	10
4	1	1	1	1	1	1	1	1	1	1	1	1	10
5	1	1	1	1	1	1	1	1	1	1	1	1	10
6	1	1	1	1	1	1	1	1	1	1	1	1	10
7	1	1	1	1	1	1	1	1	1	1	1	1	10
8	1	1	1	1	1	1	1	1	1	1	1	1	10
9	1	1	1	1	1	1	1	1	1	0	1	1	9
10	1	2	1	1	1	1	1	0	1	0	1	1	8
11	1	2	1	1	1	0	1	1	0	1	1	1	8
12	1	1	1	1	0	1	1	1	1	1	1	1	9
13	1	2	1	1	0	1	1	1	1	1	1	1	9
14	1	2	0	1	1	1	1	1	1	1	1	1	9
15	1	2	1	1	1	0	1	1	1	1	1	0	8
16	1	1	1	1	1	0	1	1	1	1	1	1	9
17	1	2	1	0	1	1	1	1	1	1	1	0	8
18	1	2	1	0	1	1	1	0	0	1	1	0	6
19	1	2	0	1	1	0	1	1	1	1	1	1	8
20	1	2	1	1	1	1	1	1	1	0	0	0	7
21	1	1	0	0	1	1	1	1	1	1	0	0	6
22	1	2	1	1	1	1	1	0	0	1	1	0	7
23	1	2	0	0	1	1	0	1	1	1	1	1	7
24	1	2	0	0	0	1	0	1	0	0	0	1	3
			19	19	21	20	22	21	20	20	21	18	8.38
			79.2	79.2	87.5	83.3	91.7	87.5	83.3	83.3	87.5	75.0	84

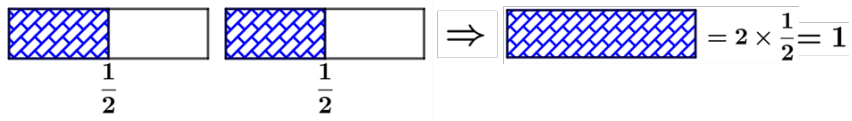


III. Findings and discussion

Concrete and pictorial method are the tactics in mathematics teaching and learning for providing knowledge for students. Application of (drinking straw) is a method to provide appropriate reasons for explaining the concept of mixed-number and the product operation. Through the application of this method, students practise, visualize, measure and consider the real objects and theories for verification and conclusion. Moreover, IBL is part of student-centred approach in teaching and learning in order to effectively provide knowledge for students. With the application of this method, students can explore and present the concept of mixed number and the product operation in the class and in the real world. Moreover, the combination and application of concrete and pictorial and IBL approach, students can work together to explore the theory, concept and the real application in their daily life and in the real world.

We can observe students' knowledge throughout their performance in the comparison of $2\frac{1}{2}$ and $2\times\frac{1}{2}$ in which some students find it difficult to understand. However, when we use the drinking straw or the like, they are able to understand it.

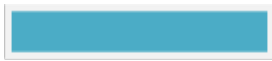




Notably, we observed that the real activity implies that students understand the conversion of decimal number, for example, when we let students measure the length of the objects below in cm and list them in the table. We then let students write numbers as summation and converse as mixed number.

Object A 

2.50cm

Object B 

1.25cm

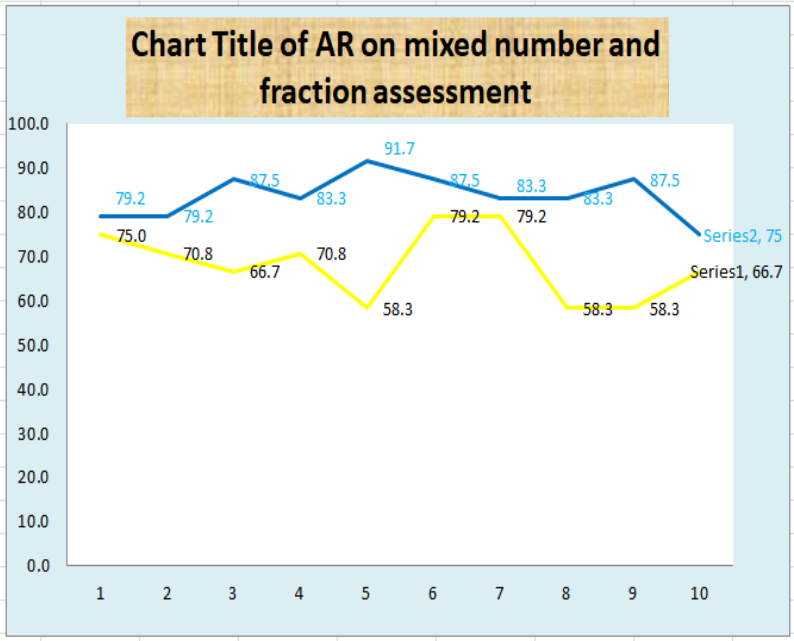
NO	Objects	Lenght(cm)
1	A	$2.50cm$
2	B	$1.25cm$

$$2.50cm = 2cm + 0.50cm = 2cm + \frac{1}{2}cm = 2\frac{1}{2}cm$$

$$1.25cm = 1cm + 0.25cm = 1cm + \frac{1}{4}cm = 1\frac{1}{4}cm$$

Measurement and conversion help student teachers understand the relationship between decimal number fraction and mixed number. Moreover, the conversion of decimal number and fraction help student to do the operation of mixed number clearly. Through data collection and data analysis on the student teachers' performance of their pre-test and post-test, we have observed the trends in the figure as follows:

Pre-Test	Pos-Test
75.0	79.2
70.8	79.2
66.7	87.5
70.8	83.3
58.3	91.7
79.2	87.5
79.2	83.3
58.3	83.3
58.3	87.5
66.7	75



IV. Conclusion

More detailed analysis of the students' spatial reasoning skills is needed to identify what implication can be learnt from our finding. The student teachers can use items and drawing diagram to prove all the concepts in mathematics. In fact, they used real items and diagrams to verify more clearly that the notation of mixed number and product notation of natural number to fraction are different. Converting the calculation from mixed number to extra fraction number is not enough to visualize their thinking clearly because they can misunderstand the operation. However, they will not do that if they use real items or diagram to determine each result or conception. IBL method and the use of real activities in teaching and learning can help student teachers minimize their misconception of mixed number and product operation.

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Developing Effective Teaching Method to Introduce the Touch Typing

CHOR Sophea and CHOUNG Sovandara

Department of Information and Communication Technology

ABSTRACT

This action research aims to find an effective method to teach student teachers at Phnom Penh Teacher Education College (PTEC) how to type characters as well as words faster using the touch-typing technique. In this research, I have selected 25 year-one student teachers of primary education in class BI of the first generation. The data were collected using survey tools including the test, requiring student teachers to type numbers of characters and asking them some required questions of their implications and recommendations for the future research. The data were then analysed to answer the research question "What teaching method should be applied to train student teachers to type texts fast using Touch Typing technique?"

I. Introduction

This research discusses the role of Touch-Typing technique in typing text to produce documents to meet demands for everyday work. But choosing an effective method in teaching this technique is always changing due to the students' real conditions. All ICT students are sometimes from different livelihoods. That is, some come from low-income families, medium-income families, and some from well-off families. I have noticed that most of them from poor families do not have their own computers. I started teaching them for a semester with the Touch-Typing technique, but when I continue teaching them for the second semester, I have noticed that they still can't type texts fast when I have them do classwork that requires them to type texts. Therefore, I propose a hypothesis "If type character fast using touch typing technique is

applied for 15 minutes before starting every class, the student teachers will be able to type faster than just starting class without reviewing the Touch typing."

This study employs an action research design as a crucial way to seek an effective method for ICT lecturers to teach student teachers how to type characters as well as words faster using the touch-typing technique. It also examines the behaviours and habits of the 25 student teachers in class BI in year one of primary education in text typing, and it helps find ways to solve the problem in which student teachers still cannot type fast although they are taught computer skills in the first semester.

This action research is divided into two phases of actions and data collections. The data were collected twice; the Pre-test and Post-test. The Pre-test occurred before the start of using the new method in teaching and the Post-test and questionnaire were done after the new teaching method has been applied.

II. Literature Review

Typing is the process of writing or inputting texts by pressing keys on a typewriter, computer keyboard, cell phone, or calculator. It can be distinguished from other means of text input, such as handwriting and speech recognition. Text can be in the form of letters, numbers and other symbols. The world's first typist was Lillian Sholes from Wisconsin, the daughter of Christopher Sholes, who invented the first practical typewriter. Touch typing involves the use of the home row method, where many beginner typists keep their wrists up and elevated. This can cause overuse or even carpal tunnel syndrome. Resting the hands-on desk or keyboard rest reduces fatigue and improves performance. To avoid fatigue and back/shoulder pain, typists should sit up tall, slightly leaning forward, from the waist. They should place their feet flat on the floor in front of them with one

foot slightly in front of the other. It is best to keep the elbows close to a typist's side with forearms slanted slightly upward to the keyboard. The typist's fingers should be curved slightly resting on the home row (i.e. the a s d f and j k l ; keys) (Kennedy, 2011). If you regard touch-typing as a secretarial skill, and not an essential writing skill, consider the following:

- How much time do you waste looking backwards and forwards from the screen to your paper, and locating your place on both screen and paper each time? Even if it is only a few seconds, it can add up.
- How does this split concentration affect your work? Glancing at the keyboard disrupts your flow of thoughts and ideas – affecting your writing and efficiency.
- How many typing errors do you make? How much energy goes into finding and correcting them (not to mention those that slip through unnoticed and end up in print!). Some typos are unique to two-finger typing, Shlomo Perets.

Bhatia (n.d.) said, "Typing Ergonomics are the factors which provide logistic support and comfort to do a typewriting job efficiently and effectively. They are important as the position adopted when operating a computer keyboard has an important bearing on the degree of accuracy and speed one is able to attain and maintain. Some of these factors included are given as under:"

- Sitting Posture: While operating computer keyboard, you should sit straight, slightly bending your neck forward. Be comfortable and there should be no tension in the body. The lower portion of your back should touch the lower portion of the back rest of the chair. Both of your feet should touch the floor. When typing, you should not cross your legs. There should be a distance of approximately 15 cm between two knees. Knees should be bent at 90-degree angle.

- Position of Hands: Your forearms should be at level with the keyboard and palms down. Keep your wrists straight. The shoulders and elbows should hang naturally. The elbows should neither touch the body nor be too far away from the body. Elbows should also be bent at 90-degree angle.
- Monitor Placement: The close proximity of your monitor may lead to headaches, tense neck muscles, eyestrain, etc. You should not bend your neck while working on the monitor and the upper border of screen should be at eye level. The distance of screen from the user depends on the size of screen. Approximate distance is 60 cm for 17 inches screen.
- Mouse and Keyboard Placement: Keep your keyboard and mouse close together. The user should have an approximate distance of 20 cm from the keyboard, which will help in smooth and effortless operation of keyboard. Same height of keyboard, mouse and elbows helps the users to work comfortably.
- Chair and Table: Both computer user's chair and table should be adjusted to an optimal height. Chair of computer user must be supportive of his lower back. Upholstery of chair should have a non-slip material. Keyboard and vibrating devices like printers should be on separate tables. Computer table should also have sufficient spaces for your legs. Once an ergonomically correct workstation is ensured, typewriting effectively and efficiently becomes a natural phenomenon without causing unnecessary fatigue.
- Placement of Matter to be Typed: In case you need to copy matter while typing, it may be either placed left or right to the keyboard preferably on a Copy Holder which has a sloping surface.

As typing is equivalent to pen or pencil now-a-days, mastery of computer keyboard has become obvious. Mastery typewriting skills means to attain necessary knowledge and skill of keyboard operation by correct positioning of fingers. Here, we will discuss the Touch Method

of Typewriting on QWERTY Keyboard Layout. In the Home Row Approach, also called Horizontal Approach, all the eight fingers of both the hands rest on Home Keys during the course of the keyboard operation. The fingers are trained to make the correct movement to the other keys in such a way that each finger return immediately to its home key after it has depressed the corresponding key in any other row. The thumb of right hand is used to operate Space Bar. The keyboard learning process starts from the second row (Home Row) followed by the Third Row (Upper Row), First Row (Bottom Row) and the Fourth Row (Number Row). The fingers of both the hands have to operate the keys allotted to them on each row. It must be remembered that each finger has to operate only the key allotted to it. The process of allocation of different keys to different fingers on different rows is discussed below:

- Allocation of keys to fingers on the Second Row (Home Row): Place four fingers of each hand on Home Keys as shown above. The remaining two keys ‘g’ and ‘h’ on the second row are operated by the forefingers (Index Finger) of left and right hand respectively.
- Allocation of keys to fingers on the Third Row (Upper Row): The next step is learning the key-reaches from the Home Row to the row above it. The learning begins with the reaches from ‘a’ to ‘q’ by left hand little finger and from ‘;’ to ‘p’ by right hand little finger. This is followed by the placement of the third fingers (Ring fingers) to the adjoining keys ‘w’ and ‘o’ and so on.
- Allocation of Keys to Fingers on the First Row (Bottom Row): After learning how to operate keys on Home Row and Third Row, the next step is to learn how to operate keys on First Row. Keys Z, X, C, V, B, N, M, Comma, Full Stop and ‘/’ sign are located on this row. In the earlier two rows, all the eight fingers of both the hands were used to operate the keys. But while typewriting on the First Row, little finger of left hand is not used i.e., no key is assigned to it. So, from the Home Row, turn downward the Ring

Finger of left hand and strike key ‘z’. Similarly, type keys ‘x’ and ‘c’ with middle and forefinger respectively. Type full stop, comma, m, n with little, Ring, Middle and forefinger of right hand respectively, Dr R C Bhatia, G Lal & Co.

III. Research methods

This design for this research study is quantitative and qualitative in nature and uses compare means with the Pared-Samples T Test and frequency analysis to find the student teachers’ problem in both their livelihood and the situation during their typing.

1. Sample: Setting and Participants

This study was conducted in a class BI bachelor of primary education pre-service student teachers in year I, semester II, with 25 pre-service student teachers. And it started with the processes of collecting data before starting the experiment, doing experiment, collecting data after the experiment, analysing data, and reporting results to management board.

2. Data Collection

In this action research, I used two methods in collecting data as follows: 1) Qualitative Measurement, by which a group of three members was observed for 10 minutes each typing typing a text paper around with 2000 characters and capturing the activities of each group's video activities at the same time; 2) Quantitative Measurement, by which the characters typed by each participant are counted, using Word count and Spelling and Grammar tools in Microsoft word and compare between the two tests (Pre-Test and Post-Test.); and 3) Collecting final data in which the final tool used in the action research is a questionnaire administered to the student teachers (Appendix C). The questionnaire is divided into two sections: the first section, asking the pre-service student teachers about how often they use computer and the second one, asking the pre-service student teachers about the behaviours in typing texts.

3. Data Analysis

Data from the surveys were examined using quantitative and qualitative analysis techniques, specifically by means of content analysis. Content analysis entails developing categories and then counting the frequency of instances when those categories occur (Silverman, 2001). According to Gall, et al. (1996), there are several steps involved in content analysis. This research study followed the subsequent steps: 1) Researchers identified relevant questions to analyse, 2) Researchers developed a category coding procedure, 3) Researchers conducted the content analysis, and 4) Researchers interpreted the results.

In this action research, the data were analysed and final testing and evaluation of the hypothesis were done on the basis of the data obtained during the study.

IV. Finding

Data were analysed according to the guiding research question "What teaching method should be applied to train student teachers to type texts fast using Touch Typing technique?" The findings were organized accordingly. Each of the questions is discussed in the following section.

1. Comparing the Number of Characters

This section discusses the analysis of data obtained from the two tests, Pre-test and Post-test. To test hypotheses, we compared the number of typed characters, excluding mistyped characters, for comparison with the Pared-Samples T Test in the SPSS and the results have shown as follows:

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before the course	534.60	25	165.971	33.194
	After the course	693.72	25	242.572	48.514

The table above shows the comparison between the mean of characters typed by the pre-service student teachers in the two tests: Pre-test and Post-test. The mean for the Pre-test (Before the course) is 535.60; the mean for the Post-test (After the course) is 693.72; the standard deviation for the Pre-test is 165.971; the Post-test is 242.572, and the number of participants in each condition (N) is 25.

a) Paired Samples Test

			Pair 1
			Before the course - After the course
Paired Differences	Mean		-159.120
	Std. Deviation		207.259
	Std. Error Mean		41.452
	95% Confidence Interval of the Difference	Lower	-244.672
		Upper	-73.568
T			-3.839
Df			24
Sig. (2-tailed)			.001

The table above shows that the significance level (Sig. (2-Tailed)) is 0.001. This value is less than .05. Based on this, we can conclude that there is a statistically significant difference between the mean numbers of characters for the pre-test and post-test conditions. Since the teable revealed that the mean number of characters for the post-test condition was greater than the Mean for the pre-test condition, we can conclude that pre-service student teachers in the post-test condition were able to type numbers of characters significantly more than pre-service student teachers in the pre-test condition.

b) Students' situation

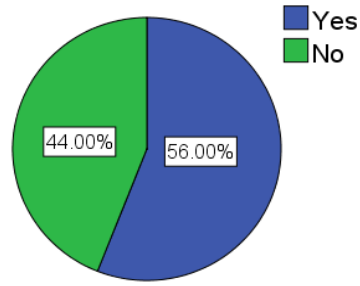

Figure 1: Have own computer

The figure 1 answers to the question "Do you have your own computer?" And 56.00% of pre-service student teachers have their own computer, but 44.00% doesn't have.

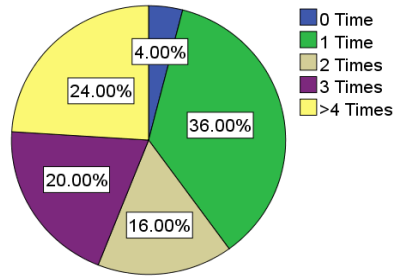

Figure 2: How many times per week do you use computer?

When a question asking "how many times per week do you use computer?" There are 4.00% of pre-service student teachers said that they never use computer, 36.00% use one time per week, 16.00% use two time per week, 20.00% use three times per week, and 24.00% use computer more than four times per week.

When asking about where do the pre-service student teachers use computer, their answers are as follows:

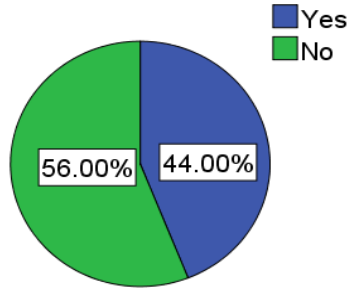

Figure 3: At home

The figure 3 shows that there are 44.00% of the pre-service student teachers using computer at home.

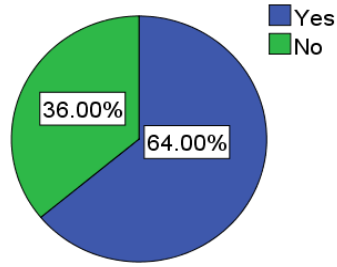

Figure 4: At school

The figure 4 shows that there are 64.00% of the pre-service student teachers using computers at school.

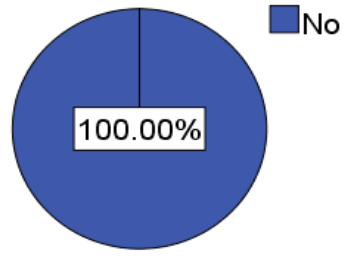

Figure 5: At library

The figure 5 shows that there are 0.00% of the pre-service student teachers use computer at library.

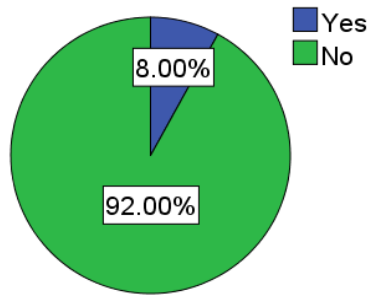

Figure 6: Other places

The figure 6 shows that there are 8.00% of the pre-service student teachers use computer at other places.

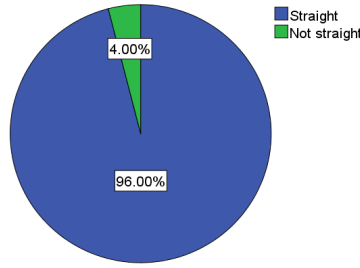

Figure 7: Do you sit straight during typing?

Figure 7 shows that there are 96.00% of student teachers who sit straight while typing, while only 4.00% do not.

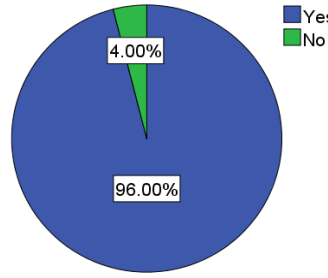

Figure 8: Do you put your legs flat to floor?

The figure 8 shows that there are 96.00% of the student teachers who put their legs appropriately during typing, while the other 4.00% that do not.

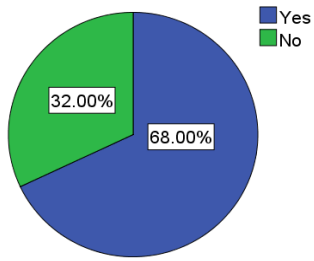

Figure 9: Do you hang wrists pass over the keyboard?

Figure 9 shows that there are 68.00% who hang their wrists pass over the keyboard appropriately, and only 32.00% of the pre-service student teachers do not hang their wrist pass over the keyboard during typing text.

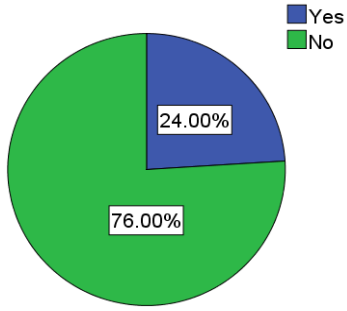

Figure 10: I look at only the screen during typing.

When ask “Do you look at only the computer screen during typing?” Only 24.00% that answer positively, but other 76.00% of the pre-service student teachers answer negatively.

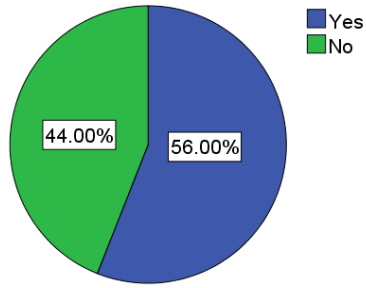

Figure 11: I look at only the keyboard during typing.

Figure 11 shows that there are 56.00% of the student teachers who look at only the keyboard, and the other 44.00% do not.

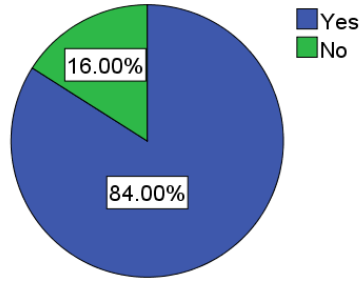

Figure 12: I look at both the screen and the keyboard during typing.

Figure 12 shows that 84.00% of the student teachers look at both the screen and the keyboard while typing while the other 16.00% do not.

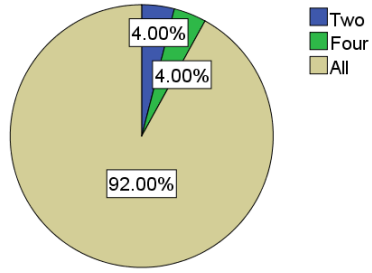

Figure 13: How many fingers do you use during typing?

Figure 13 shows that only 4.00% of pre-service student teachers use two of their fingers during typing; 4.00% use four fingers; and the other 92.00% of them use all their fingers to type.

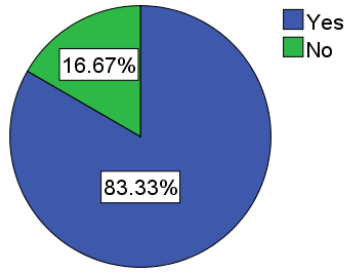

Figure 14: I press key using the fingers kept on them.

Figure 14 shows that the 83.33% of the student teachers press key using the fingers kept on them, and 16.67 % do not.

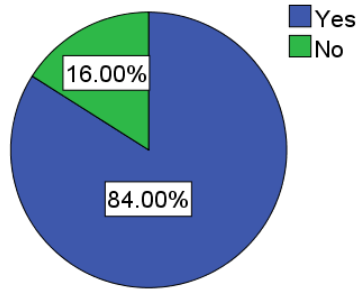

Figure 15: I always change my fingers position to the home row.

Figure 15 shows that there are 84.00% of the student teachers who always change their fingers' position to the home row of keyboard during typing, but the other 16.00% don't.

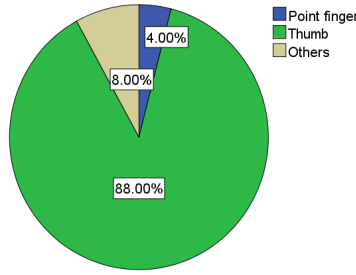

Figure 16: What finger do you use to press the space key?

Figure 16 shows that 4.00% of the student teachers use their point finger to press the space key; 8.00% use their thumb; and the remaining 88.00% of them use their other fingers.

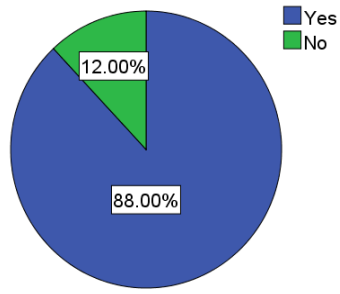

Figure 17: I press shift key using another hand's fingers.

Figure 17 shows that 88.00% of the student teachers press shift key using the other hand's figures, while the other 12.00% do not.

V. Conclusions

Through the study, we noticed that the usage of the new teaching method in utilizing the Touch Typing or Touch Keyboarding technique that required the pre-service student teachers to train typing for 15 minutes before every class helps make the student teachers accustomed to their typing. When they type character or text faster without looking at the screen, they feel like using computers in their learning. Regarding the computer utilization for

daily lives, the result showed that although most of them do not have their own computer because of their family condition, they can type faster than when we had just started new lesson without the pre-training.

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PHNOM PENH TEACHER EDUCATION COLLEGE

Steet 271, Sangkat Terk Laork III, Khan Toul Kork, Phnom Penh

www.ptec.edu.kh info@ptec.edu.kh ptec.edu

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