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The Compatibility of Intelligence and Learning Styles: A Case Study among Malaysian Preschoolers

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ABSTRACT

Since year 2010, the Ministry of Education (MOE) Malaysia has implemented thematic learning in preschool classrooms. However, most preschools in Malaysia apply passive learning in classroom teaching which neglect the holistic development of preschoolers. Therefore, the objective of this study is to investigate the compatibility of intelligence and learning styles among preschoolers to improve motivation in learning. This study focused on multiple intelligences theory, pioneered by Howard Gardner and visual, auditory and kinesthetic learning styles. Three six-year-old preschoolers with outstanding academic achievement were interviewed and were observed. Collected interview data were analyzed using performance based assessment. Six interdisciplinary activities were designed based on animals theme to observe the learning styles of these three preschoolers in different areas of intelligence. The findings show that preschoolers tend to use learning styles that are similar to their intelligence for learning.

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INTRODUCTION

Gardner's multiple intelligences theory was pioneered by Howard Gardner in year 1983. Gardner explained that human beings have eight intelligences; which are linguistic, musical, visual-spatial, bodily kinaesthetic, logical mathematic, intrapersonal, interpersonal and naturalists (Ormrod, 2008). Each intelligence is unique and is not interrelated with one other. People may be more intelligent in some area than in others. Nevertheless, some people may develop two or more different intelligences (Ormrod, 2008).

Gardner determined eight criteria to support the existence of each intelligence in multiple intelligences:

I. Studies of brain injury

When the brain is damaged, only specific intelligence will be lost, another intelligences would still remain if part of the brain that determines other intelligences are not affected.

II. Extraordinary individual

Each individual will have high intelligence in one or more of the fields of intelligences.

III. Core set of operations

Each intelligence has a set of operation to evaluate the intelligence.

IV. Historical development

Intelligence of each individual has different development periods; intelligence may grow or decline when one's age increases.

V. The history of evolution

Each intelligence has its origins or history.

VI. Evidence from the psychological studies

Psychological studies have tested or measured each intelligence with various tests and indicated that intelligence functions separately.

VII. Psychometric study

Equivalent test helps determine the strength or intelligence of each individual more accurately.

VIII. Symbol systems

Each intelligence can be symbolized or shown in its own unique symbol and is concrete; which can be observed.

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(Verenikina *et al*., 2005)

There are eight types of intelligences in Gardner's theory of multiple intelligences:

I. Logical-mathematical intelligence

The ability to reason, computate, and solve problems.

II. Linguistic intelligence

Individuals who are proficient in reading, writing and speaking and learning a foreign language.

III. Musical intelligence

Individuals who are sensitive to tone, rhythm and sound. They appreciate the rhythm and compose the song.

IV. Visual-spatial intelligence

The ability to form three-dimensional drawing and illustration. In addition, they love to travel to seas, sky and mountains.

V. Kinaesthetic intelligence

Individuals tend to use body in solving problems, creating and presenting ideas.

VI. Interpersonal intelligence

Strong leadership, can communicate and understand others.

VII. Intrapersonal intelligence

Individuals who understand themselves and are always motivated.

VIII. Naturalist intelligence

Those who enjoy nature.

(Santrock, 2008)

Each individual has certain intelligence and would probably have to adapt and change over time (Rahil Mahyuddin & Habibah Elias, 2008). The theory of multiple intelligences is fair to everyone. When evaluating an individual, cultural background of individuals is taken into account (Metha, 2002).

According to cognitive researchers, 99% of people learn through their senses which are seeing, hearing, smelling, tasting and touching (Suppiah Nachiappan *et al*., 2009). Jensen (1997) identified three types of learning styles, namely visual learning, auditory learning and kinaesthetic learning (Suppiah Nachiappan *et al*., 2009). Visual learners tend to learn using pictures, charts and writing. They tend to read and are able to clearly understand concepts through writing. Auditory learners are people who learn through listening and oral communication. They are more likely to understand something through hearing. They like to listen to music and verbally communicate with others. Kinaesthetic learners tend to learn through bodily movement and experiential learning. They need hands-on activity to understand something. If students can learn using learning styles which are compatible with their needs and interests, they will be more effective and efficient in learning. Thus, a student's academic achievement will improve and become more productive (Suppiah Nachiappan *et al*., 2009).

Pre-schoolers are children aged three to six years (Rachel, Maria Chong & Habibah, 2005). In Malaysia, children at this age level will enter kindergarten and begin to receive formal education. In Malaysia, the Ministry of Education (MOE) Malaysia has implemented thematic learning in preschool classrooms. Thematic learning is a common teaching approach in preschool classrooms (Kementerian Pendidikan Malaysia, 2010). Educators will create or design learning activities based on a theme and the learning activity will cover several areas of the curriculum (Morrison, 2008). Thus, children can learn through various activities and preferable learning style. Besides, they are provided the opportunity to demonstrate their intelligence in different areas.

There are three objectives in this study, which are:

I. To identify types of intelligence of each child.

II. To identify the learning style of each child.

III. To identify compatibility of intelligence and learning styles among pre-schoolers.

MATERIALS AND METHODS

Performance based assessment is assessing children through their performance in the learning activity or task (Wortham, 2008). Three pre-school children aged 6, two boys and a girl were selected as samples in this case study. The three children's academic achievement and ability are similar, they have studied at the same kindergarten for more than one year.

The three children are Alex, Jenny and Kelvin.

Alex is a six year old boy. Alex is happy to go to school. According to Alex, his father is a mechanic and his mother is a housewife. Alex's sister is eight years old. Alex said he likes to dance and sing. At home, he watches video recordings of his during a dance performance during the kindergarten annual concert. He loves the morning assembly (circle time) in kindergarten because he can sing and dance. The teachers said that Alex is an active boy. He likes to help his teachers and friends in school. He often helps teachers to collect books and takes care his friends. Alex has outstanding academic achievements, he is quick to understand and master

something. He often acts quickly in tasks given but can be very careless and often makes mistakes in mathematic. Alex is talented in dancing, he helps his teachers to develop dance steps and dances well in the kindergarten annual concert. However, he cries easily when teased by his friends. Alex lacks of patience in doing work given. He does not like to sit quietly when doing something.

Jenny is a six year old girl. Jenny said she likes to go to school because she can play with her friends. Jenny's father is a businessman and her mother is a manager in a company. Jenny lives with grandparents, parents and a brother. Jenny's brother is eight years old. At home, Jenny loves to read story books and play dolls. Teachers feel that Jenny is a girl who is well-mannered and has good behaviour. Jenny loves to talk to her teachers and friends. She likes to share her experiences at home and while traveling. Jenny is very independent, she can manage herself at school such as bathing, washing dishes, folding blanket and others. Jenny's academic achievement is outstanding. Jenny has good performance in language subjects. She loves to read and will read in the morning (free play time). Jenny likes to express her opinion and speak in class. Jenny is quite spoilt, especially by her father. She will cry if her father doesn't send her to school on any particular day. Jenny likes to talk to her friends in class when the teacher is teaching.

Kelvin is a six year old boy. Kelvin's father is a businessman and his mother is a clerk in a company. Kelvin is the only child at home. Kelvin says he likes going to school because he can play with his friends but he does not like sitting in class. Kelvin likes to play at the playground in the morning the most (free play time). The teachers said that Kelvin is an active boy. He likes to try everything without fear. When the nurse came to explain about dental care, the nurse needed a child to be model for the demonstration. He was the first to raise his hand and stepped up as compared to a lot of children who did not dare to even try when encouraged. Kelvin is a friendly boy, he is not afraid of strangers and can chat with them. He likes to answer teachers' questions in class. His academic achievement is good and Kelvin remembers things fast. Kelvin dislikes sitting still, especially for activities that he is not interested in. Kelvin cannot engage in group activities. He prefers individual work.

The study is a case study. This study identifies the compatibility between Gardner's theory of multiple intelligences and learning style. Data were collected through interviews, observations and children's work. The purpose of interviewing the children and teachers is to be more holistic in determining a child's intelligence. The researcher will focus on the child's performance and work during the learning activities.

The researcher created six learning activities based on the thematic approach. The theme was animals. The researcher created six learning activities based on the multiple intelligences theory. The researcher analysed data for children's intelligence based on conversations with them and the teachers' interviews and observations when the children engaged in the learning activities. The researcher identified intelligence based on Gardner's theory of multiple intelligences and divided the eight intelligences based on the characteristics and behaviour displayed by the children. Learning style was identified through reaction, performance and results of the six children's activity.

Researcher conducted interviews individually with each child and teacher. The researcher then recorded the conversation with a pencil and paper. Three children were fully involved in the six activities. The six activities planned were:

1. Language activity - reading a story book

The researcher read a story book "Go to the Farm" to the children. The researcher asked the children to read the sentences in the story books together. The researcher then explained and discussed the pictures in the story with the children. The children were encouraged to express their opinions in the discussion. After reading the story, writing exercise was given. The content of the writing exercise was related to the story. The purpose of this activity was to observe how children learn language by reading, speaking and writing. The story will stimulate children's interest in participating in the language activity.

2. Bodily-kinaesthetic activity - dancing

The researcher used the song "Go to the Zoo". The children had to respond or act using actions which are associated to the animals mentioned in the song. The song did not show any movement or hint to the children. Therefore, the children would need to think and show actions associated to the animals indicated. The researcher provided guidance at the beginning so that the children understand the lyrics of the song and stimulated them to dance. The purpose of this activity was to observe the children's ability to move creatively. Children were not shown any movements so as to encourage them to think creatively.

3. Musical activity - singing

The researcher used the song B.I.N.G.O. This song requires reconstruction applause at the word BINGO and the word will be repeated 6 times. For the first time, the song will be sung without any applause. For the second time, the first letter, which is 'B' will disappear and they cannot sing 'B' but to replace it with an applause. Then for the second time, the song will continue with the 'B' and 'I' disappears and is replaced by an applause, in which they need to clap twice. This activity was to test the children on singing and the ability to capture "beat" in music. Children should applaud according to the rhyme.

4. Visual-spatial activity - play clay

In this activity, the researcher played clay with the children. The researcher required the children to produce an animal with clay. The children are free to use clay to produce any animals. The purpose of the activity was to investigate spatial ability of the children, in which they can form and change something in their imagination into something concrete.

5. Intrapersonal and interpersonal activity - play puzzles

In this activity, the researcher provided puzzle activities. It is a group activity. Children were divided into two groups. Researcher showed a complete picture of the animal to the children before starting the activity and asked the children to observe the pictures carefully. After that, the researcher cut the picture into small pieces with scissors. Children were asked to refigure the picture. This activity was to observe intrapersonal and interpersonal aspects as demonstrated by them, such as how they play a role in the group, communicate with their members and the style they used to complete the picture.

6. Logical-mathematic activity - math exercises

The researcher provided mathematical questions related to logical thinking and matching. Researcher only showed how to answer the questions on the whiteboard. The purpose was to observe how the children learn mathematics and think logically. The researcher deliberately did not give verbal commands in order to observe how they work without verbal instructions.

Results:

In this study, the researcher has determined the children's intelligence by interviewing and observing the children, and discussing with the teachers.

Alex:

Alex has bodily-kinaesthetic intelligence, logical-mathematic intelligence, interpersonal intelligence and musical intelligence. Alex loves to dance and he is able to help teachers create dance movement. He is also able to produce creative and wonderful movements. Besides, he can memorize all dance movement. Alex has never attended any dancing class or course. All dance movements originate from his thought and imagination. Alex was very happy and enjoyed dancing and kept smiling when dancing.

Alex shows talent in mathematics too. According to his teacher, Alex is quick to understand all the topics, he can think logically. For example, for the BINGO game, it is similar to chess and it requires logical thinking and prediction. Alex always wins in this game. However, Alex often makes minor errors in mathematics exercise due to carelessness and less patience.

Alex has interpersonal intelligence, he is gregarious and friendly with his teachers and friends. He likes to help people. He helps teachers without any prompts. He also likes to help his friends, especially friends who are younger than him. He would feed them, help them wear shoes and hold their hands while queuing and calm them if they cry. It shows that he is able to understand, have empathy on other people and can give encouragement.

Alex also has musical intelligence; he loves to sing. He quickly remembers the lyrics and is able to catch up with the "Beat" of a song. He learns songs quickly too. Alex loves to sing, he smiles happily and will always ask to repeat a song.

Jenny:

Jenny is talented in learning languages. Jenny can speak fluent English language and Mandarin. She is able to pronounce words correctly, clearly and is easily understood by adults. Jenny likes to read books. During her free time (free play time), she would prefer to read books. In reading activities (Paul and Mary), a set of story books are assigned to kindergartens to improve the language proficiency of children. The book has many levels and Jenny has reached a higher level as compared to her same-aged peers.

Jenny also has interpersonal intelligence. She has many friends; she likes to make friends with anyone. She loves to chat with her friends and teachers. In the classroom, Jenny likes to answer questions and give opinions. Jenny likes group activities, she plays a good role in the group. She will actively participate by giving ideas and completing work within the group.

Jenny also has intrapersonal intelligence. Her teachers feel that Jenny is very self-sufficient, she knows how to take care of herself and to finish any work without prompts. Every time after shower, she will fold shirts and prepare her own bed without being instructed by the teacher. Jenny is active in discussion activities. She is able to give thoughtful opinions. For example, during a discussion on the topic of pollution, she suggested collecting and recycling old newspapers to help prevent pollution.

Kelvin:

Kelvin is someone who has bodily-kinaesthetic intelligence. He is very active and loves physical activities. Kelvin shows good performance in sports. He always wins in sports events. Kelvin likes to play at the playground and uses the facilities well.

Kelvin also has visual-spatial intelligence. According to the teacher, Kelvin likes to play with blocks, he can produce creative things with blocks. Kelvin is also good in moulding clay, he can produce creative products with clay. Kelvin likes to draw but does not like to colour. Teachers feel that this may be related to Kelvin being active and cannot sit for a long period of time to complete his work.

Kelvin also shows intrapersonal intelligence. According to Kelvin's teacher, he is very brave in trying new things and accepting challenges. For example, Kelvin often volunteers to come out and perform in front of his friends and teachers. When the nurse came to give information about dental care, he volunteered to be the model. All examples shown by Kelvin portray confidence and motivation.

Learning styles of each child were observed through six activities planned based on different areas of intelligence. The researcher observed how the children learn and the learning styles displayed by them when they learned something related to their intelligence. This table describes learning styles, characteristics and behaviours displayed by the children in six activities.

Table 1: Learning styles, characteristic and behaviours of three children

Activity	Alex	Jenny	Kelvin
Reading story book	Not interested, kept moving while reading books, couldn't concentrate. He seldom gave opinion during the discussion.	Interested, expressed her own opinion during the discussion.	Interested and active in answering teacher's questions.
Dancing	Interested, can follow the movement and created new movements.	Less interested, at the beginning unable to follow the dance steps. She correctly followed the movement of the teacher's. Initially no motivation to dance from time to time.	Less interested, at first he did not want to participate in the activity and did not follow the movement but was able to generate new movements.
Mathematic	Interested, observed demonstrations attentively. Acted quickly to finish the task. All questions were answered correctly which indicates understanding of the demonstration.	Interested, observed demonstrations attentively, finished the task without assistance. All questions were answered correctly which indicates understanding of the demonstration.	Less interested and did not understand the teacher's demonstration. Need help in finishing the task. Most of the time did not understand the question and gave wrong answer which indicates that he did not the demonstration.
Singing	Not interested in listening to the song but interested when applausing. Applause "beat" was very accurate.	Interested in listening to and following the singing. Not interested while performing the applause and cheered "beat" was not accurate.	Interested in listening to the song and did the movement applause. Accuracy "beat" was not consistent, sometimes got it right.
Puzzle	Interested and often tried fixing the image pieces to complete the puzzle. He kept discussing with his group members.	Interested and carried out activity attentively. She kept expressing her opinion.	Not interested, just joined briefly then stood up and walked around.
Play clay	Interested and produced creative work. He produced a man using the clay.	Not interested and had no idea of making something with the clay.	Interested and produced a very creative work. He made a horse using the clay.

From the observations, the researcher analysed the learning style of the three children:

Table 2: Learning style of the three children

Name	Learning style	Characteristics
Alex	Kinesthetic Visual	• Fidgeting while seated. • Quick to learn something about movement like dancing. • Be able to understand something through observing.
Jenny	• Visual • Auditory	• She likes to see image. • She is able to understand something through hearing and responded appropriately.
Kelvin	• Kinesthetic • Auditory	• He likes activities pertaining to bodily movements such dancing. • He likes listening to a story and responds to the questions.

From the observation of the multiple intelligences of the children and their learning styles, the researcher did a compatibility comparison which are:

Table 3: Compatibility of intelligence and learning styles

Name	Intelligence	Learning styles
Alex	Bodily-kinesthetic Musical Logical-mathematic Interpersonal	Kinesthetic Visual
Jenny	Linguistic Logical-mathematic Interpersonal Intrapersonal	Visual Auditory
Kelvin	Bodily-kinesthetic Visual-spatial	Kinesthetic Auditory

Discussion:

From the data analysed, the researcher found that there is compatibility between intelligence and learning style. Children tend to apply learning styles that is convenient to their intelligence. Alex is intelligent in bodily-kinaesthetic and will use kinesthetic learning style. Jenny has language intelligence, and tends to use visual and auditory style of learning. Both styles are required in language subjects as language learning emphasizes words or texts, hearing, mimicking and repeating words mentioned then read. Kelvin also has bodily-kinesthetic intelligence and also prefers kinaesthetic learning style.

In this study, the researcher found that the children are more comfortable using a style that is compatible with their intelligence in learning. In the learning activity, the researcher asked Kelvin to sit and finish the task, but he refused to complete the puzzle. Then, he was allowed to stand and walk around. After that, he started to try to participate in the activities. Although encouraged to sit, he could hardly do anything. Hence, Kelvin's intelligence is in visual -spatial intelligence. Alex uses visual and kinaesthetic learning styles when asked to sit down to sing a song. When the music was played, he became not attentive. Over time, he looked around and did a lot of small movements. However, when the researcher began a new game which requires applause, it caught Alex's attention. This indicates that children should use their own learning styles to complete tasks given. If students are interested in learning, learning outcomes will be more positive (Suppiah Nachiappan *et al*., 2009).

Children will show interest and a high level of confidence when learning something using the intelligence that they possess and based on their learning styles (Sternberg, 2006). Alex has kinaesthetic intelligence and kinaesthetic learning style. He very enjoy and kept ask repeat the dancing activities. In contrast, during the storybook reading session, he showed no interest and looked around and did not participate in the activity. When the researcher asked questions to Alex, he was unable to respond immediately and was in doubt. Jenny is good in kinaesthetic activities. She was bored because she did not like the activity and needed to be encouraged to participate in the activities. When asked to produce creative movements, she stood up and did not want to make any movement. If a child succeeds using the talent that they have, they will be more convinced.

The researcher also found that children understand lessons faster using their preferable learning styles and intelligence. When teaching mathematics, the researcher showed the steps using the white board; that is only visual without verbal explanation, and Kelvin could not understand, and almost all the answers in his exercise were wrong. Kelvin utilizes auditory and kinaesthetic learning styles; he has difficulty understanding something through visuals. He took more time to understand the lessons as compared to Jenny and Alex who are using visual learning style.

Conclusion:

Children who are gifted in certain areas should be given encouragement and attention to help them develop their potential so as to improve their intelligence to a higher level and to apply in the learning process to improve their academic achievement. According to the theory of multiple intelligences, intelligence will change with age. Some will rise with age but some may also disappear if not noticed (Verenikina *et al*., 2005).

Teachers need to provide a variety of learning activities and apply different teaching methods in the teaching and learning process. Thus, every child gets the opportunity to show their intelligence and can use the method that they are comfortable so that it is much easier to achieve the objectives of the teaching and learning process (Santrock, 2010). In the study, the children will become motivated if the activity is compatible with their preferred intelligence and learning style.

Teachers need to understand the intelligence and the learning style of each child; find out the strengths and weaknesses of their students (Noriati *et al*., 2009). Then, teachers can apply appropriate teaching and learning methods to students' intelligence and learning style. These children could be successful in their learning. This also helps children to increase their self-esteem and pride.

Overall, the study found that there is compatibility between intelligence and learning style. If a child learns something right with their intelligence and learning styles, they will be able to achieve the learning objectives

sooner. Therefore, educators must apply teaching approaches or methods appropriate to the needs of the children. If being able to successfully help children find their talents and learning styles is the best gift for them in their lifetime, children can use it in their learning because learning is a lifelong process.

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