Designing for Children
- With focus on 'Play + Learn'

Exploring Play and Learn Methodology and its Effectiveness among Middle School Students in India

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Abstract: The study of play has a long history. Research in early childhood education demonstrates the vital importance of playful learning - defined as both free play and guided play - as a whole-child educational approach that promotes academic, socio-emotional, and cognitive development. Despite play and learn being commonly associated with childhood yet their place within formal secondary settings has been overlooked. Thus, this study aims to explore play and learn methodology in middle school education. A questionnaire survey among undergraduate, post graduate and doctoral level students confirms the scope of this research. In this study, a collaborative game-based artefact is developed that uses colour codes for self-assembly by students and facilitates group learning, problem solving and interdependence. To evaluate the effectiveness of the developed artefact, an experiment is conducted on a middle school science course to compare the learning performance of the students who participated in the learning activity with different learning strategies. Through control and experimental group approach and Exit Exam method, test results of the two groups are collected, analysed and reported. Suggestions for future research in play and learn methodology across secondary and post-secondary education are discussed.

Key words: Design Education; Middle School Education; Play and Learn Methodology; Guided Play

1. Introduction

In an era marked by globalization and advancing technology, 21st century children must engage in the world around them, actively seek new knowledge and solve problems. They must be able to communicate, collaborate, and lead effectively (Fisher, Hirsh-Pasek, Golinkoff, Singer, & Berk, 2011). Researchers have documented that children who are exposed to rich academic content through free and guided play acquire a cadre of cognitive and social skills beyond those taught via traditional, direct instruction practices.

Moreover, play and learn methodology as a learning process enables a broader perspective on the key skill sets required for 21st century (Fisher et al., 2011).

A plethora of research demonstrates advanced performance in academic knowledge and social skills among play-based learners over traditional instruction learners. (Fisher et al., 2011). Play has been at the centre of the early childhood curriculum from the beginning of our history in early childhood education to present day (Blom, 2015). However, the space and time for this kind of play and experimentation with complex, layered texts has been squeezed out of the curriculum to focus on "priorities," taught in isolation through levelled texts with controlled vocabulary and structure (Honeyford & Boyd, 2015). Few have examined the effectiveness of play based methodology among middle school students. Therefore, the purpose of this study is to explore play and learn methodology and test its effectiveness among middle school students in India.

Using the approach of guided play, the topic of 'sericulture' in seventh standard science curriculum in CBSE is chosen for this study. For this research, questionnaire survey among 235 students across undergraduate, post graduate and doctoral levels is conducted to understand the depth of learning on sericulture as studied in seventh standard; and to identify the need for a more effective approach to learning. Resultantly, the next stage includes design and development of the artefact that aims to engage the students and the teacher towards effective learning. The effectiveness of this model on the learning performance of the students from seventh grade is tested using Exit Exam method. The results obtained from this qualitative study are reported and discussed to compel the need and scope for future research in play and learn methodology across secondary and post-secondary education.

2. Play and Learn Methodology

Playful learning or Play and Learn Methodology is a whole-child educational approach that promotes academic, socio-emotional, and cognitive development (Fisher et al., 2011). Within studies that have examined the benefits of play based learning, two different types of play have been the primary focus: free play, which is directed by the children themselves, and guided play, which is play that has some level of teacher guidance or involvement (Pyle, 2018). Research indicates that play that is both teacher guided and child initiated is most beneficial for children (www.researchconnections.org, 2011). Arising from experimentalism and constructivist philosophies, play and learn methodology represents a predominant method for children to acquire information, practice skills, and engage in activities that expand their repertoire (Fisher et al., 2011).

In early childhood contexts, play is learning. While school systems rarely make similar statements for adolescent play, research in several areas suggests that a strong sense of play is integral to lifelong learning. Play-based learning provides opportunities for engagement with high-level thinking around complex texts (Honeyford & Boyd, 2015).

2.1 Early Education

Research in early childhood education demonstrates the vital importance of play to young children's linguistic, social, emotional, intellectual, and physical development (Honeyford & Boyd, 2015). Philosophers and educationists such as Plato, Montessori and others have created curricular approaches to early childhood education (Blom, 2015). In the Montessori approach, teachers use a variety of free play and guided play techniques to promote holistic development. Teaching materials are specially designed to promote exploration and discovery, long time periods are given for individual and small-group learning in child-chosen activities, and educators place equal emphasis on academic and social development (Fisher et al., 2011).

2.2 Middle Education

Play is commonly considered a central tenet of childhood. However, there is also some agreement that play is present throughout the human lifespan (Blom, 2015). Play and learning have been commonly associated with childhood, and their place within formal education settings has been overlooked. Arising from the essentialist and behaviourist philosophies, learning at post-early education level is compartmentalized into domain-specific lessons (mathematics, reading, language) to ensure that appropriate knowledge is conveyed. Some have referred to this as the "empty vessel" approach where children are to be filled with facts by supportive teachers (Fisher et al., 2011). Terms such as play and play based learning are not commonly used in literature specific to teaching and learning in middle and higher education. This leads to the scope of exploring play and learn methodology within the middle and higher education settings.

3. Research Methodology

In order to identify, explore and test play and learn methodology in middle school education, the study comprises of three phases. Phase 1 includes questionnaire-based survey among undergraduate, post graduate and doctoral students. The results from the survey lead to the second phase of the study, which comprises of design and development of the teaching aid that aims to incorporate academic goals of learning of the topic and

non-academic goals of exploration, enquiry and collaboration. Phase 3 involves testing of the developed artefact among the students of the seventh standard to determine the effectiveness of the aid. Through control and experimental group testing, the results are obtained using Exit Exam method and analysed.

3.1 De-limitation of the Study

This research is limited with the restrictions of convenient sampling. This study is also limited to middle school education. Senior school education could also be included to address broader areas of concern.

4. Phase 1: Survey on 'Remembering Sericulture'

The questionnaire on 'Remembering Sericulture' was used to survey among undergraduate, post graduate and doctoral students across varied disciplines. A total of 235 responses were collected and the findings of the study are presented below.

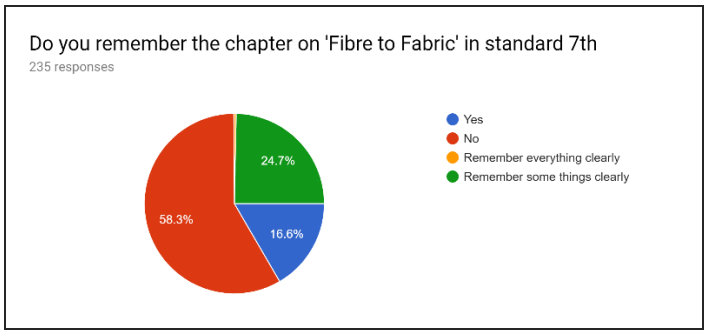

Figure.1 Questionnaire Result 1 on 'Remembering Sericulture'

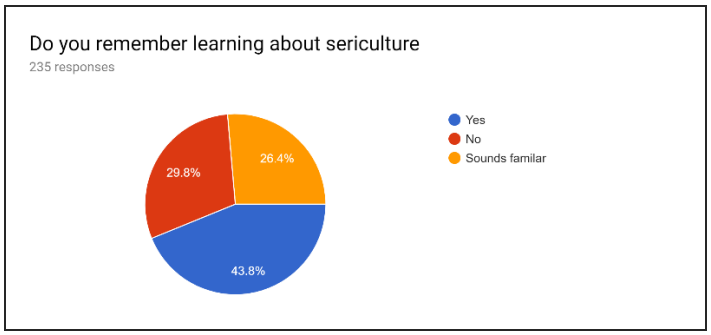

Figure.2 Questionnaire Result 2 on 'Remembering Sericulture'

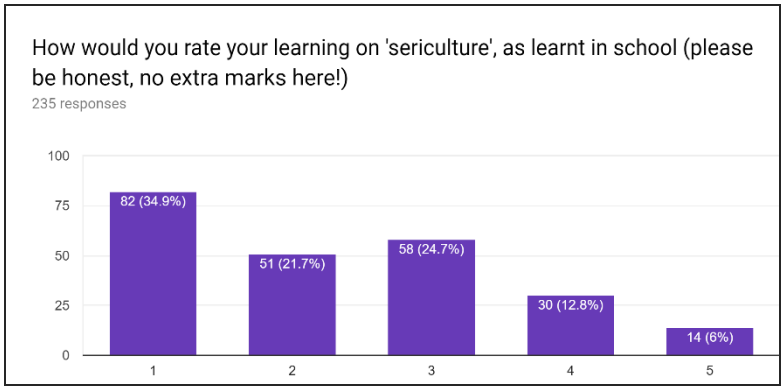

Figure.3 Questionnaire Result 3 on ‘Remembering Sericulture’

Response analysis shows that while majority of the respondents (58.3%) did not remember the science chapter on Fibre to Fabric in seventh standard, 43.8% of the students remembered learning about sericulture.

Despite the conflicting results above, when asked about the learning experience, a clear majority (81.3%) rated their learning on sericulture between 1 and 3 on a scale of 1 to 5 (1 being poor and 5 being excellent). These results directly point to the need of an engaging method of learning that helps students gain and retain knowledge at the middle school level.

5. Phase 2: Design and Development of Teaching aid

With the results from questionnaire survey pointing towards ‘poor’ learning experience, and studies advocating effectiveness of play and learn methodology; an artefact is designed in order to aid the teaching of the topic on sericulture. This artefact comprises of a colour coded self-assembly silk reeling set that imitates the process of reeling cocoons. The aid encourages guided play under play and learn methodology, where the students and the teacher work in collaboration. Once the colour coded apparatus is assembled, the teacher can demonstrate the traditional process of silk reeling. The material used for constructing the artefact is primarily wood as it is inspired from the traditional silk reeling set which was also made from wood. Since, the process originally involves immersion of silk cocoons in boiling water in order to spin the silk fibres, a mock apparatus of a vessel and aluminium stand is created as part of the reeling set for safety concerns within the classroom. Accordingly, mock thread is used for the purpose of demonstration of the process.

Real silk cocoons are provided in the classroom for experiential learning, where the students can touch and explore the cocoon and the silk fibres. Thus, the aid aims at academic understanding of the subject, along with learning of attributes like curiosity,

cooperation, group learning and problem solving. Therefore, the artefact enables holistic development of students as aimed by play and learn methods in the past.

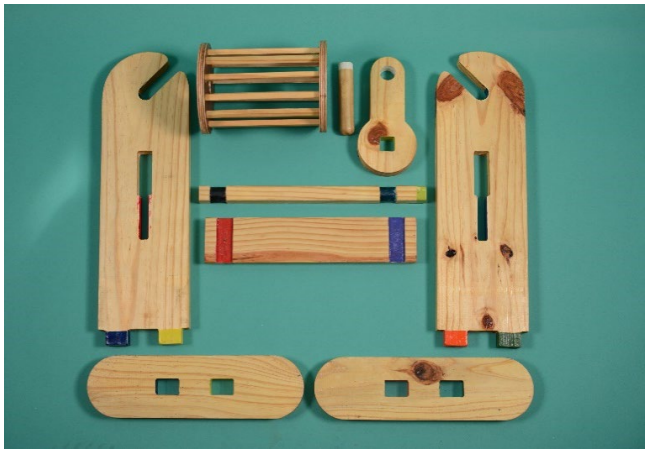

Figure.4 Colour coded parts of Set 1

Figure.5 Assembled Set 1

Figure.6 Colour coded parts of Set 2

Figure.7 Assembled Set 2

Figure.8 Final arrangement of the artefact (Set 1 and Set 2)

6. Phase 3: Testing the effectiveness of the Developed Aid

To evaluate the effectiveness of the innovative approach, an experiment was conducted on a middle school science course to compare the learning performance of the students who participated in the learning activity with different learning strategies. The selected topic was “Sericulture”. The aim of the subject topic was to enable students’ understanding of the life cycle of silk worms and the process of silk rearing.

6.1 Participants

The participants of the experiment were students of seventh grade in a CBSE school of Hyderabad. A total of seven students participated in this study. Group 1 was a control group which comprised of three students. Group 2 was an experimental group which comprised of four students. Group 1 was taught by the science teacher and Group 2 was taught by the researcher.

6.2 Experiment

The students in control group learned with conventional method of learning without using the artefact; that is, the teacher and students discussed the process of sericulture.

Figure.9 Group 1 learning sericulture through conventional method

The students in the experimental group learned with the developed silk reeling set using the guided play approach; that is, after discussing the basics of sericulture and the process in the classroom, the students held a real cocoon to experience it and the silk fibre, followed by playing the game of assembling the parts of the silk reeling set as per the colour codes and the image reference of the final set pinned on the board.

Figure.10 Experiencing Silk Cocoon

Figure.11 Students assembling the apparatus

Figure.12 Reeling Demonstration

6.3 Written Test

To avoid the influence of researcher on the written test, the test was conducted by the science teacher. The students were given 5 questions to answer, 3 of these questions were one-word answer type questions and 2 of them were short answer type questions. The total duration of the written test was 15 minutes. Each student was asked to write their

name, class and group number at the top of the sheet and submit the answer sheets to their science teacher.

Figure.13 Students writing the test paper

Figure.14 Teacher collecting written papers

The questions asked and their corresponding expected answers are defined below:

Q.1) What is the process of obtaining silk called?

A.1) Sericulture.

Q.2) What type of fibre is silk?

A.2) Animal Fibre.

Q.3) What do silk worms eat?

A.3) Mulberry leaves.

Q.4) What is a silk reeling set?

A.4) Silk reeling set is an apparatus for obtaining silk thread from silk cocoon. On immersing the silk cocoons in hot boiling water, the silk fibres are spun together and wound around to form silk thread with the help of the silk reeling set.

Q.5) Explain the process of sericulture.

A.5) Sericulture is the process of rearing silk worms to obtain silk thread. Once the moth lays the eggs and they hatch, small silk worms are fed mulberry leaves until they grow big

to form cocoon. These worms secrete silk in their saliva n make a cocoon around them. These cocoons are then boiled in hot water to obtain silk thread from them.

6.4 Written Test Results

Using the exit exam approach (Cohen, Manion, & Morrison, 2007), the results of the 7 students in their written test are presented below:

Student 1 (Group 1): The student, belonging to Group 1 where sericulture was taught using conventional method, answered all the one-word answer type questions incorrect. Out of the two short answer type questions, the student answered only one of them correctly, where he described the process of sericulture.

Group 1

Student 1: The student, belonging to Group 1 where sericulture was taught using conventional method, answered all the one-word answer type questions incorrect. Out of the two short answer type questions, the student answered only one of them correctly, where he described the process of sericulture.

Student 2: The student 2 taught using conventional method, answered two out of three one-word answer type questions correctly. The short answer type questions, however, were not answered correct.

Student 3: The last student under Group 1 answered only one question out of the three one-word answer type questions correctly. The two short answer type questions were also answered incorrect.

Group 2

Student 4: The student, belonging to Group 2 where sericulture was taught using the developed artefact, answered four out of five questions correctly. One of the one-word answer type questions was answered incorrect.

Student 5: The student answered one question from each question category incorrect. Resultantly, two one-word answer type questions and one short answer type question was answered correctly.

Student 6: The student 6 also answered four out of five questions correctly. However, the first one-word answer type question was answered incorrect.

Student 7: The last student under Group 2 answered four questions correctly. The one-word answer type question on ‘what do silk worms eat’ was answered incorrect.

7. Findings and Discussion

In this study, play and learn methodology was experimented using a developed artefact originating from guided play approach, that aimed to effectively teach the existing

science topic of sericulture among seventh grade students, and compare their learning outcomes from those students who learnt the topic using conventional method of teaching, through exit exam method.

The findings from this study are presented below in a tabular format where the result (in percentage) is compared between students of Group 1 and Group 2.

	Answer 1	Answer 2	Answer 3	Answer 4	Answer 5	Result (%)
Group 1						
Student 1	incorrect	incorrect	incorrect	incorrect	correct	20%
Student 2	correct	correct	incorrect	incorrect	incorrect	40%
Student 3	correct	incorrect	incorrect	incorrect	incorrect	20%
Group 2						
Student 4	correct	incorrect	correct	correct	correct	80%
Student 5	incorrect	correct	correct	incorrect	correct	60%
Student 6	incorrect	correct	correct	correct	correct	80%
Student 7	correct	correct	incorrect	correct	correct	80%

Table 1. Comparative Analysis of the Results of students from Group 1 and Group 2

On comparing the results of the students across the two groups, it is found that the students from Group 1 scored between 20% to 40% and the students from Group 2 scored between 60% to 80%. This means that while students taught using conventional method scored a minimum of 20% and a maximum of 40%; students who learnt the topic through play and learn methodology using guided play approach scored a minimum of 60% and a maximum of 80%.

Such findings confirm the presence of play throughout the lifespan and its longstanding relationship with education (Blom, 2015). The proposed play and learn methodology of teaching middle school students has shown significant effectiveness in students' learning performance. Consequently, it is concluded that play and learn methodology need not be limited to early years of education.

Figure.15 Students using the artefact

However, the scope of this nature of study is vast and extending. The proposed approach can be applied to the learning activities of science, social science, language and other courses to investigate more research issues, such as the effect of students' learning styles and achievement levels on their performance.

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