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School ground as environmental learning resources: Teachers' and pupils' perspectives on its potentials, uses and accessibility

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Abstract

This paper addresses the role of school ground as outdoor learning resources for environmental education. The opportunities to use school ground are particularly prominent in tropical climate, where the weather permits plenty of outdoor learning activities. A study in primary schools in Jakarta explored the relationship between the spatial aspects of school ground and its role in providing access to outdoor environmental resources, from the perspectives of teachers and pupils. The findings reveal that the potentials of school ground environment in many schools have not been fully utilised. Outdoor opportunities offered by school ground environment do not immediately result in active environmental learning. The findings suggest the needs to rethink the position of school ground within the current spatial design of school environment, to address the demands for more engagement with nature and current perspectives towards environmental learning.

Keywords: Environmental education, learning resources, school ground

Introduction

Environmental education has become a critical necessity in facing the current environmental issues and problems. Since 2005, UNESCO has declared UN Decade of Education for Sustainable Development (UNDESD) 2005-2014. The objective of UNDESD is "to integrate the values inherent in sustainable development into all aspects of learning to encourage changes in behavior that allow for a more sustainable and just society for all" (UNESCO, 2007). Such declaration means the need for environmental education to be integrated in all aspects of everyday learning in all levels of education. Environmental education in primary levels becomes important for developing early awareness and care towards environment.

To support environmental education in primary schools, it becomes necessary to provide enough access for pupils to interact with various aspects of environment. Learning resources may be found anywhere including in the closest everyday environment. School grounds may become potential resources for various activities in understanding about environment. It consists of various elements, both natural and man-made, that may become a micro representation of our larger scale environment and therefore become a potential setting for learning. This is particularly true in urban contexts, where children have limited

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opportunities to interact with nature, and thus school ground may play an important role for developing children's environmental awareness and knowledge.

In general, research has indicated the important roles of school ground for children's development in general (Fjortoft & Sageie, 2000; Wells, 2000; Taylor et al., 2003; Taylor, Kuo & Sullivan, 2002). In relation to environmental education learning process, school ground offer potentials as 'outdoor classrooms' (Malone & Tranter, 2003a) that provide learning resources for various aspects of environment. In particular, the school ground could play important role in providing sensory stimulation, opportunities for action and response feedback (Wohlwill & Heft, 1987), which are all necessary to develop children's engagement with nature and acquisition of environmental knowledge. School could develop learning programs that utilize school ground as a setting for science and environmental learning (McKendrick, 2005). School ground becomes a place for learning about living habitat and various environmental process as well as for developing environmental awareness and stewardship (Education Development Center, 2000).

School ground plays an important role for environmental education. However, the presence of school ground does not necessarily guarantee its optimum utilization as environmental learning resources. It is then necessary to discuss the extent to which school ground could play its role as a meaningful learning environment that could support environmental learning processes.

School ground as a meaningful environment for learning

The presence of school ground environment becomes meaningful when it is embedded within the everyday use by the teachers and pupils and plays a significant role in the everyday learning process. To play such a role, school ground should be connected to children and become an environment where children are fully involved and engaged with. Chatterjee (2005) suggested some criteria to determine children's friendship with places, in which an environment that is friendly for children is

an environment that promotes exploration and actualization of its many affordances for different activities and social interactions; offers opportunities for environmental learning and competence by shaping physical characteristics of the place through repeated use and promoting children's participation in care and maintenance of the place; allows children to express themselves freely in creation and control of territories and special places; and protects the secrets and activities of children in these childhood places from harm. (p. 17)

The above criteria indicate that the physical aspects of an environment only play a partial role in determining the meaning of an environment for children. In terms of promoting children's close connection with school ground, it becomes necessary to aim towards the creation of school ground environment within the everyday life of the children. Research suggested some factors that appear to be contributing to the role of school ground in everyday activities and educational process. These factors include the way the school management and teachers see the role of school ground, teacher's attitudes towards school ground and their role in developing learning programme in relation to school ground, spatial design of the school ground environment and other external factors including weather.

School ground physically appears as a complementary of indoor spaces of the schools. However, the point of view of school management or teachers towards school ground may determine the role of this outdoor spaces within the everyday activities of the pupils - whether school ground is considered merely as complementary spaces with no built part of the schools or as an integral part of learning spaces. School ground may become a setting of

the 'hidden curriculum' (Titman, 1994), which is no less important than the formal curriculum established in the formal learning spaces. In fact, the way the school management view the importance of school ground as outdoor learning environment is related to the extent to which children could benefit from it for their learning (Malone & Tranter, 2003a). This means that the way the available spaces are used might be determined by the access and opportunities provided through the establishment of school policies relating to school ground use and management.

Attitudes of school management towards school ground may also be reflected on the way the teachers manage their teaching programs in relation to school ground. Teachers play an important role as 'the gatekeepers' who determine daily schedule of the learning activities and make decision whether or not the children go outdoor (Copeland et al., 2012). It is important that teachers become aware on the role of school physical environment – including school ground – and their ability to use it effectively to achieve the learning goals (Lackney, 2008). Such competence needs to be possessed by the teachers in order to promote the supporting role of the school ground for environmental learning. Otherwise the available school ground spaces would be neglected and disconnected from overall learning activities. Various factors appear to be obstacles for teachers in using the school ground environment effectively (Maynard & Waters, 2011). These factors include their lack of awareness of the benefits and potentials of outdoor environment, as well as the pressure to accomplish the required education requirements which eventually result in the limited use of school ground.

The role of school ground as a meaningful environment for children's learning cannot be separated with its spatial characteristics. Research has found associations between the quality of schoolyards and the physical activity (Ozdemir & Yilmaz, 2008). Arbogast et al. (2009) found that the presence of vegetation in school ground is related to the amount of recess time spent outside. Another study compared biodiverse and barren school ground, and found that school ground with more biodiversity is related to children's more diverse and more nature-oriented preference, as well as more complex use of outdoor environment (Samborski, 2010). In addition to the quality of the school ground spaces and their elements, the spatial design of the school ground within the whole school layout may also determine their role as meaningful learning environment. As found in a study by Maynard and Waters (2011), teachers often felt practical difficulties in using the outdoor environment due to the size, the condition and the location of outdoor space, with the design that does not support the free flows of activities between inside and outside. These studies suggest the need to consider the spatial design of the school ground to enable indoor-outdoor connection that promote a rich and integrated environmental learning programs.

As the school ground is associated with outdoor activities, weather also plays an important role in determining the use of school ground and their educational values. In general research found that outdoor activities tend to increase in warmer season and decrease in colder season (Wolff & Fitzhugh, 2011; Chan & Ryan, 2009). In particular studies on children's outdoor activities suggested that children are more active in summer than autumn or winter (Silva et al., 2011) and that cold climate and rainy weather becomes one of the barriers to children's outdoor activities (Brockman, Jago & Fox, 2011; Dyment, 2005). However, when looking at children's outdoor activities within the context of school environment, school policy should also be taken into consideration. Some schools may have different policies in determining whether or not the pupils conduct physical activities indoor or outdoor during rainfall (Harrison et al., 2011), and this might eventually affect the pupils' activity levels. In relation to environmental education, pupils' opportunities to interact with various school

ground elements might also be determined by opportunities provided by school management and teachers.

Based on the discussion above, it becomes clear that the development of school ground as a meaningful environment that can support environmental learning process need to be considered in relation to different aspects. The findings of various researches above suggest that the optimum use of school ground for environmental learning is a result of a complex relationship between the spatial design, teachers' attitudes towards school ground and their roles in providing access and opportunities for pupils. We will now look into the situation of school ground in primary schools in Indonesia with tropical climate context.

Overview of school ground in Indonesia

School ground has become an aspect of educational facilities that tend to be overlooked in Indonesia. The data indicates that among the primary schools in Indonesia, only 65% are equipped with school ground (Balitbang Depdiknas, 2004). The condition of school grounds that are available also highly varied. Some schools may possess a sufficient open space of school ground with various physical elements, while some others only have very limited open spaces or even none at all. In Jakarta, there are about 1,137 state primary schools which possess their own school sites. The school grounds that are available in these schools vary from none at all to over 10,000 m2 (Dinas Pendidikan Dasar Provinsi DKI Jakarta, 2008). This variety indicates different resources of environmental learning that might be available in the primary school. The fact that school ground has not been provided sufficiently in many schools should be a primary attention, since this may reflect on limited understanding on the role of school ground to support environmental learning.

The standard for educational facilities (*Standar Sarana dan Prasarana Pendidikan*) in Indonesia has stated a minimum space of 3 m^2/pupil to be provided as school ground (Peraturan Menteri Pendidikan Nasional RI Nomor 24 Tahun 2007). Such minimum space allows pupils to conduct playing and sport activities. However, the standard has not taken into account the need to provide various physical elements in school ground that should become learning resources. Therefore more spaces need to be provided in addition to the minimum requirement above, in order to provide sufficient spaces of school ground to support environmental learning.

The utilization of school ground as resources of environmental learning is highly related to the school curriculum. The recent national standard of educational process for primary and secondary education or *Standar Proses* (Peraturan Menteri Pendidikan Nasional RI Nomor 41 Tahun 2007) has highlighted various aspects related to learning process that should be practiced by teachers. This include the learning methods that involve exploration, in which teacher should encourage pupils to learn from various resources, involve pupils to be active in learning activities and facilitate pupils to conduct experiments in laboratory, studio and field. The standard implies the need for teachers to utilize any available resources to allow pupils for exploration in the process of acquiring knowledge. Furthermore, another standard of curriculum or *Standar Isi* also highlighted the various competencies that pupils should acquire at each educational level for each subject (Peraturan Menteri Pendidikan Nasional RI Nomor 22 Tahun 2006). The description in the standard indicates that there are opportunities for teachers to apply various methods, including various resources for learning.

Environmental education has not become a compulsory subject in national curriculum. However, the Ministry of Environment has published *Garis-garis Besar Isi Materi Pendidikan Lingkungan Hidup* or an outline of curriculum for environmental education (Kementerian Negara Lingkungan Hidup, 2006). The document highlights various aspects of

environmental learning which can be integrated into curriculum of any subjects. Some provinces in Indonesia have also included environmental education as a part of local curriculum. Although the contents vary, in general these are the attempts to encourage pupils' understanding and awareness of environmental issues and problems. Such attempts need to be supported by sufficient learning resources in order to build sufficient environmental understanding.

Objectives of the study

This paper addresses the importance of school ground environment in relation to its role as learning resources and its effective use within the school curriculum. The objective of the study is to explore the relationship between the spatial aspects of school ground and their role in providing access to outdoor environmental resources, from the perspectives of teachers and pupils. We began with an assumption that the presence of school grounds in primary schools Indonesia with its tropical climate would enable the teachers and pupils to obtain benefit for environmental learning process, as they would have access to outdoor environment all year long. We were interested to see the extent to which the available school ground environment were actually used and accessed for learning activities that could promote pupils' environmental awareness and knowledge. In particular, this study addressed the following questions:

- How do teachers and pupils use school ground for environmental learning activities?

- How do they perceive the pupils' accessibility to their school ground environment?

- How does the spatial organization of school ground offer opportunities for environmental learning activities and accessibility for the pupils?

Methodology

Research setting

The study was conducted in school grounds in fifteen state primary schools in Jakarta. The fifteen schools were taken as research settings to represent various areas of school ground environment. Five schools have the school ground with the area of less than 2,000 m^2; six schools have the school ground with the area between 2,000 to 4,000 m^2, and the other four schools have larger school ground areas, which are more than 4,000 m^2. Compared to the number of pupils in each school, the school ground area-pupil ratios of the fifteen schools also vary, ranging from 2.1 to 24.1 m^2 per pupil. By taking such variety of school ground, we expect to obtain a general description on how the school grounds are utilized for environmental learning activities and the degree of accessibility for the pupils.

Research procedures

The study was conducted through the observation of spatial environment of school grounds and the distribution of questionnaire to pupils and teachers. The purpose of the observation of the school ground was to provide an illustration on the spatial environment of the school ground that exists in different primary schools. During the observation we recorded the spatial layout of the school ground within the context of the whole school layout and the presence of physical elements that have potentials as learning resources for environmental education.

The questionnaires for pupils and teachers were the instruments to assess the utilization of school ground by teachers and pupils as well as opportunities given to pupils by the teachers to access school ground. The questionnaires were distributed to teachers and Year

5 pupils in the fifteen schools chosen as the research settings. In total there were 83 teachers (20 males, 63 females) and 493 pupils (258 males, 235 females) participating in this study.

To examine the utilization of school ground environment, we asked the teachers to list learning activities that they had conducted utilizing the school ground. In addition they also made another list of the ideas of learning activities that they might have in their mind. They were encouraged to list as many activities as possible. For each activity, the teachers should mention the school subjects to which the activities are relevant, their learning objectives and the physical elements in the school ground that they used for the activities. In the questionnaire for pupils, we listed ten environmental learning activities that could be conducted in the school ground. For each learning activities, the pupils were asked whether they had or had not done those activities. They were also asked to provide a few sentences to describe their experience in those learning activities. The data obtained from teachers and pupils were then compiled to provide an illustration on the extent to which the physical environment of school ground had been utilized for environmental learning activities.

To assess the accessibility to school ground given by the teachers to the pupils, we presented a list of twenty activities that are considered supportive for promoting the pupils to get closer to nature and to understand various environmental phenomena. We asked the teachers whether they usually allow or not allow the pupils to do these activities, by rating each activity in the scale of 1 to 5 (1=never allow; 5=always allow). The similar list of activities was also presented to pupils in the questionnaire, and we asked the pupils whether in their opinion these activities are allowed or not allowed to be conducted in the school ground, by rating activity in the scale of 1 to 3 (1=never allowed; 3=always allowed). In addition, the teachers and the pupils were also asked to mention any elements that the pupils should not touch or approach. The data obtained from teachers and pupils would provide a description on the extent to which the school ground is accessible by the pupils for various environment-related activities.

The following sections describe the findings from the study which are presented in two parts. The first part discusses the findings on the teachers and students' uses of school ground to support learning activities. The second part discusses the teachers and students' perspectives on the accessibility of school ground in everyday learning activities. The third part discusses the spatial design of the school ground environment in relation to the findings on its use and accessibility.

Findings

School ground as a setting for learning activities

The use of school ground by the teachers. The results of the study indicate that the majority of teachers (91.6%) had conducted learning activities utilizing school ground. Only a small proportion (8.4%) mentioned that they never utilized school ground for learning at all. The teachers also mentioned the detailed information about the learning activities that they had conducted by utilizing school ground. In total there were 277 learning activities mentioned by the teachers.

The result indicated that the teachers had utilized the school ground for learning activities related different school subjects. It indicates that school ground have been utilized primarily to support learning activities in science (52.0%). Other subjects that utilize school ground are: social studies and civics (8.5%), arts and crafts (8.19%), physical education (7.83%), languages that include English and Bahasa Indonesia (6%). Other subjects such as religion, mathematics, local studies, and extracurricular subjects were less often mentioned by the teachers as school subjects utilizing school ground for learning resources.

The data above illustrates that science is the subject that most often utilize school ground. There are various science activities that may be delivered by using elements in school ground as examples, object of observation and as a setting for experimentation. Compared to other subjects, school ground offers various possibilities for teachers and pupils to use to support their learning activities in science.

What is interesting is the low utilization of school ground for local studies subject, namely *Pendidikan Lingkungan dan Kehidupan Jakarta (PLKJ)* subject. The title of the subject bears the name environmental education (*Pendidikan Lingkungan*), and the environmental contents in the curriculum include knowlegde and understanding about healthy environment, management of garbage, the importance of clean water, the maintenance of various water bodies, clean air, air pollution, and the importance of green environment (Dinas Pendidikan Dasar DKI Jakarta 2007). Such knowlegde and understanding are very likely to be developed by utilizing school ground as learning resources. However, the low utilization of school ground for this subject as found in this study indicates a tendency to deliver the subject based on theory and not relating directly to the surrounding environments of the pupils. Ideally, school ground may provide various examples for pupils to learn about various aspects of environment, without having to go further to other places or taking references from other types of environments somewhere else.

It also becomes necessary to explore the types of activities that utilize school ground as learning resources. Based on the description by the teachers, we could categorize these activities into two groups. The first group consists of learning activities that really utilize the physical elements of school ground. Around 54.2% of the activities mentioned by the teachers falls within this category. The second group, the rest 45.8%, consists of learning activities that only use the school ground as location of activities, without any relationship with the physical elements of school ground. For example the use of school ground for practicing traditional games, running and jumping exercise and marching. These activities do not require any physical elements of school ground as learning resources.

The learning activities mentioned by the teachers consist of five types: a) observation of natural elements (43.7%), such as observation of plants, animals and their characteristics; b) other observation activities (10.5%), such as drawing objects, measuring distance and area, drawing plan of school; c) science experiments (7.2%), such as experiments with sunlight, water, soil, rainbow; d) growing and caring for plants (6.5%); and e) other activities, such as sport, traditional games, religious practice, storytelling etc (32.1%). The majority of the other activities that belong to this last group are those that do not have any relationship with the physical elements of school ground. The data suggests that school ground has been utilized for various activities but mostly as the objects of observation by pupils. The observations generally involve the observation of plants that exist in the school ground. Meanwhile, the physical elements of school ground also provide possibilities for various other observation activities like measuring, plan drawing, as well as for scientific experiments and growing or caring for plants, although less often that their use for observation. However, there are many activities that do not directly relate to the physical elements of school ground, hence the school ground only become a location of learning activities, which can also be done somewhere else.

The use of school ground as learning resources by pupils. To understand the utilization of school ground from the point of view of pupils, we also found out different types of learning activities related to school ground that had been conducted by pupils. We provide a list of ten activities which involve interaction with natural environment and each pupil should state whether they had or had not done the activities. From the ten activities, two activities are related to plants, two activities are related to animal, one activity related to ground

surface materials, two activities related to water and three activities are related to trash. The responses of the pupils regarding these activities are illustrated in Figure 1.

The majority of pupils stated that they had done the following learning activities: observing types of plants and their characteristics (88.6%), growing and caring for plants (91.1%) and observing types of animals and their characteristics (61.8%). Observation of plants, as well as caring for plants, seems to be the most common activities done by the pupils. This is related to the facts that plants are the most common physical elements that can be easily found in most school grounds. Some schools even dedicate certain areas of school ground as the planting area that are maintained by pupils. The activities of growing plants become a part of their learning to take care of the nature. However, it seems that pupils are only given responsibility to take care of a small part of school ground. In fact, they may be actively involved in the maintenance of the wider areas of school ground.
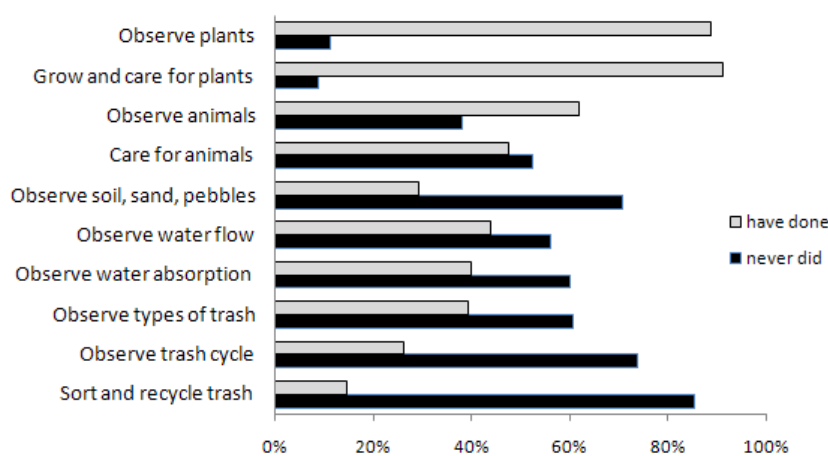
Figure 1. Environmental learning activities conducted by the pupils

Meanwhile Figure 1 also shows that the following activities have been done by fewer pupils: caring for animals (47.7%), observing the characteristics and condition of soil, sand and gravels (43.9%), observing types of trash (39.2%), observing the trash cycle (26.2%), sorting and recycling trash (14.7%) and observing the absorption of water on the ground surface (39.8%).

The data indicates that there are very few pupils who have done learning activities related to trash, including the observation of how the trash are managed in school environment as well as how trash can be sorted and recycled. It seems that the education of trash tend to be concentrated on the formation of habit not to litter, but the learning of trash as related to the environment as a whole still need to be developed. It becomes necessary for schools to provide various physical elements that may support the development of knowledge on trash management and recycling, such as separated trash bins to sort organic and non-organic trash, and composting boxes.

Other learning activities that seem to be uncommon are the activities related to the understanding of water flows and water cycles. Some schools provide water pool that may be utilized as learning resources to learn about water, its characteristics and its cycles. However, not all these pools are in good condition; some are even abandoned and no longer used as pool. Another important learning activity is the observation of what happen to water when reaching the ground, which is an important part of the whole cycle of water.

Pupils need to be aware that different surfaces of ground may have different ability in absorbing water. Different parts of school ground may be utilized to demonstrate such simple but important knowledge. However, the study shows that it is not a common learning activity experienced by pupils.

School ground as an accessible space

Accessibility to conduct environment-related activities. An indicator of school ground accessibility for environmental learning activities is the extent to which the students are given opportunities to interact with the physical elements in the school ground. In this study, the accessibility of the school ground was examined by taking into account the perspectives of both the teachers and the students. We provided a list of twenty activities that are related to the school ground, and the students and the teachers should mention whether these activities are allowed or not allowed to be conducted.

Figure 2 illustrates the students' opinion of the activities in school ground that they are allowed or not allowed to conduct, while Figure 3 illustrates the teachers' opinion on activities that they would allow or not allow their students to conduct in the school ground. The data in both figures suggest the presence of some environment-related activities that tend to be perceived as forbidden activities for the students, such as: touching area with plants, stepping on grass, touching soil/sand/stone, climbing on trees, sitting on the soil/grass, getting close to trash collection area, getting close to water drainage, and playing with water. These findings indicate that the school ground is not fully accessible to students, with certain activities that could not be conducted by the students.
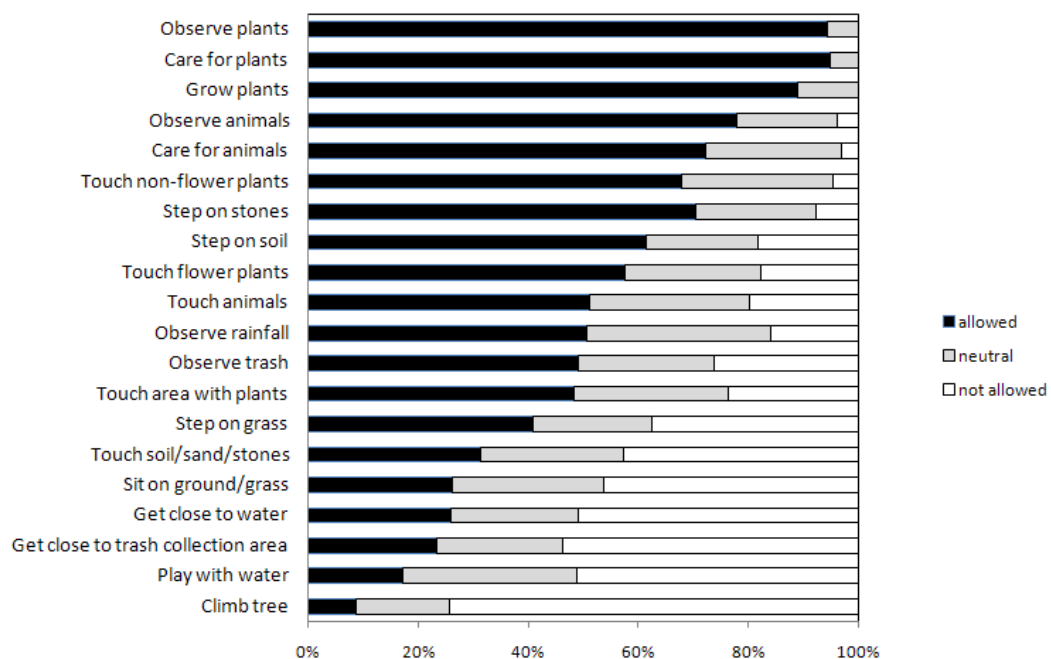
Figure 2. Activities that are allowed and not allowed in school ground according to pupils
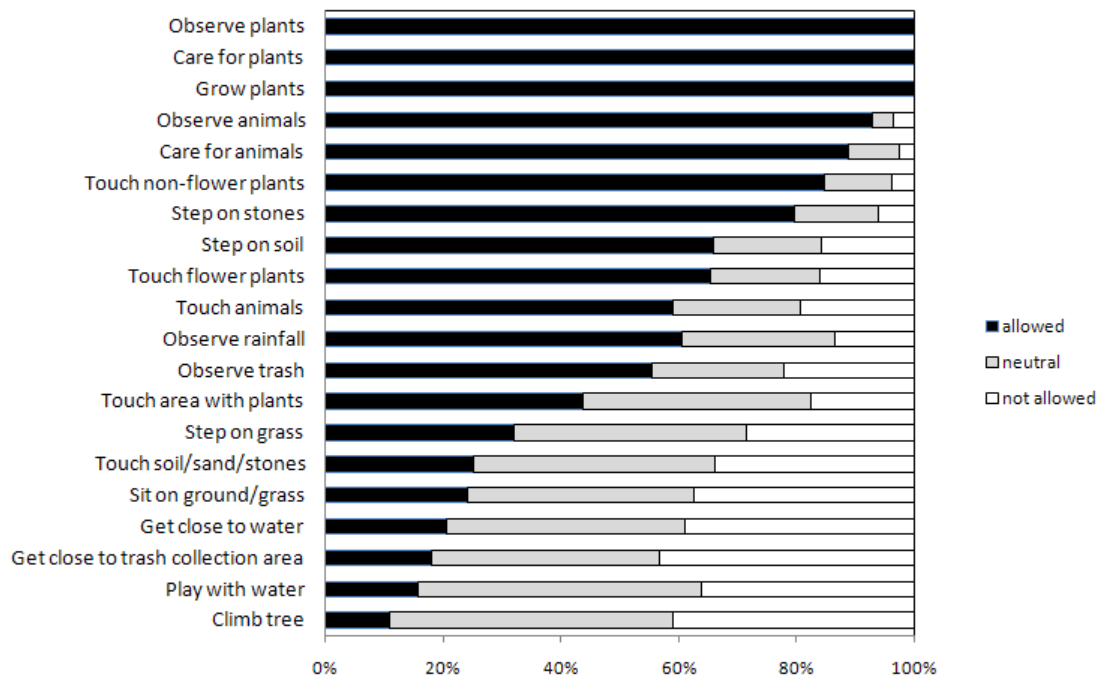
Figure 3. Activities that are allowed and not allowed in school ground according to teachers

Accessibility to interact with school ground environment. Another indicator of school ground accessibility is the physical elements in school ground that could or could not be touched or approached. The more elements that are restricted for the students suggest limited access for the students to interact with the school ground environment. In this study, we asked the teachers and students to mention the elements on the school ground that could not be touched or approached by the students. The students' responses were illustrated in Figure 4 and the teachers/ responses were illustrated in Figure 5. The findings suggest that both teachers and students mentioned various elements in school ground that the students should not touch or get close to. These elements can be categorised into the ground surface elements (such as soil, sand, stone), plants, animals, water elements and trash elements.
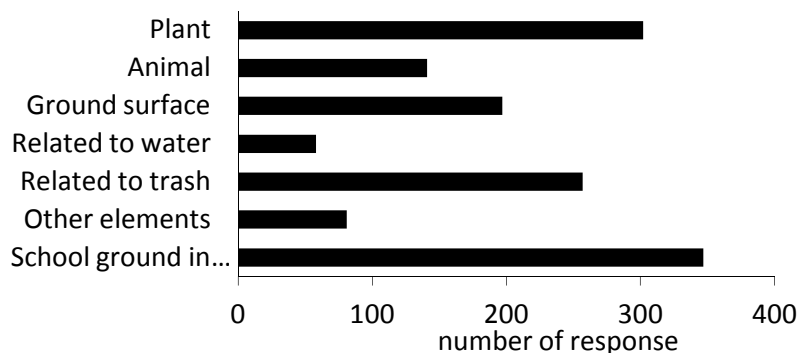
Figure 4. School ground elements that could not be accessed by pupils according to pupils
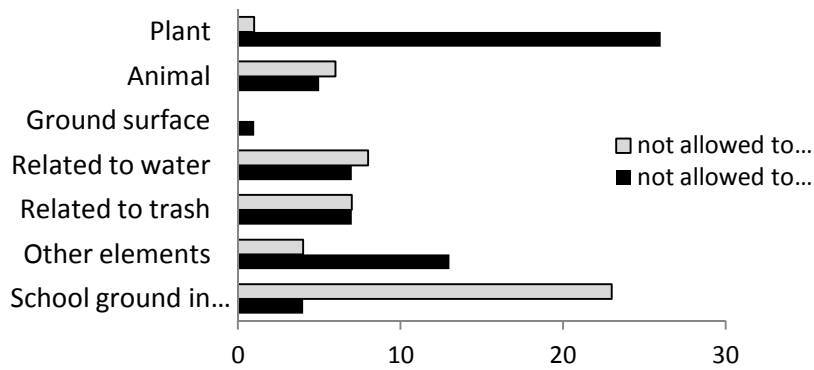
Figure 5. School ground elements that could not be accessed by pupils according to teachers

There are various reasons behind the restriction of students' interaction with these physical elements (Figure 6 and Figure 7). Some of the reasons mentioned by both the teachers and students are related to health; they thought that some elements are related to dirtiness, smell and therefore the students should not interact with them. Some reasons are aesthetic; the elements could be broken or ugly if they are touched, stepped into or sat on. The aesthetical reason primarily came from the teachers who felt afraid that the students' interaction with the school ground elements might reduce the aesthetical values of the school ground. Others reasons are related to safety; that the students might get hurt or wounded if they interact with the elements. These reasons show the fear of both teachers and pupils that the elements might be broken, might cause accident or health issues and thus the access of the students to these elements need to be limited.
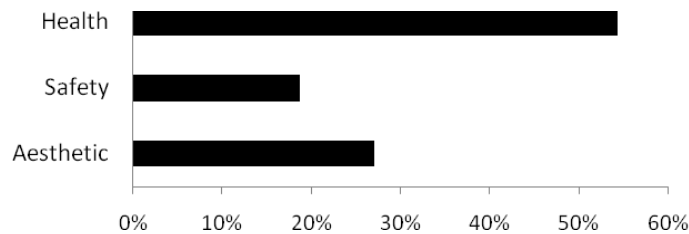
Figure 6. Reasons of why certain elements are not accessible according to pupils
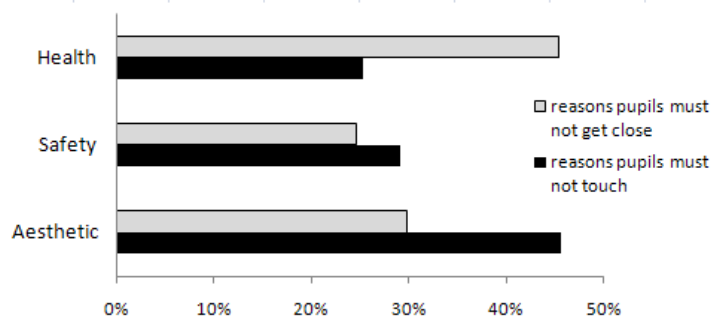
Figure 7. Reasons of why certain elements are not accessible according to teachers

The above findings reveal that the potentials of school ground environment in many schools have not been fully utilized. The outdoor opportunities offered by school ground environment do not immediately result in active environmental learning. The findings on the use of school ground indicates that school ground has been utilized for learning activities, however, the pupils' engagement with school ground environment tend to be limited to certain common learning activities and integrated with certain subjects only. Various learning experiences that should contribute to the development of environmental knowledge and awareness have not become common learning activities that utilise the school ground.

The findings indicate that the use of the school ground as learning resources among the schools in this study is not optimum yet. The fact that this limited use happen in a tropical climate context is somewhat disappointing, considering that this context allows for plenty of outdoor opportunities all year long. The limited use of school ground also means that rich experiential and sensory experience that could be gained from outdoor activities (Waite, 2011) is missed. The lack of school ground use for learning is often related to the lack of awareness the possible links between the school ground and the curriculum, and this is particularly true in subjects other than science (Dyment, 2005). The findings of this study suggest similar pattern on less awareness on the potentials that exist in school ground that could be utilised as learning resources.

The findings on the accessibility of school ground also indicates the limited access to the school ground for the pupils, as illustrated by the presence of many activities that are not allowed for the pupils. There is limited accessibility for pupils to interact with the physical elements of school ground based on various reasons of health, safety and aesthetics. These reasons have also been identified in other studies (Maynard & Waters, 2011; Dyment, 2005). However, this also indicates a failure to recognise the potentials of the school ground to offer an open, natural environment that is relatively safer compared to other environmental setting outside school (Dyment, 2005). The inaccessibility of school ground is a result of the tendency of "dwelling on barriers rather than opportunities" (Waite, 2011, p. 77); hence the school ground tends to be seen as sources of problems rather than sources for learning. Such attitude eventually neglects the existing potentials of the school ground.

Another important point is related to the aesthetic-related reasons that tend to be expressed by the teachers, illustrating their understanding of school ground as an environment that need to be taken care as a nice, ordered environment but as a result become inaccessible environment. It becomes necessary to address such misunderstanding by increasing the teachers' awareness of the educational values of the school ground environment rather than its aesthetical values. The ability of teachers to use school ground effectively becomes an important competence (Lackney, 2008) that needs to be continuously developed.

Reconsidering the spatial design of school ground environment

The following discussion would reveal the spatial aspects of school ground environment that might contribute to the limited uses and accessibility of school ground as environmental learning resources. The spatial environment of school ground in this study will be discussed by considering various aspects: space area, availability of environment-related elements, and the spatial layout of school ground within the whole school.

The fifteen school grounds included in this study represent school grounds with different space areas. Interestingly, the quantitative area of school ground does not necessarily reflect the quality of school ground. The observations in the fifteen school ground show that there was a variation on the availability of environment-related elements. Nine schools possess a

good variety of physical elements in the school ground, while six schools have less variety of physical elements in the school ground. Some of these schools, however, have plenty of space available for school ground but not maintained very well.

This fact suggests that the schools with limited space area might still possibly provide variety of elements that could contribute to various environmental learning experiences. On the other hand, some schools might have plenty of outdoor space, but when not equipped with variety of environment-related elements and not maintained very well, this potentials would not be used optimally as learning resources.

The observation in the fifteen school ground also indicates that there was a variation in terms of spatial layout of the school ground. Our findings show that there are at least three different typical layout of school ground within the context of the whole school layout.The first type is the schools with the school ground located in front of the school, with most of the classrooms and corridors are orientated to the school ground (Figure 8 and Figure 9). Generally this layout consist of a part of school ground with hard landscape (sport yard, assembly field) and a part of school ground with more natural elements. However, there are some schools with hard landscape only and no natural area of the school ground.
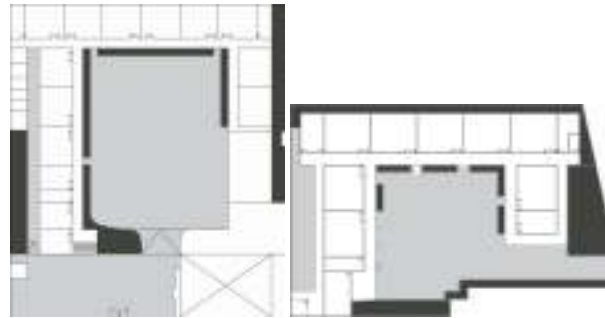
Figure 8. Examples of school layout with school ground in front of the school building with hard landscape only
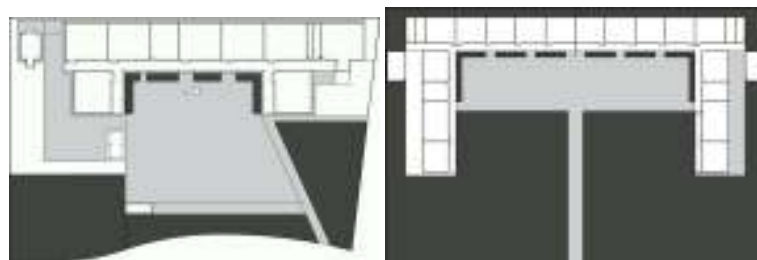
Figure 9. Examples of school layout with school ground in front of the school building with both hard and natural landscape

The second type is the schools with school ground located both in front and at the back of the school (Figure 10). Generally the part of school ground with hard landscape is located in front of the school, while the rest of the school ground is not accessible from most classrooms and corridors. This inaccessible part of the school ground usually creates problems as they are not maintained very well and definitely not used very often. The third type is the schools with school building located in the middle of the school site (Figure 11).

In addition to the main school ground, there are some parts of the school ground surrounding the school building. The main part in the middle of the school usually consists of some parts of hard landscape and it becomes the main orientation of most classrooms and other spaces, while the school ground around the school building is usually consist of natural ground area. Some of these parts might be accessible while some are not accessible, not maintained and used.
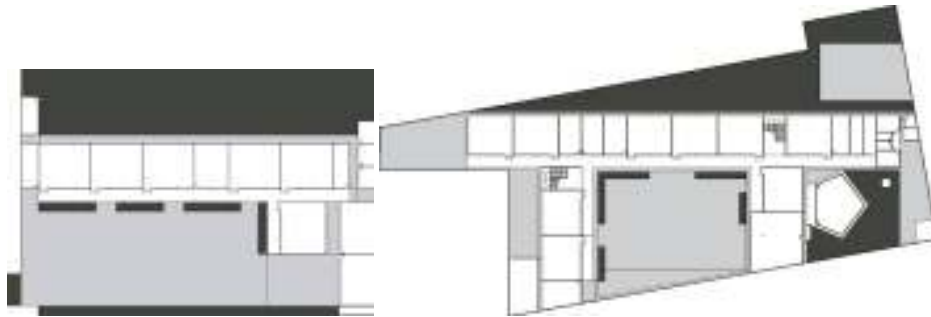
Figure 10. Examples of school layout with school ground in front and at the back of the school building
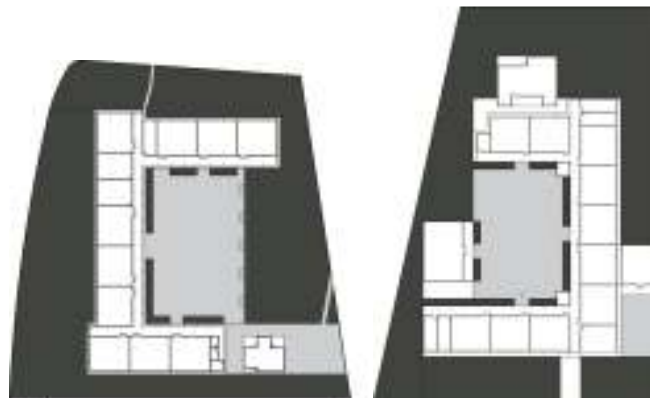
Figure 11. Examples of school layout with school ground in the middle and surrounding the school building

In all these three types of spatial layout of school ground, it could be observed that there has been a tendency to differentiate between the 'main' school ground area, which is located in the middle of the school building and becomes the main orientation of most classrooms and other spaces, and the 'other' school ground area, which could be located in front, at the back, or surrounding the school building. Differentiation of these two parts of the school ground could be seen in the provision of physical elements, the uses and the maintenance.

The 'main' school grounds tend to consist of hard landscape, with the main function as a space for sports and play activities. Meanwhile, the 'other' parts of the school ground tend

not to be considered as important part of learning environment. This is evident in some schools where the parts of school ground that are located at the back or surrounding the school building are not maintained very well. These spaces tend to become abandoned spaces, as they are located away from the other school activities, with no spaces orientated to these school ground spaces. To access these spaces, usually there are no clear circulation spaces and in some cases the spaces are hardly accessible at all. In this way, there is no strong connection between the school ground and the other activities that are centred in the classrooms or other parts of the school building.

The condition in some schools observed also indicates that the parts of the school ground at the back or surrounding the school building tend to be the places where there are elements that are considered as dirty, unhealthy or dangerous as mentioned in the previous section. These are the places of trash collection, wild plants, mud or water, which tend to be perceived as elements that should not be touched or approached by the students. Therefore, these spaces become the inaccessible spaces.

These spaces actually have some potential to offer learning experiences that could not be found in the 'main' school ground area with hard landscapes and more structured elements. Parts of these spaces provide opportunities for planting, interacting with natural elements, learning about trash, water and other natural elements. The findings in the fifteen school ground studied here suggest that such opportunities are still rare, and thus the potential of the school ground, regardless of its spatial layout, have not been utilised in an optimum way.

An environment becomes meaningful when it offers benefits for those using it. Gibson (1986) proposed a concept of environment affordance to explain the potential possessed by an environment. "The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or for ill" (Gibson, 1986, p. 127). However, not all existing potentials of an environment are perceived and then utilised. Among the potential affordances possessed by an environment, only some are perceived and some are utilised (Kytta, 2004). In line with Gibson, Gans (1968) also proposed the idea of potential environment and effective environment, and that only some aspects of the potential environment could be transformed into effective environment. There are various contextual factors that might "define and evaluate portions of the physical environment relevant to the lives of the people involved and structure the way people will use (and react to) this environment in their daily lives" (Gans, 1968, p. 5). The findings of this study illustrates clearly that the existing potentials of the school ground have not been fully utilised and become effective environment for the purpose of environmental education. The availability of large areas as well as various school ground elements does not automatically result in the optimum use of school ground. To some extent the limited use of the school ground is reflected by the limited opportunities for the pupils to access various school ground elements.

Nevertheless, the use of school ground could not be separated from its design. Poor design might influence the limited use of school ground (Dyment, 2005). What is also important is also how the design could reflect the views of learning that recognise the importance of relating the indoor and outdoor environment (Malone & Tranter, 2003b). The spatial layouts of the school grounds within the context of the whole school environment in this study reflect the views of learning that tend to be oriented to the indoor environment. Meanwhile, the existence of the outdoor environment is still considered as complimentary spaces, and thus access to school ground is not fully encouraged. The findings of this study suggests the need for redesigning the available school ground space and how it relate to the whole

school environment in order to maximise its potentials, especially in terms of providing enough access for the pupils to access school ground and its various elements.

Conclusion

This study examines the potential of school ground environment as learning resources for environmental education. Based on the study in fifteen primary schools in Jakarta, Indonesia, the findings reveal that the potentials of school ground environment in these schools have not been fully utilized. Outdoor opportunities offered by school ground environment do not immediately result in active environmental learning, as indicated by limited use of school ground to support learning activities, and limited access for the students to interact with various school ground elements and to conduct various environment-related activities.

The findings suggest that there is a need to rethink the position of school ground within the current spatial design of school environment. The design and development of schools need to put more emphasis on the outdoor environment and to address the demands for more engagement with nature and current perspectives towards environmental learning. The year-round outdoor opportunities of tropical climate need to be optimised to support environmental learning process. However, rich environmental learning experiences could only be offered to the students when the school ground environment are equipped with variety of elements and become accessible to the students. This would mean the needs to create physical access to the spaces as well as to allow students to conduct various learning activities and to interact with various elements, without any restriction. The provision of physical elements and the spatial design of school ground environment should also support the shifting of students' and teachers' attitudes towards school ground environment, by allowing more interaction without any concerns on aesthetic, health and safety issues.

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References

Arbogast, K. L., Kane, B. C. P., Kirwan, J. L., & Hertel, B.R. (2009). vegetation and outdoor recess time at elementary schools: What are the connections? *Journal of Environmental Psychology*, 29, 450–456.

Balitbang Depdiknas (2004). *Statistik Persekolahan SD 2003/2004.* Jakarta: Pusat Data dan Informasi Pendidikan.

Brockman, R., Jago, R., & Fox, K. R. (2011). Children's active play: Self-reported motivators, barriers and facilitators. *BMC Public Health*, 11, 461.

Chan, C. B., & Ryan, D. A. (2009). Assessing the effects of weather conditions on physical activity participation using objective measures. *International Journal of Environmental Research and Public Health*, 6, 2639-2654.

Chatterjee, S. (2005). Children's friendship with place: A conceptual inquiry. *Children, Youth and Environments*, 15(1), 1-26.

Copeland, K. A., Kendeigh, C. A., Saelens, B. E., Kalkwarf, H. J., & Sherman, S. N. (2012). Physical activity in child-care centers: Do teachers hold the key to the playground? *Health Education Research,* 27(1), 81-100.

Departemen Pendidikan Nasional (1993). *Pembakuan Bangunan Sekolah Dasar (SD)*. Jakarta: Depdiknas.

Departemen Pendidikan Nasional (2005). *Standarisasi Bangunan Sekolah Dasar*. Jakarta: Depdiknas.

Dinas Pendidikan Dasar Provinsi DKI Jakarta (2007). *Kurikulum Muatan Lokal Sekolah Dasar dan Madrasah Ibtidaiyah Provinsi DKI Jakarta: Standar Isi, Standar Kompetensi Lulusan dan Model Silabus*. Jakarta: Dinas Pendidikan Dasar Provinsi DKI Jakarta.

Dinas Pendidikan Dasar Provinsi DKI Jakarta (2008). *Sistem Informasi Manajemen Aset Sekolah (SIMAS)*.. Retrieved 20 July 2011 from http://www.simas.or.id.

Dyment, J. E. (2005). Green school grounds as sites for outdoor learning: Barriers and opportunities. *International Research in Geographical and Environmental Education*, 14(1), 28-45.

Education Development Center (2000). *Schoolyard learning: The impact of schoolgrounds*. Newton, MA: EDC.

Fjortoft, I., & J. Sageie (2000). The natural environment as a playground for children: Landscape description and analyses of a natural landscape. *Landscape and Urban Planning*, 48(1/2), 83-97.

Gans, H. J. (1968). *The potential environment and the effective environment.* In H. J. Gans (Ed.), *People and plans*. New York: Basic Books.

Gibson, J.J. (1986). *The ecological approach to visual perception*. Boston: Houghton Mifflin.

Harrison, F., Jones, A.P., Bentham, G. Sluijs, E.M.F.V., Cassidy, A. & Griffin, S.J. (2011). The impact of rainfall and school break time policies on physical activity in 9-10 year old british children: A repeated measures study. *International Journal of Behavioral Nutrition and Physical Activity*, 8, 47.

Kementerian Negara Lingkungan Hidup (2006). *Garis-garis Besar Isi Materi Lingkungan Hidup*. Jakarta: Kementerian Negara Lingkungan Hidup.

Kytta, M. (2004). The extent of children's independent mobility and the number of actualized affordances as criteria for child-friendly environments. *Journal of Environmental Psychology*, 24(2), 179-198.

Lackney, J. A. (2008). Teacher Environmental competence in elementary school environments. *Children, Youth and Environments,* 18(2), 133-159.

Malone, K., & Tranter, P. (2003a). Children's environmental learning and the use, design and management of schoolgrounds. *Children, Youth and Environments*, 13(2).

Malone, K., & Tranter, P. (2003b). School grounds as sites for learning: Making the most of environmental opportunities. *Environmental Education Research*, 9(3), 283-303.

Maynard, T., & Waters, J. (2007). Learning in the outdoor environment: A missed opportunity? *Early Years*, 27:3, 255-265.

McKendrick, J. H. (2005). *School grounds in Scotland*. Research Report. Scottish Poverty Information Unit.

Ozdemic, A., & Yilmaz, O. (2008). Assessment of outdoor school environments and physical activity in ankara's primary schools. *Journal of Environmental Psychology*, 28, 287–300.

Peraturan Mendiknas RI Nomor 22 Tahun 2007 tentang Standar Isi untuk Satuan Pendidikan Dasar dan Menengah.

Peraturan Mendiknas RI Nomor 24 Tahun 2007 tentang Standar Sarana dan Prasarana Sekolah Dasar/Madrasah Ibtidaiyah (SD/MI), Sekolah Menengah Pertama/Madrasah Tsanawiyah (SMP/MTs), dan Sekolah Menengah Atas/Madrasah Aliyah (SMA/MAK).

Samborski, S. (2010). Biodiverse or barren school grounds: Their effects on children. *Children, Youth and Environments*, 20(2), 67-115.

Silva, P., Santos, R., Wel, G. & Mota, J. (2011). Seasonal differences in physical activity and sedentary patterns: The relevance of the PA context. *Journal of Sports Science and Medicine*, 10, 66-72.

Taylor, A. F., Wiley, A., Kuo, F. E., & Sullivan, W. C. (1998). Growing up in the inner city: Green spaces as places to grow. *Environment and Behavior*, 30(1), 3-27.

Titman, W. (1994). *Special places, special people: The hidden curriculum of schoolgrounds*. Surrey: World Wide Fund for Nature/Learning through Landscapes.

UNESCO (2007). *Highlights on DESD progress to date*. Retrieved 10 December 2012 from http://www.unesco.org.

Waite, S. (2011). Teaching and learning outside the classroom: Personal values, alternative pedagogies and standards. *Education 3-13: International Journal of Primary, Elementary and Early Years Education*, 39 (1), 65-82

Wells, N. M. (2000). At home with nature: Effects of 'greenness' on children's cognitive functioning. *Environment and Behavior*, 32(6), 775-795.

Wohlwill, J., & Heft, H. (1987). The physical environment and development of the child. In Stokols, D. and I. Altman, eds. *Handbook of environmental psychology, Vol. 1*. New York: Wiley.

Wolff, D., & Fitzhugh, E.C. (2011). The relationships between weather-related factors and daily outdoor physical activity counts on an urban greenway. *International Journal of Environmental Research and Public Health*, 8, 579-589.

Çevre eğitimi kaynakları olarak okul arazisi: Öğretmen ve öğrencilerin okul arazilerinin potansiyeli, kullanımı ve ulaşılabilirliği üzerine bakış açıları

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Özet

Bu makale çevre eğitimi için açık öğrenme kaynağı olarak okul zemininin rolünü ele almaktadır. Özellikle tropikal iklim gibi havanın dışarı aktivitelerini öğrenme için kullanmaya bolca izin verdiği yerlerde okul arazisini kullanmak için çok fırsat vardır. Araştırmada Jakarta'daki ilkokullarda okul arazisinin mekânsal yapısı ve onun çevre eğitimi ile arasındaki ilişkiyi öğretmen ve öğrencilerin bakış açısıyla keşfetmeyi amaçlamaktadır. Bulgular birçok okulda okul-arazi çevre potansiyellerini tam olarak kullanılamadığını ortaya koyuyor. Okul arazisinin sunduğu açık hava eğitim fırsatları hemen etkin çevresel eğitime yol açmaz. Bulgular çevre eğitimine yönelik doğa ve güncel bakış açıları ile daha fazla katılım talebini sağlamak için, okul ortamının mevcut mekânsal tasarımı içinde okul arazi konumunun yeniden düşünülmesine ihtiyaç duyulduğunu göstermektedir.

Anahtar Kelimeler: Çevre eğitimi, öğrenme kaynakları, okul arazisi

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RESEARCH ARTICLE

Raising environmental awareness among miners in Iran

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Abstract

Generation of waste is inevitable but controllable in minerals industry. The aim of this research is to find ways for raising environmental awareness among miners. Miners' attitude towards environmental mining has been investigated. A survey has been done collecting mine managers' point of view coupled with current trend on mine waste management in Iran. Their opinions on methods used for minerals extraction and waste production are sought in order to investigate possible educational schemes for waste reduction and mine waste disposal. The type and quantity of waste produced by respondents have been identified to prioritise the wastes produced in minesites. Environmental legislations and policies for good practice minerals extraction are surveyed and demonstrated. These are regarded as our clients' preferences on managing mining waste. When combined with other existing policies and methods, they could become part of a learning program to boost awareness among miners.

Keywords: Vocational learning, environmental awareness, mine wastes, research survey.

Introduction

The human need for use of mineral commodities is developing fast. This increasing demand for minerals production has resulted in economic use of low grade mineral reserves. Excavation of low grade mines brings about higher waste production, which in turn damages the nature with additional pollution release into the environment (Blight, 2011). More than 235 million tones of different minerals are extracted from large and small mines in Iran annually. This figure calls for a huge awareness to be raised among miners.

The damaging effect of mining to the environment is partially due to the tailings generated in mines, which could be toxic. However, some mining residues left in stone quarries and mines are typically dry and less pollutant (Blight, 2011). Yet, the waste-to-ore ratio can range between 1 and 5 for underground mines and between 1 and 60 for open pit mines. This is the tonnage of non-mineralised waste material removed to allow the mining of one tonne of ore. The waste remaining from stone mining also encompasses some considerable percent of mineral extracted. Hard rock quarries produce variable amounts of quarry waste. Some produce small amounts of overburden while others may have large amounts of overburden and interburden that is not of sufficient quality for the desired product (British Geological Survey, 2009). Quarry fine and unwanted broken rocks resulting from excessive blasting

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operations are the most well-identified residues in limestone and tuffstone mines (Ministry of Industry and Mines, 2008).

In the current research mine mangers are targeted to find out the most effective methods that could be adopted to educate them. Thus, a survey has been conducted aiming at acquiring miners' viewpoint in terms of managing mining waste. The questionnaire is designed to deal with the miners' awareness and attitudes towards reduction of waste and also their familiarity to mining legislation. In addition to the questionnaire, a number of professional reports (Ministry of Industry and Mines, 2006) were reviewed to find out mining methods used and to survey the quantity of minerals produced and to estimate the associated wastes left. The questionnaire was sent to 70 mine managers, out of which 32 responses returned. The survey outcome is then combined with other measures acknowledged by academics and government bodies to develop new curriculum for educating mining workforce.

National curriculum for vocational learning programs for Iran manufacturing and industrial sectors has been developed since decades. This is well-established in metals and food industries, for example (Occupational Training Organisation, 2013). Nevertheless, little is done within the mining sector throughout the country. Therefore, the need for such educational agenda is apparent to a great extent. Such program has been advanced in most developed countries. In Great Britain the number of national vocational qualifications (NVQ) held is numerous and increasing in the field of environment including NVQ Environment, NVQ Environment distance learning, NVQ Waste management, NVQ Waste disposal, NVQ Recycling distance learning, NVQ environmental management, NVQ environmental health, NVQ environmental conservation and NVQ environmental impact (Emagister, 2013). Employees are urged to attend these courses and learn the necessary skills to perform their role more effectively. Each award can be tailored to the role an employee performs to cover every aspect of the waste operation. Distance learning programs are now supplemented to boost waste recycling plans.

Resource efficiency initiatives have been found to be successful in UK businesses, implementing materials reduction measures is an example. Personnel are trained how to walk around the site and mark on the map the visible and potential areas where waste is generated. They also learn how to put some figures to these materials and resources followed by recording the material use and reducing it (WRAP, 2013a). Undoubtedly, education is an inevitable part of a conceptual framework for solving mine environmental issues. An example of an academic led program is a series of "Be Aware" workshops organized by the UK government to identify cross-sector waste streams/products. In these workshops representatives of several product manufacturers and consultants met to discuss common issues relating to waste production, mapping, and recycling challenges and opportunities. The workshop outcomes have been used by consortium partners to produce a series of BeAware sector guidance reports that can be downloaded from the publications page (BeAware Project, 2007).

Mining methods and minerals type

The purpose of asking about the type of minerals and mining methods used is to understand the type and quantity of wastes produced in different mines. 89% of respondents were managers of surface mines while 11% of them were associated with underground mines. Surface mining generates more waste than do underground mining. Waste in some quarries such as silica, kaolin and feldspar mines comprises mostly overburden and top soil, which needs replacing and stockpiling. In underground mining backfilling of mined areas is known to comply with environmental laws (Gilchrist, 2007).

However, backfilling is only applied in some coal mines in Iran, and is not considered in this survey, because none of our respondents were coal miners.

Around 43% of quarries surveyed are stone quarries including limestone and tuffstone mines; other non-metallic minerals such as silica, kaolin and feldspar are also included.

Waste quantity and type

Acid mine drainage, which is a major problem in many metallic mines is likely to be a less crucial problem in non-metallic mines. However, damages due to dust generation and ecological changes are of most concern for stone mines and other non-metallic mines. Many dusts do contain metals which are potentially hazardous and have the potential to severely affect flora and fauna near the mine and to impact on the health of mine workers (British Geological Survey, 2009).

According to this survey most of the wastes produced in non-metallic mines are dry residues. Dust emission in quarries is regarded as one of the most disturbing problems associated with wastes (Ministry of Industry and Mines, 2008 & British Geological Survey, 2009). The dust originates mainly from blasting as well as top soil removal by mining machinery. Also, unwanted broken rocks in stone mines resulted from blasting is massive in quantity, 30% of total ore extracted in average (Ministry of Industry and Mines, 2006). These wastes are stockpiled somewhere near the quarries and may require control of water runoff, surface water conditions and flood flow design and drainage basin analysis (Renteria, 2001).

Mining licensing and environmental legislation

Approximately, 80% of miners responded that they are familiar with environmental legislation in some respect, but 20% were not accustomed to it. Common elements in mining licensing such as clear legal authority are vital to avoid misuse of mineral wealth and also are essential for national income growth (World Bank, 1998). More examples in mining licensing, as World Bank reported are exclusivity of exploration and mining rights in designated concession areas and special licensing and regulatory regime for small-scale mining. Making use of mineral resources and taking public right into account at the same is an indispensable prerequisite for environmental mining. One major concern the legislator may have is the tax income due to mining practices, however this in turn could be achieved by providing a fair condition for the mining industry to produce saleable minerals commodity. In order to maintain public prosperity and development in the country he needs to take environmental issues into consideration. Consequently, it is essential to support integrated approaches for sustainable development within the mining sector. More importantly is publicising this important concern among miners through holding vocational courses and learning workshops.

The costs and benefits

It is important to find out miners' attitudes towards environmental costs and benefits. Around 36% believe that environmental laws related to mining could bring about some benefits alongside the associated costs. But, approximately 64% stated that they are only costive.

When it comes to the implementation of environmental laws more than 95% of miners revealed that both penalty and incentive strategies are very effective means. Knowing mining managers' opinions will help making more viable decisions on designing professional courses especially for mining workforce. For instance, whether praising and/or penalizing approaches are adopted by government the miners should be aware of the reason behind it and the environmental benefits associated with it. Around 40% of clients

reveal that motivating rules are more effective while only 13% believe in opposite way with 47% indicating that both incentive and fine policies should be used.

Reasons for disregarding environmental issues

Knowing what makes miners disregard environmental issues would help devise more informative learning programs. Filling this gap could be one of the key targets when designing occupational learning curriculum. 57% of respondents believe that lack of mining standard in Iran is the main reason for not pursuing environmental laws, while 33% of them believe that lack of knowledge about its detrimental impacts may be the main reason. The rest also disclose that dealing with waste is time consuming and therefore impractical. While implementing rules to advance mining standard is the key improving mining managers' knowledge on economic and environmental benefits are likely the most viable way to practise environmental laws in Iran.

Changing the way of dealing with mine wastes

Planning for waste reduction in mines and quarries in Iran needs a change in minerals waste management. Thus, information about miners' present circumstances could help change their attitude towards waste production. Whilst 38% of clients respond positively to such change the rest are reluctant to alter the way they deal with minerals waste.

Discussions

Sustainable mining requires a waste reduction strategy that is well-known to all mine managers. Such strategy cannot be gained without raising awareness among miners, which in turn requires sustainable learning and cultural strategy. According to this survey to deal with wastes in non-metallic mines training courses on the following subjects are likely to be effective: a) reduce and control dust emission in quarries. b) familiarity with mining licensing and taxation. c) good understanding of environmental costs and benefits.

First, conventional mining and operation needs re-examining to reduce mine waste and associated hazardous residue. Topsoil stripping and blasting are identified to be the major origins of dust in mines and quarries. Integrating dust control provisions into these operations planning are among the best practice principles applied to controlling dust (Needham and Brooks, 1998). Some clients in stone quarries expressed more concern than others did on dust emissions. There are limited options for controlling dust from blasting. On time watering of the blast area may assist, particularly to combat dust emissions from certain quarries. Delaying blasting under unfavourable wind and atmospheric conditions is another method that can be effective in protecting areas adjacent to the mine from blasting dust involves. These resolutions need to be understood by mine managers; they are therefore advised to enrol the learning programs concerned.

In stone quarries over 30% of extracted rock is normally left as waste rock due to possessing unfavourable size. This waste rock dump is often stockpiled near the pit. Bench blasting techniques may be introduced as one possible remedy for waste reduction of this type (Lopez Jimeno et al.1995). Moreover, such waste rock dumps require control of erosion and soil mass movement as well as control of water runoff for surface water and flood control (Renteria, 2001). These technical matters are often disregarded in conventional mining and need further investigation. Once fulfilled for inclusion in a series of vocationally recognized workshops, it needs accreditation by law.

As surveyed in this research, miners are somehow familiar with environmental law but they rather believe that it is costive; yet some 36% of them state that it is cost-effective. Hence

there is a great potential for mine managers to become eco-miners should they appreciate the economic benefit as well as environmental benefit associated with eco-mining (Deak et.al. 2009). Training programs could be useful to establish and strengthen these promising objectives. Also, activities such as a plan scheme of miner's environmental awareness are likely to be effective.

The government should have a well-planned and well-thought-out legal programme for waste management. However it can be understood from clients' responses that an effective implementation and enforcement scheme will be a prerequisite. This also needs reliable data collection systems, procedures for raising miners' environmental awareness, and appropriate systems of adequate and dissuasive fines and penalties. It is important to design regulatory systems that can monitor and control the implementation of the environmental matters in a practical and cost-effective manner (Regional Environmental Center, 2008). In order to ensure that these systems operate as intended, the government needs policy instruments including economic instruments and incentives to promote legal compliance as well as systems of administrative, civil and criminal sanctions. Nonetheless, the mining culture in Iran should experience a change not to disregard environmental issues and join the waste reduction and recycling national scheme (Tehrantimes, 2013). This may require an effective Cultural Exchange Association to establish to help transfer experience and knowledge between industries.

As it comes to the costs and benefits, lesson can be learned from non-profit organisations in other countries who have contributed to economic growth through introducing and educating "Waste Mapping: Your Route to More Profit" (WRAP, 2013b & WRAP, 2013c). The government policies are shown to be a critical component of social, economic and environmental systems influencing production. The role of government in introducing the associated benefits when becoming eco-miners is very decisive. One grown-up example is the eco-industrial development. Eco-industrial projects originate from the local community (Cohen-Rosenthal and Musnikow, 2003). It is a voluntary activity of individual firms seeking to enhance resource efficiency and save costs. It is very much likely to achieve such level of environmental awareness among miners by running well-organized educational programs as well as legislating and implementing good practice mining. Nonetheless, enforcement activities are required to safeguard the strategic and implementation plan. Thus, undertaking monitoring and other forms of assessment would also be indispensable for succession of project (Regional Environmental Center, 2008). There are a number of organizations and agencies sponsored by their governments in the developed world to plan and manage learning programs and workshops (The Waste Exchange, 2013). These workshops are for managers of different industries and for individuals who work with resources conservation and protection. These conservation education programs are advertised in designated websites and receive substantial attentions by professionals who are keen to attend. The site also provides members with search facility for a material they could use or find a market for a material they generate (IOWA, 2013 & Nguyen Ngoc and Schnitzer, 2009).

 While other industries tend to use as little resource as possible, extract the maximum possible value from resources and generate as little waste as possible the mining sector also should focus on waste reduction and recycling. However, the miners' awareness and attitudes towards reduction of waste can only be achieved through holding awareness programmes. Training personnel is essential when designing clean processes and remediation/restoration measures. Mine managers can only achieve designated environmental targets by promoting their personnel's knowledge on waste reduction and

recycling. A decrease of 10% in the production of coal mining wastes by reuse of mining wastes as underground fills is an example (Bian et al, 2010). Again miners should be trained to become familiar with the backfilling process in this case.

Acknowledgements

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References

BeAware - Research Project to Reduce Waste and Improve Efficiency, (2007), Available at: <http://www.bre.co.uk/page.jsp?id=707>, Accessed 1 November 2012.

Bian, Z., Inyang H.I., Daniels, J.L., Otto, F., Struthers, S. (2010), Environmental issues from coal mining and their solutions, Mining Science and Technology (China), 20(2), 215–223.

Blight, G. (2011), Mine waste, a brief overview of origins, quantities, and methods of storage, in: Trevor Letcher and Daniel Vallero (eds.), Waste: A Handbook for Management. Academic Press, pp. 604.

British Geological Survey (2009), Goodquarry article: quarry fines & waste UK, pp. 32.

Cohen-Rosenthal, E. and Musnikow, J. (2003), Eco-Industry Strategies: Unleashing Synergy between Economic Development and the Envirment, Greenleaf Publishing, pp 362.

Deak, G., Homan, J. and Deak, Şt (2009), Cities And Science Communication (CASC): Finding innovative ways to engage the public in science. in: ECOMINING – Europe. Proceedings of the 3rd International Seminar, Greece.

Emagister, Courses on Business and Management, Available at: <http://www.emagister.co.uk>, Accessed 1 November 2012.

Gilchrist, C. (2007). Cleveland Potash, Reduction of waste discharge by underground disposal of process residues, Europa: Project No: LIFE ENV/UK/000603.

IOWA, Department of Natural Resources, Available at: <http://www.iowadnr.gov/Education/ForProfessionals.aspx>, Accessed 10 November 2012.

Lopez Jimeno, C., Lopez Jimeno, E. and Carcedo, A (1995). Drilling and Blasting of Rocks, Taylor & Francis, Chapter 30.

Ministry of Industry & Mines (2006), sandstone, kaolin, feldspar, limestone and tuffstone, Zanjan, Tehran, Markazi provinces, Tehran Department, Iran.

Ministry of Industry & Mines (2008), Minerals production statistics in Iran, Tehran Department, Iran.

Needham, S. and Brooks, D (1998), Best practice environmental management in mining, Dust Control, Commonwealth of Australia, Department of Environment Australia. pp. 50.

Nguyen Ngoc, U., Schnitzer, H (2009), Sustainable solutions for solid waste management in Southeast Asian countries, Waste Management, 29 (6), 1982-1995.

Occupational Training Organisation-Iran, (2013), Available at: <http://www.portaltvto.com>, Accessed 11 November 2012.

Regional Environmental Center (2008), Handbook on the Implementation of EC Environmental Legislation, Umweltbundesamt GmbH, Chapter 4.

Renteria, R. A. (2001), Reclamation and surface stabilisation, in: Hustrulid, W., MacCarter, M. and Zyl D V (eds), Slope stability in surface mining, SME, Chapter 35.

Tehrantimes, Available at: <http://www.tehrantimes.com>, Accessed 21 November 2012.

The Waste Exchange, Available at: < http://www.nothrow.co.nz/>, Accessed 29 November 2012.

World Bank Group (1998), Sector Licensing Studies, mining sector, Investment Climate Advisory Services.

WRAP: Workforce Partnerships for Resource Efficiency, (2012a), Available at: <http://www.wrap.org.uk/content/workforce-partnerships-resource-efficiency>, Accessed 15 November 2012.

WRAP: Contribution to Economic Growth, (2012b), Available at: <http://www.wrap.org.uk/content/economic-and-environmental-benefits>, Accessed 15 November 2012.

WRAP: Environmental Benefits of Recycling, (2012c), Available at: <http://www.wrap.org.uk/content/environmental-benefits-recycling>, Accessed 15 November 2012.

İran'da madenciler arasında çevre bilincinin artırılması

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Özet

Atık üretimi mineraller sektöründe kaçınılmaz ama kontrol edilebilirdir. Bu araştırmanın amacı madenciler arasında çevre bilincinin arttırılmasının yollarını bulmaktır. Çalışmada, çevre madenciliğine yönelik madenci tutumları araştırılmıştır. İran'da maden atık yönetimi konusunda mevcut trendi anlamak ve maden yöneticilerinin atık yönetimi konusundaki görüşlerini toplamak amacıyla tarama yapılmıştır. Yöneticilerin görüşlerine göre mineral çıkarma ve atık üretimi için kullanılan yöntemler atık azaltma ve maden atık bertaraf için eğitim program şemaları oluşturulmak amacıyla kullanılabilir. Sorumlular tarafından üretilen atık türü ve miktarı, maden sitelerinden üretilen atıklar öncelikle tanımlanmalıdır. İyi bir uygulamayla mineral çıkarılması için çevre mevzuatı ve politikalar taranmıştır. Bu maden atık yönetimi konusunda müşterilerimizin tercihleri olarak kabul edilmektedir. Diğer mevcut politika ve yöntemler ile birlikte müşteriler, madenciler arasındaki farkındalığı artırmak için öğrenme programının bir parçası haline gelebilirler.

Anahtar Kelimeler: Mesleki eğitim, çevresel farkındalık, maden atığı, tarama araştırması

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Cultivating artistic approaches to environmental learning: Exploring eco-art education in elementary classrooms[*]

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Abstract

This article explores curriculum development in eco-art education, an integration of art education and environmental education, as a means of increasing awareness of and engagement with the environment. It reports on a qualitative research study that tracked teachers' experiments with the design and implementation of eco-art education in elementary classrooms. Guided by the framework of collaborative action research, a team of educators generated practical and theoretical knowledge to plan, implement, observe and reflect on eco-art curricula and pedagogy. As the first inquiry to examine eco-art education in a sustained way across multiple school sites, it makes a significant contribution to the emerging knowledge and growing discourse of eco-art education by demonstrating how arts-based learning at the elementary level can align with and support environmental education concepts and pedagogy.

Keywords: Children's visions, future, education for sustainable development, intergenerational relations, phenomenology

Introduction

In 2007 Hicks and King called for 'new artistic visions and narrative-based understandings' (2007, p. 335) to develop humans' means of living more responsibly on this planet. By re-affirming the need for art educators to address the environmental crises of our times through their theoretical and pedagogical practice, they continued a significant yet intermittent conversation running in art education circles since the 1970s. Yet few outside of these circles are aware that art educators have been playing a role in environmental education in recent years. As an educator focused on teacher training, I share Hicks and Kings' belief in the importance of this endeavor, manifested in my ongoing research into how to use visual arts education as a means of envisioning new routes into environmental and sustainability education. In response to their call, this article presents the results of the one of the first sustained qualitative studies into environmental art education in North America.

Using a framework of collaborative action research, this study aimed to investigate how integrations of environmental education and art education could be manifested in elementary classrooms. It was grounded in the core belief that art education can and should be used to foster environ‡mental literacy, and that developing this form of literacy in children is considered by many educators to be essential to the continued existence of

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human life on this planet (Orr, 1992; Thomashow, 1995; Smith & Williams, 1999). In the past, environmental literacy work has been developed and implemented primarily by science educators (Sauvé, 1998; Palmer, 1998; Gurevitz, 2000). While environmental education has made some headway in this in the past, some researchers in that field (Hungerford & Volk, 1990; Leeming, Dwyer, Porter & Cobern, 1993) freely admit that this progress has been limited as there has been more success in inducing learners' attitudinal shifts than in changing their behaviors to lead to living more lightly on the earth.

Art education offers a dynamic way to increase the power and relevancy of environmental education by providing an alternative means of furthering learners' ecological literacy. This assertion has support from experts in environmental education; for example, Orr (1992) argued that ecological literacy would only be developed in children if it is integrated into a wider variety of subject areas such as the arts. The need for more arts-based, affective approaches to environmental education has been echoed by many others (Graff, 1990; Adams, 1991; Lindholdt, 1999; Gurevitz, 2000; McKibben, 2005; Gradle, 2007; Palmer, 1998; and Graham, 2007). I share with these authors the belief that the values-based, subjective orientation of learning often found in art education not only helps change learners' attitudes about environmental concerns, but also offers the possibility of altering their behavior towards the environment. By providing the means to reach learners' minds as well as touch their hearts, the arts have the potential to become powerful allies in fostering environmental literacy.

This can be achieved through an interdisciplinary endeavor called environmental art education, or eco-art education in brief[1]. Eco-art education integrates knowledge, skills, values and pedagogy from the visual arts, art education and environmental education as a means of developing awareness of and engagement with environmental concepts and issues such as place, interdependence, systems-thinking, biodiversity, and conservation. In this it offers opportunities for artistic forms of environmental activism for students of all ages that encourage the development of creativity alongside cross-curricular learning in pursuit of the higher goal of sustainability.

As an emerging area of inquiry, eco-art education also provides a means for art educators, artists and scholars to contribute to the greening of art education, a re-thinking of how we can effect positive environmental change and help grow a more sustainable praxis in and through our discipline. This entails not only a philosophical shift, one that re-connects art-making and art education to the issues and concerns of the communities in which these take place, but also a practical shift that reduces the waste and toxicity on which many art programs are built. It aligns art education with a social reconstructivist agenda and encourages educators to consider learning in, through and about art in relation to the environment in their practice.

Eco-art education draws inspiration from activist artists who have been responding to environmental issues and concerns in creative ways for over three decades, including Joseph Beuys, Hans Haacke, Alan Sonfist, Agnes Denes, Mel Chin, Newton Harrison and Helen Mayer Harrison, Lynne Hull, Mierle Laderman-Ukeles, Dominique Mazeaud, Andy Goldsworthy, Chris Jordan, Brian Jungen and Edward Burtynsky, to name only a few[2]. These artists, and the next generation following in their footsteps, have touched countless viewers through their understanding of environmental concerns as well their innovative solutions for them, thereby reaching people in ways that scientists and academics have been unable to do.

Scholarly conversations have also contributed to the development of eco-art education, the roots of which can be traced to writings on environmental design (McFee & Degge, 1977),

green aesthetics (jagodzinski, 1987), and place-based art education (Blandy & Hoffman, 1993)[3].   Gablik's (1991, 1995) work on connective aesthetics helped to lay the groundwork as she articulated the need for better connecting art to the realities of daily living by detailing a shift from modernist to reconstructivist, postmodern aesthetics[4].   By arguing that art can be used effectively as an agent of social change, she believed that art could capture the public's attention through its innovative approaches to society's social and environmental problems.

These early voices were strengthened by other scholars' contributions to the discourse. Neperud (1995) positioned eco-art education as a community-based endeavor that could lead those involved from environmental awareness to environmental action.   Lankford (1997) drew from the scientific roots of environmental and ecological education by defining eco-art education as 'purposeful creativity' where people were 'attempting to reconnect with the earth in positive, restorative, and often spiritual ways' (p.50). His article was part of a special issue of the journal Art Education that focused on art and ecology, a major step forward that brought a new level of attention to environmental art and its emerging relationship to art education. Further contributions from Ulbricht (1998), Garioan (1998), and Krug (2003) began discussions about pedagogy appropriate for this area: they advocated for an approach that was community-based, interdisciplinary, experiential, dialogic, ideologically aware, and built on the values of empathy, sustainability, and respect for the environment. These same qualities were evident in more recent additions to the literature from Gradle (2007), Graham (2007), and Inwood (2008, 2010), all of whom argue for grounding eco-art education in place-based approaches to learning.

Other educators have deepened the conversation on eco-art education by experimenting with eco-art lesson and program design. Barbosa (1991) implemented learning about environmental art in a museum setting, while Blandy and Cowan (1997), Birt, Krug, and Sheridan (1997) and Anderson (2000) documented programs in natural environments. Others have focused on the use of re-using and recycling in art-making (Elliot & Bartley, 1998; Gomez, 1999; Congdon, 2000.) Taylor (1997), Keifer-Boyd (2001), Holmes (2002), Rosenthal (2003) and Anderson and Milbrandt (2004) described courses for secondary and college learners in this area.

Yet what has been clearly missing in this literature is a richer mapping of two areas of eco-art education that to date have received minimal attention: one is a focus on generalist teachers' engagement with eco-art education, and the other is on elementary settings. If generalist teachers are to introduce and teach students about eco-art education, they need to develop curricula in this area. How do they do this with little previous learning in this area, and with few resources at their disposal? The second gap centers on elementary settings, as most of the case studies reported on to date have been in secondary or post-secondary settings. Can teachers create learning appropriate for elementary students that integrates art and environmental education? If so, what does this learning look like? This study aimed to help fill these gaps in the literature by investigating teachers' experiences in developing curriculum for and delivering eco-art education in their elementary classrooms.

Methods

This inquiry brought together four elementary teachers with a university-based educator (myself) to investigate the experience of developing working models of eco-art education through the framework of collaborative action research. The teachers were positioned as co-researchers to explore the development of curriculum in eco-art learning, as well as its benefits and challenges. The key questions of the study focused on what eco-art education looks like in elementary classrooms: how do teachers connect learning in the visual arts to

environmental concepts and issues? What forms the curricular content and pedagogy of eco-art lessons? And what challenges do teachers face in implementing eco-art education with their students?

Collaborative action research provided the framework for a team-based approach centered on cooperation and co-learning, and gave room for multiple voices to contribute to the development of eco-art curricula. As the main elements of collaborative action research include empowering and involving all team members, information sharing, creative and co-operative problem-solving, and cultural transformation (Oja & Smulyan, 1989; Schensul & Schensul, 1992), all members of the research team were involved in these activities. The teacher-researchers focused on developing, implementing and reflecting on eco-art lessons that were firmly grounded in the realities of classroom life. They participated in completing an initial questionnaire to ascertain their starting points, and collected data on their experiences as the year progressed by making observations and field notes, keeping reflective journals, and taking photographs. The teacher-researchers were involved in the initial stages of analysis by reflecting on their experiences, sharing these with the team, and using them to inform new iterations of the action research spiral central to collaborative action research: planning, implementing, observing and reflecting (Lewin, 1948; Kemmis & McTaggart, 2003). As lead researcher I facilitated the team meetings, participated in the data collection by observing lessons in each of their classes, and acted as a participant observer to assist with lessons as required. At the study's end, bringing together the questionnaires, journals, field notes, journals, photographs, artworks and meeting transcripts resulted in a rich set of textual and visual data that was used in the analytic and interpretative phrases of the study.

In these phases we were guided by Herr and Anderson's (2005) approach to data analysis and interpretation: they advise that data analysis begins immediately in action research and continues throughout the research spiral as it 'guides further data gathering and decision-making' (p. 80). The early stages of analysis began after the first group meeting (as each meeting was audio-recorded and transcribed into written form) and continued throughout the nine months of the inquiry. The analysis evolved individually for the team members as well as collectively in the meetings, evident in the research journals and in the meeting transcripts. Analysis in the journals was formative and summative in nature, and transpired as a natural part of the actions taken by each team member. Perhaps not surprisingly given their busy schedules, the teacher-researchers chose not to be involved in the traditional qualitative analysis techniques of coding transcribed and written data that I employed after the data collection phase ended. This is most likely a manifestation of one of the tensions of collaborative action research (Herr & Anderson, 2005)[5] ; they were satisfied with their roles in the curriculum development process, but saw the data analysis, interpretation and reporting as part of the more formal research study, which they perceived as my responsibility as an academic. I undertook this part of the study via a combination of coding, thematic analysis, concept-mapping, revisiting data for deeper understandings, and member-checking, all commonly used in qualitative forms of research, guided by the work of Wolcott (1994), Mills (2003) and Herr and Anderson (2005). These processes resulted in the identification of patterns in the teacher-researchers' practices in terms of inspiration, alignment to environmental learning, definitions of eco-art education and pedagogical strategies. It also led to a discussion of the potential benefits, challenges and barriers to eco-art education for elementary educators, as well as a range of insights into curriculum development in this area.

I also utilized strategies from arts-informed research[6] to deepen the interpretative process and frame the data in a variety of ways (as imagery as well as text). This resulted in the

study being presented in three ways: as a formal report, as a textual/pictorial narrative, and as a series of 'portraits' of the teacher-researchers, presented in the form of sculptural books (see illustration 1 for one example). The narrative was a means to provide multiple entry points into the report through text/imagery integrations, ones that illustrate the study's key themes through a more personal lens. It aimed to demonstrate that not only had I immersed myself in eco-art education in a theoretical way in the course of this study, but that I had also incorporated it into my teaching and artistic practice as well; it has become part of my lived experience as well as that of the teacher-researchers. The sculptural books, in addition to acting as an alternate means of interpretation, were also a personal challenge as an artist: I wanted to recognize the power of visual culture by sharing the study's data in different artistic forms, and potentially widen the audience for the inquiry beyond the traditional confines of the academy.

The Teacher-Researchers

The teachers-researchers worked in four schools spread across the city of Toronto, Canada. They were experienced educators, each with more than fifteen years of teaching experience, who had taught in elementary schools for the Toronto District School Board. The TDSB has had a growing Ecoschools program in place for over a decade, helping students, teachers and their schools embed conservation, stewardship and sustainability practices into their curricula and school culture[7]. All of the teacher-researchers were working in certified Ecoschools at the time of the study. Dorie, an experienced teacher of thirty years, taught grade five in a K-6 school on the east side[8]. As a generalist teacher, she had a love of art and an interest in the environment but no special training in either; she was clear from the outset that she wasn't sure what she could bring to the team. Astrid, a primary teacher with a strong track record of life-long learning, split her time between two classes (a grade one class and a grade five special needs class) at a school just a few blocks from the edge of Lake Ontario. As a dedicated leader of the school's Eco-Club, she had a desire to learn more about how the arts can help children learn about the environment, but didn't know where to start. Karen brought a deep dedication to the arts, outdoor education and environmental learning to her grade 2/3 class in a west side school; this school was situated within walking distance of one of the largest parks in the city. Karen had joined the research team to explore how to integrate these areas of interest, as well as to find some moral support as she was often teased about her involvement in environmental education by the colleagues in her school. The fourth team member was Anne, whose love of art ensured that arts-based learning was central to her grade five French immersion class. She articulated a desire to integrate her love of and training in art with learning in the school's extensive naturalized garden, which she had helped to establish fifteen years earlier.

In addition to their desire to learn more about integrations of art and environmental learning, what these teacher-researchers did share across their school sites was a lack of support for their curricular interests amongst the colleagues at their schools[9]. While each had one or two teachers at their school who shared an interest in environmental education, they were often ignored or derided by fellow teachers for their own interests in this area. Karen described her situation on this front by saying '…at school they're always teasing me for bringing in more earth stuff, tying it somehow into the assembly that will affect the whole school, the messages. And last year they were starting to call me the Earth Mother and all these other things.' Despite this lack of collegial support, each of the teacher-researchers were dedicated life-long learners, and eager to continue their professional learning so as give them new ideas to broaden and deepen their teaching about the environmental with their students.

The teacher-researchers planned and implemented eco-art lessons in their own classrooms, observed the effects on their students, shared these results with the team, and analyzed their experiences and reflected on them individually and collectively. Their collaborations came primarily through five team meetings that provided an opportunity to summarize and analyze their lessons as well as brainstorm new ones together. They took their commitment to the collaborative nature of the inquiry so deeply that three of the teachers involved their students as active participants in the journey by asking them to help investigate the study's key questions alongside them as the year unfolded.

Findings

The study's findings demonstrated what eco-art education can look like in elementary classrooms, as together the teacher-researchers designed and delivered over fifty eco-art lessons (a resounding number over the course of nine months given that they were responsible for teaching all parts of the curriculum, not just art.) The lessons utilized a wide array of materials and techniques, ranged in complexity and depth, and supported a variety of environmental education concepts, from explorations of place to investigating eco-systems, to addressing human impacts. (For an overview of a sampling of these lessons, see fig. 1). The data analysis identified commonalities in the teacher-researchers' approaches to the types of alignment made to environmental learning, in the structure and pedagogy used for eco-art lessons, and the challenges and barriers to this type of learning.

Table 1.

Sampling of Eco-Art Lessons

Approach	Type of Lesson	Art Education Concepts	Environmental Education Concepts
Learning *in* the environment:	Ice sculptures	Sculpting, shape	Sense of place
	Waterfront eco-art designs	Installation design	Ecosystems thinking
	Bark rubbings	Drawing, texture	Sense of place
nature as site for	Natural sculptures	Sculpting , composition	Sense of place
art-making	Butterfly relief sculptures	Clay modelling, shape	Ecosystems thinking
and/or exhibiting	Clay insect homes	Clay modelling	Sense of place
art	Eco-Art exhibition	Exhibit & touring techniques	Ecosystems thinking
Learning *about* the	Leaf and tree drawings	Drawing, line, shape, shading	Sense of place
environment:	Landscape drawings		Ecosystems thinking
nature as subject	Rainforest batiks	Drawing, line, perspective	Human impacts
for art	Community mural	Drawing, colour, line, shape	Sense of place
	Transparent ground drawings	Drawing, painting, colour	Sense of place
	'Take 30' photographs	Drawing, line	Sense of place
art created with	Nature quilt	Composition	Human impacts
natural materials	Natural dyeing	Collage	Sense of place
	Seed and sand drawings	Dyeing, colour	Human impacts
	Potato print frames	Collage	Human impacts
	Edible veggie sculptures	Printmaking, shape	Human impacts
art created with	Junk art sculptures and masks	Composition	Sense of place
the 3Rs		Sculpting, form	Human impacts
	Urban/rural drum collages	Collage	Human impacts
	Papermaking	Papermaking, drawing	
	Scarecrow sculptures	Sculpting, form	

Table 1. cont.

Learning *for* the environment: *viewing and critiquing eco-art art as activism*	Andy Goldsworthy	Art history/criticism	Sense of place
	Emily Carr	Art history/criticism	Human impacts
	Brian Jungen	Art history/criticism	Human impacts
	Art gardens, Harbourfront	Art history/criticism	Sense of place
	Giant grapevine basket/fence	Weaving	Human impacts
	God's eye garden sculptures	Weaving, colour	Human impacts
	'Solution to Pollution' video	Video production	Human impacts
	Earth day posters	Drawing, printing	Human impacts
	Wish scrolls	Drawing, printing	Human impacts
	Pioneer art garden	Sculpting and planting	Ecosystems-thinking

Over the course of the year, the team capably demonstrated that eco-art education could be used to support learning about environmental concepts and issues while simultaneously providing innovative art lessons for their students. The lessons aligned to environmental learning in two ways; firstly by connecting to their school board's key concepts in environmental literacy (connecting to a sense of place, developing ecosystem-thinking, and understanding human impacts) that were discussed as part of the research team meetings and the Ecoschools program to which their schools belonged. But they could also be aligned with the more common approach of learning in, about and for the environment (Palmer, 1998), a guiding trilogy often found in the development of environment education lessons.

The eco-art lessons that aligned with learning in the environment took students outside the classroom to draw, sculpt and exhibit in locales outside of the classroom. This is an unusual practice for art lessons, as many teachers deem it too unwieldy to move students, art materials and tools outside to work. Some of the art components of these lessons were brief, like the bark rubbings that were done as a larger unit on tree study; but others required research, advance preparation and collaboration, like the tree baskets that Anne's class made (see illustration 2) or the eco-art exhibition and performances in the butterfly garden at Dorie's school (see illustration 3).

Those lessons that aligned with learning about the environment often took more traditional forms as most were made inside the classroom (accommodating the need to work inside in the cold Canadian climate), and therefore involved more common art-making techniques. Yet they still involved nature as the subject for art-making (found in the rainforest batiks of Anne's class, or the community mural created by Astrid's school (see illustration 4). They also manifested in art made with either natural materials or found objects, allowing the teacher-researchers to reinforce sense of place connections or concepts of human impacts (such as the 3Rs); Dorie's edible veggie sculptures were one such example, as were Karen's junk art masks.

The examples of eco-art lessons that fell into the learning for the environment category could be divided into two types: one was learning about artists who engaged in their own forms of environmental activism (such as Andy Goldsworthy or Brian Jungen), and the second was students' attempts at their own artistic forms of activism to address local environmental issues. For example, Anne's class installed God's Eye sculptures and a giant grapevine basket in their school garden, both forms of aesthetic stewardship aimed at

protecting heavily trampled parts of the garden. In contrast, Karen's primary students created a cross-curricular activist video, which Karen described in her journal:

> …*students were engaged in the preplanning, writing and dramatization of an integrated news type show about the environment, entitled 'The Solution to Pollution: A Child's Perspective'. It included sections on littering, vermicomposting, the Boomerang Lunch, books with environmental messages, an interview with a child who had just returned from Costa Rica about the rainforest, an eco-art show, an interview with a senior citizen about how life was different as an 8 year old, eighty years ago (imagine no plastic and no jeans!), poetry reading and lip-synching a song with a strong environmental message.*

Its production integrated all aspects of the curriculum, and became the focus of learning in the classroom over a number of weeks. It was played for the school community at an Open House, alongside eco-arts activity centers (including weaving, sculpting, drumming, reading and paper-making) run by the students themselves.

Many of the lessons focused on nature as the source of materials, images or sites for art-making, illustrating the strong value placed by the teachers on the natural world as a way into environmental learning with their students. They built on the innate curiosity that many elementary students have for the natural world as a common thread between the visual arts and environmental education: this was achieved through observations of nature, the incorporation of natural materials, processes and/or imagery, and the development of students' physical and affective connections to local places. Developing a sense of place was considered a major tenet of environmental education in their school board[10],   but they also had personal beliefs informing their impetus for taking this approach. Anne said:

> *I think sense of place is another really important part of that whole definition of eco-art… just in terms of getting the kids to really respect and appreciate the neighborhood and the environment that's closest to them… if through your teaching you can help kids to develop the real sense that 'this is where I belong', that 'this means so much to me that I will never do anything to destroy it'.*

Anne was realistic about the effects of this*: 'I'm not sure if this awareness will translate into a life-long sensibility to environmental issues, but it sure is a great start! They are very attached to this [garden] space'.*

When analyzed as a whole, the findings did address the question of the curricular content and structure of eco-art lessons in elementary settings. The structure of eco-art lessons proved similar to general art lessons, making it comfortable for these generalist elementary teachers to implement without special training: some were tightly structured with defined beginnings and endings, while others were more open-ended; some focused more on process, while others were more product-oriented. At times there was a greater acceptance of ephemerality in the art-making process than is the norm in most classrooms, placing less emphasis on the traditional 'make and take' approach and more on the use of biodegradable materials (like vegetables, grapevine or leaves) and natural processes (like freezing or decomposition). Also evident was the intentional inclusion of collaborative modes of art-making, involving small teams or the class as a whole in creative eco-action (such as found in the primary video). This varied the structure of eco-art lessons beyond those dictated by modernist approaches to art education towards postmodern ones that

were more dialogic, collaborative and community-oriented, as recommended by Gablik (1991).

While some of the pedagogy of eco-art learning was similar to general art lessons at the elementary level (like experiential learning and viewing artists' work), there were important distinctions as well: the teacher-researchers used outdoors learning more often, as well as incorporating cross-curricular integration more clearly than is typical in elementary art lessons. Making explicit links to environmental learning was also distinctive; this was achieved by integrating various approaches to learning in, about and for the environment into their lessons; by modeling the 3Rs; and by highlighting environmental concepts (like ecosystems-thinking and human impacts) as part of their art lessons. As these same pedagogical strategies are found in environmental education and outdoor education, these teachers showed that the pedagogy of eco-art education can balance the needs of art-based learning with that of the environment, rather than subverting one over another.

There is no doubt that the teachers' definitions of eco-art influenced their classroom practice. The team agreed that while eco-art education was defined in part by the materials and techniques used (showing sensitivity to biodegradability, recyclability and use of the 3Rs), what was more important was the inclusion of themes or concepts that raise awareness of humans' relationships with and/or impact on the earth. Many of the lessons used nature as the source of materials, images or sites for art-making, illustrating the strong value placed by the teachers on the natural world as a way into environmental learning with their students. A few took their lead from their students in this: for example, Karen's primary students were adamant in their linking of eco-art to the natural world. In her research journal she reflected that 'my students seem to have translated our year's integrated studies into 'most eco-art means no glue, no tape, no adhesives, little impact on the earth, [and] minimum consumerism'. But she also acknowledged that there was an underlying philosophy that summarized her own emerging definition of eco-art:

> …eco art is all art that conveys a respect for the earth, for our natural environment, the interconnectedness of our eco systems, and the importance of ecological literacy… I think the bottom line for me was always respect. And the kids got that very strong message — respect for self, respect for others, respect for community, respect for the world, respect for everything in it.

These perspectives on eco-art education brought by the teacher-researchers into the study raised more questions: does eco-art have to be made of environmentally friendly materials? Does using found or reclaimed objects fall into this category? Does eco-art have to demonstrate a connection to the natural world? And is it eco-art if no message is apparent, but the materials are eco-friendly? Astrid demonstrated that she was struggling with similar questions about materials in her journal:

> …in the EcoClub, I had all these pine cones and leaves from when my Grade 1s collected them. So we took cardboard that was in a recycling bin and they put sand on it and they glued these things to it. And they made art and they took it home and they were all excited about it. But a couple of the artworks stayed at school and I'm thinking what am I going to do with this now? You know, we just made more garbage in a way.

All of the team wrestled with this issue over the course of the year: how do we continue to make art with children in a world struggling under the weight of its own refuse, when we

know that those artworks will likely end up in landfill one day? One way that this contentious issue was addressed was by experimenting with biodegradable materials and natural processes in art-making; another was through an ongoing discussion about whether eco-art should contain a message to rationalize its existence. If eco-art helped to make the world a better place, could we justify the place of product-based art projects in schools? Karen raised this issue in her journal, noting in her journal that eco-art can be used

> …*outside the classroom to engage other people and give a very strong political environmental message. And that's really how I interpret eco-art although it's still something I'm trying to figure out, what makes eco-art different than art based on nature. But this way, it's engaging other people which art does, but it's got more of a kick to it, and…more of a message… All art is supposed to have a message. But you know what I'm trying to say? Like kind of a slap in the face almost, like what are we doing to this land, what are we doing to our earth? That's kind of how I look at a lot of eco-art.*

Through the curriculum development process and the data analysis, the advantages of eco-art education were also identified. One was the excitement it generated in students, seen in their expressions of delight at the start of lessons, a high degree of engagement during the lessons, and positive feedback at the end. There was also a recognition by the team that eco-art had an ability to strengthen students' connections with place, sharing the perspective of many environmental educators who have seen the benefits of better connecting children to their local places (Thomashow, 1995; Sanger, 1997; Smith, 2002; Sobel, 2004). They also liked the ease with which they were able to link it to other parts of the curriculum: integrations with science, social studies, and language arts were seen frequently. And the team was quick to point out its practical advantage: by reducing their consumption of traditional art materials, they could save money in their classroom budget for other things.

The challenges of eco-art education were also identified; some of these were not particular to eco-art, such as dealing with student behavior and an insufficient amount of class time to follow through with activities to their fullest, both encountered in any subject area. A few of the teachers found that some eco-art lessons took more time than usual to prepare for (citing clay work and papermaking as examples), or needed an extra set of adult hands to facilitate (like batik). The weather was another challenge, as its unpredictability required a greater degree of flexibility when working outside. While these challenges didn't stop any lessons from proceeding, it did mean that the teacher-researchers sometimes had to show a greater resolve and ingenuity to move ahead with what they envisioned. At the outset, all of the team was in agreement that the advantages of eco-art education far out-weighed its challenges, and that there were no barriers to its implementation.

Conclusion

As the first study to examine eco-art learning in a sustained way across four school sites, this inquiry has made a contribution to the emerging knowledge and growing discourse of eco-art education, as well added new understandings to the roles of art-based learning in the more established field of environmental education. It has demonstrated that eco-art education can support learning in, about and through art education and environmental education simultaneously in elementary classrooms. It has resulted in the creation of a database of elementary eco-art lessons that exemplifies art-based, environmental learning and supports the emerging theoretical body of knowledge about eco-art education built over the past thirty years (McFee & Degge, 1977; Gablik, 1991; Blandy & Hoffman, 1993; Lankford, 1997; Graham, 2007). The database also provides a ready set of models for those

wishing to introduce eco-art learning to their students by exemplifying how to use eco-art learning to make connections to the natural world, support learning in other areas of the curriculum, and undertake place-based learning and age-appropriate activism. The roles of collaboration, place-based learning, and activism in eco-art learning have been demonstrated, as have the use of biodegradable materials and natural processes in making art with children. Equally important, the design and delivery of eco-art lessons has proven similar enough to general art lessons that elementary teachers can undertake eco-art learning with their students without specialized inservice training, crucial to the widespread implementation of eco-art education in future. In this, eco-art education should be expanded into more elementary settings in future, helping teachers to implement art-based and environmental learning in an integrated way, and broadening the science –based approaches to environmental education more commonly found in classrooms (Sauvé, 1998; Palmer, 1998; Gurevitz, 2000).

The study also identified areas where practitioners of eco-art education need to more carefully consider its emerging directions. One is the heavily nature-centric approach that was evident in many of the eco-art lessons in the study. While connecting with the natural world has been advocated by many art educators in recent years (Anderson, 2000; Blandy & Cowan,1997; Holmes, 2002) what was missing was considering the built environments in each of the school communities as a source of environmental learning, as advocated by McFee & Degge (1977) and Adams (1991). Broadening eco-art practice to include this would better meet the needs of students who live in urban environments.

As this inquiry focused on the experiences of the teachers, there was little focus on tracking the attitudinal or behavioural shifts of students; certainly an important next step is to explore students' experiences with eco-art education. What characterizes their experiences, and what is their effect on environmental literacy and/or eco-friendly behaviors?[11] Other questions resulting from the study center on the materiality of teaching eco-art education: how can teachers be convinced to decrease their reliance on plastic markers and bleached paper to reduce the ecological footprint of their art programs? And how can they ensure 'a deeper shade of green' (Selby, 2000, p. 89) in their art lessons when they have little background in environmental education themselves? These are complex questions that will require multiple studies to address, yet are necessary to more fully understand the design and delivery of eco-art learning in elementary classrooms.

On a personal level the study was a deeply gratifying experience for all on the team: working together on a collaborative action research project helped to inspire the teacher-researchers to take on new initiatives in their own schools the following year. Dorie not only expanded the eco-art exhibit at her school, but took on new leadership roles by sharing her knowledge with students in summer camps and preservice education. Karen and Anne initiated new Eco-clubs at their schools, and Astrid was inspired to start a website to encourage knowledge-sharing with her fellow teachers. Karen nicely articulated the effects of her involvement in the study:

> Being a part of this team empowered me to take more leadership at work, to reach out more to like-minded families at school to help educate others about the importance of integrating ecological literacy in all that we do. This enlarged the circle and in turn empowered other children and parents to have a stronger voice and sense of ownership [in environmental education].

I felt a similar effect as I was able to integrate my roles as researcher, educator, environmentalist and artist into the praxis of eco-art education. I gained invaluable

experience in curriculum development alongside a group of enthusiastic and dedicated teacher-researchers who shared my belief in the value of integrating art and environmental education; together we created a rich collection of lessons, developed insights into the content and pedagogy of eco-art education, and better understood where our learning in this field needs to go next. Through workshops, lectures, writing and continued research, we plan to share this learning with others in hopes of growing eco-art education and inspiring students and teachers to experiment with this form of artistic activism in their own learning environments in future.

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References

Adams, E. (1991). Back to basics: aesthetic experiences. Children's environments quarterly, 8(2), 19-29.

Anderson, H. (2000). A river runs through it: art education and a river environment.

Art Education, 53(6), 13-18.

Anderson, T. & Milbrandt, M. (2004). Art for life: Authentic instruction in art. New York: McGraw Hill.

Barbosa, A. (1991). Art education and environment. Journal of multicultural and cross-cultural research in art education, 9, 59-64.

Birt, D., Krug, D. & Sheridan, M. (1997). Earthly matters: learning occurs when you can hear the grass singing. Art Education, 50(6), 6-13.

Blandy, D. and Hoffman, E. (1993). Toward an art education of place. Studies in art education, 35(1), 22-33.

Blandy, D. and Cowan, D. (1997). Imagine Yellowstone: Art education and the reinhabitation of place. Art education, 50(6), 40-46.

Capra, F. (1999). Ecoliteracy: The challenge for the next century. Retrieved on

July 24, 2006 from the Center for Ecoliteracy website at http://www.ecoliteracy.org/publications/pdf/challenge.pdf

Congdon, K. (2000). Beyond the egg carton alligator: To recycle is to recall and restore. Art education, 53(6), 6-12.

Cole, A. & Knowles, G. (2008). Arts-informed research. In G. Knowles & A. Cole (Eds.), Handbook of the arts in qualitative research: Perspectives, methods, examples and issues (pp. 55-70). London: Sage Publications.

Elliot, S. & Bartley, S. (1998). Materials arts design: An exploration in creativity, ecology and culture. Art education, 51(3), 52-55.

Eisner, E. (1997). The new frontier in qualitative research methodology. Qualitative inquiry, 3(3), 259-273.

Gablik, S. (1991). The re-enchantment of art. New York: Thames and Hudson.

Gablik, S. (1995). Connective aesthetics. In S. Lacy (Ed.), Mapping the terrain: New genre public art, (pp. 74-87). Seattle: Bay Press.

Garoian, C. (1998). Art education and the aesthetics of land use in the age of ecology. Studies in art education, 39(3), 244-261.

Gomez, A. (1999). American art of conspicuous recycling. Art education 52(3), 25-28, 38-39

Gradle, S. (2007). Ecology of place: Art education in a relational world. Studies in art education, 48(4), 392-411.

Graff, T. (1990). Art, art education and the ecological vision. NSCAD papers in art education, 5(1), 79-96.

Graham, M. (2007). Art, ecology, and art education: Locating art education in a critical place-based pedagogy. Studies in art education 48(4), 375-391.

Gurevitz, R. (2000). Affective approaches to environmental education: going beyond the imagined worlds of childhood? Ethics, place and environment, 3(3), 253-268.

Herr, K. & Anderson, G. (2005). The action research dissertation. Thousand Oaks, CA: Sage.

Hicks, L. & King, R. (2007). Confronting environmental collapse: Visual culture, art education, and environmental responsibility. Studies in art education 48(4), 332-335.

Holmes, S. (2002). Creative by nature: Integrating the arts into environmental science education. Green teacher, 69, 23-28.

Hungerford, H. & Volk, T. (1990). Changing learner behavior through environmental education. Journal of environmental education, 21 (3), 8-21.

Inwood, H. (2008). At the crossroads: Situating place-based art education. Canadian journal of environmental education, 13(1), 29-41.

Inwood, H. (2009). Artistic approaches to environmental education: Developing eco-art education in elementary classrooms. Unpublished doctoral dissertation, Concordia University, Montreal, Canada.

Inwood, H. (2010). Shades of green: Growing environmentalism and sustainability in art education. Art Education, vol 63(6), pg. 33-38.

jagodzinski, j. (1987). Towards an ecological aesthetic: Notes on a 'green' frame of mind. In D. Blandy, & K. Congdon, (Eds.), Art in a democracy (pp. 138-163). New York: Teachers College Press.

Keifer-Boyd, K. (2002). Open spaces, open minds: Art in partnership with the earth. In Y. Gaudelins and P. Spiers, (Eds.), Contemporary issues in art education, (pp. 327-343.) Upper Saddle River, NJ: Prentice Hall.

Kemmis, S. & McTaggart, R. (2003). Participatory action research. In N. Denzin &

Y. Lincoln, (Eds.), Strategies of qualitative inquiry (2nd edition) (pp. 336-396). Thousand Oaks, CA: Sage.

Krug, D. (2003). Teaching art in the context of everyday life. Retrieved on July 30, 2003 from the Green Museum website at http://greenmuseum.org/generic_content.php?ct_id=134

Lankford, E. (1997). Ecological stewardship in art education. Art education, 50(6), 47-53.

Leeming, F., Dwyer, W., Porter, B. & Cobern, M. (1993). Outcome research in environmental education: a critical review. Journal of environmental education, 24 (4), 8-21.

Lewin, K. (1948). Resolving social conflicts. New York: Harper and Rowe.

Lindholdt, P. (1999). Writing from a sense of place. Journal of environmental education, 30(4), 4-10.

McFee, J.K. & Degge, R. (1977). Art, culture, and environment: A catalyst for teaching. Belmont, CA: Wadsworth.

McKibben, B. (2005). What the world needs now, is art, sweet art. Retrieved on Feb. 25, 2008 from the Grist website at http://www.grist.org/comments/soapbox/2005/04/21/mckibben-imagine/index.html

Mills, G. (2003). Action research: a guide for the action researcher. (2nd ed.) Upper Saddle River, NJ: Merrill Prentice Hall.

Neperud, R. (1995). Texture of community: an environmental design education.

In R. Neperud (Ed.), Context, content and community in art education: Beyond postmodernism (pp. 222-247). New York: Teacher's College Press.

Oja, S. & Smulyan, L. (1989). Collaborative action research: A developmental approach. London: The Falmer Press.

Orr, D. (1992). Ecological literacy: Education and the transition to a postmodern

world. Albany: State University of New York Press.

Palmer, J. (1998). Environmental Education in the 21st Century. New York: Routledge.

Puk, T. (2002). Ecological literacy as the first imperative. Retrieved on July 16, 2006 from the Lakehead University Faculty of Education website at http://flash.lakeheadu.ca/~tpuk/Version%20Principles.pdf

Rosenthal, A. (2003). Teaching systems theory and practice through environmental art.

Ethics and the environment 8(1), 153-168.

Sanger, M. (1997). Sense of place in education. Journal of environmental education, 29(1), 4-8.

Sauvé, L. (1998). Environmental education between modernity and postmodernity: Searching for an integrating educational framework. In A. Jarnet (Ed.), A colloquium on the future of environmental education in a postmodern world (pp. 44-55). Whitehorse: Whitehorse Yukon College.

Schensul, J. & Schensul, S. (1992). Collaborative research: Methods of inquiry for social change. In M. LeCompte, W. Millroy & J. Preissle (Eds.) Handbook of qualitative research in education (pp. 161-200). San Diego: Academic Press.

Selby, D. (2000). A darker shade of green: The importance of ecological thinking in global education and school reform. Theory into practice, 39(2), 89-96.

Smith, G. & Williams, D. (1999). Ecological education in action: On weaving education, culture and the environment. Albany, NY: State University of New York Press.

Smith, G. (2002). Place-based education: Learning to be where we are. Phi delta kappan, 83, 584-594.

Sobel, D. (2004). Place-based education: Connecting classrooms and communities. Great Barrington, MA: The Orion Society.

Sobel, D. (2005). Beyond ecophobia: Reclaiming the heart in nature education.

Great Barrington, MA: The Orion Society.

Taylor, P. (1997). It all started with trash: Taking steps toward sustainable art education. Art education, 50(2), 13-18.

Thomashow, M. (1995). Ecological identity. Cambridge, MA: The MIT Press.

Toronto District School Board. (2007). Grasp: A tool for developing ecological literacy. Retrieved on June 30, 2008 from the TDSB website at http://www.tdsb.on.ca/

wwwdocuments/programs/ecoschools/docs/GRASP%20FINAL.pdf

Ulbricht, J. (1998). Changing concepts of environmental art education: toward a broader definition. Art education, 51(6), 22-24, 33-34.

Wolcott, H. (1994). Transforming qualitative data: description, analysis and interpretation. Thousand Oaks, CA: Sage.

Notes

[1]I use the term 'eco-art' to encompass both environmental and ecological art, taking my lead from Matilsky (1992). She proposed that 'environmental art' be used to designate works that call attention to nature and establish 'a reverent relationship between the viewer and the earth' (p. 37). In contrast, 'ecological art' embodies more of an activist stance, not only raising awareness of ecosystems but also proposing or creating solutions to their human-induced challenges.

[2]For a fuller cataloguing of artists working with environmental themes or foci in their work, refer to the database of artists on Green Museum [http://greenmuseum.org].

[3]For a fuller discussion of these scholars' contributions to the discourse on eco-art education, refer to Inwood (2008, 2009).

[4]Gablik is one of the first in the 20th century to articulate a need to move towards a more collaborative, community-oriented form of art-making, in which the 'paradigm of social conscience replaces that of the individual genius' (1991, p.114). She calls for art to move beyond 'nonrelational, noninteractive, nonparticipatory' aesthetics of Modernism towards 'connective aesthetics', that is art that builds community, engages with the reality of contemporary issues, and 'speaks to the power of connectedness and establishes bonds, art that calls us into relationship' (1991, p.114).

[5]Herr and Anderson (2005) noted the inherent tension that can arise in this type of situation, stemming from between the dualities of practical/formal knowledge and the insider/outsider status of the research team.

[6]Arts-informed research is a family of approaches to inquiry that bring together 'the systematic and rigorous qualities of conventional qualitative inquiry with the artistic, disciplined, and imaginative qualities of the arts' (Cole and Knowles, 2008, p. 59). Exploring new means of conceiving meaning-making and knowledge creation is central to arts-informed research, as traditional modes of research offer limited means for investigating and understanding arts-based learning. Eisner (1997) has identified the potential benefits that arts-based educational research can offer, and believes that it forces a re-examination of the assumptions and values that underlie social science-based research, many of which run counter to the ways the arts are involved in education. By better integrating the arts into a new paradigm of research, art educators are offered a better means to 'fit their interests, [be] congruent with what they wish to study, and play to their strengths' (p. 265).

[7]For a fuller introduction to this program, please refer to the TDSB's Ecoschools website at: http://www.tdsb.on.ca/_site/ViewItem.asp?siteid=207&menuid=1425&pageid=1052

[8]As a means of recognizing their contributions to the development process and this research project, the teacher-researchers agreed that their real names should be used in this article.

[9]It should be noted that the local school board, the TDSB, did have a growing Ecoschools program in effect at the time of the study, but with a small team of leaders supporting over 600 schools in the board and limited release time for bringing teachers together, it was hard for teachers in individual (and often geographically dispersed) schools to identify and/or connect with others who shared their interest in environmental education.

[10]The three tenets of environmental education, used by the Toronto District School Board (2007) at that time to inform curriculum development and classroom practice were sense of place, ecosystems thinking, and human impacts. Due to a change in provincial policy in 2009, they now use the categories of learning in, about and for the environment more commonly.

[11]While not the focus of this study, there are indications that the students might have improved their environmental literacy as part of their eco-art lessons. While viewing the gr. 2/3 students' 'Solution to Pollution' video might be sufficient evidence for this assertion in and of itself, Anne reinforced this in a reflection on her students' work on eco-art installations for the waterfront:

…you sort of hope that they grow in many ways, but to see that kind of very observable growth in terms of their understanding about the environment, about art, and its implications on the environment and so on…that's been very exciting.

Further study is required to more fully investigate and understand the effects of student learning in eco-art education and its impact on students' environmental literacy.

Çevre eğitiminde sanatsal yaklaşımlar geliştirmek: İlköğretim sınıflarında eko-sanat eğitimini keşfetmek

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Özet

Bu makale çevre bilincini ve sorumluluğunu arttıran bir araç olarak sanat ve çevre eğitiminin entegrasyonunu amaçlayan eko-sanat programının geliştirilmesini amaçlamaktadır. Bu nitel araştırmada öğretmenlerin ilköğretim sınıflarında eko-sanat eğitiminin tasarım ve uygulamasına yönelik deneyimleri rapor edilmiştir. Bir grup öğretmen işbirlikli eylem araştırması çerçevesi rehberliğinde uygulama, teorik bilginin planlanması, gözlemleme ve buradan elde edilen bilginin eko-sanat müfredat ve pedagojiye yansıtılması için çalışmışlardır. Çok sayıda okul arasında sürdürülür bir şekilde eko-sanat eğitimini incelemek için yapılan ilk araştırmada, ortaya çıkan bilgi birikimi ve sayısı artan eko-sanat eğitimi çalışmaları sanat tabanlı eğitimin ilköğretim düzeyinde pedagoji ile çevre eğitimi kavramlarının nasıl uyum içerisinde birbirini desteklediğini göstermektedir.

Anahtar Kelimeler: Çevre eğitimi, sanat temelli, çevresel sanat, artistik eylemcilik, eko-sanat eğitimi

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