

HANDS-ON AND MINDS-ON LEARNING OF SCHOOL CHILDREN IN ZOOLOGY MUSEUM

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Abstract: Present study aimed to find out the IVth class students' learning experience and achievement levels after they visited a Zoology museum. The students were guided to observe museum exhibits with explanation. Every student submitted a museum visit report and attended a posttest after a week time. Their reports and posttest marks were analyzed and results were discussed. It is observed that the children were much enthusiastic on seeing varieties of animals in one place, posed many questions and actively involved in touching and holding the specimens (birds, starfish, etc.). Further, achievement test score of girls ranged from 3 to 9 with the average value of 6.73 and that of boys from 6 to 10 with average of 8.25, but their averages were not significantly different ($t = 0.047$). The kinesthetic learning experiences were found associated with developing many skills and motivating them to participate actively in various learning processes and accomplish better learning outcomes. They understood the concepts of adaptation, structure and function relation. Though they expressed concern and kindness towards animals, they could not comprehend 'biodiversity'. In addition, museum visit can help in popularizing science and bridging the school and community. Therefore, it is strongly recommended that museum visit may be considered as an essential part of beyond school activity for hands-on and minds-on learning.

Keywords: Kinesthetic learning, active participation, science popularization, animal museum visit.

I. INTRODUCTION

Museum exhibits do more than entertainment and enhance students' knowledge and motivation (Allen, 2004) and optimize the connection between science and everyday life (Martin et al., 2016). A few studies also reported that museum trip can enrich environmental awareness (Punzalan and Escalante, 2021), develop inquiry skills (Ash, 2003), provide opportunities for sensory and aesthetic encounters (Bell, 2017), sustain interest in learning, develop social skills, problem solving ability and regulate the emotions of children (Luke et al., 2019). In this connection, a few suggestions were made, particularly for optimum integration of classroom and museum experiences for effective learning (Ziebell and Suda, 2020), a national frame work to support learning in museum (Wardrip and Brahms, 2020) and teacher's independence to transform student learning in the museum (Krucoff, 2019).

Moreover, several studies revealed many learning outcomes during a class visit to museum viz. understanding form and function, comparison, observation, identification (Trinity college, 2015), increased motivation and achievement (Holmes, 2011), changes in beliefs (Schwan et al., 2014), ability to relax and recover from the stressful life (Packer, 2008) and acquiring communicating knowledge, interest and curiosity in learning (Bambarger and Tal, 2008).

However, Whitesell (2016) stated that a little research has explored the impact of field trips on learning; Terrassa et al. (2016) reviewed the literature and found that evidence of museums' impact on students was lacking and National Education Policy (2020) stressed the importance and need of children's learning beyond text book through experiencing for developing various skills. In view of these, the present study was carried out with the aim to explore the learning experience and achievement of IVth class students in animal museum.

II. MATERIALS AND METHODS

In many investigations various methods employed were observations (Faria and chages, 2012), semi-structured interview (Anderson et al., 2000; Bamberger and Tal, 2008), dialogic inquiry (Ash, 2003), questionnaire (Sheng and Chen, 2012; Luke et al., 2019; Altintas and Yenigul, 2020), pretest and posttest (Holmes, 2011; Spiegel et al., 2012), students' write-up (AlAjlan, 2021) and mixed method approach (Shaby et al., 2019; Punzalan and Escalante, 2021) to understand the quantity and quality of learning that takes place in the museum.

In the present study, IVth class students (N = 27; boys = 12, girls = 15) of Demonstration School, Mysuru visited to Zoology Museum of Regional Institute of Education (in the same campus), Mysuru on 22 March 2022 along with their class teacher. The Zoology Museum showcases variety of exhibits like, phylum-wise arranged invertebrate (Poriferans, Coelenterates, Annelids, Arthropods, Molluscs and Echinoderms), chordate preserved/stuffed specimens (prochordates, fishes, amphibians, reptiles, birds and mammals), skeletons, models, etc. Students were asked to observe the museum exhibits patiently and also given brief explanation about them. The scientific concepts in social science text book especially adaptation, mammals etc. were highlighted here. They were informed well in advance to submit a write-up/museum visit report including their experience, the animal(s) which they liked most and diagrams of the animals drawn. Besides, their initial knowledge level about animals was pretested by oral questions. They were also administered a posttest after a week time. Their write-up and posttest marks were analyzed and results were discussed.

III. RESULTS AND DISCUSSION

A. Learning experience

The children's museum visit reports were evaluated and it was found that they were much eager to identify different animals displayed in a single place and actively explored their structure and function (picture 1), as reported in a study at Cambridge Zoology Museum (2022). They posed curiously many questions like, 'Are they real animals? What is a liquid used to preserve? How are birds preserved? Are their eyes real? etc. They were fascinated while touching/ holding the birds and starfish. Similarly, Shaby et al. (2019) observed the domination of physical interaction of the students in the museum and stated that museum experiences were more meaningful.

Interestingly, most of them hold the preserved snakes in hands and said that earlier they were scared of snakes and now they were not scared of dead snake. Thus, they indicated the positive influence of museum visit.

Additionally, it was explained how children get 'autoinfection' of pinworm and hook worm from anal to oral route through unclean nails. Children realized the importance of hygienic habit and narrated this 'autoinfection' along with other museum experience to their parents and in turn parents gave appreciation feed back to us. In this way the concepts of science (especially the health and hygiene) were taken to the community (parents), which in turn indicates the roles of museum in popularizing science and also helping to bridge school and community. In support, Martin et al. (2016) reported that museum visit improves the beliefs about health practices relevant to everyday life. Likewise, Elizabeth (2020) stated that Zoology Museum is a key tool to engage local community with science and Tal and Morag (2007) suggested that museum should shift from the traditional knowledge transmission to more socio-culturally contextualized model.



Picture. 1. Active participation of children in learning in Zoology Museum

B. Learning achievement

1. Cognitive levels

Achievement test score of girls were ranging from 3 to 9 (out of 10) and the average was 6.73, whilst the same for boys were 6 to 10 and 8.25. When the difference between the two averages was not statistically significant ($t = 0.047$), it is obvious that the gender differences in learning from museum exhibits are also less. Besides, museum has great deal of information to exhibit, unlike traditional books (AlAjlan, 2021) and museum is more effective to the cognitive domain than affective domain (Altintas and Yenigul, 2020). The museum visit increased understanding the concepts through active participation of school students (Stavrova and Urhahne, 2010).

The students of IV class were able to identify mammals (92.6%), food habit of kingfisher (85.2%), and able to differentiate starfish from fish (92.6%) (table 1). Likewise, Holmes (2011) reported that museum exhibits motivate the students to achieve better in science. Wardrip and Brahms (2020) claimed that museum can foster the conditions for learning. In addition, studies stated that museum visit had significant impact on students' learning (Whitesell, 2016; Anderson et al., 2000; AlAjlan, 2021) and preservice student teachers recognized the museum as a teacher (Hamilton and Margot, 2020).

While handling and comparing beaks of birds and the skeletons/ bones of different animals the children showed better understanding of structure and functions of beaks (77.8%) and bones (70.4%). In Support, Tunncliffe and Laterveer-de Beer (2002) found that interactive exhibition about animal skeleton in museum has increased understanding of the concept of skeleton and the relationship between structure and function.

The children compared models of eyes, brain and hearts of different animals and were able to identify differences in their sizes and shapes. Researches also stated that museum can be used to teach different concepts/themes like wild life forms (Elizabeth, 2020), animal adaptations (Ash, 2003), animal behaviour (Josh, 2015), skeleton (Cambridge University, 2022) food chain, prey-predator relation (Trinity College, 2015) and biodiversity (Wendy, 2020).

Table 1: Item-wise analysis of students' achievement in posttest

SN	Item	Correct answer						Inappropriate answer						No answer					
		Boys		Girls		Total		Boys		Girls		Total		Boys		Girls		Total	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Name an animal that give birth to babies.	11	91.6	14	93.3	25	92.6	1	8.3	1	6	2	7.4	0	0	0	0	0	0
2	What is the food of king fisher?	12	100	11	73.3	23	85.2	0	0	3	20	3	11.1	0	0	1	6	1	3.7
3	Is starfish a fish?	12	100	13	86.6	25	92.6	0	0	2	13.3	2	7.4	0	0	0	0	0	0
4	Are the beaks of all the birds same? Why?	10	83.3	11	73.3	21	77.8	2	16.6	2	13.3	4	14.8	0	0	2	13.3	2	7.4
5	What is the use of skeletal system?	10	83.3	9	60	19	70.4	2	16.6	4	26.6	6	22.2	0	0	2	13.3	2	7.4
6	Among the museum animals which animal (s) can be made as pet?	11	91.6	11	73.3	22	81.5	1	8.3	3	20	4	14.8	0	0	1	6	1	3.7
7	If you see a snake, what will you do?	1	8.3	1	6	2	7.40	11	91.6	14	93.3	25	92.6	0	0	0	0	0	0
8	Which animal is more important for our environment?	10	83.3	11	73.3	21	77.8	1	8.3	3	20	4	14.8	1	8.3	1	6	2	7.4
9	What do you understand by seeing different types of animals?	8	66.6	5	33.3	13	48.1	4	33.3	8	53.3	12	44.4	0	0	2	13.3	2	7.4
10	Draw diagram of animal/model etc. you have seen in the museum.	12	100	15	100	27	100	0	0	0	0	0	0	0	0	0	0	0	0

Note: N: Boys = 12, Girls = 15, Total = 27.

2. Attitude development

From the post test, the students' responses showed that they were fond of rearing pet animals (81%), taking care of snakes (77%) and realizing importance of pet animals in their surroundings (77%) and thus they showed positive attitude towards animals. Similarly, Stavrova and Urhahne (2010) indicated that the higher secondary school students from Munich showed higher interest in learning and positive attitude. Eric Jensen (2014) reported from guided zoo visit that school students showed changing attitude towards conserving animals.

When 7, 8 & 9 questions of table 1 were asked in detailed manners, the responses of children were different (table 2). More than 50% of them said that they were scared of live snake and would run away, which may be practically correct from the children's point of view. Further, 14.8% said they would hold it which is not advisable/ not correct action and only one boy said that he would call the snake catcher which may be the appropriate action (question 7). Next, for the item no. 8, it was expected that children would answer that 'all the animals are important' but, they wrote different animals' names of their surroundings but not wild animals. The children's answers for the 9th question (table 2) were not related to expected answer of diversity of animals in a living place and indicated that students understanding about different animal types could not be linked with habitat through the visit to animal museum and it is due to beyond the age level of students. Thus it is pointed out importance of teachers' role in museum visit. In support, Faria and Chagas (2012) suggested that the role of teachers during the visit could determine the level of students learning.

Table 2: Variety of responses of students for the items 7, 8 and 9

SN	Item	Students' response	Boys		Girls		Total	
			N	%	N	%	N	%
1	7. If you see a snake, what will you do?	I am scared	5	41.7	2	13.3	7	25.9
		I will run away	1	8.3	6	40	7	25.9
		I will hold it	2	16.7	2	13.3	4	14.8
		I will cut	0	0	1	6.7	1	3.7
		I will be silent	0	0	1	6.7	1	3.7
		We should no hurt them	0	0	1	6.7	1	3.7
		I will call snake catcher	1	8.3	0	0	1	3.7
2	8. Which animal is more important for our environment?	Dog	1	8.3	5	33.3	6	22.2
		Snake	3	25	0	0	3	11.1
		Lion	3	25	0	0	3	11.1
		Cow	1	8.3	2	13.3	3	11.1
		Fish	1	8.3	1	6.7	2	7.4
		Cat	0	0	2	13.3	2	7.4
		Sheep	0	0	1	6.7	1	3.7
Tiger	1	8.3	0	0	1	3.7		
3	9. What do you understand by seeing different types of animals?	So many types of animals in our nation	5	41.7	4	26.7	9	33.3
		God created nature	2	16.7	4	26.7	6	22.2
		Happy and enjoy	0	0	2	13.3	2	7.4

Note: N: Boys = 12, Girls = 15, Total = 27.

3. Skill development

It may be inferred from the correct answers of the students in table 1 that all the students (100%) had drawn diagram of animal(s). The response for the item no.10 and write up (table 3) showed that most of them drew readily the diagram of snakes (81.5%), fish (77.7%) and starfish (74.1%) and showed that scary as well as attractive animals registered in their mind for long time. Similarly, Spiegel et al. (2012) stated that the reasoning patterns about evolution were related to the personal, socio-cultural and contextual variables of the visitors. It has been reported that a single visit to museum promoted among school children 21st century skills (Krantz and Downey 2021; Ziebell and Suda, 2020), social and thinking skills (Luke et al., 2019; Noy and Hancock, 2021; Ash 2003), whereas in our study, the 4th class students enthusiastically participated in drawing animals that may lead to developing skill through practices.

Table 3: List of animals drawn mostly (in item 10 and in write-up)

SN	Animal	Boys		Girls		Total	
		N	%	N	%	N	%
1	Snake	12	100	10	66.7	22	81.5
2	Fish	8	66.7	13	86.6	21	77.7
3	Starfish	9	75	11	73.3	20	74.1
4	Human skeleton	5	41.7	2	13.3	7	25.9
5	Crab	1	6.7	5	33.3	6	22.2
6	Bird	3	25	0	0	3	11.1
7	Shells	0	0	2	13.3	2	7.4
8	Rabbit skeleton	2	16.7	0	0	2	7.4
9	Crow	0	0	1	6.7	1	3.7
10	Parrot	0	0	1	6.7	1	3.7
11	Tortoise	0	0	1	6.7	1	3.7
12	Rat	1	6.7	0	0	1	3.7
13	Octopus	0	0	1	6.7	1	3.7
14	Skull	1	6.7	0	0	1	3.7

Note: N: Boys = 12, Girls = 15, Total = 27.

IV. CONCLUSIONS

Museum creates excitement and interest in learning. The kinesthetic learning experience of children in Zoology Museum develops observation, inquiry, comparison, reasoning and handling skills and motivates them to achieve better. They understood the concepts of adaptation, structure and function relation; however they could not comprehend 'biodiversity' which may be a high-level concept for their age. The difference in achievement level between genders was not statistically significant. In addition, museum visit can help in popularization of science and bridging the school and community. Therefore, it is strongly recommended that museum visit may be made as part of learning activity for hands-on and minds-on learning and used for theme/concept based teaching and learning activities, revision and evaluation of previous knowledge. .

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