



Child's construction of Knowledge: Role of Activities in Classroom

Manisha Wadhwa nee Dabas* and Kirat Kaur

Department of Education, Aditi Mahavidyalaya, University of Delhi, Bawana, Delhi. India.

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ABSTRACT

"What we have to learn to do, we learn by doing." This quote of Aristotle has stood the test of times. In the decade of 1980s constructivist theorists advocated the role of hand on activities in the construction of knowledge by children. This brought in new ideas of teaching and learning in classroom and curricular reforms. The role of teacher changes from an information provider to that of a facilitator; and children from passive to active learner. This paper provides insights about how activities are conducted in classrooms, which in turn led to knowledge construction among children and signifies on why there is need to change our teaching methodologies in primary classroom. A variety of activities – experiments, interactive tasks, role play, survey and others were organised for children of class IV for Environment Studies. Classroom observations were recorded and analysed to find out how these activities facilitated in construction of knowledge.

Keywords: Constructivism, Construction of Knowledge, Primary classroom, Environment Studies, Hands on activities

Introduction

The most common method used in schools' classroom is a 'lecture'. The delivery of the method assumes children as passive receivers of information and teachers as source of knowledge. Even though, educational psychology courses in teacher education programmes have changed over a period of time and a lot of emphasis is given on constructivist theories of learning (Sharma, 2006; Shukla, 2015). But practice at large remained unchanged. What does construction of knowledge mean? How children can be actively engaged in this process of knowledge construction? These are some questions which are always on minds of pre-service teachers.

The following is an excerpt of an interaction with pre-service teachers (PST):

Teacher: What would they teach to children in classroom?

PST 1: Textbook

PST 2: Chapters from textbooks

PST 3: Topics

PST1: Themes

PST4: Principles and Laws

PST5: Concepts

Teacher: What are concepts?

Silence

Teacher: Are concepts taught or learnt?

The group was left to think about these questions. By definition concepts are abstract ideas; something which can't be seen or felt using our senses. For instance, concept of a 'boy' or a 'beautiful girl' or 'plants' or 'motion' or 'democracy' or 'human rights', all these are abstract in nature. One may argue that boy, beautiful girl or plants are observable. On contrary, we only see a particular example not the concept that too in some cases. We may see vehicles moving on roads but not the concept of 'motion'. We know that India is a democratic country but not the notion of 'democracy'. Now arriving at the second question posed to pre-service teachers. The concepts are constructed by individuals in their minds. 'How these concepts are constructed?' is argued differently by different constructivist psychologists. Jean Piaget (1966) theorized that children construct concepts using the process of assimilation and accommodation; they modify their schemas of concepts, which are constantly reviewed and extended with new experiences. In this process they either modify their existing schema of a concept or form a completely new schema. Another social constructivist, Lev Vygotsky (1978) emphasised the role of language and thought in learning of concepts. He argued that interaction with peers and adults in a social and cultural environment facilitate 'construction of knowledge'. In a classroom setting a teacher acts as a facilitator for creating meaningful interaction where in

*Corresponding Author: Dr. Manisha Wadhwa
Aditi Mahavidyalaya, University of Delhi, Bawana 110039,
Delhi. India.

Tel: -----

Email: manisha.edu@gmail.com

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children share their existing knowledge and build upon new knowledge. Constructivists like Posner et al (1982) argued that learning is an adaptive process in which conceptual schemes are reconstructed from time to time. But it only happens when learners are dissatisfied with previous knowledge.

Constructivism has long lasting impact on curriculum and teaching – learning process, as this process moved from teacher centered to child centered. However, the common premise among constructivist theorists is that child is an active in her/ his learning. In other words, meaningful and active engagement of children for their own construction of knowledge is important. The research literature suggests that ‘hands on activities’ ensure meaningful engagement of children in authentic tasks. According to National Curriculum Framework (NCF, 2005) activities help teachers to give individual attention to children and engage them in mental processes. Sharma (2006) advocated use of hands of activities including experiments for construction of knowledge among secondary school children. But how the activities help in internalising the concept? For this, the research was conducted in which different types of activities were tried in a classroom.

Research Questions

This research is planned only for a single classroom. Research conducted on a small group although does not lead to generalizations of results to a larger population. However, at the same time purpose is to do qualitative research and find answers to the questions listed below. The research is conducted only for one subject – Environment Studies at the class IV level. Environment studies is envisaged as an integration of science, social science and environment education.

- Which different types of activities can be planned and conducted in Environment Studies (EVS) classroom for encouraging children’s construction of knowledge?
- How different activities facilitate in construction of knowledge.

Knowing Learners in their context

This study was conducted with students of class IV placed in Uttari Nagar Nigam Uttkrisht Vidyalaya (Northern Municipal Corporation School), located in the North Delhi. The school is considered as one of the best schools in the area by MCD. It is a single storey building with nursery and class I on ground floor and other classes on the first floor. Other than classrooms, school has rooms for computer, Subjects (Hindi, English, Mathematics), Sports, Library and principal’s office. School has a big hall for cultural activities, a large playground and a park. There were 375 students enrolled in school. All of children coming to school reside in nearby areas. Most of them come from families with annual income of about ₹70,000. No tuition fee is charged from them. Moreover, additional support in terms of books and uniform was provided to all children. In the class from where data was collected had 37 children enrolled with only 15 girls. The age – group of children ranged from 10 to 12 years.

For the sake of maintaining confidentiality, children were labelled from S1 to S37. The intern (pre-service teacher) had taught them for a duration of four months. She had very good repo with them. A lot of interactive activities were conducted in the classroom. The regular classroom teacher labelled quite few of them as children with low mental ability. The rationale of this label to children is their achievement in class tests and examinations.

Teaching Strategies Used

The following chapters from the EVS textbook titled Environment Studies: Looking Around, Text book for Class IV (NCERT, 2007) were taught:

Chapter	Areas covered in the chapter	Teaching techniques used
Ear to Ear	Animals in their habitats – Physical characteristics (Ear, Hair, Skin); Food habits	Interactive tasks, Picture Reading, Riddles
A day with Nandu	Behaviour/ Habits of Animals- living in herd/ alone/ shy. How do animals feel when they are chained?	Interactive tasks, Riddles, Role play
A River’s Tale	Water pollution and its effects on humans and animals; purification of water; solubility in water; Are there any changes in a river’s water during summer, rainy season and in winter?	Experiments, Picture reading, Interactive group tasks
Basava’s Farm	Process of cultivation of crops; Tools used in farming; different types of soils for different types of crops; developing sensitivity towards the hard work done by farmers.	Role Play, Picture reading, interactive tasks
From Market to Home	How does food reach us – field to mandi and mandi to home? How vegetables and foods get spoilt?	Role Play, Picture reading, Interactive tasks
Spicy Riddles	Spices and their identification – colour, smell, texture, taste;	Riddles, Picture reading, observing samples
Chuskit goes to school	Understanding challenges faced by physically challenged children for reaching to school and in school; Developing sensitivity towards differently able children.	Role Play, Survey, Picture reading

A variety of techniques were used in teaching – learning process. These are depicted in the figure and also explained briefly.

Experiments

In an experiment some variables are controlled and others are manipulated to find the cause and effect relationship. For instance, in an experiment to find the effect of one variable (temperature) on the growth of a plant, other variables (sunlight, type of soil, water, air, humidity, manure, plant) are kept constant. In this process of experimental set up children will learn to design, plan, predict, observe, record, manipulate variables, infer, communicate results. All these are process

skills of science, can only be learnt through doing. During this process children learn to draw meanings from their observation, prediction, inference and finally construct their own knowledge.



Role Play

Role playing is an activity where in children perform the role of someone. They will put themselves in others context (situation) and try to empathize with them. For instance, in our research, children played role of farmers and understood the process of farming; understood the challenges faced by them. Similarly, in another exercise, children played role of a physically challenged girl who had difficulty in reaching to school.

Survey

Survey is the technique of collecting information by asking questions. For instance, children in the research asked questions from other children in school about water and washroom facilities in the school. They also asked children about challenges may be faced by special children in their school.

Riddles

“Statements intentionally phrased as to require ingenuity to ascertain its answers” (from www.oed.com Oxford English Dictionary). For example, a riddle on species from Environmental Studies: Looking Around, Text book for Class IV (NCERT, 2007 pp199) is given here:

Grind me and powder me
To make your food look yellow,
I am mixed in Oil by Granny
And applied to wound quickly,
I heal all wound – big and small,
That’s why I am loved by all!
Think and tell me who am I?

If read carefully, it is found that there are many cues like yellow colour, mix in oil, applied to wound to the answer ‘turmeric’. Such riddles are entertaining for children. Children

learn with fun too. In this research a number of riddles on ‘Birds’ and ‘Spices’ were taken.

Picture Reading

It is a task where in a picture is shown to children for careful observation and after that they answer questions related to the picture. The questions asked in this task encourage children to relook at the picture. Thus, such activities motivate children for careful observation and also reflecting/ predicting the context of the picture.

Interactive tasks:

These activities encourage children to be active and talking about the work at hand. There are two main features – doing and communication. Children do the task given to them, then structure their thoughts and communicate with peers/teachers/ entire class.

Data Collection and Analysis

The data was collected by two ways. One was the daily recording of observations of classroom interaction with children during the environment studies classes. Secondly, children’s scores obtained in the test conducted at the end of four months.

Following are few recordings of observation of different individual or group tasks performed during EVS classes.

Experiment on Solubility of Substances

A series of activities were planned and conducted to determine solubility of various things - Chalk powder, soil, sugar, salt, turmeric, black chilli powder, red chilli powder, soap, oil, wax, sand, alum, potassium permanganate crystals, baking powder, bleaching powder or any other thing that they would like to try out.

Students were expected to predict whether the thing will dissolve in water or not. After making a prediction they were expected to try out and record their observations in the form of table given below:

Things to be tested for solubility (Solute)	Chalk	Salt	Sugar	Sugar	Baking Soda
Solvent	Water	Water	Water	Oil	Water
Prediction (Will it be soluble/ or not?)					
Observation (Soluble or not/ Under which conditions solubility happen?)					

Children conducted experiment and recorded their observations. They came up with some very interesting observation:

- Sugar takes less time to dissolve as compared to sugar cubes. Same is true for chalk and chalk powder. Thus, the time taken to dissolve is dependent on the size of the particle (the solubility of a solute in solvent depends on the size of solute particles). However, sugar was completely soluble in water and chalk was not. The sugar was not visible but chalk powder was visible. Thus, some things are completely soluble and some things are partially and some things like iron nails are insoluble.
- Sugar dissolved quickly in hot water as compared to cold water. Hot water helped in quick solubility of all materials whether it was sugar, salt or potassium permanganate. Temperature plays an important role in solubility of a substance.
- When we kept adding salt to water then there was a point salt didn't dissolve any further in water. Thus, there is only small proportion of a substance (in this case, salt -solute) which is soluble in water. However, when it was heated some more salt got dissolved in water.
- Potassium permanganate was soluble in water but it remained insoluble in mustard oil throughout the activity. After stirring only few of its crystals were dissolved.

Assessment of Children: Teacher's Records of Individual Learning

The following is the sampler from the teacher's daily observation record notebook.

S-2: Today he played the role of writer in the process and made immediate connection with the other observations of real life and activities as he shared during the 'Ekadashi' large amount of sugar is mixed in water and milk. Thus, milk and sugar both dissolved in water. I found him as a critical and keen observer who was playing his role efficiently in the group.

S-1: Today her observation about soil as soluble substance triggered an important discussion in class about the classification of substances into soluble and non-soluble. Yet, he observed and reported that soil was visible in the mixture.

S9: She remained mostly silent during the discussion but was listening carefully. She shared her observation about potassium permanganate and said 'it vanished' and color of water changed to pink.

S5: He shared his observation from his real life in the discussion and was trying to build up linkage with the experiment.

This kind of discussion stimulated thinking among children and encouraged them make connections with their everyday life's experiences.

Two more experiments - purification of water and germination of seeds were done with children. In the experiment on purification of water, a variety of substances - filter paper, cloth, sieve, potash alum and chlorine tablets were given to children to investigate how impurities of different types require different filtration methods. Children conducted the series of activities and found out that potash alum settles down the impurities and cloth and filter paper remove the impurities large in size. In the other experiment on germination, children investigated favourable condition for germination and also recorded growth of sprouts for a week.

Survey: Water and Toilet Facilities in the School

Children were divided into groups of 5. They listed their concerns about water and toilet facilities in the school. They framed items for the checklist about supply of water in the school, wastage of water in the compound, cleanliness of toilets, water pollution. The purpose was to encourage children to observe carefully and make them conscious of the fact that people waste resources, especially in institutional settings. They observed and recorded how many times water taps at the school coolers were found open during the day. It also brought an awareness among them and they started critically analysing problems in their localities.

Excerpts from the discussion after data was collected from the survey:

Teacher: (Ask group 1) Please share your observations and findings.

Student 7: On the water colour, one of the taps did not work. From the second tap water was continuously dripping. The third tap was properly turned off and the fourth tap was not turned off. Water from this tap was being wasted.

Teacher: Ok, do anyone want to add more in this?

Student 2: There was wastage of water as it was flowing without any usage.

Teacher: Yes, it was. Anything else.

Silence

Student 5: One the drainage holes of the sink of water cooler was blocked by some leftover food from our mid-day meal.

Student 4: Children throw their leftover food.

Student 9: Children wash their lunch box there after Mid-day meal.

Teacher: What could be an alternative for this?

Student 10: A dustbin can be placed near water cooler and leftover items should be thrown in that.

Student 3: We should take food according to our requirement and should not waste it.

Teacher: Any other observations...

Student1: Water was coming out from a single tap only in the boy's washrooms.

Student 6: There was foul smell outside girls' washrooms.

Student 4: Girls' washrooms are not clean many times. Today also only one toilet was clean and rest all three were not. There was no water in the toilets.

Thus, children not only became aware of the problems, they also discussed a few possible solutions. Later in the other interaction, they decided to write a letter to school's principal for drawing her attention towards the problems faced by children for inappropriate water supply and insufficient cleanliness of washrooms. Thus, they learnt to raise voice, which is very crucial in the Indian context.

In the other survey of the school building for physically challenged children, which was drawn from the chapter 'Chuskit goes to school', children made a list of different rooms/ facilities in the school and investigated their accessibility. This activity helped children to be sensitive

towards differently abled children and also at the same time, think from others perspective too. They critically observed school building, its infrastructure and found out the challenges faced by differently abled children. They found two places in the building where there were slopes. From those slopes the school building is accessible for children using wheel chairs. There were two physically challenged children in school. They surveyed the entire school building and found out which rooms are inaccessible for children. In the follow up discussion a child (Student 12) mentioned that the building would be more inaccessible if there would be a visually challenged child in the school. Such observations clearly showed that children are understanding and internalizing the concepts.

Interactive Tasks

Knowing Spices and vegetables: The activity was designed to encourage children to identify different vegetables using sense of touch, smell and taste. They learnt the importance of all senses. Then later on they found out which part of the plant we consume. For instance, leaves are eaten for fenugreek and spinach, seeds are consumed for cumin and mustard, fruits are eaten for cucumber and lemon, roots are eaten for onion and carrots. Then children made a weekly expenditure chart for purchasing vegetables for a family of 6 members. This also encouraged them to find quantities required for a particular family and the cost of vegetables. Further, children were motivated to trace the bark of different types of trees in school garden. They were able to list out differences in the barks and leaves of trees.

A story *Fir Khil Gaye Phool* (National Book trust, NBT) was read. It has colorful pictorial representations to elaborate the conditions necessary for growth of plants. Another story on 'Chipko movement' was also read followed by discussion that how women from tribal areas fought to conserve forests.

Role Play

In role play activity on farming flash cards were used for illustrating different steps in farming – from sowing to harvesting. Children were asked questions like why are seeds sown with gaps in between? What would happen if there are two plants in the same spot? Children played different roles in groups. One group explained how farming was done in earlier times using bullock carts. The other group showed how technological advancement has brought revolution in agriculture. As most of children were from migrant families from the state of Uttar Pradesh, West Bengal, Bihar and Orissa, they are aware of process of farming. They were contributing significantly to the role play like a child showed how does a tractor work, the other said I am a boy, I will go for selling crops; another girl questioned what would go wrong if girls go for selling crops to mandi. Children had no answer to this question and it generated a debate on challenging gender stereotypes in our society.

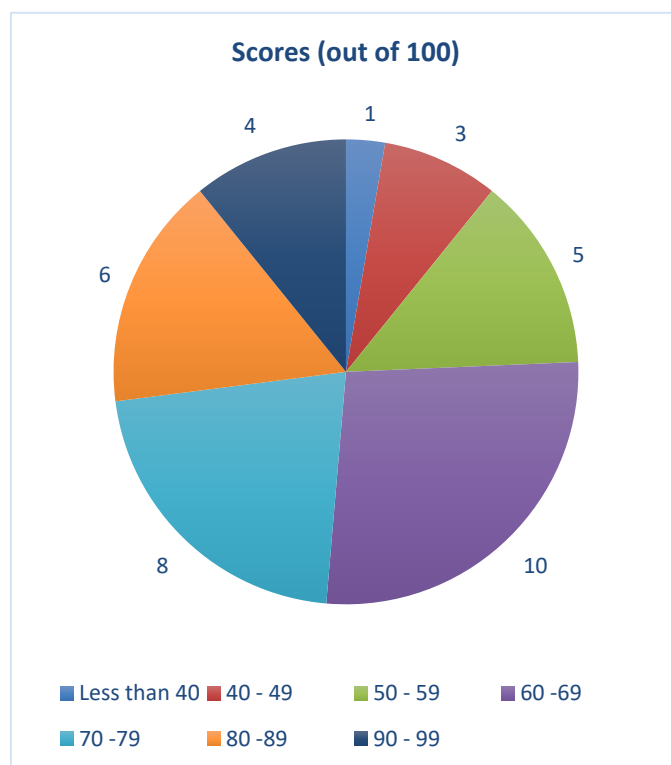
Picture Reading Tasks

A number of picture reading activities were done. For instance - different types of houses in the world (Igloo, Wooden houses, Multi-storeyed buildings, Bungalow, Boat houses); sources of water (tap, well, pond, river, tanker); journey of river (mountains, villages, cities, industries); conservation of water (focus on reduce, reuse and recycle); Tools for farming; Birds - beak and feet (huhud bird eat insects from soil, has long and sharp beak, thus beaks determine the food eaten by birds); types of bridges. All tasks

focussed on drawing attention to the minute details of the pictures.

Assessment

Assessment of children's learning was done by variety of ways. One, daily observation records of children's interaction enabled the teacher for drawing out learning trajectories of each child as mentioned above in the experiment section. Such records over a period of time provided detailed records of information about what children have learnt; in which areas they need improvement. For the term end assessment, a test was under taken with a maximum score of 100 marks. The figure represents the scores of children in the test. It showed that 89% of children scored more than 50% and 76% scored more than 60% of marks. These scores showed a remarkable improvement in their performance. Children also shared that they found discussion in EVS interesting, connected to their life so it was easy to recall during the test too.



Discussion

The task to educate the young minds has paradigms of complexities arising due to the diverse social backgrounds of learners, family environment of child (Mishra, 2014), and learning along with developed cognitive interest in the kids. Continuous teacher training and development of skills of teachers with capacity to adjust and develop teaching practices with change in scenario and level of students have been the front contention of education of diversity of kids (Sharma, 2015; Shukla, 2015). The student discipline in class is an assistive tool for it (Matangi, 2014). However, the main cognitive development in student come through the activity based practices.

Here in this study, different types of activities were used for finding their effect in children's construction of knowledge (Chandra, 2016). Some activities were planned and organised as group activities while others were individual ones. Each one created a different learning experiences for children. The

survey activities provided children a chance to observe, communicate and finding appropriate solutions to problems. The discussion held before and after activities enhanced their thinking and reasoning. Secondly, children were always questioned during activities, “why they are doing it in a certain way? How will they do it?” Such questions encouraged them to think reasons for their actions, they discussed their ideas with peers and communicated to others. Such analysis of thought triggered structuring their own thoughts coherently and thus, developing of critical analysis skills. Interactive tasks and role play also challenged gender stereotypes in situations when a girl asked, “why can’t she go to a mandi for selling of crops?” On the other hand, situations created in an experiment also created conflict when after a point no more sugar was dissolved in water. Such conflicting context brings a disequilibrium in the ‘schemas’ of learners then, with new experience they assimilate or accommodate new experiences. Children also learnt to work in groups, they learn to cooperate with each other. During the role play of the text “Chuskit goes to school and survey of school building for differently able children, they developed sensitivity towards others. A girl also commented on hardships may be faced by a visually challenged children in their school.

Conclusion

Thus, it can be concluded that hands on activities helped children in understanding a concept and also remembering it for a longer duration of time. Also, children acquire process skills of science namely observation, classification (drawing comparison and similarities), predicting, experimenting and communicating. Hence the active participation of children in activities helped in construction of knowledge. Researches conducted in this field (Prince, 2004) have shown the importance of collaborative learning and said that curriculum should be built to promote cooperative and collaborative learning. The students fared very well in the test taken for their achievement in the environment studies. However, one needs to be caution that not everything is activity. Planning and organising activities in classroom require proper planning for making it successful in class.

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