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THE APPLICATION OF PLAY-BASED LEARNING FOR A SCIENCE SUBJECT OF GRADE 5 BHUTANESE STUDENTS

Tshering Pem[1*] and Nipaporn Sakulwongs[2]

[1*]Graduate students in Master of Curriculum and Instruction, Suryadhep Teachers College, Rangsit University Phahonyothin Rd, Lak-hok, Pathum Thani, Thailand

[2]Lecturer in Master of Curriculum and Instruction, Suryadhep Teacher College, Rangsit University Phahonyothin Rd, Lak-hok, Pathum Thani, Thailand

*E-mail: tshering.p63@rsu.ac.th

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ABSTRACT

The objectives of this mixed method study were to compare the learning achievement and attitude of grade 5 Bhutanese students before and after the use of play-based learning. Tests for learning achievement were employed to collect the quantitative information (pre-test and post-test). The qualitative data was gathered through semi-structured interview and structured observation. The outcome showed that the mean score on the pre-test was 11.43, while the mean on the post-test was 23.01, representing a mean difference of 11.58, it was clear that play-based learning had helped students learn more effectively. A paired sample t-test in the table also displays a significant value of .01 which indicated the significance of the test. According to the results of semi-structured interview and structured observation, students were not only motivated and satisfied to learn science through play-based learning, but also developed positive attitude towards the subject. The following themes; 1) Fun, 2) Self confidence, 3) classroom participation and 5) Performance improvement showed how much the students got the opportunity to work with their friends which made them comfortable enough to freely share what they thought.

Keywords: Play-based Learning, Learning Achievement, Attitude, Guided Play, Free Play

Introduction

To succeed in this modern era of invention, you must be able to understand the essence of a variety of issues, recognize important patterns, and recall and apply relevant information. Science is viewed as a way to interact directly and personally with the physical world and as a technique to get the environment to respond to our inquiries about it.

Bhutan has a long history of modern education dating back over a century. Bhutan is a particularly intriguing case study because of its unique position in the world as the only country that measures Gross Domestic Happiness which is a national 'consciousness' that strives to integrate spiritual and cultural growth with economic progress.

However, students in Bhutan (bhutanese students) average Math and Science achievements are lower than in developed nations. According Ndayambaje, Bikorimana & Nsanganwimana 2021, the primary reasons for underperformance were found to be a lack of laboratory equipment, shortage of teachers, a lack of teaching learning material, inappropriate teaching methods (theory), and amount of time and content allocated. According to the study conducted by the University of Cambridge (2022), a playful approach to learning can be just as effective as more conventional, teacher-led strategies. Play also encourages students to have a positive attitude about learning. Therefore, this study will aim to solve the problems in teaching and achievements in science by using play-based learning.

According to Curriculum Development Centre 2021, as a result of these shifting dynamics, the worldwide education system, including Bhutan, has adopted the twenty-first-century educational framework as the new conceptual window of education. Basically, the goal of Bhutan's science curriculum is to support STEM education.

Science education places more of an emphasis on what students do than on anything that is done to them. Making science a learning experience is one of the driving forces behind "hands-on" activities and practical lessons. The concept of "science as process" emphasizes the value of students developing their observational, inferential, and experimental skills (Kezang & Chayanuvat, 2019).

Research Objectives

1. To improve the learning achievement in science of grade 5 Bhutanese students using Play Based Learning.

2. To find out the attitude of Grade 5 students towards using Play-Based Learning inlearning Science.

Literature Review

1. Science

We can make sense of the world with the help of scientific thinking. Scientific thinking skills include observation, questioning, generating predictions, testing ideas, recording data, and expressing thoughts (Larm & Jaros, 2017). It is hard to underestimate the value of a quality science education in terms of productivity and success. If children are provided with better science education, they will be able to make better decisions and apply their knowledge in practice.

2. Science Instruction

Having said that the performance of students in science is quite poor. Furthermore, there are several well-documented studies documenting declining interest in science and science jobs at the primary level across the world (Jarvis & Pell, 2012).

Schools, rather than teaching content, should focus on developing students' capacity to acquire and evaluate knowledge as needed. Schools, rather than teaching content, should focus on developing students' capacity to acquire and evaluate knowledge as needed, according to this position.

Therefore, it is very important to have a method to teach children Science effectively.

3. Learning theories related to play-based learning.

From learning theories, the most influential theories of learning are mentioned by the International Bureau of Education, UNESCO (2010) as; Behaviorism, Cognitive psychology, Constructivism, Multiple Intelligence, Social Learning Theory, Socio- constructivism, Experiential Learning, situated learning theory, and community of practice, and 21st-century learning or skills.

According to the constructivism philosophy, people acquire their knowledge and understanding of the world through experience and reflection (Akpan, et. al, 2020). This theory can be seen in primary class through guided play. In that it provides a learning aim, scaffolds the environment, and offers students a lot of control over their learning, guided play is a combination of direct instruction and free play (Weisberg, et.al, 2013).

In his 1983 book "Frames of Mind," Howard Gardner proposed the theory of multiple intelligences by broadening the concept of intelligence

and identifying numerous other types of intellectual skills (Marenus, 2020) This theory considers a broader range of abilities, such as mathematical and physical skills, as well as musical, social, and naturalistic aptitudes, as indicators of intelligence.

Students are encouraged to think critically and creatively while gaining a better understanding and developing abilities that will aid them throughout their life, both inside and outside of the classroom when Howard Gardner's multiple intelligences are used along with play in the classroom (Bowker, 2020).

4. Play-based learning

Everyone understands what 'play' means when they see it on the streets, in communities, on playgrounds, and in schools. People of different cultures, economic groups, and communities engage in play from their earliest years, play-based learning is, essentially learning while at play yet it might be difficult to define (UNICEF, 2018). There are various types of play but in this study, the researcher mainly focuses on free and guided play.

Free play: occurs when the student chooses the task. Adults are welcome to play, but they are not in charge of the student or the game's rules (Lewis, 2021).

Guided play: is a type of play in which an adult person scaffolds the activities of the children, allowing their actions to guide them to the desired learning outcome (Weisberg, et al., 2016).

4.1 Play and Learning Environment

A student feels at ease in a welcoming environment where healthy relationships with peers and teachers develop. If the learning environment is not conducive to the development of new knowledge or abilities, learners will struggle to stay absorbed or interested.

4.2 Role of adults/ teachers in Play-Based Learning

According to Fiechtner & Albrecht (2019), in addition to setting up the physical environment, planning student's learning experiences, and observing students learn more about their individual developmental needs, the early childhood teacher's role also includes cultivating an understanding and the important role adults play in supporting it. The teacher's involvement is confined to supplying play materials and helping rather than taking over or interrupting free play. Whereas in adult-led or guided play teachers provide instructional materials and information while keeping adult supervision over activities.

4.3 Benefits and Drawbacks of Play-Based Learning

Play-based learning can help you take full advantage of play to create an enjoyable and successful learning environment, whether in the classroom or at home. Nevertheless, there are some drawbacks of play-based learning such as: it might not result in learning if they repeat the same play repeatedly; it could be also unjust as a child knows how egotistical they can be; it could be dangerous as it could lead to unexpected occurrences and lastly, it might not be the best option for language learning

Conceptual Framework

Students learning achievement and attitude towards using play-based while learning Science were the dependent variables, whereas play-based learning was the independent variable in this study. Figure 1 shows the illustration of conceptual framework of this study.

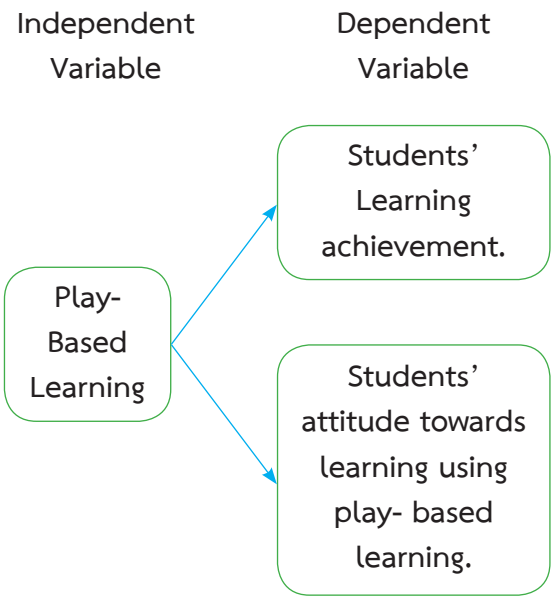

Figure 1 Illustration of Independent variables and Dependent Variables.

Research Methodology

1. Research Design

The researcher applied this mixed methodology mainly to gather in-depth findings of the information for the study. A mixed method may assist with a better understanding of the research problem by addressing the gaps in the literature that cannot be solved by a single method (Sahin &

Ozturk, 2019). Figure 2 shown below describes the research procedure of the study

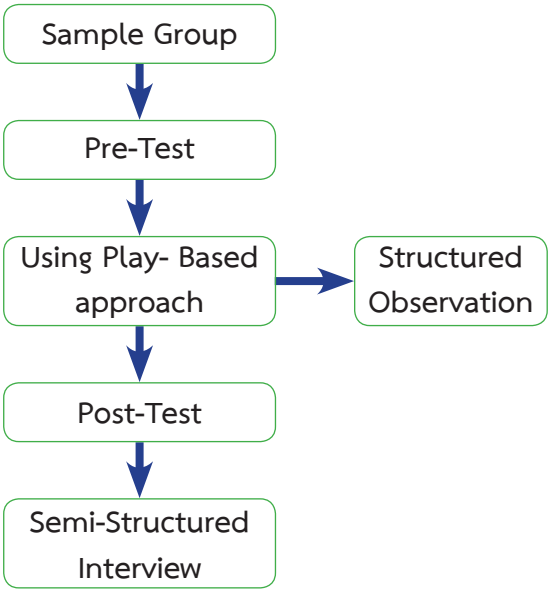

Figure 2 Illustration of Research Procedure

2. Research Instruments

The researcher used qualitative and quantitative tools in this study to reduce inadequacies and improve research outcomes.

2.1 Lessons Plans

The researcher taught one topic and two if the topics are short, incorporating a play-based learning approach to teach the topic 'Human and Animal', lessons in a week. Each lesson consisted of 90 minutes; therefore, the researcher took 2 periods of 45 minutes in one week to cover a lesson.

2.2 Achievement Test

The learning achievement test was created using the Royal Education Council's (REC) curriculum framework's learning outcomes. The achievement test was also written according to the BCSEA's (Bhutan Council for School Examination Assessment) norms. The Bhutanese educational framework requires that test questions be structured according to Bloom's Taxonomy which contained six levels; remembering, understanding, applying, analyzing, evaluating, and creating. For the pre-test and post-test, there were 10 marks for multiple choice answer questions, 5 marks for true or false answer questions, 5 marks for fill in the blank answer questions, and 10 marks for short answer type questions.

2.3 Semi-structured Interview

The 40 students of sample group in the study were interviewed in groups by the researcher at the end of the study. The main objective was to find out their thoughts, beliefs and attitude towards using play- based learning to learn science. It was conducted in groups of five.

2.4 Structured Observation

The observation was carried out by an experienced peer teacher in all the lessons taught by the researcher.

The structured observation had a checklist with seven observation statements:

1) Learners are actively involved in the lesson activities through fun.
2) Learners actively volunteer to answer the question.
3) Learners participate actively in groups.
4) Learners are very mindful to listen and follow the instructions correctly.
5) Learners are comfortable to seek help from peers or the teacher.
6) Every learner got an opportunity to participate in activities.
7) Every learner was helping each other while doing group work.

3. Validity

To evaluate the validity of the instruments, Item Objective Congruence (IOC) was used to determine the instruments validity which helped to determine whether the items were in line with the research objectives. For this study to evaluate the validity of the instruments, three experts, one from Thailand and two from Bhutan, who are experienced Science teachers, conducted content validation All the instruments for this study were validated and rated above 0.67 by experts which indicated that the items were valid for the study. The IOC for the lesson plan, semi-structured interview, and structured observation were rated +1. The learning achievement test question was rated above 0.67 which indicated the items were valid for the research.

4. Reliability

The researcher conducted a reliability test with 41 students (focus group) from class 6 'A' at the same school to assess the reliability of the achievement test. The reliability test items' Kuder-Richardson coefficient (KR-20) was used to calculate them. The KR-20 coefficient should be more than 0.70 and the result obtained was 0.80. Thus, the coefficient of 0.80 showed the reliability of the test items.

5. Participants

The study was conducted in one of the Higher Secondary schools in Thimphu, Bhutan. There were four sections of grade 5 and one section was selected through a cluster random sampling method by lucky draw as sample group. The section chosen was grade 5 'D', with the population of 40 students and

the class conisisted of mixed-ability learners.

Data Collection Procedures

1) Approval and Ethics Concern

The researcher sought authorization to conduct the study from Rangsit University's research and development institute. After that, the researcher sent the approval letter to Bhutan's Ministry of Education (MoE). The researcher sought authorization from the Chief District Education Officer (CDEO) after getting the MOE approval letter. Before beginning data collecting, the researchers asked permission from the Principal, Academic Head, Class Teacher, and Subject Teacher. To guarantee their legal and ethical rights, research participants signed a permission form. Because the research participants are under the age of 18, their parents also signed the permission form.

2) Teaching Framework

This study involved the researcher teaching a chapter (Human and Animal) from the Department of Curriculum and Research Development's grade 5 Science book (DCRD). This chapter was divided into four sections. The researcher took four weeks to teach the lesson. Role play, magical message game, Simon says, cook something yummy and circulatory system game were few activitities that were used to teach the topics. Before the chapter was taught, a pre-test was given, and after the chapter has been taught using Play-Based Learning, a post-test was given

Research Results

Data Analysis of Students' Learning Achievement Tests

To answer the first question of the study, quantitative data from the pre-test and post-test were gathered and evaluated. By comparing the sample group's pre-test and post-test results, the comparison was conducted "within the group."

The data revealed that the post-test scores of the sample group were comparatively higher than the pre-test scores. Likewise, the mean difference of the post-test was found significantly higher than the pre-test shown in figure 3.

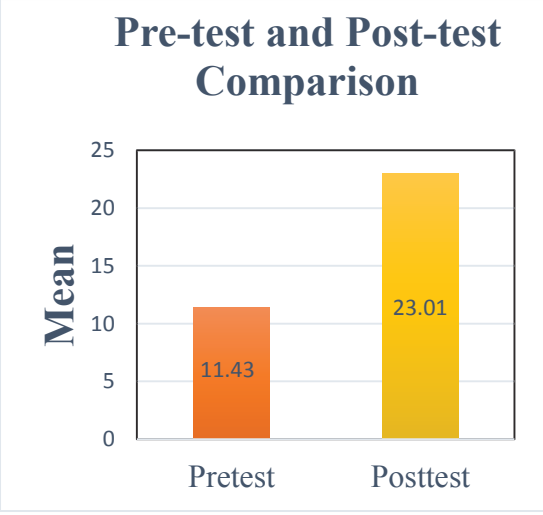

Figure 3 comparison between pre-test and post-test results.

The comparison showed that the pre-test mean was much lower than the post-test one. Thus, it clearly indicated that play-based learning had improved learning achievement. The learning achievement data were also furthere analyzed using paired sample t-test to show the descriptive statistical analysis for the sample group's achievement test score as shown in table 1.

Data Analysis of Semi-Structured Interview and Structured Observation

Thematic analysis was used to assess the data, and it became clear that students had a positive attitude toward play-based learning in science. The students described their learning experiences in play-based learning lessons throughout the interview.

The data collected from the semi-structured interview were analyzed using thematic analysis under four themes: 1) Fun, 2) Self-confidence, 3) Classroom participation and 4) Performance Improvement. According to the data, most of the students provided positive responses.

Fun: Learners revealed that they enjoyed the chapter 'Human and Animal' with the use of play-based learning. Almost every learner mentioned liking the subject and enjoyment and the fun they had while learning. Almost every learner mentioned liking the subject

Table 1 Comparison between pre-test and post-test within sample group.

Group	Pre-test		Post-test		Mean Difference	T	P-value
	$\bar{X}$	SD	$\bar{X}$	SD			
Sample Group	11.43	3.72	23.01	3.33	23.01 - 11.43 = 11.58	-19.01	.000

Significance level (p): <0.05- significant

and enjoyment and the fun they had while learning.

"Usually, we used to feel tired especially during Science period since it was an afternoon class but this time with the help of different activities which required group work, we enjoyed learning together." (Group 4)

Self Confidence: With the use of play-based learning in learning science, it was discovered that every student participated in group activities because most of the activities needed cooperation.

"Since everyone was listening to what each other had to say, we felt loved and respected." (Group 3)

"Play-based learning made sure every one of us was not only studying but also having fun which was something new." (Group 4)

Classrroom Participation: The students admitted during the interview that they had previously been unable to actively participate because they did not comprehend the topic being covered. However, play-based Learning made it simple for children to comprehend the idea.

"Before we didn't participate in many in-class activities, but this time we did because we could understand the topic being taught." (Group 2)

"We liked the various activities because it made us understand better and we also got many opportunities to speak in the class." (Group 1)

Performance Improvement: Most children who participated in the interview said that play-based learning had improved their performance.

"I was very bad at scoring marks in science subject before but now I am confident that I can perform well and score good marks." (Student 11 from Group 2)

"I enjoyed learning with play-based learning as my group was very interactive and cooperative while activities, especially during Role Play and Cook Something Yummy activities." (Student 32 From Group 4).

Another tool the researcher used to address the second study question was structured observation**.** the researcher held eight classes, and a peer teacher observed each of those eight classes using the checklist with seven statements on it. In this study, the major goal of structured observation was to assess how well the themes derived from structured interviews correlated with the observational statements.

The students were seen to be enthusiastically participating in the lesson

activities. While classes were still in progress, students volunteered to answer questions when they were asked. In addition to completing the assignment well and with equal participation from all members of the group.

Structured interview and structured observation provided the two dimensions firstly Interest and Motivation and secondly Engagement and Efficacy of play-based on students learning from which the data was collected.

Results, Conclusion and Discussion

Result Conclusion

The results of a study on the use of play-based learning in a science class for Bhutanese students in grade 5 showed that it had a beneficial impact on the students' practice and learning. Students were likely to participate in an engaging learning environment because they were eager to learn through play. This gave them more chances to communicate and work together and use their higher-order thinking and problem-solving skills in real-world situations. Play-based learning makes learning fun and enjoyable, which makes it much simpler to learn, remember and recall. If schools adopt play-based learning, students will do better on tests because play-based learning encourages active learning engagement and learning from each other. In general, play-based learning is a highly effective teaching strategy that is crucial in the classroom of today, especially when teaching and studying science, which will ultimately increase academic achievement.

Discussion

Research Objective 1- To examine the learning achievement in science of grade 5 Bhutanese students using play- based learning. Tai et al. (2021), who discovered that play was crucial for kids' academic development. Numerous play-based activities enhance children's social and emotional development. This study also supported the fact that the use of play-based learning in the classroom had a constructive impact on the academic achievement of the students. The findings were parallel to the studies conducted by Rennie (2017). The researcher reported that if children are encouraged out-of-school learning experiences which can be carried out through play-based learning, it is proven to be significant and successful for their learning.

Research Objective 2- To find out the attitude of grade 5 students towards using play-based learning in learning Science. Teaching science through play

involves getting children involved in several hands-on activities that are connected to a topic or getting them involved in variations of the same activity to learn about the concept from various perspectives.

When teaching science, using a variety of play-based activities would help students to have a positive attitude toward the use of play-based learning. The students' intense curiosity while participating in the exercises was noted, which was a certain indication of their motivation.

2.1 Suggestions and Recommendations.

The following are recommendations for practices;

1) The learning outcomes of the students were improved through play-based learning in the classroom. The study's findings demonstrated that the post-test measure of learning achievement was higher than the pre-tests. As a result, it is strongly advised to incorporate play-based learning into regular classroom teaching.

2) No matter the subject, grade level, or size of the class, all teachers should use play-based learning to raise students' academic progress and engagement.

3) Learners showed a positive science attitude towards play-based learning in learning science. Thus, play-based learning in daily teaching in the classroom is highly recommended.

4) Additionally, Bhutanese researchers could use this study as a guide while conducting research in a relevant area of study.

5) The Science Curriculum Officer could create play-based learning activities that would make it simple for children to comprehend, relate to, analyze, and remember the material in science.

Here are some recommendations for Further Research.

1) To strengthen the findings, similar research might be carried out at various grade levels with larger sample size and a longer time frame.

2) In this study, only a few play-based activities on a few topics were used. As a result, more studies on play-based activities and other scientific topics may be conducted.

3) The students recognize that play-based learning may be employed as project work, thus more research could be undertaken to determine the relationship between play-based and project work in boosting student learning.

4) To make the results more trustworthy and meaningful, longer-term study can be conducted.

5) Finally, more research may be done to determine how factors like gender, age, level of study, mode of study, etc. affect the play-based learning.

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