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Teachers' Perceptions of the Impacts of Environmental Science on Children's Environmental Behaviors in Lower Primary Classes in Botswana

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Abstract:

This study was conducted to assess teachers' perceptions of the impacts of environmental science on children's environmental behaviors. The aim of environmental science is to teach children responsible environmental behaviors at a tender age. Research has shown that personal environmental behaviors and actions established at a tender age are often carried out through adulthood, hence the introduction of Environmental Science (ES) in Lower Primary Classes.

One hundred and fifty teachers who taught lower primary classes participated in the study. Since children spend more time with teachers in schools, it was found appropriate to assess their perceptions of children's environmental behaviors. Given that teachers are providers of knowledge on environmental issues, their perceptions regarding the impacts of environmental science on children's environmental behaviors is considered critical. Two instruments designed for this study were used to collect data, namely a questionnaire consisting of seventeen items and an open ended interview schedule consisting of nine items.

The results of the study suggest that children's environmental behaviors have changed much. Children in lower primary classes now possess favorable environmental behaviors suggesting the impacts of ES after thirteen years of its inception. Seventy-seven percent (77%) of teachers reported that children in lower primary classes have pro-environmental behaviors while twenty-three percent (23%) of teachers reported children in lower primary classes have unfavorable pro-environmental behaviors.

From the findings, it could be concluded that Botswana's fragile ecosystem would be sustained for future generation because its future citizens possess responsible environmental behaviors. The subjects of the study reported that responsible environmental behaviors should start at home where parents, siblings nurture children's environmental behaviors. In conclusion suggestions on ways of promoting responsible environmental behaviors are made in the hope of conserving Botswana's fragile ecosystem.

Keywords: Teachers' Perception, Environmental Science (ES), Environmental Behavior, Lower Primary Classes, Botswana

1. Introduction

The notion of responsible environmental behaviors or sustainable development was held with high esteem by the indigenous people because their livelihood depended entirely on the environment (Schapera, 1933). Leading figures in calling for sustainable development were chiefs or tribal leaders (Mosothwane, 2007). After getting its independence from Britain in 1966, Botswana chiefs' environmental powers were restricted; consequently, environmental problems began to escalate (Mosothwane, 2007). As Cheng and Monroe (2013) point out, human behaviors are implicated in a number of environmental problems. To redress environmental problems, Botswana introduced a subject called; Environmental Science (ES) whose aim is to promote children's environmental behavior at a tender age (Republic of Botswana, 2002). Environmental Science panel believed that children's environmental behaviors can easily be changed while they are still young'. This perception is in agreement with the Setswana proverb which says 'Lore lo ojwa le sale metsi' which literally translates into 'Children's environmental behaviors can easily be changed while they are still young. Eilan and Trop (2012) also reported that acquisition of environmental behavior is much higher for young children than it is for adults. As individuals, children's acquisition of responsible environmental behaviors could ultimately sustain our global environment. Although Eilan and Trop (2012) perceive the school as the best place where responsible environmental behaviors should be taught, Collado and Correliza (2015), contend that home is the best place where environmental behavior should be taught. Collado and Correliza (2015) perceive children's understanding of the environment and ecology as essential for the future of planet earth which is the only planet sustaining life. Children should therefore be exposed to the environment so that they get committed to its protection. Research studies reported that naturalness around homes improves children's environmental self-discipline. Further, nature has a positive influence on children's environmental behaviors and can increase children's psychological well-being (Collado & Corraliza, 2015). If children are exposed to nature at home, it is likely that they will develop pro-environmental behaviors which will help them develop skills that they can use to reduce littering in their school play grounds (Collado & Corraliza, 2015).

Kaiser, Hartig, Brugger & Duvier (2011) reported that direct contact with nature would enhance children's ecological behavior such as picking up litter from the classroom, closing tap water, reducing noise in the classroom. Several studies conducted on environmental behaviors, have shown that responsible environmental behaviors are influenced by a number of factors and processes (Collado & Corraliza, 2013; Cheng & Monroe, 2012; Eilan & Trop, 2012) According to the researchers, some of these factors include role models by people staying with children, role models by teachers, childhood experience in nature, behavior, appreciation of quality environment, visits to game reserves and forests, active members of environmental clubs. For example, in Botswana we have 'Bird Clubs, Wild life clubs to name a few. These factors and processes are reported to have influenced children to behave more ecologically. The study intends to find out from teachers if environmental science has an impact on children's environmental behaviors. ES teaches children factors and processes that will influence Botswana children's environmental behaviors so that they are pro-environmental. Collado & Corraliza (2015) point out that those children who grow up in contact with nature tend to develop love for all forms of life. Children with responsible environmental behaviors perceive the environment as an integral part of their life (Barr, 2003). Childhood natural experiences will influence their environmentalism. Our children are future citizens of Botswana and as such should be active in environmental activities when they grow up to sustain our environment. Research indicates that children who grow up in natural environments tend to have an increased psychological wellbeing (Wells & Evans, 2003). For example, they have positive attitudes toward the environment; they are stable and can cope with stress more than those whose homes lack nearby natural environment (Cheng and Monroe, 2013). Children whose homes have more nearby nature tend to have less stress than those whose homes lack nearby natural areas. As these children become adults, they will engage in responsible environmental behaviors due to experiences with natural environments.

Davis, Rea, and Waite (2006) suggest that spending time outdoors helps children develop positive values about nature; similarly, Environmental Science (ES) stresses the importance of outdoor learning because it improves children's cognitive functioning as it links children's everyday life activities to natural environment. Children's cognitive processes will help them to understand that they are not divorced from the environment.

Cheng and Monroe (2013) observe that 'People who had more nature experiences during their childhood are more likely to have pro-environmental attitudes, which may further influence their pro-environmental behaviors' (p.36). In Botswana, environmental science teaches children connections to nature from grade 1 through grade 4 and it is important that their environmental behaviors be assessed through their teachers who are in a better position to indicate if ES had impacts on their environmental behaviors. Research indicates that change in environmental behavior is an indication that they have connections to nature (Cheng & Monroe, 2013).

Cheng and Monroe (2013) observe that children's connections to nature influence their intention to participate in nature based activities in the future. 'Children's connection to nature, their previous experience in nature, their perceived family value toward nature, and their perceived control positively influenced their interest in performing environmentally friendly behaviors' (p.31).

Matsuoka (2010) found that students in schools with more nature experience obtained higher grades than those whose schools have less nature experience. Children in schools with more nature experience plan their studies carefully, have few criminal records and have positive motivation to protect the environment. The goal of ES is also to expose children to nature experience and help them understand that humans are sources of environmental problems. The basis for choosing teachers as the subjects of this study is that teachers are instrumental in teaching children responsible environmental behaviors. Children and the general public look upon teachers as embodiment of knowledge (Mosothwane & Ndwapi, 2012). Teachers are therefore the right people from which to get information on children's environmental behaviors because they stay with children for five days, observing children now and then and seeing if children are involved in environmental activities such as closing running water taps, switching off lights in classrooms, picking up litters from school play grounds and classrooms. Vision 2016 calls for sustainable use of the environment and as a result Environmental Primary Science panel introduced environmental science as a means to teach children sustainable use of the environment. Through environmental science, children will be persuaded to accept responsibility for the production of environmental problems and to change their everyday practices as a means to alleviate future environmental problems (Burgess, et al, 1998).

Teachers' perceptions of the impacts of Environmental Science (ES) on children's environmental behaviors are critical because teachers teach children environmental issues that will help them to be engaged in pro-environmental activities.

Teachers' perceptions of the impacts of ES on children's environmental behaviors are based on observation and application of content knowledge taught to children. Concepts such as road safety, recycling, litter removal and refuse disposal, conservation of natural resources have been identified as critical for children to understand. In Botswana, teaching of these concepts is considered critical for the development of children's responsible environmental behaviors.

The main goal of ES is to produce future citizens who possess responsible environmental behaviors. Responsible Environmental Behavior (REB) has for many years been used by educators and behavioral scientists to inform the development of environmental behavioral change in students and teachers. Hines; Hungerford & Tomera (1987)'s model of responsible environmental behaviors has factors that are considered critical for shaping environmental behaviors and as such serves as the theoretical basis for this study.

2. Methodology

This study employed a mixed research design using a questionnaire with seventeen (17) items and nine (9) free responses items. Although a large number of items are predominantly quantitative in nature, the researcher however found it necessary to include free responses items to get more information about children's environmental behaviors. One hundred and fifty teachers who taught lower primary pupils participated in the study. The sample was composed of female teachers only. A list of all government primary schools in Gaborone, the capital city was available for the researcher to select from. Names of schools were written on separate papers and out

of fifty schools fifteen schools were randomly selected. From the selected schools a stratified sampling procedure was used to select teachers and two hundred teachers were selected without replacement. Prior to the administration of the instruments, letters were written to teachers asking them if they will be willing to participate in the study, all two hundred teachers agreed to participate, however, when questionnaires were administered and interviews conducted, only one hundred and fifty teachers managed to participate, but fifty teachers declined or opted out of the study.

2.1. Instrumentation

Two instruments were designed for this study. They consisted of a questionnaire and open ended response items. A survey questionnaire was composed of seventeen items which sought teachers' perceptions of the impacts of ES on children's environmental behaviors. The participants were to show the impacts of ES on children's environmental behaviors by ticking Likert Scales, Agree (A) or Strongly Agree (SA) or Disagree (D) or Strongly Disagree (SD). There were eight open ended questions which were to be answered by the participants. The purpose of open ended questions was to solicit information from teachers which could not be provided by the questionnaire.

2.2. Validation of Instruments

Information provided by questionnaires and open ended items should be trusted by the general public, hence the need to validate the instruments. The questionnaire was validated by a team of experts by matching the items with constructs; attitudes, action skills, locus of control, personal responsibility, knowledge of environmental issues and knowledge of action skills which are aspects of Hines, et al (1987)'s model of responsible environmental behaviors. Although a team of experts were from different departments, their responses had an inter-agreement of 0.81. With regard to open ended questions, the experts also matched the questions with aspects of Hines; et al (1987)'s model of responsible environmental behavior such as observation, obligation/duty, verbal communication/commitment, locus of control and personal responsibility knowledge. The experts had an inter-agreement of 0.9 which confirms that the instruments truly measured what they intended to measure, the impacts of ES on the development of children's responsible environmental behaviors.

2.3. Reliability of Instruments

A pilot study was conducted using teachers from schools that did not participate in the study. The reliability score from the pilot test was a Cronbach alpha of 0.81.; hence the questionnaire was used in collecting data because of its high reliability coefficient with regard to free response items, the researcher was not so much concerned with instrument reliability but rather with the themes under which the responses could be assigned. Since free response items are usually analyzed qualitatively, the reliability of free response items will come out as more and more participants give responses to the items.

3. Data Analysis

The purpose of the analysis was to answer the research question: What impacts does the teaching of ES have on children's environmental behaviors? To analyze the impacts of ES on children's environmental behaviors, I calculated the frequency distribution of teachers' responses to seventeen items of the survey questionnaire. A change in children's environmental behaviors is indicated by a high percentage of responses to an item.

4. The Results

4.1. Survey Questionnaire

The following results are the responses of teachers on their perceptions of the impacts of the teaching of ES on children's responsible environmental behaviors.

Statement	N	A	SA	D	SD
1. Our children like a clean environment	150	60(40%)	65(43%)	12 (8%)	13 (9%)
2. Our school playgrounds are clean	150	50(33%)	65(40%)	15(10%)	20(13.3%)
3. Children know that they are part of the environment	150	70(47%)	63 (42%)	10(7%)	7(5%)
4. Our children recycle papers/cans	150	87(58%)	23(15%)	15(10%)	25(17%)
5. Solid waste disposals in our schools have been reduced	150	45(30%)	32(21%)	43(29%)	30 (20%)
6. Our children clean their classrooms without supervision	150	70(47%)	45(30%)	13 (9%)	10 (7%)
7. Children now know that a clean environment has health benefits	150	102(68%)	30(20%)	15(10%)	3(2%)
8. Children discuss the effects of environmental problems on humans	150	23 (15%)	41((27%)	72 (58%)	12(8%)
9.Children can now control noise in class when the teacher is not available	150	87(58%)	13(9%)	27(18%)	23 (15%)
10.Children close running water taps	150	90(60%)	20(13%)	14(9%)	26(17%)
11.Children obey road safety laws when they cross the road	150	100(67%)	13(9%)	27 (18%)	10(7%)
12.Girls are actively involved in environmental activities/issues	150	120(80%)	20 (13%)	7 (5%)	3 (2%)
13. Children put solid wastes in erected rubbish bins in their schools	150	45(30%)	22 (15%)	42 (28%)	41 (27%)
14. Children do not use toilets when water taps do not have running water	150	110(73%)	20 (13%)	15 (10%)	5 (4%)
15. Children plant trees in their schools	150	83 (55%)	17((11%)	26 (17%)	24 (16%)
16. Primary school have conservation clubs	150	39 (26%)	21(14%)	46 ((31%)	44 (29%)
17. As adults our children will apply skills, knowledge learned in ES to solve environmental problems	150	77 (51%)	21(14%)	9 (6%)	32 (21%)

Table 1

4.2. Open ended items

You are requested to provide detailed answers/responses the questions below.

1. After listening to children talking about environmental issues/problems, do you think our children will be able to act on specific environmental problems/issues? Why or why not?
2. In your views as a teacher in lower primary classes, does ES have any impact on children's environmental behaviors? Please support your answer/response.
3. Do you think the teaching of ES has changed children's behaviors to be pro-environmental? Support your response.
4. By observing your class, do you think children understand the effects of pollution on their health? Support your answer.
5. Are there teaching subjects that you think you should be/taught to promote children's environmental behaviours? Support your answer.
6. Apart from the school, who else should be involved in promoting responsible environmental behaviors? Support your response.
7. Does your class like ES? Support your response.
8. The Government of Botswana is concerned about the quality of Botswana's environment so much that it introduced ES in primary schools. Is the concern justified? Is the introduction of ES in primary schools also justified?
9. In your views, what factors and processes influence children's environmental behaviors? Support your answer.

4.2.1. The Responses of Teachers to Free Responses Items

For free response items, only teachers with years of experience ranging from four to thirteen were requested to participate. Their responses are presented below:

1. Four Years of Teaching Experience 'We have observed that our children especially standard 4s now appreciate a clean environment. This is evident from play grounds, classrooms. Children pick up papers in our schools. We think it is because of the teaching of ES. It is encouraging to see young children being actively involved in environmental activities that will help to sustain their environment/natural resources even when they are adults'.
2. Six Years of Teaching Experience 'Indeed children know the effects of environmental problems on their health. There is a stream behind our school. This stream is polluted with plastics, cans, beer bottles and other solid wastes. No child ever drinks water from the stream. Children understand that water from this stream is polluted and if they drink it, their health will be at risk.'
3. Eight Years of Teaching Experience: 'Outdoor teaching exposes children to real life situation. Visits to nature areas, I mean things like game reserves, forestry help children to feel the real thing. Participating in cleaning campaigns also help children to realize that environmental problems are caused by humans. I think teaching all children Environmental Education will increase children's knowledge of sustainability. Social Studies will also help to promote children's responsible environmental behaviors.'
4. Ten Years of Teaching Experience: 'Yes, children do like ES. ES teaches children that they are an integral part of the environment. If they pollute the environment, they are polluting themselves. Children have positive attitudes towards their environment. They want to keep the environment clean and to sustain the resources. The teaching of ES in lower primary classes is commendable, because it exposes children to nature. It increases their love for a quality environment.'
5. Thirteen Years of Teaching Experience: As teachers we should act as appropriate models because children emulate the way their teachers act. We should act in a way that will develop children's responsible environmental behaviors. Young children copy environmental behaviors whether pro-environmental or non-pro-environmental behaviors. Promoting responsible environmental behaviors is not the duty of teachers' only, family values toward the environment is the most critical factor. Children from families who have positive attitudes towards the environment tend to love a healthy environment. Promoting interest in participating in environmental activities is also essential. This should be the duty of teachers, parents and the general public. Visits to natural areas tend to create responsible environmental behaviors amongst children. It should be part of teaching and it is encouraged by environmental educators. Knowledge of the environment is very critical for it helps someone to know that behaving in unfriendly way to the environment will negatively affect their health. Nature at school is also important. Planting trees in schools, having flowering plants in the schoolyard are important as these will promote children's responsible environmental behaviors'.

4.3. Discussion of the Findings

Rather than discussing data from survey questionnaire and free responses items, item by item, a number of themes were identified as a means to restructure the discussion. Consequently, the discussion of the findings is presented as follows:

4.4. Action Skills

The results of the study suggest that teachers perceive children as having acquired action skills in learning ES. The responses to items, 2, 4, 5, 6, 10, 11, 13, and 15 of the Survey Questionnaire are a testimony to teachers' perceptions. According to the respondents, the skills acquired in ES include critical thinking, problem solving and inquiry. Teachers' perceptions are in agreement with ES that skills learnt are expected to develop the learner's sense of responsibility toward the environment (Republic of Botswana, 2002). Therefore, recycling of cans, bottles, papers by children show the positive impacts of ES on their environmental behaviors.

4.5. Observation

Teachers stay with children for five days, therefore their perceptions of children's environmental behaviors reflect children's true environmental behaviors. Teachers observe children playing, talking, and running, on a daily basis. According to teachers, ES has helped children to realize that they are an integral part of the environment. The Lower Primary School Syllabus is in an agreement with teachers' perceptions as it contends 'ES is a subject that helps learners to understand their environment and how they relate to it' (Republic of Botswana, 2002, p.90).

4.6. Knowledge of Environmental Problems

Teachers reported that children gained knowledge of environmental problems in ES as indicated by responses to items 5, 7, 8, and 14 of survey questionnaire. Further, questions 1 and 4 of free response items also support the perceptions that children have gained knowledge of environmental problems in ES. Teachers' responses suggest that the possession of knowledge and action skills by children could help them solve environmental problems. Therefore, both content knowledge and action skills should be emphasized in teaching ES in lower primary classes.

4.6.1. Attitudes toward the Environment/ES

According to the participants, lower primary children have favorable attitudes toward ES and the environment as indicated by the responses to items 7 and 10 of open ended questions and items 1 and 4 of survey questionnaire. Cheng & Monroe (2013) indicated that favorable environmental attitudes established at a tender age are often practiced throughout adulthood. ES intends to develop children's desirable attitudes toward the environment so that they continue with such attitudes even when they are adults. It cannot be expected that children will develop desirable environmental attitudes if they do not like ES.

4.6.2. Environmental Education and Social Studies

The participants are of the view that even though ES is specifically developing children's environmental behavior, academic subjects such as EE and Social Studies must be taught to children in lower primary classes because they will also enhance responsible environmental behaviors which are required for sustaining our fragile environment. Social Studies and Environmental Education are not taught to children in lower primary classes. In-fact Environmental Education (EE) is not an independent subject in Botswana; it is infused into other subjects of the school curriculum. Teachers believe that both Social Studies and Environmental Education are justified to be taught in lower primary classes.

4.6.3. Essential Elements Promoting Responsible Environmental Behaviors

In their responses to open ended questions, teachers indicated some elements that are essential for promoting responsible environmental behaviors. These include family values toward the environment, visits to game reserves, participation in environmental clubs or organizations, homes as places of nature, teachers acting as models of appropriate environmental behaviors. The subjects of the study also emphasized the use of participatory methods which are recommended by Lower Primary School Syllabus (Republic of Botswana, 2002). In support of teachers' importance of using activity oriented method, the lower primary ES syllabus contends 'Teachers may use various teaching methods including problem solving, project method, thematic approach, experimentation, investigation, demonstration, field excursion and discussions. The local environment should be used to provide context to the syllabus' (Republic of Botswana, 2002, p.90).

5. Conclusion

Although the results of the study suggest that children in lower primary classes have developed responsible environmental behaviors, however, on the ground we do not see the impacts of ES on their behaviors. Outside our primary schools there are litters such as cans, plastics, papers from sweets. The question of interest is why is it that teachers who teach lower primary children are confident that children have developed responsible environmental behaviors yet away from schools such behaviors are not practiced? ES must be taught in practical way. Visits should be made to show children places which are polluted. However, teachers should ensure that the pollutants do not affect children's health in any way at the time of visits. Teachers indicated that the responsibility to develop children's environmental behavior should be a concerted effort if Botswana's fragile ecosystem is to be sustained. Teachers, parents, the general public, leaders of different tribes (chiefs) should all teach children responsible environmental behaviors. Before Botswana became independent in 1966, chiefs had powers and instructed their tribes to have clean environments around their homes at all times. Chiefs successfully implemented traditional environmental laws and as a result I recommend that they be given powers for dealing with environmental issues because they are respected by their people and their people also acted on environmental issues when they instruct them to do so. Our environments used to be very clean because chiefs enforced indigenous environmental laws and such laws saved our ecosystem. If environmental laws are given to chiefs as it used to be then Botswana's environmental quality will be maintained.

ES was introduced in primary schools in 2002 to raise the environmental literacy of Botswana and to promote their environmental knowledge in accordance with UN's Millennium Development Goals. Since in each village or town there are wards, environmental organizations should be formed in each ward to teach young children responsible environmental behaviors because their minds can easily be molded at a young age (Govendaswamy, 2012). As these children grow older the need for action to address environmental issues will come more urgent. Research reports that children who grow up in a friendly environment tend to show behaviors that

support sustainable use of natural resources (Mosothwane, 2005). As children in wards become older they begin to re-examine their personal and social values and actions in the light of environmental problems and provide useful framework to move forward in the direction they see fit (Binstock, 2006). In different wards, they will be taught strategies to conserve and use resources sustainably. ES was introduced thirteen years ago and teachers now need thorough in-service training to learn new teaching strategies that would help them implement it effectively. Further research is needed to use teachers from urban, semi-urban and rural areas because they will provide information that will be more representative of children's environmental behaviors in these areas. Such information would help researchers to assess which area has children who possess favorable environmental behaviors. Since the study was confined to only one urban area, it cannot be conclusively concluded that ES has an impact on children's environmental behavior throughout Botswana. If the results of the study reflect the actual behaviors of children in lower primary classes, it could be safely concluded that Botswana's environmental literacy would be raised.

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