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VOCABULARY KNOWLEDGE IN SCIENCE LEARNING ON CHILDREN'S DEVELOPMENT THROUGH FARMING ACTIVITIES IN THE RURAL AREA

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ABSTRACT

Outdoor activities can harness children's personal and social abilities differently than could indoor activities. Children experience a variety of words associated with science learning through smelling, feeling, and tasting. The direct contact with nature and vegetation is the point where children's communication ability is harnessed as they begin to use proper vocabulary. Yet, they are less educated on the importance of appropriate vocabulary learning, particularly using scientific vocabulary when confronted with the outdoor environment. Therefore, this study aims to identify children's vocabulary knowledge on science learning towards supporting their personality development through hands-on engagement with farming activities. Ten children of aged 6-12 years old were recruited for a programme in a rural area at Laman Tamara, Kg. Sikai, Negeri Sembilan, Malaysia. They were observed for changes in their vocabulary using hands-on techniques. Data on their hands-on approaches and perceptions w ere elicited from a participatory behavioural approach, photo-taking, and interviews. Content analysis of the data was performed using Nvivo 12 Plus. The results indicated that the children developed a greater emotional affinity from the various hands-on approaches through specific vocabulary such as *feel, activities, soil, vegetables* and *farming* when dealing with life experiences. They were observed to possess good vocabulary following the high correlation between listening, reading, speaking, and writing. Their perceptions of their knowledge and vocabulary strategies were congruent with their content achievements. These findings align with early childhood education development and growth, such as teachers, playmakers, and parents. Such could expand the quality of science learning on the correct path to be skilled lifelong learners.

Keywords: outdoor learning, farming, vocabulary, middle childhood, imagery, hands-on

INTRODUCTION

From a child's perspective, the outdoor environment is a wonderful place to play with many opportunities. The setting creates a vibrant and challenging environment that entices their needs and desires. The presence of greenery increases their creativity (Chawla, 2015) and enables them to create play episodes based on their past experiences, curiosity, creativity, and sharing of new ideas. The outdoor environment is fundamental to childhood; it supports outdoor learning that connects them to the natural world. Thus, allowing children to play in a natural outdoor setting has been a key component of early childhood education. Children use

the outdoor environment intensely for unstructured play (Mustapa et al., 2015). They seem to be curious when exploring and experiencing nature by using their fifth senses to be informed about their surroundings (See Figure 1). Some children perform rigorous actions when they engage in spontaneous, ludic, and imaginary activities through solitary and social interaction with new objects and friends.

Children express their emotions through verbal language skills, which comprise speaking when they are together with their peers (Vygotsky, 1986). Using their language is the fundamental vocabulary that directs their experience when they are given full access to the nature. Engaging and giving children access to the outdoor spaces provide them an opportunity to get familiar with the outdoor environment. It offers children experiences with curiosity and fascination for each area that they explored. Hence, the learning process involves multiple processes and interactions to a meaningful vocabulary in outdoor learning. According to Chatterjee (2005), children develop affective interactions in various contexts, for example, to provide cognitive and social affordances that satisfy children's sense of place development. Such could imply that children potentially express and communicate their ideas, understanding, imagining observations, and feelings and therefore how their minds are engaged in various ways to be a part of their receptive and expressive vocabulary. Vocabulary knowledge is a salient factor influencing the cognitive process; children develop an understanding based on new and prior knowledge, personal and social experiences, and learning material (Vygotsky, 1986; Snow et al., 2005; Anis et al., 2020). As noted by Bruner (1990), constructing vocabulary knowledge provides learners with new ideas based on their existing knowledge. In this study, the children involved were asked to elaborate on their perceptions of the words employed by a vocabulary that reflects their thinking knowledge in content areas, such as science. The children's words are presented to represent their experiences. Taking part in the activities demonstrated flexibility in their play cum learning experiences.

A growing body of research claims the importance of engaging with the outdoor environment as part of children's overall well-being (Shim et al., 2012; Nedovic & Morrissey, 2013; Adams & Savahl, 2017; Kuo et al., 2019). Also noted is the importance that collaboration with the learning process in an outdoor environment is to be understood as social interaction among peers and viewed as constructed collaborative (Melissa et al., 2017). Such connection will encourage children to learn and use expressive and receptive vocabulary skills, which they could later practice while engaging in outdoor scientific investigations.

Figure 1. An Example of Child-Initiated Play in a Garden Setting

Interacting with children in an outdoor activity could develop mutual exchanges, besides promoting knowledge expansion. According to Said (2003), an outdoor space is a platform for children to apply five playing and learning styles: deductive, inductive, visual and auditory, impulsive, and reflective. When children access a garden, they can understand environmental tendencies by using sticks, branches, or logs. As they run and kick or twirl and swirl, their imaginations engage them mentally, physically, and emotionally (See Figure 2). Studies by Miranda et al. (2016) found that allowing children to construct concepts, make observations, and ask questions would enrich their repertoire and promote the construction of knowledge through real-life experiences. This situation commonly results in the feeling of satisfaction when the children desire to play freely without adults' supervision. Every process is a learning stage that allows children to use materials for interactions within the play settings through direct experience with nature.

Figure 2. Various Affordances Offered at the Garden for the Children to Play

In Malaysia, outdoor STEM (the disciplines of science, technology, engineering, and mathematics) activities allow children to achieve direct experiences when they are outside with nature. Children are willing to learn the biology and ecology of flora and fauna, geography, and geology. Thus, they would enjoy more inquiry-based learning through a hands-on approach in practical sessions, leading to the wondrous of being with nature. Such indicates that the major component of literacy vocabulary in science learning is important for children, as they are confronted with new terms and concepts taught by the school. According to Voeten and Oud (2001), vocabulary refers to rhetorical words with images and meanings. For children, language development is engaged in several ways of interaction, whether on their own or in groups, based on their capacity and curiosity. Consequent to that definition, Stahl (1990) added that children could pick up the meaning of vocabulary through incidental exposure to new words. Thus, the growth and strengthening of a child's vocabulary is an important step for them to get familiar with the vocabulary and structures of their own languages (Sandai & Mahmud, 2014).

The children in this study connected the vocabulary word based on what they experienced and learned during hands-on farming activities. The focus on vocabulary helped the children understand and communicate using appropriate terminology, and the incorporation of imagery made their learning fun. Without a clear understanding of science learning terms, children will experience difficulties, such as a lack of interest in the subject.

They could describe nature materials in many ways as they can present through various practices, such as inquiry and exploration, which foster the vocabulary knowledge in content areas such as science. In addition, children developed high socio emotional as they cope with different situations that develop their communication with others (Zakaria et al., 2020).

METHODOLOGY

This study drew on a qualitative approach that involved children's participation, which concerned the subjective assessments of opinions, attitudes, and behaviour (Kothari, 2004). The study relied on children's relationships in project-oriented hands-on activities on farming and constructing vocabulary knowledge in science learning. Through exploration, the children involved could learn more about the environment and equip their main skills and abilities through participating, exploring, discovering, failing, and succeeding (Holloway & Wilson, 2014). The hands-on gardening experience provided a collaborative connection between food sources, living processes, and the plant growth cycle. Subsequently, the children were able to go through the process of enhancing their vocabulary much deeper and more meaningfully. Their participation resonated an interactive process whereby they became fast learners at different skill levels and learning preferences.

Data Collection

This study was conducted at Kg. Sikai, Seri Menanti Negeri Sembilan, which lies on the western coast of Peninsular Malaysia. The unit of analysis for this study was elicited among ten children aged between 6 and 12 years from a preschool and a primary school in Kuala Lumpur, Malaysia. The children were selected for their involvement in an annual outdoor school programme, which increased their interest in co-curricular activities in an outdoor environment. They were able to explore and were quickly attracted to whatever inspired them and gave them plenty of opportunities to develop their learning skills. As such, new vocabulary offered them a meaning to organise their thoughts as they confronted their lived experiences. The site was chosen for its location on the outskirts of town. The rural village has large green areas, orchards, forests, and rivers, where the children could have a sense of wonder. The reason is that the environment itself would encourage children to create their affordance (Kyttä, 2002). Therefore, the site conditions were thought to spark the children's sensory actions because the settings comprise abundant natural elements sources. The children could notice the intricate colours and patterns of flowers and the smell of the fragrance of a flower or differentiate between rough and smooth by touching the tree bark.

The rural area was chosen as the outdoor learning setting because it offers an abundance of natural elements, such as greenery and living organisms (See Figure 3). The setting was thought to encourage children to take the lead in their learning during the gardening activities. They were informed clearly of the rules and location boundaries to ensure safety during the exercises. A few studies addressed how experience in nature led to future interest in gardening. The children's activities, which took place in the rural setting, encouraged them to participate in hands-on planting activities such as seedling planting, watering, and identifying soil samples. The experience with natural sources promoted independence and self-understanding. Their engagement became more fun, playful, and experiential, thus increasing their interest in the knowledge of nature (Fjortoft, 2001). During

the exercise, the children produced vocabulary linked to their experience to work in groups with their peers with various sensory experiences.

Figure 3. Scenes of a Typical Environment of the Malay Village at Laman Tamara

Procedure

Two methods were employed to gather the children's behavioural and perceptual data by focusing on the vocabulary knowledge they developed during the farming activities. Data were derived from interviews with ten children. Participatory research with children's concerns involving children actively in a project (Hart, 1979; Thomas, 2007). The first method was derived from semi-structured interviews to elicit information and opinions on science vocabulary that could facilitate the children's acquisition of new knowledge, skills, and emotional affinity. This method was ideal because the flexibility of the questions allowed the interviewee to probe into the participants' responses (Yahya, 2014). The children were grouped into two (mixed aged) with the assistance of the research assistants. The children enjoyed the hands-on experience and engaged with the discussions during the activities, which helped them to explore new vocabulary. The activity was conducted to view the children's preference for their knowledge of learning science. Their words were recorded using a voice recorder. Listening was effective in their vocabulary as it could increase their learning process, hence mastery of their content area (Young, 2016). The interviews took 10 to 15 minutes after the hands-on session, which was informal and unstructured (Zamani, 2016; Hammarsten et al., 2018). The second method was derived from direct observation to record their spontaneous actions and behaviours during the experiments. The children were allowed to play with the soil, get dirty, create things, and watch plants grow, which made the outdoor space a place for socialising (See Figure 4). Such allowed the children to raise flexible questions that reflected their knowledge and let the researcher rephrase and clarify their question in that particular time to know what the children understood about the farming programmes. The children were involved in the basic planting, including the plant life cycle, such as how plants grow, what the plants are, what plants need and are they important, and how to do plant maintenance. During the activities, the children were to engage a few critical thinking processes, in which they were asked a few questions throughout the session, such as *"What did you observe here? What did you sense about the soil texture? What will you like to try next? Can we find out if the seed has germinated?"* These conversations took place during the hands-on session, allowing the children to explore at their own pace and engage in the experiential learning. The researcher was also involved participants' direct observation by

recounting their personal experiences, which address factual information on learning preferences.

Figure 4. Hands-on Children's Activities Prepared by the Research Team

DATA ANALYSIS

Content Analysis

The data sets were analysed using content analysis and triangulated with words or phrases from the children by using NVivo12 Plus. According to Miles et al. (2014), the terms were a source of well-grounded and rich descriptions and explanations of the processes in farming as outdoor learning. Data were collected in the form of audio, video recording, and children's behaviour through observations. To gain deeper insight into the children's participation in farming, the researcher discussed her previous gardening experiences with them. When the children were allowed to express in their own words, they were more likely to feel ownership of what they had experienced. When it comes to planting, children of all ages love to experiment by tending the plants, discussing among their peers what will happen, and watching the plant grow. Such activities would give them the opportunities to develop outdoor physical competencies and preferences (Gordon & Browne, 2015).

RESULTS

This section discusses the findings from the interviews and the direct observation of the children's vocabulary knowledge in science learning from the hands-on activities. The researcher anticipated a range of themes of the vocabulary knowledge of farming from the children as the participants of the hands-on activities. The findings indicate that the children could identify the meaning of the vocabulary through incidental exposure by hearing words used in the environment. The size of the word was directly correlated with its usage

frequency (See Figure 5), which efficiently enriched the visualisation by illustrating major descriptive words related to children's vocabulary conversations (See Table 1).

Figure 5. Word Cloud on Children's Vocabulary Words In Farming.

The frequency data identified in the Word Cloud indicate the connections across specific vocabulary that the children had spelt out during the interviews. The researcher noticed a closed convergent on the definition of *feel, activities, soil, vegetables, and farming*. The researcher found that grouping the terms resulted in fewer duplicate resources. To relate the content area with the frequently occurring words, the children were asked about the outcome of their willingness to memorise the growth process. The hands-on activities were considered breakthrough learners for the urban children as they had interconnection throughout the process. The interaction afforded exploration and discovery, which led to experiential learning. The children were able to engage with a different actions when they interacted spontaneously with the surrounding.

The findings illustrate the codes based on the frequency of words iterated by the children that have semantic relationships, which indicate that the words are related to each other. The children made meaning and expressed ideas through interactions, conversations, and social skills throughout the farming process. Table 1 shows a schematic list of five significant descriptive words for each word length and how many times they appeared during the interviews and conversations. Therefore, the results showed that the word most commonly used by the children in the focus group interviews were *feel* (62 counts with 2.52%), followed by *activities* (54 counts with 2.2%), *soil* (54 counts with 2.20%), *vegetables* (53 counts with 2.16%), and *farming* (49 counts with 1.99%).

Table 1
Percentages Values of Children Descriptive Words Based on the Range of Children Experiences in Farming

Word	Length	Count	Weighted Percentage (%)
Feel	4	62	2.52
Activities	10	54	2.20
Soil	4	54	2.20
Vegetables	10	53	2.16
Farming	7	49	1.99

Feel

When the children described how they *feel* when they got their hands dirty during the exercise, they built a sense of curiosity through exploration and played simultaneously. From there, the children quickly got along with the new environment and wanted to share their excitement with their friends. Their sensory experiences appeared to be impacted to create their own learning experiences from manipulation and the feeling of objects to symbolic gesturing, which later emerged as descriptive words.

A girl aged 7 said:

"I like to plant a few seeds in each tray in case one or two don't make it. I place the seeds in my palm, and I share them with my friends too. Both of us use the fingers from the other hand to pinch the seeds and placed them in the soil, and I feel it so soft and slimy."

In another scenario, a boy aged 9 described:

"*I feel happy to watch the seeds grow, these seeds are alive! Inside of each seed there is an embryo. It is a kind of like baby chick consumes the contents of the egg*".

The scenario above represents some examples of the essential functions of having a direct experience, which stimulated the children's feelings. They learned new vocabulary terms such as slimy, embryo, germinate etc. Such indicates that letting children mess around in the dirt can be a great way for them to create their own learning experiences and describe words according to texture, size, pattern, and hardness.

Activities

The activities in this study took place in the garden, where there was no limit to what the children could learn and practice at their own pace. They knew even the part of a planting process, such as transplanting the seed to the planter bed. The children could enjoy measuring the different heights of the plants. They worked in a group and measured the tallest plant and predict with their peers how tall the plant will be the next time they measure it.

A girl aged 12 said:

> *"Look, the plants are growing! Look at the stems, the roots, the leaves!* And another girl, aged 9, said, *"I want this plant to grow healthy and bare fruits for me later, and can we make it grow faster?"*

The scientific vocabulary such as *stems*, *roots*, and *leaves* that were linked to the children's reflections on their planting was all about plants sizes.

Soil

In the beginning, before the children got an insight into soil knowledge, the researcher held them in a group with the research assistants. After the experiment, the researcher asked the children to describe their personal experiences about the process with a range of open questions to encourage them to elaborate their answers. One of the children commented on her experience moistening the soil lightly and preparing several similarly sized soil clods with her hands.

A girl aged 7 described:

> *"The soil is a field where I can plant plants, flowers and vegetable and I also been told that the soil is a place to find worms when the temperature cold."*

Based on her knowledge of soil, she described that without soil, she would not be able to grow plants, including vegetables. This shows that a child learns faster when he/she has an opportunity to experiment, particularly with natural materials, such as soil. Somehow, the way children showed their interests toward the raw materials displayed a high level of inclusiveness in their actions and vocabulary; for example, they related soil to terrain, ground, and land.

Vegetables

Children's perception of consuming healthy food is referred to as fruits and vegetables. Some children can be food neophobia; they dislike consuming vegetables. Some others like eating vegetables as they grew up and are taught by their parents. In this study, the children initially indicated vegetables as fruits, edible foods, crops, and kitchen gardens that taste either sweet or bitter.

A boy aged 9 explained:

> *"My mother always encouraged me to eat vegetables during mealtimes, and therefore I asked her the name of the vegetables."*

Another example was from a girl aged 7 who described:

> *"I don't like to eat vegetables because it tasteless and bitter, but my mom keeps offering the vegetable at different meals in different ways."*

Farming

The children were seen to be naturally curious and keen to discover things for themselves. They experimented what they already knew and applied the researcher's instructions. They were allowed to experience planting seeds, caring for plants, and harvesting. Such illustrates how adults can provide opportunities for children to acquire knowledge, skills, and dispositions of experiential learning.

One of the girls, aged 6, narrated:

"My garden has various types of vegetables that were growing in a pot. According to my mother, this is our mini kitchen garden which is located next to the window. Sometimes my mother will talk about cooking these vegetables; even she said some veggies could eat raw. For example, they are salad, cauliflower, and cucumber. And these vegetables are the easiest to grow. Therefore, my mother kitchen garden is now full of leafy plants and at any time ready to pluck.

Another boy, aged 10, mentioned:

"The most interesting part in farming is when it comes to harvesting because I can help my mother take her self-grown vegetables and cook them. Now it makes me understand where food comes from".

The results demonstrated how the children began structuring their vocabulary skills by recounting their personal experiences and develop narrative skills, which expanded into communication, literacy, and cognition during interactions with their parents. They expressed their emotions through active interaction with various people and situations, such as parents or teachers.

DISCUSSION AND IMPLICATIONS

The children in this study were found to be better equipped to understand the language of their science subjects from their direct engagement in the farming activities. They were able to understand novel words such as *feel, activities, soil, vegetables,* and *farming* when they were exposed to open-ended natural materials while doing hands-on activities that fostered imagination, creativity, and symbolic thinking. The use of imagery is a way to facilitate vocabulary learning (Cohen, 2012) as it integrates literacy and science instruction, which will be beneficial to children's experiential learning. Children started with basic concepts, whereby the science vocabulary had been taught effectively during their early education. As noted by Rupley and Slough (2010), the development of vocabulary begins with observing, identifying, and analysing, and eventually the conceptualisation of the vocabulary. As for the children in this study, experiential and conceptual learning were important in their vocabulary development as they were allowed to represent something in their minds. Such understanding indicates that the children began to construct a meaningful vocabulary when they encountered multiple exposures to the new words used across time. Most of the vocabulary captured were descriptive/keyword themes that express ideas constantly. The children learned to combine different scientific words through their behavioural actions during the planting session. For

example, transplanting seeds allowed them to observe the growth, touch the soil, smell the soil, and manipulate the natural elements with their hands.

The results also indicate the need for imagery intervention that focuses on connecting words to the meaning. The children showed interests and willingness to explore what they had discovered during the hands-on experiences with farming activities. They seemed to be more active in observing details, sorting, and classifying, i.e. recognising similarities and differences. The activities allowed them to share an appreciation for nature and the opportunities that nature provides for play, freedom, comfort, and solace (Chawla, 2002). Their systematic vocabulary developed through the play interaction as they used simple terms such as *feel, activities, soil, vegetables,* and *farming*. Such indicates that natural materials are effective in supporting children's schemata . In other words, children are actively engaged in making sense of their words, promoted more self-sufficient as independent learners (Bransford et al., 1999). Therefore, the findings suggest that when children understand the language of their science vocabulary, they are well-equipped in their science knowledge content. It would allow teachers to enhance their knowledge with intellectual connections, thus improving confidence for future communication in science learning.

CONCLUSION

The children in this study were found to generate spontaneous actions and behaviour from their direct experiences in outdoor activities through imagery. Enriching their experiences through hands-on approaches would propel them to enjoy learning through their spontaneous discovery as they could see objects in a practical and tangible form. Such indicates that observing children at play when they practise hands-on gardening instructional activities would give positive results in terms of the development of their vocabulary variations. The richness of the outdoor environment would allow children to get information and interact with natural materials that are intertwined with their play. Therefore, the images of the children's words can facilitate their acquiring new vocabulary which then becomes a part of their cognitive skills.

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