

RELIGIOUS INFLUENCE ON GARDENING SKILLS AMONG PUBLIC SCHOOL STUDENTS FOR INQUIRY-BASED SCIENCE LEARNING

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ABSTRACT

The present paper is an attempt to assess the skills for school gardening for inquiry based science learning of fourth, fifth, sixth, seventh and eighth grade basic level students of public schools. To achieve this aim, questionnaires were developed for students who follow Hinduism, Buddhism and Christian. A sample of 404 (N=388) were selected from one leader and four feeder schools to take part in the present study located in Chitwan and Nawalparasi districts of Terai region of Nepal. Students from all the schools participated in school gardening activities as part of their science curriculum to motivate inquiry based science teaching and learning. Findings showed a weak association between the religion and gardening skills among the basic public level students. There was no statistically significant difference ($\alpha=0.05$) between gardening skills of students and the religion they follow. Quantitative analysis was done on the basis of frequency, Chi square test at 0.05 level of significance and phi to see the association between two variables. Analysis showed that school gardening skills such as plough the land and soil preparation, sow the seeds, watering and caring plant, takeout weeds, planting crops and using tools in the school garden among the students who follow Hinduism is better than that of students who follow Buddhism and Muslim. Gardening enthusiasm with basic skills varies among students with different religious group of students. The shift from traditional chalk and talk method to inquiry based science learning through garden pedagogy can be promoted the understanding level of science to develop scientific literacy among the students in public schools.

Key words: Garden pedagogy, inquiry based learning, transformation, scientific attitude

1. Introduction

Nepal is multi religious and multi ethnic country. Majority of Nepalese are Hindus (81.3%), Buddhists (9%), Islam (4.4%), Kiratism (3%), Christians (1.4%) and other religion (0.9%). Chitwan District is one of 75 districts in Nepal, and is located in the southwestern part of province no. 3, the fourth largest city of Nepal, as its district headquarters. It covers an area of 864.25 sq. m., and had a population of 579,984 people (CBS, 2011). Education in Nepal was long based on home schooling and Gurukul Education in Nepal from the primary school to the university level has been modeled from the very inception on the Indian system. In Nepal, an understanding of basic science is critical in today's society which is increasingly technology driven. Nepalese people use the knowledge of science on a daily basis to make decisions on evolving issues and technologies. It is becoming apparent that public schools in Nepal need to educate students on basic science literacy issues since they will be the ones making future decisions. In order to understand these issues and develop informed opinions, a society needs to have the basic understanding of the principles of science education (O'Brien & Shoemaker, 2006). Basic science skills are often referred to as science literacy (Bowker & Tearle, 2007), which can be defined as the knowledge and understanding of scientific concepts and processes required for personal decisions making participation in civic and cultural affairs (Kim, Park & Son, 2014).

In line with the recently adopted Global Goals for Sustainable Development, this research aims to catalyze improvements in the quality of teaching and learning science at the basic education level in Nepal through innovative, transformative and contextualized pedagogical approaches. The uniform nature of the national science curriculum at the schools has faced criticisms for not being sufficiently contextual and practical to capture all aspirations and topographies in Nepal. The vast majority of classroom teaching includes didactic teacher centered lectures (Acharya, 2017). The novice and some professionally motivated science teachers are more likely to use child-centered methods and strategies inside classroom. As far as assessment is concerned, standardized testing has encouraged rote learning and reproduction on the part of students rather than creating their own knowledge.

Science education is the field concerned with sharing science content (DeMarco, 1997) and process (Demarco, Relf & McDaniel, 1999) to the pupil and from pupil to the people to increase scientific literacy (Acharya, 2017). We've known for years that there are better and more effective ways to educate our students than the current school system. It takes a long time for institutions such as schools to change from the status quo, even when everyone can see that there is a desperate need to do so. Perhaps one of the greatest difficulties in the schools

face today in Nepal is the challenge of engaging students and creating excitement about science learning. Engagement is possible by adopting garden pedagogy (Blair, 2009). Traditionally, our educational endeavor has been pre-occupied with filling buckets or teaching students to recall specific content given to them through lecture (Acharya, 2016). In order to engage students, attention must be paid by educators to the capacities (Dobbs, Relf & McDaniel, 1998), interests (Herrington, 1998), and habits of students (Pigg, Waliczek & Zajicek, 2006). In essence, effective engagement of students requires engaging the imagination and lighting the fire of creativity (Thorpe & Townsend, 2001). Integrating science teaching and learning with the research, a higher order thinking can be developed among our students (Lineberger & Zajicek, 2000). It is with this paradox in mind that we turn our attention to the future of science education research and the changing paradigms through school gardening that will shape the society as a whole (Nabhan, 1994; Klemmer, Waliczek & Zajicek, 2005 and Skelly & Zajicek, 1998).

1.1 Situation of Learning Science

Science learning beyond the classrooms is a recent trend to learn science in the context of Nepal. According to Smith & Motesenbocker (2005), the outdoor classroom science activities provides a meaningful way to engage students in practical activities, giving them real experience of collecting and analysing data, and making predictions in the real world, beyond the limitations of the science classroom or laboratory. Providing students with real quality learning activities in relevant situations beyond the walls of the classroom is vital for helping them appreciate their first hand experiences in the school garden forms a variety perspectives (Acharya, 2017). Experiences outside the classroom also enhances learning by providing students with opportunities to practice skills of inquiry, and problem solving in everyday situations.

This study explored the relationship between the religious beliefs with basic gardening skills for inquiry based science learning integrated with garden pedagogy. It explores the knowledge regarding selective gardening skills such as plough the land, soil preparation, sow seeds, care, watering plants and the use of tools among N=388 students of 4 to 8 grades, who attended an intensive, fifteen days inquiry-based science enrichment program with intervention. The intervention was on the school garden by the participation of the subject teacher and the co-researcher for collaboration and discussion among the friends. I used pre- and post-surveys, and selective in-depth interviews with the students and the teacher to collect data relating the knowledge of gardening skills among the students. Participatory action research cycle was completely followed to see the learning habit of students in terms of skills by meaningfully engaging them in the school garden.

1.2 Theoretical Framework

The Constitution of Nepal (2015) respects and acknowledges the rights of all citizens including students of all ethnic groups, cultures and religions. There is a provision of the right to child friendly justice. Basic Education Curriculum (2069) has highlighted national educational objectives not only to respect, acknowledge and protect all the cultures, social values, and social collaboration but also to create social equality and inclusive society regardless difference in different genders, cultures and religions.

Policy reform documents value inquiry-based learning in Nepal (National Curriculum Framework, 2075). Science learning primarily based on learning experiences. It is based on the theory of constructivism which is the main part of observation and scientific study about how people learn. Gardening skills are related to learning experience which was specified by Dewey (1934). Comprehensive understanding of inquiry-based learning supported by the participatory action research (PAR) approach through the development of higher-level sequential thinking involved in the co-creation of knowledge in science among the students.

2. Purpose of the Study

The study examined how the school garden develop an inquiry among the basic level students' attitudes about science based on different religion. The research questions were as follows:

1. How does the school garden help to enhance inquiry in science learning among the basic school students' attitudes about science?
2. How useful is the school garden in supporting basic school students' attitudes about science and science inquiry learning?
3. To improve the quality of teaching and learning science at the basic education level (grades 4-8) in Nepal through innovative, transformative and contextualized pedagogical approaches.

3. Method and Materials

3.1 Population and Sample of the Study

A total of 404 (N=388) students (Table 2) from five public schools (Table 1) who were in the four to eighth grade were recruited for this study because they were at the critical age when students tend to increase interest in doing practical activities in science (Dobbs, Relf & McDaniel, 1999). I also limited the number of the participants to 388 that helps to ensure quality inquiry-based learning using school garden relating with basic gardening skills. The selected students completed an intensive fifteen days intervention in the school garden to learn gardening skills. Information of students as per the religion indicated that 73.5% were Hindus, 17.8% were Buddhists and 8.7% were Muslim. In addition, 40.8% were Chhetis, 25.7% were Brahmin, 14.2% were Magar, 9.5% were Newar, 7% were Tharu, and 2.8% were highly marginalized. In the same way, 73.5% of the students said Nepali was their mother tongue; 1.2% was Newari, Tamang 7.6%, Tharu 10.4%, Magar 1.4%, Darai 2.8% and 3.1% were highly marginalized Chepang. The age of the students ranged from 8 to 10 years old (18% of participants), from 11 to 13 years old (62.5% of the participants), from 14 to 16 years old (19.5% of the participants) and only 0.2% participants were at the age of 17 years at the time of the study.

Table 1: Sample schools and the total number of students

Name of the Schools	Frequency	Percent	Valid Percent	Cumulative Percent
Bag Devi Basic School	38	9.4	9.4	9.4
Jana Ekata Basic School	77	19.1	19.1	28.5
Jan Jiwan High School	209	51.7	51.7	80.2
National Basic School	50	12.4	12.4	92.6
Nawa Durga Basic School	30	7.4	7.4	100.0
Total	404	100.0	100.0	

Table 2. Number of students in each class

	Frequency	Percent	Valid Percent	Cumulative Percent
4	45	11.1	11.1	11.1
5	57	14.1	14.1	25.2
6	96	23.8	23.8	49.0
7	105	26.0	26.0	75.0
8	101	25.0	25.0	100.0
Total	404	100.0	100.0	

3.2 Site Location

The study area was held in the school garden and in the classroom. The school garden is near by the main school building and besides the eco-san toilet. Activities in the garden was done from 9:00 a.m. until 4:00 p.m. but the time to go in the garden depends on the period assigned to learn science each day. Students were able to experience like to learn in a school garden by inquiry-based lessons. They were meaningfully engaged in all the activities and in the interventions packages. Almost all (99.7%) students had never been done activities in the school garden (survey report). Mostly girl students were interested in this type of setting and expressed an interest a science practical activities for inquiry-based learning science. The intervention provided an integrated knowledge of basic gardening skills. Intervention in the garden promoted hands-on, cooperative learning through an inquiry approach for students with the participation of teachers as co-researchers.

3.3 Instruments: Science survey test instrument was developed by the co-researchers (myself) and the science teachers of the Jana Jiwan Higher Secondary School, Chitwan. Participating teachers were familiar to participatory action research approach by our prolonged engagement in the field and the inquiry based science learning. The survey questions were related with the basic gardening skills such as the knowledge of plough the land, soil preparation, mixing compost manure and urine, care of plants and the use of tools in the school garden. The goal is to develop instruments that were grade-appropriate to assess the knowledge of skills as per their religion.

4. Data Analysis

Simple frequency, chi-square test at 0.05 level of significance and phi were performed in order to understand whether there is an association between the basic public school students with the school gardening skills in terms of religion variable. Before conducting Chi-square test analysis, the assumptions of the analysis were checked. The followings were tested, respectively (a) independence of observations (b) homogeneity of variable (c) Two variables should be measured at an ordinal or nominal level (d) two variables should consist of two or more categorical, independent groups (e) the levels (or categories) of the variables should be mutually exclusive. In all statistical tests, $\alpha = 0.05$ significance level was used in order to see the association, phi was calculated by using SPSS programme of data analysis.

5. Results

Inferential statistics of the association between the basic school gardening skill (plough the land and soil preparation) with the religion of the students in Table 3.

Table 3. Skills of students for school gardening: Plough the land

Gardening skill	Religion						Total	
	Buddhist		Hindu		Christian		N	%
	N	%	N	%	N	%		
Skills of students forNo school gardening: Plough the land	17	25.0	125	43.4	10	31.3	152	39.2
Yes	51	75.0	162	56.3	22	68.8	235	60.6
Total	68	100.0	288	100.0	32	100.0	388	100.0

Percentage exceeds to 100% due to MR.

Table 2 shows that the knowledge of gardening skill related to plough the land and soil preparation for the school gardening was 75% among the students who are Buddhist, 68.8% among Christian and 56.3% among the Hindus.

Table 4. Chi-Square test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.241 ^a	4	.055
Likelihood Ratio	9.843	4	.043
Linear-by-Linear Association	.197	1	.657
N of Valid Cases	388		

3 cells (33.3%) have expected count less than 5. The minimum expected count is .08.

Chi-square value is 0.055 which is more than 0.05 (Table 2) shows that there is no association between the religion and the gardening skill in terms of plough the land and soil preparation for the school gardening. The calculated value of Phi (0.154) also shows the modest association between the variables.

Table 5. Skills of students for school gardening: Sow the seeds

Gardening skill	Religion						Total	
	Buddhist		Hindu		Christian		N	%
	N	%	N	%	N	%		
Skills of students forNo school gardening: Sow the seeds	17	25.0	103	35.8	14	43.8	134	34.5
Yes	51	75.0	185	64.2	18	56.3	254	65.5
Total	68	100.0	288	100.0	32	100.0	388	100.0

Regarding the skill related to sow the seeds in the school garden, 51% Buddhist students have the knowledge that were shown in the school garden. Among the Hindus students, only 64.2% shown the gardening skills and 56.3% Christian students have the knowledge and skills of sowing the seeds in the school garden (Table 5).

Table 6. Chi-Square test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.129 ^a	2	.127
Likelihood Ratio	4.236	2	.120
Linear-by-Linear Association	3.451	1	.063
N of Valid Cases	388		

0 cells (.0%) have expected count less than 5. The minimum expected count is 11.05.

The association between the skills of sowing the seeds in the school garden in respect with the religion is 0.127 and the calculated Phi value is 0.103. Both the values indicate that there is not the relation/association between the gardening skills in terms of sow the seeds with the religion of public level students in Nepal.

Caring and watering plants in the school garden among Christian students was 56.3% and the students who follow Buddhism was 72.1%. But there is not an association between these two variables (Table 8).

Table 7. Skills of students for school gardening: Watering the plants

Gardening skills	Religion						Total	
	Buddhist		Hindu		Christian		N	%
	N	%	N	%	N	%		
Skills students for schoolNo gardening: Watering the plants	19	27.9	92	31.9	14	43.8	125	32.2
Yes	49	72.1	196	68.1	18	56.3	263	67.8
Total	68	100.0	288	100.0	32	100.0	388	100.0

72.1% Buddhist public school students, 68.1% Hindus and 56.3% Christian students have the skills of caring and watering plants in the school garden.

Table 8. Chi-square test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.528 ^a	2	.282
Likelihood Ratio	2.447	2	.294
Linear-by-Linear Association	2.467	1	.116
N of Valid Cases	388		

0 cells (.0%) have expected count less than 5. The minimum expected count is 10.31.

The association between the religion and the watering and caring of the green vegetables and plants in the school garden was weak which is shown by Phi 0.081.

Table 7. Skills of students for school gardening: Takeout weeds

Gardening skills	Religion						Total	
	Buddhist		Hindu		Christian		N	%
	N	%	N	%	N	%		
Skills of students for schoolNo gardening: Takeout weeds	22	32.4	99	34.4	14	43.8	135	34.8
Yes	46	67.6	188	65.3	18	56.3	252	64.9
Total	68	100.0	288	100.0	32	100.0	388	100.0

Skills of students for school gardening in terms of takeout weeds from the plot is seems good among the students who follow Buddhism (67.6%), and Hinduism (65.3%) and 56.3% Christian students have the basic skills of gardening. The association between the taking out weeds from the school garden and the religion of students is shown weak (chi square value 0.796 at $\alpha=0.05$). Weak association between these two variables seems weak by Phi (0.066).

Table 8. Skills of students for school gardening: Planting crops

Gardening skill	Religion						Total	
	Buddhist		Hindu		Christian		N	%
	N	%	N	%	N	%		
Skills of students for school gardening: Planting crops	16	23.5	95	33.0	12	37.5	123	31.7
No Yes	52	76.5	193	67.0	20	62.5	265	68.3
Total	68	100.0	288	100.0	32	100.0	388	100.0

Majority of Buddhist public school students (76.5%) have the basic gardening skills in terms of planting crops. 67% Hindus and 62.5% Christian students have the basic knowledge of gardening skills. The association between the basic gardening skills and the religion is very weak (ϕ 0.085) and there is no significance difference at 0.05 level of significance (Chi square 0.245) which is more than that of the tabulated value.

Table 9. Skills of students for school gardening: Using the tools

Skills of students for school gardening: Using tools	Religion						Total	
	Buddhist		Hindu		Christian		N	%
	N	%	N	%	N	%		
No	16	23.5	95	33.0	12	37.5	123	31.7
Yes	52	76.5	193	67.0	20	62.5	265	68.3
Total	68	100.0	288	100.0	32	100.0	388	100.0

67% Hindus public school students have the basic skills of using the tools such as spade, shovel, sickle, etc. in the school garden whereas 76.5% Buddhist students have the similar skills. There is a strong relationship between these variable as shown (Table 10). The chi square ($\alpha = 0.000$) is less than that of tabulated value at 0.05 level of significance. Phi value (0.56) shows the strong relationship between the variables.

Table 10. Chi-square test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.743 ^a	2	.000
Likelihood Ratio	18.671	2	.000
Linear-by-Linear Association	6.528	1	.011
N of Valid Cases	388		

Table 10. Comparison between gardening skills in terms of religion

	Gardening skills among public school students in relation with religion						Total
	Plough the land and soil preparation	Sow the seeds	Caring and watering plants	and Takeout the weeds	Planting crops	Using tools	
Buddhist	51 13.6%	51 13.6%	49 13.1%	46 12.3%	52 13.9%	52 13.9%	65 17.4%
Religion Hindu	162 43.3%	185 49.5%	196 52.4%	188 50.3%	193 51.6%	139 37.2%	277 74.1%
Christian	22 5.9%	18 4.8%	18 4.8%	18 4.8%	20 5.3%	16 4.3%	32 8.6%
Total	235 62.8%	254 67.9%	263 70.3%	252 67.4%	265 70.9%	207 55.3%	374 100.0%

Percentages and totals are based on respondents. Dichotomy group tabulated at value 1.

Public school students in Chitwan district of Nepal have different gardening skills in terms of religion. It is found out that Hindus have good knowledge of basic gardening skills comparing with Buddhist and Muslim students (Table 10). By the comparison among the three religion in terms of school gardening skills of the public level students, students who follow Hinduism have comparatively better gardening skills than that of Buddhist and Christians. 43.3%, 49.5%, 52.4%, 50.3%, 51.6%, 37.2% and 74.1% Hindus students have the skills to plough the land, sow seeds, watering plants, takeout weeds, planting crops and using the tools respectively. Basic gardening skills among the Christian public school students is least on comparison with the rest of two religions. It is found out that 13.6%, 13.6%, 13.1%, 12.3%, 13.9%, 13.9% and 17.4% Christian students have the skills of plough the land, sow the seeds, watering plants, takeout weeds, planting crops and using the tools respectively. Buddhist public school students have the moderate percentage of basic skills in comparison with Hindus and Buddhism (Table 10).

6. Conclusion

The present research aimed to assess the gardening skills by the students at the basic level school students in the public schools at Chitwan district of province no 3. Findings showed that students who follow Hinduism have relatively good gardening skills such as soil preparation, sow the seeds in different seasons in the school garden, taking out weeds form the garden, caring and watering plants and the use of simple tools in the school garden. In addition, no significant difference were found among them in accordance with to religion and basic gardening skills. Phi value showed a very weak relationship and the associations between the variables except the use of tools in the school garden. Furthermore, having the knowledge of basic gardening skills is important for the inquiry based science teaching and learning for the transformation of teacher centered pedagogy to child centered approach of teaching and learning science in the public schools in Nepal.

7. Proposed Research

The present study believes that conducting these studies will shed more light on the use of school garden for inquiry based science learning to transform the classroom pedagogy in the context of Nepal.

1. Cultivating the enthusiasm among science teachers and students for enquiry based learning through the provision of practical classes outside the structured classrooms in Nepal.
2. Difficulties facing public school science teachers when using garden pedagogy system in science teaching and learning.
3. A proposed training programme for the public school science teachers on garden pedagogy and the design of courses.

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