RESEARCH PROPOSAL

Literacy of Children on Ecological System and Environmental Learning in Home Garden Environment

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May 2018
1. Research Topic

Literacy of Children on Ecological System and Environmental Learning in Home Garden Environment

2. Research Aim

The aim of study is to investigate the depth of middle childhood children’s literacy on ecological system in home garden environment of Malaysia and its effects on their competences toward environmental learning.

3. Research Objectives

To achieve the aim, the following research objectives are formulated:

i. To identify the factors that influence the literacy of children on home gardens ecosystems;

ii. To examine the children’s performances on ecological literacy in home gardens when engaging with their everyday ecology; and

iii. To analyse the perceptions of children on home gardens ecosystems through the process of interaction for environmental learning

4. Assumption

Reconnecting children to interact with the living systems in the natural environment allow them to enrich their thinking and learning as well as a belief that ecological may be a particular important domain in early childhood (Worth, 2010). The exposure to nature is not serving as a basis for future science understanding, but also to build important skills and attitudes for learning (Worth, 2010). The openness to experience with biodiversity in the outdoor environment (Chawla & Heft, 2002) will lead children to have sense of sensibility (Cobb & Mead, 1977) and sensitivity (Corsino, 2006). Learning ecology are “privileged domain” in which children have natural tendency to learn, to experiment, to explore that will allow them to nurturing the capacities (Kellert, 2002) and beyond the boundaries of learning (Wake & Eames, 2013) in which they already actively. Thus, the context of home gardens including
orchard, open field, neighbourhood yards and street has a significant impact on children’s direct experience, learning and supportive of childhood development in physical, cognitive, social and emotional performances (e.g. Gordon, A. & Browne, 2015; Murtaza, 2011).

5. Research Questions

The research questions are as follows:

i. Does the everyday landscape in rural environment afford place for children to be physically active towards environmental learning?

ii. How the children used the home gardens environment for outdoor play and learning?

iii. What are the elements of home gardens that influence children’s activity and play behaviour patterns towards environmental learning?

iv. What are the possible competences of children when experiencing their everyday ecology?

v. What are the children’s perceptions and preferences on home gardens environment and environmental learning?

6. Research Background

There is a growing body of empirical studies that children’s play and learning contact with natural environment is fundamental for children. An example, in rural village has large green areas, orchard, forest, and river where children are allowed to wander (Kyttä, 2002), have high degree of sensitivity (Corsino, 2006) and sensibility (Cobb & Mead, 1977) and sense of control (Maitland, Stratton, Foster, Braham, & Rosenberg, 2014). Traditionally, the natural environment has been a site for children to play with many physical activities (e.g. Wheway, 2015; Fjortoft, 2004). Rivkin (2000) states that most children appear to benefit from being outdoor where they able to intense their sensorial actions including seeing, hearing, touching, smelling, tasting and navigating in exploring and discovering their environment. This understanding suggests that children’s interaction with nature is expanding their physical and social,
cognition and emotion performances (Rios & Menezes, 2017; Rezasoltani & Said, 2012; Malone, 2007; Chawla & Heft, 2002). Children contact with nature through tending gardens and being in outdoor spaces with plants and animals (Chawla, 2007; Lester & Moudsley, 2006; Clayton & Opotow, 2003). Appropriate physical environment such as children home environment has potential as site which promote environmental learning and will give them endless ways to develop and maximizing learning. Children able to maximize their learning when learning promotes high motivation for interaction, exploration, discovery and experimental (Malone & Tranter, 2003a; Moore, 1997) in constructing knowledge, not by memorizing facts (Piaget, 1962). This is because the home surrounding is the richest, most detailed, and most readily available informational context provided for children to encounter (Kellert, 2005b). Therefore, Gardner (1991) posits that environmental learning fosters connected knowing of children where education is part of, rather than separate from life.

Children have their own unique experiential ways of learning (Leach, Driver, Scott, & Wood-Robinson, 2007) and knowing the natural world (White, 2004b; Corsino, 2006). For instance, why children learn about rambutans from a book or digital media when they could have them in an orchard outside their window. Engaging children with the nature allows them to discover and support the link between experience and developing environmental learning (Malone & Tranter, 2003a). Generally, environmental learning can occur in three ways of experiencing the nature; (i) directly: physical contact with nature environment, (ii) indirectly: limited of physical contact with nature and instructed, and (iii) vicarious or symbolism: no physical contact with nature environment where children learn by their imagination through feelings or actions (Duerden & Witt, 2010; Malone & Tranter, 2003b; Kellert, 2002). In other words, direct experience with nature, as opposed to indirect and vicarious, more commonly and fully provide the unstructured, spontaneous, unplanned immersion, challenges, and inspirations necessary for maturation and development in children (Kellert, 2005a). Therefore, by listening and interacting with children within this environment may develop mutual exchanges, thus promoting expansion of knowledge as well as giving children the opportunity to move to a different stage of conceptual understanding (de Brito Miranda, Jófili, & dos Anjos Carneiro-Leão, 2016). Home gardens are one of the settings that can address the flexible learning as it
gives children choices about what, where, why, when and how they learn. This implies sensitivity (Corsino, 2006), sensibility (Cobb & Mead, 1977) and willingness (Corsino, 2006) on children to classify, observe, investigate, explore, develop responses and interpret the phenomena around them (Kellert, 2005a). Moreover, environmental learning is an environment that affords the children to learn about nature and ecological system in which influence their childhood growth and development (Kellert, 2002) as well as their performances.

Figure 1: Modes of experiencing nature and learning in childhood development (Source: Kellert, 2002)

In order to constantly restructure their thinking, children need to be given opportunities to construct concepts or ideas, make observations, ask questions, read the world, create relationships, test hypotheses and reflect on their actions (de Brito Miranda et al., 2016). This presupposes a great challenge for teacher to be able to observe the children constructing meaning, through the process of interaction (de Brito Miranda et al., 2016) in the schools’ curriculum. In parallel to Lima (1999), the environment should enable the children to construct concepts, at any level of education and period development, gaining experience and information to enrich their repertoire and to use methodological procedures for the successive integration of new learning into their existing knowledge base.

Ecological literacy plays an important part of learning at all levels. Literacy of children on ecological system depends on children’s ability to know and understand
basic knowledge of ecology. Fundamental of ecology is defined as the study of organismal diversity and of the interactions between living organisms to one another and their surroundings including water, sunlight and soil (Courchamp et al., 2015). Children seek to understand the living organisms interact *with* other living organisms that are between plants and animals and its physical environment (Ünal & Nan, 2010). For instance, children learn the interactions and interrelationships among and between organisms found in orchard. A key part of ecological literacy is reconnecting children to living systems that is children’s good knowledge on relationship with nature. This understanding allows children to learn nature through direct experiences (Capra, 2006) that fosters their interaction, autonomy, exploration, curiosity and sense of responsibility (Ferreira, Cruz, & Pitarma, 2016; Courchamp et al., 2015; Murtaza, 2011; White, 2004). In order to constantly restructure their thinking (de Brito Miranda et al., 2016), children are given opportunities to make observations, ask questions, create relationships, test hypothesis and reflect on their actions.

In summary, children perceive the outdoor as a place (Shamsuddin & Said, 2008) that affords them to play and learn about natural elements including ecological system where they are able to be physically active, creative and problem solving. In addition, perception and action in the natural setting can permit them to exploit nature and learn about nature elements (Kellert, 2005a) in ecology. This is because children perceive the environment more to the functional. Therefore, this can stimulate their performances and shaping their learning behaviour.

7. **Problem Statement**

Home setting is a place that children spend most of their time to play, rest or enjoy (Said, 2007). Children begin their everyday life from home to the outdoor surroundings including home yard, ditch, orchard, forest, and street. Without children realized, they are engaging with their surroundings and naturally become a part of their play activities and daily learning. The environment is a giant and open-ended learning laboratory (Children and Nature, 2013). However, school has been a place for children where they spent a large portion of their knowledge in the classroom. Gardner (1991) posits that scholastic knowledge to children seem strictly bound to school settings. In Malaysian school curriculum, children are taught on principles of ecology. However,
children have been taught the science learning more on abstract where they cannot feel, touch, navigate and observe directly. Limiting children’s ability to participate in data transformation processes (Lanouette, Wart, & Parikh, 2016). This phenomenon of study is often decontextualized (Metz, 2004) and separated from children’s everyday life experiences (Rivet & Krajcik, 2008), with science instruction rarely engaging with their everyday surroundings as sites for ecological inquiry. As a result, children related literacy is seldom utilized, missing a key opportunity to integrate children’s extensive everyday forms of knowing (Vygotsky, 1986), seeing and doing.

In 2017, the composition of children under 18 years old is 29.4%, that is approximately 9.4 million children out of 32 million populations in Malaysia (Children Statistics Malaysia, 2017). According to the Ministry of Education Malaysia (2016), the number of children enrolled in the public primary school in Malaysia, aged 7-12, currently about 2,683,753. The middle children have been taught the syllabus related about environment including in science subject. Based on education report from Syllabus for Integrated Curriculum for Primary School Science (2003), children learned about living things (i.e. animals, plants, soil, sun) and world around them by using their senses in the lower level of learning, that is standard one to three. As the children go to a standard four and above, the syllabus expended to a complex and investigation. For instance, children begin to investigate living and non-things which are life processes, food chain, photosynthesis, force and energy, the Earth and the universe, materials and technology. The learning outcomes integrated into two themes; 1) scientific skills required investigation and understanding of nature including problem solving, decision making and manipulative skills and 2) thinking skills required to develop children’s thoughtful learning such as being critical and creative in attributing, analysing, evaluating, making inferences, generalizations and making hypotheses.

To investigate the literacy of children on ecological system towards environmental learning, a preliminary study was conducted at Kampung Jawa Ulu, Pontian, Johor on 6th November 2017 at community services responsibility (CSR) program. Thirty-seven primary school children from standard five to standard six, aged 11-12 were participated. Participatory observations were recorded the children’s ideas, actions, expressions and spontaneous talk with the instructor. This session allowed the
children to develop their competencies in perceptual and action that lead to ecological literacy for children on learning to know, learning to be, learning to do and learning to live together (Draft Global Issues Pilot August, 2011). This phenomena revealed that children explore the natural elements, be curious, make observation and engage in simple investigation (Worth, 2010). During the ecological trail, the instructor was brought the children to home gardens including yard, ditches and oil palm farm at the village. The instructor was briefing described the ecological system. For example, children were able to know and see that the rambutan tree provide shelter for ants and ants provide protection from other animals. This shows that children are started to see things directly in which stimulating children’s sensorial and action, thus leads to deep ecology. Children are given their opportunities to make observations, ask questions, read the world, create relationships and reflect on their actions (de Brito Miranda et al., 2016). At the same time, researcher observed the depth of children’s literacy on ecology through their responses. The results showed that children’s experience in their home gardens appeared to increase their responses on particular situations and involved in sensorial actions (Malone & Tranter, 2003a) to learn about ecological system. Therefore, children have their own senses on how they fit themselves into situations. Children able to have their opportunity to reflect on their ideas especially when they experience with peers. Through direct engagement with the elements of nature, children are given opportunities to integrate their ideas about the nature systems.

Based on the result, it shows that literacy of children on ecology are most intense their own common ideas and senses rather than using scientific terminology. None of them were answered from what they had learn in the school. When the children were asked about how the water striders can be floating on the water. Some examples of interesting answers given by the children were, “...because it was light” and “...because the legs act as lifebuoy, so that is why it can float on the water”. From the result of pilot study, it showed that children develop their own answers to problems (Ferreira et al., 2016). In parallel to Pereira (2009a:12), children build their concept ideas and explanations, which may not correspond to current scientific knowledge, beyond on what is written in the books. Therefore, there is a chance for researcher’s gap to give a look at children when they engage with outdoor environment within home environment including garden, yard, orchard, trench, stream, street, river, and
farm. This shows that when they engage with these spaces, they get or understand naturally about ecology. According to Coffey (2001), nature environment itself is children’s best teacher rather than textbooks, videos, and lectures because it is the ways for children to learn about environment is to experience it.

Therefore, there is a chance for researcher’s gap to give a look at children when they engage with outdoor environment within home environment including garden, yard, orchard, trench, stream, street, river, and farm. This shows that when they engage with these spaces, they get or understand naturally about ecology. According to Coffey (2001), nature environment itself is children’s best teacher rather than textbooks, videos, and lectures because it is the ways for children to learn about environment is to experience it.

8. Research Gap

Over the years, the body of research in play and learning of science regarding the natural environment has grown. From the previous research, these has been revealed that children prefer to be in contact in the outdoor environment (Norðdahl & Einarsdóttir, 2014; Waller et. al, 2010; Malone & Tranter, 2003b). Despite of urban children, there are few studies have explored on how children’s understanding of concept ideas in ecological systems at specific ages within their outdoor environment. Little attention has given to explore the children’s understanding of matter plants and animals (Leach et al., 2007; Wood-Robinson, 1991) within their home gardens in Malaysia. The present study is therefore designed to investigate the ways of children thinking and explain situations which involve their current knowledge of understandings the plants and animals and its interdependency in ecosystems. Table 1 shows the summary of related studies on children engaging with outdoor environment.

<table>
<thead>
<tr>
<th>Authors (Years)</th>
<th>Concerns and Findings</th>
<th>Settings</th>
<th>Variables</th>
</tr>
</thead>
</table>
| Colb (1969); Heft (1999); | **The ecology of imagination**  
- The imagination of childhood is based on the biographical and autobiographical memories that are relating with relationship between observer and environment; human and place. | Natural setting | - Understanding  
- Behaviour  
- Sense of place |
<table>
<thead>
<tr>
<th>Study References</th>
<th>Concerns: Learning setting</th>
<th>Concerns: Learning experience</th>
<th>Concerns: School grounds, zoo, parks and forest as sites for learning of nature systems</th>
<th>Concerns: Everyday landscapes as sites for outdoor play and learning</th>
<th>Education setting</th>
<th>Learning experiences</th>
<th>Perceptions</th>
</tr>
</thead>
</table>
• Out-of-the-school learning experiences, both structured and less formalized were perceived by children as being more active, collaborative and challenging, contributing to their understanding of their place within the environment. | **Concerns: Learning experience**  
• Direct experience with natural elements contribute to the children’s development of environmental disposition, intense opportunities for them to apply what they had been instructed during the preparation process.  
• The children have been focused on the impact of learning and skills development in natural spaces. | **Concerns: School grounds, zoo, parks and forest as sites for learning of nature systems**  
• Most of the urban children have limited access to natural landscapes and lack of affordances, which influence the cognitive, social and physical activity levels.  
• Most of the studies focused on urban children who have limited access to nature. Therefore, the affordances of environment influence the physical activity levels. | **Concerns: Everyday landscapes as sites for outdoor play and learning**  
• There is still lack of studies that examine the lived experiences on place-based education  
• Children with good natural resources (have high accessibility to spaces) have greater degree of interaction and competences than children with limited resources. | Primary schools (UK), Schools of rural and middle-class community, Elementary school (US) | Primary school project work, Middle children in urban & semi-urban area (Portugal), Primary school in urban & rural area (Malaysia), London Zoo (UK) | Primary schools (UK), Schools of rural and middle-class community, Elementary school (US) |
| Fjortoft (2001); Chatterjee (2005); Maynard, (2013); Skar, Gundersen & O’Brien (2016) | **Concerns: Learning experience**  
• Direct experience with natural elements contribute to the children’s development of environmental disposition, intense opportunities for them to apply what they had been instructed during the preparation process.  
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• Children with good natural resources (have high accessibility to spaces) have greater degree of interaction and competences than children with limited resources. | Natural environment (Norway), Learning in outdoor environment | Natural environment (Norway), Learning in outdoor environment | Natural environment (Norway), Learning in outdoor environment |
| Sobel (2002); Malone (2003); Wagoner (2010); Veselinovska et. al (2010); Aziz (2014); Askerlund & Almers (2016) | **Concerns: Learning experience**  
• Direct experience with natural elements contribute to the children’s development of environmental disposition, intense opportunities for them to apply what they had been instructed during the preparation process.  
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| Mindes (2006); Said (2012); Lloyd & Wilkinson (2016); Green (2017); Mindes (2006); Said (2012); Lloyd & Wilkinson (2016); Green (2017); | **Concerns: Learning experience**  
• Direct experience with natural elements contribute to the children’s development of environmental disposition, intense opportunities for them to apply what they had been instructed during the preparation process.  
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As shown in the Table 1, numerous studies of children learning in outdoor classroom including forest and school ground, were conducted in both western and Asian countries. In fact, the study of children’s literacy on ecological should be
investigated because different context may afford different degree of children’s interactions. However, in Malaysia context, there are still lack of research that explore the ways of learning where children’s understanding of plants and animals and their functioning through direct experiences within their home environment. Nevertheless, this will enhance a good relationship of children with their home gardens environment which will become part of their everyday engagement, thus leads to purposeful, authentic (Maynard & Waters, 2007) and meaningful. On the other hand, children may have the intentions to go out from the classroom but hindered by school curriculums because this is a method of adults to impose on children’s ideas of what is important to learn and how to learn. Therefore, there is a need to look at children when they engage with outdoors, that are home environment. This exploratory study will lead us to understand children’s perception and behaviour in environment.

Table 2: Research Statements

<table>
<thead>
<tr>
<th>Aim: To investigate the depth of middle childhood children’s literacy on ecological system in home garden environment of Malaysia and its effects on their competences toward environmental learning.</th>
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<tbody>
<tr>
<td><strong>Problem Statements and Gap</strong></td>
</tr>
<tr>
<td>• Children are received a large portion of knowledge on science ecology in school, strictly bound to school where they learn through abstract learning. Children have been separated from their everyday experience and known as decontextualized.</td>
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<tr>
<td>• Children’s literacy are rarely utilised, missing key opportunities to integrate their extensive everyday form in knowing (perception), seeing (perception) and doing (action).</td>
</tr>
<tr>
<td><strong>Research Questions</strong></td>
</tr>
<tr>
<td><strong>Environment</strong></td>
</tr>
<tr>
<td>RQ1: What are the physical attributes and characteristics that afford places for children to be physically active towards environmental learning?</td>
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<tr>
<td>RQ2: How the children used the home gardens environment for outdoor play and learning?</td>
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<tr>
<td><strong>Actions</strong></td>
</tr>
<tr>
<td>RQ3: What are the elements of home gardens that influence children’s activity and play behaviour patterns towards environmental learning?</td>
</tr>
<tr>
<td>RQ4: What are the possible competences of children</td>
</tr>
</tbody>
</table>
• Less attention has given to explore the children’s understanding of matter plants and animals and other physical elements within their home gardens in Malaysia.

| Perceptions | RQ5: What are the children’s perceptions and preferences on home gardens environment and environmental learning? | RO3: To analyse the perceptions of children on home gardens ecosystems through the process of interaction for environmental learning |

9. Literature Review

9.1 Interaction of children in everyday landscapes

Traditionally, outdoor environment has become a place where children most of their childhood lives for play that foster their skills and thoughts (Kellert, 2005b), and contribute to their physical, social and cognitive development (Pellegrini, 2009; Hart, 1993). Children perceive the environment as dynamic, interesting and challenging place for adventure, exploration (Kyttä, 2003), manipulation (Jansson, Sundevall, & Wales, 2016; Moore, 1989) and discovery that inspires them to be physically active and to support learning.

9.1.1 Children and Place relationships

Outdoor environment or outdoor spaces, whether virtual or physical, can have a significant impact on play and learning. Outdoor environment is fundamental to childhood and supports the development of outdoor learning that leads to connect them to the natural world. Nonetheless, the rich, sensory diversity, variability of natural environment (Kellert, 2002) are not only support children’s own investigation (Fjortoft, 2004), therefore, provides an ideal context for them in which the development of knowledge, concepts and skills. The child-place relationship is important to indicate the perception, preference and action of children in the
environment, thus, to understand better environment that optimize the children’s play and learning.

9.2 Outdoor Learning Environment

9.2.1 Children’s play as Learning

Play has been defined in various definitions to the study of children in the outdoor environments. Play is associated with fun, passionate, spontaneous (Piaget, 2007), valuable as an enjoyable activity; it is also a process through which children learn without being controlled or instructed by adults. This is because the activity is more concern by children rather than the outcomes (Nor Fadzila Aziz; Ismail Said, 2016). Experience of children in outdoor involves in doing, exploring and discovering (Malone & Tranter, 2003b). Children perceived environment as a place for play and learning. Children has their own desire of learning and use their thoughts on how the world works. Play with nature gives opportunity for children appreciate and discover the natural elements while playing among the trees, hiding, and having secret place. Through spontaneous, open-ended, and play in natural surroundings offer various learning opportunities for children to observe, classify, explore, and interpret the phenomena around them. Children are preferred natural environment in properties of plants and animals as well as topography and microclimate. In parallel to Veselinovska et. al. (2010), children have daily opportunity to explore living organisms, soil and water in their environment in which they develop the understanding of their world and other species. Children has their own desire to play, learn and figure out how the world works.

9.2.2 Literacy of Children on Ecological System

Fundamental ecology is the basis for children to understand the relations and interactions between plants, animals and its physical environment. For example, children know the bees are more attracted to flowers with bright colour such as yellow and orange where the bees collect the pollen or nectar as a food source. This shows that children have the ability to understand the natural systems that offer diverse elements on earth possible, known as ecological literacy. The natural environment affords to reconnect children to natural systems with deep sense of place and
understand of their surroundings as well as support environmental learning. Ecological literacy is reflecting to children’s way of thinking that emphasize relationships, connectedness and setting. For instance, children are able to understand a water strider by exploring both its own characteristics as well as its interaction with other habitats. In other words, ecological literacy helps the children to build relationships and apply their understanding in the real-world context.

10. Theoretical Framework

In recent years there has been a growing interest of play in outdoor environment as both needs and rights of children, where they can explore and experience natural elements and phenomena of their lives. Play is a foundation and has a central role in promoting children’s learning and development (Bredikyte, 2011; Pellegrini & Smith, 1998). Children’s preferences to engage with active play in particular settings influenced by their psychological affection and distinction experiences with the settings (Andel 1990; Min, 2006). There are evidences of positive impact of play on obtaining academic knowledge and skills. Previous studies in learning and development reveal that play in outdoor does not prevent realistic learning (Fromberg and Bergen, 2002), however, play contributes to learning. The best environments for children are those which are developed on the basis of children’s natural needs, taking into account the outdoor play cooperate into learning in different domains including physical, cognitive and social play. Children favoured play in the outdoor environment with varied physical elements, high degree of challenges, taking risks and complexity (Casey, 2007; Fjortoft, 2001). The richness and diverse of outdoor environment offers more opportunities for exploration, discovery and learning corresponding to behavioural patterns and preferences (Moore and Wong, 1997) for children to gain knowledge about the world they live (Christensen, 2000). Therefore, children that spent significant time in nature show a greater commitment to protect the nature (Chawla, 2007) and know better about the environment in which develops the children to gain knowledge, values and concern, motivate and commit to participate in the environment they live. Therefore, playing in nature helps children to obtain satisfaction and contribute to their environmental understanding and experience. This is known as environmental learning.
Furthermore, to meet the needs for environmental understanding and children’s experiences of play and learning in natural landscapes, the landscape setting should be child-friendly environment. The landscape setting or geographic place in which people live is important because people-place are interrelated. The place-based approach is being used to reconnect the children with the place, that is home gardens in the rural environment. Place-based approach applied for children where they are able to learn across the subject matter.

The physical environment should afford the diversity of nature, the availability of elements, challenging and complexity. The way of the environment is configured influences the children behaviour and attitudes (e.g. feel, act, and behave). For instance, the home gardens allow children to be freely active, sense of control to access their favourite places and affords them for having various activities for play without adults intervention (Chatterjee, 2005). Reconnecting children to the natural environment must involve through hands-on multi-sensory experience in nature (Freuder, 2006), thus promotes ecological literacy in children’s outdoor play environment. Research has revealed the way in which children can learn especially through play is strongly influenced by nature, the availability of natural elements (e.g. Moore & Wong, 1997) and accessibility (e.g. Gundersen et al., 2016). For example, the environment provide space for children to run, climb, jump, and observe on particular natural elements. Inasmuch, this will capture the behavioural patterns of children and their perceptions on play activities.

11. **Underpinnings**

The underpinning of this study will be focused on (1) Human-Nature Interaction towards environmental values by Kellert (2002) and Bloom Taxonomy (1956), (2) theory related to children’s play and learning including Piaget’s Theory of Cognitive Development and Play (1972), (3) theories related to the development of environmental competence including Bronfenbrenner’s Ecological Developmental Psychological Theory (1979) and Ecological Perceptual Psychological Theory by Gibson (1979).
11.1 Theory of Human-Nature Interaction

The physical factors of an environment are associated with the availability of natural elements which offer diverse functions and opportunities for children’s play (Chawla and Moore, 2003). Children’s experience of nature is broadly perceived through direct contact with indirect contact of learning process. The children’s perception and action requires linking into three levels of experiences; (1) cognitive, (2) affective and (3) evaluative with varying modes of experiential learning in childhood development (Kellert, 2002). Cognitive development is associated with children’s formation of thinking and problem-solving skills, from basic understanding of facts and terms to complex levels that are creating categories, classifying systems and identifying relationships. Affective is an ability and attitude of children to receive and respond to information and situations in which involves willingness, sensitivity or sensibility to interact with the elements in nature. While, evaluative is an ability of children on performances and behaviour in the nature through imitating, manipulating, precision, articulation or naturalization These levels of nature experiences emerged into typology of nine basic values of nature. The values are classified into (1) aesthetic, (2) dominionistic, (3) humanistic, (4) moralistic, (5) naturalistic, (6) negativistic, (7) ecologicist-scientific, (8) symbolistic and (9) utilitarian based on children’s perception and action in various environment. Thus, this typology associated with the child’s experience of nature serve as stimulation for learning and development (Kellert, 2002).

11.2 Theory related to children’s play and learning

The underpinning of this study will be focused on a comprehensive theory about nature and human intelligence development created by Jean Piaget, also known as developmental stage theory. The theory deals with the nature knowledge and how the human, that is children come to acquire, construct and use it. According to Piaget (1972) believed that there are two key processes; 1) assimilation in which children form new knowledge and experience and 2) accommodation of those into the child’s existing internal organised patterns of thought and behaviour, known as schemas. It means children’s way of organizing knowledge to understand and respond to
situations. For instance, children might have schema about pluck a fruit on the tree. The schema is a stored form of the pattern of behaviour which includes looking at the properties of tree, climbing the tree, pick ripe fruits and eating as well as sharing with peers. This is how the children retrieve schema from memory and apply it to the situation. Piaget emphasized the importance of schemas in cognitive development and describe how children developed and acquired, therefore play is fundamental to cognitive development. Piaget’s theory of play helps the children to develop their understanding on what actions they can take in different situations and the effects of their actions. Moreover, below can related to the theory of Piaget; 1) Children learning through play. Play provides opportunities for exploration, experimentation and manipulation that are essential for constructing knowledge. Learning through play promotes the development of social, emotional and intellectual abilities of a child. It is through play that children develop their imagination and creativity. Secondly, children construct knowledge. They observe, compare, ask questions and discover answers. Knowledge is constructed as a result of dynamic interactions between the individual and the physical and social environments. In a sense, the child discovers knowledge through active experimentation, which eventually sometimes leads to “constructive errors” that are equally necessary to mental development.

11.3 Theory related to children’s environmental competence

The competence is an essential quality of development that children need to develop to become capable adults (Taylor, 2013). In fact, children are able to form their capabilities that allow them to navigate the world. Children seek for opportunities where they can show their competence. In other words, competence has been emerged from psychology research in satisfying human functioning (Sternberg & Kolligan, 1990). It contributes to children to adapt and function well in the environment as well as achieve desired outcomes. These psychological outcomes are recurring from person-environment experiences (Chawla & Heft, 2002).

The Bronfenbrenner’s ecological systems theory is focused on the quality and context of the system of relationship that form their environment affect children’s growth and development. The theory emphasizes on the complex layers of environment; (1) microsystem refer to immediate environment that children live in
(e.g. home, school, neighbourhood), (2) mesosystem refers to the connection between home and neighbourhood, (3) exosystem is defined as a system of individual in which children do not function directly, however, impact the children’s development (e.g. parent workplace schedule), (4) macrosystems are considered the outmost layer in child’s development, comprised of cultural values, customs, and laws. It also refers to the prevalent models that still influence over the children throughout the interaction of microsystems, mesosystems and exosystems.

James J. Gibson has developed a theory on ecological perceptual psychology which refer to person-environment relationship as immediate concept and particularly based on practical activity. Gibson’s perceptual psychology is based on a description of stimulus information through human senses which forms their ecological reality. The sensory information is made by multisensory perceptions: sight, hear, touch, smell and taste. Perception is fundamental in this framework and cannot be separated from the intentional activity which it is connected. Besides, accessibility and movement reveal more information about the environment. “We must perceive to be able to move around, and we must move around to be able to perceive” (Gibson, 1979, p.223). Hence, it is clearly shows that perception and mobility is closely connected. Perception is further developed by Gibson on the affordances of an environment. Perception and action are interrelated which through action, a person can reveal new affordances and through perception affordances create new action (Kyttä, 2003).

12. Scope of Study and Variables

The study focuses on investigating the depth of ecological literacy in children within their everyday landscape in rural environment - home gardens. The home gardens environment properties that influenced the children’s physical, cognitive and social in play and learning development. The key to this ‘hidden competence’ is the amount of knowledge and experience of children having in the particular domain. In order to accomplish the objectives, the study will investigate the children’s literacy for environmental learning based on their perceptions and actions when they experience their immediate environment. Refer to Figure 2.
The unit analysis is the middle childhood children, aged between 7-12 years old live in the rural environment. Middle children engage with spaces in most of their active free-play and the influences on their choice of location and activity are largely undiscovered by adults (Veitch et. al, 2006). There is a need to better understanding of where and how children engage, are important because it may inform opportunities to promote children’s environmental learning. Therefore, children have develop their own abilities to understand the environment where they form basic ideas (Kellert, 2005b) to better informed about nature and begin to address more complex concepts (Veselinovska, Petrovska, & Zivanovic, 2010; White, 2004a) such as living of species. Thus, children know how to fit themselves in the environment. According to Piaget’s theory of cognitive development stages, the middle childhood children begin to show signs of using logical thinking, analysing, recall, ability to recognize their own thoughts and perceptions that is known as concrete-operational stage (McDevitt and Ormrod, 2002). During middle childhood, the local natural setting provides many chances for them to curious, explore, discover, imagine, and create (Kellert, 2005b). Hence, increases the children’s way of knowledge by allowing them advance in their thinking and reasoning skills. For example, children able to describe that the earthworm do not need legs to move because it has muscle. Moreover, this is a phase where children learn to act and think beyond a conception of the universe. Therefore, children are able to take their point of view, and understand a part or the whole relationship and classification. This shows that they have the ability to expand their experiences, perceptions, curiosity and feelings as they use the outdoor environment extensively (Chawla, 1992; Kellert, 2002), because they have their own sense of control; children can increase their freedom to be outside without adults’ supervision. Importantly, children perceived play and learning in the outdoor environments offer various exciting and challenging elements, provide them the opportunity to choose, make decision, experiment, imagine and create new things.
HOME ENVIRONMENT IN RURAL AREA

Independent Variables
- Nature Elements
  - Animals
  - Plants
  - Topography
  - Microclimate
- Space/Domains
  - Availability
  - Rich in Diversity
  - No boundaries
  - Dynamic
  - Open-ended
- Ecosystems
  - Connection
  - Relationships
  - Process

Dependent Variables
- Conceptions (knowing)
- Actions (doing)
  - Understanding
  - Activity
  - Movement
  - Behavior
  - Interaction
  - Experience
- Perceptions (seeing)

Expected Outcomes
- Dimension of Literacy
  - Level of knowing
  - Practical Skills
  - Way of thinking
- Dimension of Environmental Learning
  - Willingness
  - Sensibility
  - Sensitivity
  - Engagement
  - Satisfaction
  - Affiliation
  - Being
  - Become
- Process of Interaction
  - Curiosity
  - Observe
  - Question
  - Explore
  - Test
  - Reflect

Children’s Literacy on Ecological Systems for environmental learning

Figure 2: Research Variables
13. **Significance of Study**

The study is significant to respond to the problem statement and research gap that have been mentioned earlier in the research proposal:

i. The study will add the body of knowledge on home gardens ecosystems afford children’s performances in conception, perception, and action through direct experiences.

ii. In the aspect of literacy, this will reveal the depth of ecological knowledge, attributes and key dimensions that support children’s environmental learning within their space domains.

iii. From the thematic analysis study, this will provide evidence on the importance of children engagement with outdoor environment leading to environmental learning and children’s functioning; physically, cognitively and socially.

iv. From the children’s performances towards environmental learning in the home gardens environment as an assessment model for ecological literacy for children on learning to know, learning to be, learning to do and learning to live together.

14. **Research Design**

To achieve the aim of the study, therefore, this research will investigate the understanding of children on ecological system of home gardens. This is environmental learning (e.g. White, 2004; Malone & Tranter, 2003a). An assessment model for ecological literacy for children on learning to know, learning to be, learning to do and learning to live together (Draft Global Issues Pilot August, 2011) will be introduced to educators. Engaging children with natural elements through direct experience can sharpen their observation, exploration and discovery in the environment which reveals any possible actions, behaviour and perception of children. This research also investigate the importance of physical environmental properties (i.e. natural elements, places characteristics) (Rissotto & Tonucci, 2002) on children’s environmental learning (Tidball & Krasny, 2011). Therefore, this study observes and documents on children’s performances with the elements of home gardens ecosystems. The performances are elicited through children’s situated perceptions (i.e. preferences
and attitudes) (Ewert, Place, & Sibthorp, 2005) and their actions (i.e. activity, behaviour and movement pattern) (Laaksoharju, Rappe, & Kaivola, 2012) on ecology. Apart from the specific literacy of children on ecological system in home gardens, the accessibility (Shamsuddin & Said, 2008) to these spaces also become a part of important consideration in this study.

The physical environmental elements of home gardens in rural environment are categorized into animal, plant, topography and microclimate while the physical environmental features are locations, space connectivity and physical characteristics. The data will be obtained through participatory observation, field notes, photographs and video recording. Therefore, the data will be analysed using ArcGIS for place mapping (Broberg, Kyttä, & Fagerholm, 2013) and Nvivo for coding and analysis (Finn, 2015).

In addition, the data of overt and covert actions will be collected. The field observation and photograph will be elicited for children’s activities and performances in motoric and sensorial actions when they engage with nature elements. ArcGIS will be used for behavioural mapping to determine how children use the spaces that are their actions and tracking their movements in particular spaces. Examples including running in open field to catch grasshopper and cricket and climbing tree at home yard to search bird nests. Therefore, children’s good knowledge on nature elements and preferences will be obtained from semi-structured interview and voice recording. Children’s expression will be analysed from drawings where children apply their understanding of home gardens ecosystems. These methods need to be conducted to investigate the depth of children’s literacy on ecological system of home gardens in rural environment in Malaysia. Table 2 shows the methods and tools used to conduct the research.
<table>
<thead>
<tr>
<th>Research Objectives</th>
<th>Determinant</th>
<th>Variables</th>
<th>Overt/ Covert</th>
<th>Methods</th>
<th>Tools</th>
</tr>
</thead>
</table>
| RO1                 | (Environment) Properties of home gardens | - Physical environmental elements  
  - Animal  
  - Plant  
  - Topography  
  - Microclimate  
  - Physical environmental quality  
  - Location  
  - Space characteristics  
  - Space connectivity | Overt | - Participant Observation  
  - Field Notes  
  - Photograph  
  - Video recording  
  - Mapping  
  - Field Notes | ArcGIS  
  Nvivo |
| (Ecology) Relations between physical elements and features | - Ecological  
  - quality  
  - Connectivity  
  - Relationships | Covert | Semi-structured interview  
  - Voice recording  
  - Drawing | |
| RO2                 | (Action) Behavioral patterns and performances | - Opportunities for outdoor play and learning  
  - Activities  
  - Movement  
  - Social interaction | Overt | Field notes  
  - Mapping  
  - Photograph  
  - Drawing | ArcGIS |
| RO3                 | Perception responses (Perceptual) | - Place preferences  
  - Perception of environmental learning  
  - Ways of thinking | Covert | Semi-structured interview  
  - Voice recording  
  - Drawing | |
15. **Anticipate Findings**

The study will reveal the factors of children’s literacy that influence the performance for environmental learning. Thus, the anticipated findings are as follows:

i. Direct experiences with elements of home gardens ecological system enhance children’s experiential learning in which simultaneously develop their competence in knowledge, skills and attitudes toward environmental learning.

ii. Conducting a module for outdoor learning that supports children’s knowledge and skills that not only learning about the environment but also learning for and learning in the environment. The module begins with the heterogeneous groups of children (Metz, 2004) working together guided by instructors.

iii. The home gardens in rural environment are highly natural diversity and may become ideal for environmental learning that is children’s needs and desires. Children who live in the home gardens environment explore and perceive more diverse elements and variety of activities which perform them in motoric and sensorial actions. This expected finding may reveal a better understanding the children’s play and way of thinking.

At the end of this research, the expected result of this study will be developed into an assessment model for ecological literacy for children’s environmental learning on learning to know, learning to be, learning to do and learning to live together (Draft Global Issues Pilot August, 2011) and could be used for further studies. Children learn about elements of the local ecology and their shared role in it, which, in turn, heightened their sense of environmental competency. It is significant to identify if there are certain factors that influence the development of children’s competence for environmental learning, especially in the outdoor environment, that is home gardens. This study seeks to determine the quality of the home gardens, which is likely to support the development of children’s competence (Duerden & Witt, 2010) in ecological system. These findings will help us to understand the importance of the home gardens for children’s environmental learning from a more holistic perspective.
16. Conclusion

The findings suggest that the home gardens setting in the rural environment become as an extension for children to develop their literacy on ecological system and support their actions; physically, cognitively and socially. The children perceived the home gardens as an open-ended laboratory because there are no boundaries for exploration. The availability of the natural resources in their home gardens is associated for children’s learning and experiences. This indicates that home gardens are affording the natural elements including plant, animal, topography and microclimate towards children’s sensory stimulation and responses through experiences and exploration to understand more about the world they live in. Thus, children perceived their home gardens as a place for them to have sense of control to discover their own play and knowledge. This interaction inspired the children to extend their knowledge about their world including noticing, wondering, finding challenges, problem solving and taking risks through their own research. It means that the home gardens setting is directly influencing the children’s perceptions and actions. Nevertheless, home gardens elucidate the importance of ideational resources for the initiation of learning activities. From pilot study, researcher had a glimpse of children’s interaction and experiences and the significance of these experiences need a further investigation. Therefore, bringing children closer to nature, that is their home gardens environment reveal that children have more enthusiasm to discover than fear of not succeeding in various aspects. Children benefit from nature contacts that boost their growth and learning development. However, it is in the hands of adults to preserve the rights and opportunities of children to encounter nature.
The home gardens in rural environment can be highly diverse, and become ideal for environmental learning that is children’s needs and desires. This expected finding reveals a better understanding the children’s way of learning through experiential and direct engagement.

Conducting a module for outdoor learning that supports children’s knowledge and skills that not only learning about the environment but also learning for and learning in the environment. The module begins with the heterogeneous groups of children (Metz, 2004) working together guided by instructors. (conducting in dyads allow collaboration and distribution of the intellectual load, and maximizes the responsibility and control of the individual)

Direct experiences with elements of an ecological system enhance children’s learning skills including exploration, autonomy, curiosity and sense of responsibility (e.g. Ferreira, Cruz, & Pitarma, 2016), and simultaneously develop their competence for environmental learning.

Figure 3: Flow Chart Diagram
## 17. Research Schedule

<table>
<thead>
<tr>
<th>Stage of Study</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
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<td>Data Collection &amp; Site Survey</td>
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18. References:


Maitland, C., Stratton, G., Foster, S., Braham, R., & Rosenberg, M. (2014). The


