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Early exploration of Forest School framework for Malaysian Indigenous People: The Application of *Fuzzy Delphi* Technique

Ramlan Mustapha PhD*, Che Lah Che Mamat, Haizuan Yunus and Khairudin Said PhD.

Institute of Teacher Education, Malaysia

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Abstract

This study is aimed at obtaining expert consent and views on elements of the jungle model framework among Orang Asli school pupils. This study uses the Fuzzy Delphi method using Likert 7 scale to collect feedback from 10 experts in various fields of education at public universities in Malaysia. A total of 4 main elements and 13 sub items of the questionnaire were given to the experts for evaluation. The Fuzzy Delphi method has been used for data analysis. The data were analyzed using triangular fuzzy number and ranking with each model element determined using the 'defuzzication' process. The results of the analysis on consensus and expert consensus show that the value of the agreement is at a good level. This shows that elements of the jungle school framework have been well-received by experts. The elements agreed upon by the experts in consensus are arranged in order of priority namely motivation, creative thinking and critical thinking, familiarity and personal and social development.

Keywords: *Fuzzy Delphi, Expert Consensus, Forest School, Indigenous People, Fuzzy Scale*

Introduction

The Forest school has become an important phenomenon over the last few decades. The Forest School Model began to take place and became popular in Britain and some developing countries such as Brazil, Indonesia, the Caribbean Islands and Latin America (Blackwell & Nawaz, 2014). The model of the forest school model was first introduced by the Scandinavian archipelago and in the early 1950s and was pragmatically taken over by the British and modified by the British archipelago (Blackwell *et al*, 2014). In principle, jungle schools are intended to develop self-concept, self-esteem and various skills as well as to encourage children to respect and care for the environment (Maynard, 2007).

The concept of Forest school is centered on learning beyond the classroom context in cultivating learning interest amongst the rural community. This concept seeks to inculcate student's interest in learning by coordinating with the environment, out-of-the-classroom environment, collaboration and exploration of the environment in their neighborhoods (Savery *et al*, 2016). In addition, this approach is based on a more natural and practical out-of-classroom learning approach by using the forest and its resources as a location and learning materials (O'Brien, 2009; O'Brien & Murray, 2007). This approach is effective in shaping and opening learning space for children and young people to develop their own talents, self-esteem and achievement (Nur Bahiyah, Maryati, Azman, & Najib Haron, 2013; Borradaile, 2006; Kirkham, 2006).

Ministry of Education Malaysia with the 2011-2020 Interim Strategic Plan initiative mobilizes transformation in improving the competency of students and students by bringing the KSSR and KSSM curriculum as the main platform (Nur Bahiyah *et al*. 2013). However, the transformation should be within the overall framework involving all races without prejudice. The curriculum transformation aspirations should also look and take into account the involvement of minorities in Malaysia including the Orang Asli (indigenous people) who is left behind in education participation. The Role of the Ministry of Education (MOE) and the Orang Asli (indigenous people) Association of Education JAKOA is still inadequate in providing significant changes in the development and participation of indigenous peoples in Malaysian educations system (Nur Bahiyah *et al*.2013). Therefore, the appropriate method of education in approaching these minorities is that the Orang Asli students should be given due attention. Traditional approaches need to be changed to an Orang Asli friendly approach to increased interest in learning can be improved.

*Corresponding author's ORCID ID: 0000-0003-2740-2133
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Therefore, a comprehensive approach should be taken in addressing this problem. Accoding to Smith & Sobel (2010) more appropriate and constructive learning approaches such as classroom outreach in accordance with the particular life environment of a society is capable of building a good and dynamic learning and seeks to explore the ability and ability of the students. Therefore, the development of this model framework is seen to be significant in designing suitable learning and the ability to attract the Orang Asli community (indigenous people).

Research Problem

The target of becoming a developed nation by the year 2020 is getting closer, but indigenous students are still facing various problems affecting learning. Academic achievement of Orang Asli students in education is still too low compared to the achievement of other Malaysians (Toh Kit Siang *et al*., 2008).

According to Johdi (2009) Low academic achievement is caused by several factors such as the nature and personality of students, families, communities, geography and nutrition. In relation to the student's personality, he argues that among the traits of students who underestimate them in academia include having low self-concept (shy and easy sensitive), hyperactive and easily tired and fail to focus on the long period of learning.

Additionally, the problem of drop-outs humped Orang Asli (indigenous people) students (Nicholas, 2006; Hassan Mat Nor, 1997; Doris, 2012; Nor Fariha,Nurul Nadia &, Soffian, 2015). Various factors have been attributed to this drop-out factor. Among them are the failure of the Orang Asli to adapt to other races, the school curriculum taught not in accordance with the culture of the indigenous community, the stereotype of the Malays towards the Aborigines and parental attitudes (Juli Edo, 2006). From the geographical perspective, the location of Aboriginal settlements scattered and largely far inland makes their accessibility to education facilities relatively low Mazdi Marzuki, Jabil Mapjabil & Rosmiza Mohd Zainol, 2014).

The role played by KPM and JAKOA especially in developing indigenous education cannot be denied. MOE demonstrated a high commitment in providing education for all including Orang Asli students towards achieving the educational opportunities (Kamarulzaman Kamaruddin & Osman Jusoh, 2008). Efforts to include Orang Asli (indigenous people) puppets into the mainstream of education beginning in 1995 are as a starting point towards ensuring equality and better quality education are given to them. Since then, various programs have been set up to increase the participation of Orang Asli (indigenous people) students in mainstream education, reduce dropout rates, improve academic achievement and address literacy and numeracy problems (Hassan Mat Nor, 1998) . Ministry of Education has introduced the Early Reading and Writing Intervention Class (KIA2M) Programme, the Native Curriculum (KAP) Program and the comprehensive school model known as the K9 School which aims to reduce the rate of drop in Orang Asli (indegenous people) students to high school. It is expected to increase the participation of Orang Asli students (indigenous people) in the mainstream education.

Although many programs have been implemented but indigenous children are still less interested in learning activities (Nur Bahiyah *et al*, 2013). Education aspect is still viewed as easy and does not play a role in the formation of indigenous peoples (Ahmad & Mohd Jelas, 2009). According to them most parents of indigenous people do not care about the attendance of their children to school (Nur Bahiyah *et al*, 2013). They also view that if they do not have a high education they can still survive (Harun, 2003). Hassan, Saharudin & Aziz (2001) argue that indigenous children are less interested in going to school due to lack of understanding of lessons, lack of interest, and failure factors in subjects are the factors causing their difficulties to school. According to Ma'rof & Sarjit (2008) lack of interest, lack of learning culture, lack of motivation, and difficulty understanding the information they are bringing to them are less interested in learning and mastering the field of education. Their findings were confirmed by the Human Rights Commission of Malaysia Report (SUHAKAM) claiming that the mainstream education method that does not fit the level of understanding, the use of language and the culture of the Orang Asli (indigenous people). Boring teaching methods, inappropriate teaching materials, School Resource Centers (PSSs) lack books, underprivileged teachers teaching Orang Asli students and teaching teachers are too bound to syllabus and public examinations. Placement of professors and teachers who are less committed and motivated. There are too many new teachers who are inexperienced. This is why many students have not mastered 3M's skills (SUHAKAM, 2010). Hence, the construction of a special model should be done in promoting interest in indigenous peoples. Therefore, this study aims to draw up a framework of a school of jungle that can be adapted to the context of indigenous children in cultivating their interest in education.

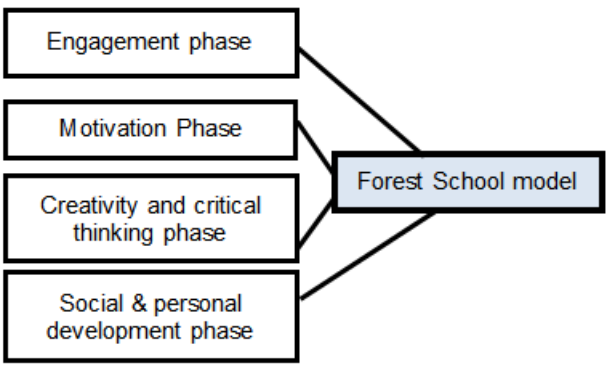

Figure 1: Research framework

Adapted from: (Early Education, 2012; Slade Lowery & Bland, 2013; O'Brian & Murray, 2006).

Research Objective

This study is aimed at confirming and obtaining a consensus on the elements of the Forest school model in the learning of indigenous people students. This confirmation is done by selected and analyzed experts using Fuzzy Delphi technique.

Research Methodology

This study used Fuzzy Delphi Method (FDM) in obtaining expert consensus on the elements of the jungle school model for native students. This study consisted of two phases, i.e., the first phase of the research was to analyze the literature in identifying the appropriate elements in the formulation of the study model. After all the factors were obtained, the researcher formed a 7-point expert questionnaire and then distributed to 10 experts with expertise -specific information. After all the factors were obtained, the researchers formed a 7-point expert questionnaire and then distributed to 10 experts with extensive expertise and experience with education among indigenous people students.

Respondent and Sampling Procedure

This study uses purposive sampling. This method is best suited as researcher wants to get expert opinion and consensus. According to Hasson, Keeney & Mc Kenna (2000) the most appropriate method in FDM is purposive sampling. Meanwhile, 12 experts were involved in this study. In this study the criteria for the selection of experts used by researchers based on Clayton (1997) recommendations which state if the involved expert is homogeneous then the required number of experts is 5-10. Meanwhile Adler dan Ziglio (1996) the number of suitable experts in the Delphi method is between 10 and 15 people if there is a homogeneous. According to Cavalli dan Ortolano (1984) states that the sample for FDM is between 8 and 12, if the sample is Homogeneous and is sufficient as well as with Philip's (2000) opinion specifying the expert sample between 7 and 12. Thus the researcher uses a total of 10 experts in this study for reasons and constraints in identifying experts.

Data Collections and Analysis

In Fuzzy Delphi Method (FDM) there are two terms that need to be understood namely Triangular Fuzzy Number and Defuzzification process. Triangular Fuzzy Number represents the values of m_1, m_2 and m_3 and they are written (m_1, m_2, m_3). The m_1 value represents the minimum value; the m_2 value represents a reasonable value while the m_3 value represents the maximum value. While Triangular Fuzzy Number is used to produce Fuzzy Scales for the purpose of translating linguistic variables into fuzzy numbers. The number of levels for Fuzzy scales is in odd numbers. The higher the Fuzzy scale, the better the data obtained. It can be explained in Figure 1.

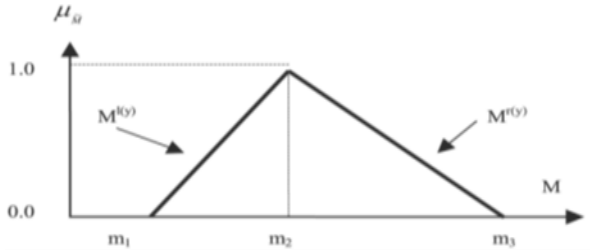

Figure 2 triangular fuzzy number (m_1 = minimum; m_2= reasonable; m_3= maximum.)

In this study, the data collection and analysis process using the Fuzzy Delphi technique was carried out after the expert was given a questionnaire and each instrument was represented by the Likert scale as well as space for the expert comments and suggestions. The obtained Likert scale data will be analyzed using the Microsoft Excel program. All data is converted into Triangular Fuzzy Number. The seven-point Fuzzy scale used in this study. Scale used as in the following table:

Table 2: Fuzzy Scale 7 points

Level of agreement	Fuzzy scale
Extremely disagree	(0.0. 0.0, 0.1)
Very disagree	(0.0, 0.1, 0.3)
Disagree	(0.0,0.3, 0.5)
Not sure	(0.3, 0.5, 0.7)
Agree	(0.5, 0.7, 0.9)
Very agree	(0.7, 0.9, 1.0)
Extremely agree	(0.9, 1.0, 1.0)

Source: (Chang, Hsu & Chang 2011)

The data obtained then analyzed to obtain Fuzzy value (n_1, n_2, n_3), average value of Fuzzy (m_1, m_2, m_3), get threshold value, percentage of expert consensus, defuzzication and ranking of item. For the purpose of obtaining an expert agreement for each item, the threshold value does not exceed 0.2. Percentage of experts' approval should exceed 75% while defuzzication value for each item should exceed a-cut = 0.5.

The threshold value is determined using the following formula:

$$d\left(\tilde{m},\tilde{n}\right)=\sqrt{\frac{1}{3}\left[(m_1-n_1)^2+(m_2-n_2)^2+(m_3-n_3)^2\right]}.$$

The next step is to identify the aggregate level of fuzzy assessment after the expert agreement is obtained by adding fuzzy numbers for each item (Ridhwan *et al*,

2013). The calculation and determination of fuzzy values is by using the formula: Amax = ¼ (m_1 +2m_2+ m3).

$$\tilde{A} = \begin{bmatrix} \tilde{A}_1 \\ \tilde{A}_2 \\ \vdots \\ \tilde{A}_m \end{bmatrix} \text{ where } \tilde{A}_i = \tilde{r}_{i1} \otimes \tilde{w}_1 \oplus \tilde{r}_{i2} \otimes \tilde{w}_2 \oplus \cdots \oplus \tilde{r}_{in} \otimes \tilde{w}_n,$$
$$i = 1, \cdots, m$$

The next step, is the defuzzication phase. It is the process of determining the position or priority of each item or to determine the position of each variable or sub-variables. In this process, there are three formulas namely:

i. A = 1/3 * (m_1 + m_2 + m_3) , or ;
ii. A = ¼ * (m_1 + 2m_2 + m_3) ,or ;
iii. A = 1/6 * (m_1 + 4m_2 + m_3).

Alpha-cut = median value for '0' and '1', where a-cut = (0 +1) / 2 = 0.5. If the value of A is less than the value of alpha-cut = 0.5, the item will be rejected as it does not show an expert agreement. According to Bojdanova (2006) the alpha cut value should exceed 0.5. It is supported by Tang & Wu (2010) which states a-cut value should exceed 0.5. The last step is ranking. The positioning process is by selecting the defuzzication value based on expert agreement where the highest value element is determined by the most important position (Fortemps and Roubens, 1996).

Finding

Based on literature analysis (see fig. 1) are listed elements of the model that underlie the forest school model that can be adapted to the natives in Malaysia

Table 3: Forest school elements

Element of the model	Sub elements
Engagement phase	• Knowing and exploring the environment
	• Play with what they know
	• Be prepared to do it themself and have self-esteem
Motivation phase	• Focus on and engage in activities
	• Be sensitive and always trying to do
	• Enjoy what they want to do
Creativity and critical thinking phase	• Introducing an idea of its own
	• Create relevance with experience, ideas and feelings
	• Make a selection of new ways and methods to do something
Social and personal development phase	• Establish relationships with friends and the environment
	• Form self-confidence and self-awareness
	• Manage feelings and behavior

Experts Consensus

Table 4: The threshold of (d) value, expert consensus percantege, defuzzication and ranking

Experts	Model elements			
	1	2	3	4
1	0.0153	0.000	0.000	0.015
2	0.0153	0.000	0.000	0.015
3	0.0153	0.000	0.000	0.015
4	0.0153	0.000	0.000	0.015
5	0.0153	0.000	0.000	0.015
6	0.0153	0.000	0.000	0.015
7	0.1375	0.000	0.000	0.015
8	0.0153	0.000	0.000	0.015
9	0.0153	0.000	0.000	0.137
10	0.0153	0.000	0.000	0.015
d value	**0.275**	**0.000**	**0.000**	**0.275**
Total of d value items		**0.027**		
Value of d Construct		**0.137**		

Table 5: Expert consensus percentage

	1	2	3	4
Numbers of = d ≤0.2	10	10	10	10
Items percentage d ≤ 0. 2	100%	100%	100%	100%
Average percentages of d ≤ 0.2		100%		

Table 7: Defuzzication process and ranking

Item	Score value		Ranking
	Fuzzy Evaluation	*Average of Fuzzy Number*	
1	6.400	0.640	**3**
2	7.000	0.700	**1**
3	6.800	0.680	**2**
4	4.600	0.560	**4**

1) *Threshold* value (d) ≤ 0.2
2) Percentage of expert's consensus ≥ 75%
3) *Alpha –Cut* value of each items = ≥ α = 0.5

The results of the analysis on consensus and expert consensus show that the value of the agreement is at a good level. Based on table 5, no threshold values are blackened beyond the threshold value of 0.2 (> 0.2). This means that no expert opinion is uncoupled or uneven and does not reach consensus on certain elements. However, the average value of all elements of the jungle school shows the threshold value (d) <0.2 which is 0.137. If the average value of threshold (d) is less than 0.2, the item has reached a good expert agreement (Cheng dan Lin, 2002; Chang, Hsu dan Chang, 2011). Whilst this percentage of the overall agreement is 100% of the agreement that is above (> 75%) means meeting the terms of the expert agreement on this item. In addition, all Alpha-Cut defuzzication values (average of fuzzy response) exceed a-cut => 0.5. According to Tang and Wu,

(2010) alpha cut values should be greater than 0.5 and if less than 0.5, then they should be dropped. The findings of this analysis show elements of the forest school framework have been well received by experts. The experts agreed consensus elements are sorted according to the ranking as shown in the following figure 1:

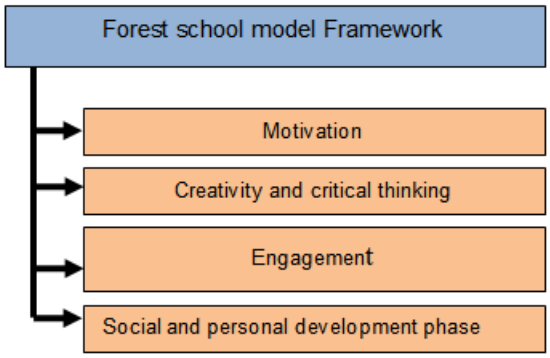

Figure 3: Forest School Framework for Malaysia Indigenous People

Conclusion

Now, there is a need to build a special model of jungle school in Malaysia, especially among Orang Asli communities. This model is important in designing and giving a special picture in the implementation of teaching and learning of Orang Asli students. The concept of the jungle school is seen to be important in developing capabilities, and opening up space and opening up opportunities for individuals involved to be more creative, conventional, socializing and improving inquiry (Parsons, 2011). In fact, Jungle School is a form of classroom outreach (PLBD) that develops achievement, confidence and self through learning process that uses the forest and its resources as a location and learning materials (O'Brien, 2009). The problems faced by these Orang Asli pupils such as those who are not interested in school, are easy to despair, lack of learning skills, easy tired, sensitive and shy are some of the factors that cause them to lag behind in mainstream education in this country. Therefore, efforts and initiatives to attract these indigenous people to equally support the aspirations of national education should not be taken lightly and should be given special attention. Approaching these groups using an educational approach that is appealing and in line with their needs is necessary. Thus, the construction of the jungle model can be a bit as a guide and reference of the relevant parties in formulating teaching and learning sessions in accordance with the theme and needs of students the indigenous people themselves.

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