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#### DOES PRESCHOOL TEACHER KNOW WHO IS THE CEO OF THE BRAIN?

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#### *Abstract*

Who is the Chief Executive Officer (CEO) of the preschooler's brain? A question that is worth of asking. The answer is Executive Function or EF. Acting like a CEO who makes major decisions and managing overall operations of the company, EF is doing the same thing. EF is a collection of higher-order prefrontal lobe's processes that manage cognitive, behavior, and emotional functions especially during purposeful and goal-directed activities. If a preschooler's EF in a good condition, means he or she is ready for the formal school as EF predict school readiness. Thus, if we truly know and understand about EF, our way of teaching towards preschoolers can be improved to the maximum level. But the question is, does the preschool teacher knows? There were 31 out of 41 teachers from various preschools never heard of this term before. This is a very interesting outcome and therefore, this qualitative research intended to uncover more in depth on this topic by selecting 3 preschool teachers as participants. Interview sessions and observations have been made in order to investigate their knowledge on EF and understand their principles of teaching methods; whether they have established EF enrichment activities. The results concluded that although these teachers never heard of EF before, but a small portion of their activities did reflect on EF training principles. But the true highlight of this study is the socio-emotional support given by them. Although they are lacking of EF knowledge, but the supports given made the preschoolers' EF at a healthy state.

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## 1. Introduction

Who is the Chief Executive Officer (CEO) of the human brain? A question that is worth of asking. The answer is Executive Function, that goes with abbreviation as EF that is widely been used. But why did it get its appellation as a brain's CEO? As the highest-ranking officer who heads the company's internal and external affairs, EF also acts in a similar way. Located at the Prefrontal Cortex (Otero & Barker, 2014), EF is seen as a system that regulates all cognitive processes (Raaijmakers et al., 2008) through the activation and deactivation of other parts of the brain (Knight & Stuss, 2002).

To put it in other words, EF works conjointly with other part of the brain in order to perform complex actions (Otero & Barker, 2014). Complex actions that involves with cognitive processes such as reasoning, problem solving, planning and organizing of actions or emotions will runs smoothly with intact EF (Collins & Koechlin, 2012). Intact EF will allow all the human body systems process and respond to the activities as well as interact with the environment accordingly (Goldstein, Naglieri, Princiotta, & Otero, 2014).

### 1.1. How Does EF Runs His Assignment as A CEO?

EF plays its role as a CEO of the brain through its three core functions; and they are inhibitory control, working memory and mental flexibility (Moriguchi, Chevalier, & Zelazo, 2016; Diamond, 2013). Inhibitory control refers to the ability in controlling attention, behavior, judgment and emotion to overcome internal impulse or strong external incitement (Diamond, 2013) and instead; one will do something more appropriate or useful as a result (Wiebe, Sheffield, & Espy, 2012). Inhibitory control will helps one to have self-control that works to resist temptation of doing something immorally. As an example, a child can stay focused on the teacher despite there is a 'temptation' from his next friend to get distracted. Temptation here could mean the friend is probably playing or doing other works and not focusing on the teacher.

The second core function is working memory; which involves with the ability of the mind to directly apply new acquired information (Diamond, 2013). In other words, working memory allows verbal instructions that one received can be 'recorded' and directly translated into an action plan on mind. Without the action plan, there will be no activity that can be accomplished. For example, a child able to remember the game rules while continuously playing the game with friends. If the child's working memory is not functioning, then he or she will have difficulties in adhering to rules and play the games accordingly. When the working memory developed well along with inhibitory control, then the third core is said to emerge and develop (Garon, Bryson, & Smith, 2008).

This third core functions known as mental flexibility will help one to have different views from different angles (for example, "how this will appear if I view it from different perspectives?") or from other person's point of view (for example, "let me see this problem if I were in his shoes"). In addition, mental flexibility is important in helping us to find other solutions when dealing with problems that cannot be solved straightforwardly. It helps us to think out of the box (Diamond, 2013) or be creative in finding the solutions by breaking the pattern of conventional thinking (Dietrich, 2004). Commonly, neurologists and neuropsychologists has long discovered and conduct continuous research on EF either by generically or go in depth towards each core function. But this is not common for educators. They only put their interest on this area only recently as they have discovered how important EF is towards school performance (Meltzer, 2010).

## **1.2. The Parallel Development of EF with Preschool Children Development**

Previously, studying on social behaviours of the children has always been the priority of the past researchers in understanding their school performances and own behaviours (McClelland, Acock, & Morrison, 2006). But in the latest researches, there are other more important aspects besides social behaviours and one of them is EF (McClelland, Acock, & Morrison, 2006). This is because EF is not only playing a major role in the development of academic skills but also influencing the way children learn in classes (McClelland et al., 2006). Moreover, EF is also important in ensuring preschool children to be able to undergo their transition process (from preschool to primary school) smoothly. Among the skills that are essential for transition are self-regulatory skills and social efficiency; both of which are highly dependent on the children's EF strength (McClelland et al., 2006).

Preschool children's EF strength contributed significantly to their school readiness too; in terms of literacy and numeracy skills. Additionally, socio-emotional aspect such as the ability to socialize and initiate friendships, capable of adapting to the new environment, express and manage own emotions are also important skills to help them ready for school (Innis, 2012). In contrary, preschool children with weak EF skills will tend to show aggressive behaviours or other noticeable behavioral problems (Raaijmakers et al., 2008). Undoubtedly, EF plays an important role in supporting the socio-emotional readiness; especially in the development of preschool children's social knowledge (Denham, Basserr, Brown, Way, & Steed, 2015).

Those preschool children who have the ability to apply their social knowledge shows that they are more skilful in social interaction and becomes favourite among friends (Ensor, Spencer, & Hughes, 2011). Besides that, this social knowledge is crucial for them too, in order to maintain good relationship between the teachers. Without a good relationship, learning process in the classroom will not be able to run smoothly and this is consistent with Izard et al. (2001) study. They have found that when preschoolers do not have good social knowledge, they will tend to isolate themselves. Therefore, teachers unable to create a good interaction with them and learning process in the class could not be done successfully.

## **2. Problem Statement**

In order to ensure children able to learn well in the class, teachers need extensive knowledge on pedagogy and the development of the children including knowledge about EF. Through the literature, we have found that EF is no least important aspect that need to be focused on by the teachers and it need to be nurtured as well. But the question is, if it is true that EF is so important in early childhood education, do preschool teachers have deep knowledge about it? Do they really execute the nurturing process of EF through their learning activities?

## **3. Research Questions**

Based on the problem statement, this research was conducted in order to answer two questions. Firstly, what do preschool teachers know about Executive Functions? Secondly, how did the preschool teachers incorporate Executive Functions components into their teaching?

#### **4. Purpose of the Study**

The main aim in this a small scale study reported in this paper is to explore the preschool teachers' knowledge on EF. The main drive of this study merely resulted from random questioning 41 teachers from various preschools about EF terminology. There were 31 of them never heard of it before. This was a very interesting outcome and therefore, this qualitative research intended to uncover more about their knowledge by selecting 3 preschool teachers as participants. The teachers' familiarity with EF terms and its relatedness in children development and the activities that can stimulate the EF are the main aspects or themes of this study.

#### **5. Research Methods**

The quest to answer these questions was done using qualitative design; using a single case study method. Semi structured interview technique has been performed to collect the data by preparing open-ended questions with having Morgan-Borkowsky (2012) research as a reference. This interview is conducted by adherence to the interview guide approach which allows interviewer to reworded the questions and change the questions' order to fit in the interview sessions (Patton, 2015). Although they are some spontaneous questions are asked as a result of the preschool teachers' responses, they are all still based on the objective of the study and the interview guide prepared. An observation in the classroom for each teacher has also been conducted for once. This is only done to ensure a clearer understanding on what has been explained and described by them can be understood more clearly.

Single case study analysis is used where the preschool teachers involved have been interviewed twice until saturation level has been reached. They were selected based on conventional sampling; eventually a private preschool located in Seri Serdang, Selangor was chosen. This preschool has four teachers and a teacher manager; who will involve with teaching on a periodical manner. Among those five teachers (including the teacher manager), only three teachers expressed their willingness to involve in this study. The teachers were given the names of Teacher A, Teacher N and Teacher E to maintain the confidentiality of their identity. Relations (rapport) have been successfully developed beforehand to ensure they are more comfortable and open in response to interview questions.

#### **6. Findings**

Before the findings were explained in depth, the background of the three teachers will be first understood and studied first (table 01). All the three of them are female graduates from the local university bachelor's degree. But surprisingly, those degrees are neither related to early childhood education nor a teaching or education related degree. All of them are in their mid-20s, married and no children during the study. At the beginning of Teacher A's career, she was still involved in a work related to her science degree. However, after the contract expired and was unemployed for a while, she accepted the offer to replace her friend's position as a preschool teacher. She worked there for 2 years before moving to the current preschool which she has now worked for 3 years.

Teacher N on the other hand is a graduate of banking studies but has experience in becoming a replacement teacher in for three years in both primary and secondary schools. She was proud of her rough

journey in being a replacement teacher as she was entrusted with various subjects that were not related to her degree. Her dedication was proven when one of the schools she worked with made a request on her to teach there and even paid her using the school's teacher parent association fund. Although being a replacement teacher for subjects that she was never familiar with, the feeling of burdensome arosed too but her positiveness was shown when she recalled those experiences as somewhat valuable. After the replacement was over, she took the offer to work at the current preschool and thinking it as new adventure.

The third teacher, Teacher E, started her job as a research assistant at the same university while pursuing her bachelor's degree in Malay Literature. For two years, Teacher E assisted the lecturer's research works and at the same time helped the lecturer in delivering tutorial classes for the lecturer's students. Reflecting on that teaching experience, Teacher E decided to continue her career in education after she received an offer from her friend to teach at the same pre-school as hers. For 3 years, Teacher E has gained valuable experiences including enrichment programs and professional development provided by the preschool management. After married, she decided to work at the current preschool that is nearer to her house.

**Table 01.** The summary of the teachers' background

Background	Teacher A	Teacher N	Teacher E
Gender/ Marrital Status	Female/ Married	Female/ Married	Female/ Married
Type of Degree	Bachelor Degree (from local university)	Bachelor Degree (from local university)	Bachelor Degree (from local University)
Degree Program	Pure Science	Banking	Malay Literature
Previous Work Experience	Research Assistant at local university	Replacement teacher at primary and secondary schools	Unofficial lecturer's assistant and tutor
Interest in Early Childhood Education	<ul style="list-style-type: none"> <li>• They did not expect to find interest and excitement before they started the preschool teaching job.</li> <li>• They agreed to sign up for the teaching job to ensure a living</li> <li>• Eventually, they feel in line with their personality and spirit as opposed to their studies.</li> </ul>		

The similarity trait of these three teachers has is that they did not expect to find interest and excitement in early childhood education (ECE) career before. Being unemployed for a longer time or having insecured job, they decided to accept this job offer so that they can also earn a living. With that mind set at the beginning, they eventually feel that this career is in line with their personality and spirit, as opposed to their their studies that has nothing to do with ECE. It is not uncommon findings as Richardson and Watt (2005) found that some teachers felt that teaching job is more "fit" with themselves and some chose teaching due to inclination towards stable job compared to their previous work. However, interest and fun are insufficient. The government has determined that by 2020, all preschool teachers need to have at least a diploma in ECE (Guru Tadika perlu Miliki Diploma Pengurusan Pendidikan Awal Kanak-kanak, 2016). Innovative in teaching alone is not enough, more preschool teachers with sufficient knowledge and ECE related skills are needed (Guru Berbakat Penentu Kejayaan Pendidikan Awal, 2017) and this includes having the knowledge and skills to enhance preschool children's EF.

Teacher A and N clearly shown that neither they have prior knowledge nor skills in training children on EF related. They have never heard or read, not even studied about EF before, too. Not only topics about EF, they were both honestly admitted that they are still lacking of skills and knowledge in early childhood pedagogy. Therefore, how did they conduct their teaching all this while? Both of them use the 'trial and improvement method' for their teaching. Normally, they will do a brief reading on the sharing of teachers and parents about ECE on social media, then tried to implement the recommended techniques on their lesson plans. Besides that, there were a number of professional development conducted by preschool and they will ensure all the input learned applied in the class. Regardless what method that they want to try, they still adhere to the curriculum prescribed by the preschool management and make modifications according to the current needs of the children. Teacher A admitted, *"I do not like to read. Just... I'm a visual learner... I can go to the training and such... but not to the extend to purchase books (on ECE). I'm not going to read it"*. Reading additional material on ECE is not favour by her. Hence, it is not surprising if Teacher A has no knowledge of EF.

According to Morgan-Borkowsky (2012) study, middle school teachers in one of the United States district considered themselves as knowledgeable about EF. Unfortunately, it did not reflect during an open-ended questions interview. In fact, they admitted that they did teach their students skills related to EF but Morgan-Borkowsky (2012) found it to be contradicted. If we can get this negative connotation as a result of study on teachers with ECE background, then it is not a surprise outcome for both Teacher A and N for not knowing or teaching EF related skills on the children. Both of them are not even an education related degree holder. Although that is the case, teachers can still learn about EF from time to time through professional development course provided by the management. However, all of the three teachers confirmed that they had never been trained about teaching EF or even discussed about it too. This scenario happened to 90% of the teachers participated in Morgan-Borkowsky (2012) study.

On the contrary, Teacher E was very confident to respond when asked about EF and its importance in ECE. However, the answers given are inaccurate. However, some parts of the answers given by Teacher E are closely related to EF. Teacher E is very clear that EF is related to one's mind; which needed to help one solve the problems and then plan for actions accordingly. To make her explanation clearer, Teacher E gives an example of a situation depicting a group of children being given a ball to play with:

*"... When we show them an object for example... a ball for a group of students...we ask them to make an interpretation (against it). Okay. So, each student will give their different interpretations into a variety of meanings. For example, em... a student will say the ball is round. Okay...Other students will say when we throw the ball, the ball will spin... the other student (will) say the shape of the ball is like a sphere, like planet Earth. Therefore, each student has different executive functions "*

(Teacher E)

Although the examples given may not have the true meaning of the EF, but the teacher's explanation is slightly related to one of EF 's core functions of mental flexibility. The ability of mental flexibility helps one to think creatively and having a different point of view. Each of the answers given by the child in the

Teacher E example is unique and reflects their creativity in ensuring that the answers given are being repeated.

Without a doubt, Teacher E clearly demonstrated her attitude of encouraging preschool children under her care to participate in activities that stimulate creativity (during the observation). Teacher E likes to take the opportunity to do art activities; which stimulates children to create artworks based on their imagination and likings. “No one who is more beautiful”, Teacher E stressed out that she will ensure all of her students know that none of their artworks are superior than the other. To put it another way, all artworks are beautiful and has its own strength and meaning. She wanted all of her students have their self-confident and be brave to voice out opinions. She also likes to give encouragement and always encourage them to work according to their own strengths. The attitude of encouraging, praising all children’s hard work and sometimes rewards them were obviously a part of practice not only in Teacher E, but also in Teacher A and Teacher N teaching practice. Although the interview session was conducted separately, but they could give the same answer when talking about the most important skills needed for them to teach or equipped the children before they leave for primary school. Although it is evident that this preschool does have advance level of reading, writing and maths teaching but they stressed out that being brave and confident are superior quality needed to instil the children. Instilling bravery and confidence is not an easy job and needs a lot of patience with the children as they need a lot practice. This spirit coming from these three teachers is a sign of devote and compassion towards the children.

Being devoted and compassion towards the children is the result of the love they have towards them. Although Teacher A, N and E may not have an in-depth knowledge of EF, but they do nurture the children’s EF indirectly but constantly without a fail. They nurture these children through their abundance of love through their actions and word choices when communicating, entertain each needs of the children, communicate and treat them like an adult, have a fun conversation, always look into the children’s eyes, care for them and established good relationship with the parents has produced positive, cheerful and confident children there. These attributes of the teachers are in-line with the study of Diamond and Lim (2016). According to them, although we can come out with many ways to improve EF skills, the main ‘ingredient’ will always remain the socio-emotional element. Specifically, teachers who are always show their concerns, supports, encouragement and become good listeners will create less stressful, cheerful and healthy children that help them to keep their EF health level at a maximum state. Although we might come to conclusion that these teachers do not have prior knowledge about EF, their teaching principles somewhat indirectly related to EF principles and four of their interventions matched with the recommendation by (Table 02). Nevertheless, Morgan-Borkowsky (2012) argued that it is still insufficient as we need to explicitly teach EF skills to the children so that they can be skilfully use them, rather than prodding the skills in the lessons.

**Table 02.** Summary of teachers’ principles and intervention related to EF (Diamond, 2013)

Category	Details	The Teachers’ Traits
Principles	Social inequality: reduce the gap among children with different socio-economic status by giving early training to all of them equally	All of the teachers stressed out that children must be treated equally regardless their background and given the same early exposure

	Transfer: each EF training will lead to improving not only 1 specific skill but also other EF skills	None
	Increase the task demand: to ensure the skills can be level up and keep the learning activity interesting	They will ensure all tasks given must be gradually challenged by increasing level of difficulty They keep on stressing out to put extra careful on those who lagging behind in class; not to put pressure on them and offer one to one help
	Persistent: repetition is not only through number of practice times or hours spent but also means repeating the skills across the activities/ curricula	They agreed that all new skills taught need to be repeated because this will help them remember. In addition, they claimed that it is their nature to learn things over and over again especially they can easily forget
Intervention	One of the intervention for inhibition (self-regulation) is providing understandable rules and reviewed them before transition.	All of the teachers always explained the rules before beginning any of the activities and remind them about the classroom's rules from time to time.
	Organizing intervention requires routine establishment not only at school but also at home	All of the teachers consented that routines need to be established first before anything else.
	One of the working memory intervention that can be implemented is using visual and verbal prompts for the children to make them less forgetful.	If students seem forgetful with what the teachers have taught them, they will provide verbal prompts or even break down difficult tasks into smaller steps.
	Consistent in giving praises to the children is a must for teachers in every chances they encountered. Each components of EF can be improved when children feel good about themselves.	The three teachers agreed that they always praise the children when they have done good works. In fact, Teacher E stressed out the importance of acknowledging their efforts, rather than focusing on the end product.

## 7. Conclusion

Although this is a small-scale study, but the idea was to get a grasp on teacher's awareness about EF and its importance in preschool children development and readiness. From this study, it is clear that these teachers are not only unfamiliar about EF but they were not given any professional development course about it, too. This can be somehow shows the preschool itself is not providing sufficient training for their teachers. With this information, it is hoped that we can better serve them by equipping materials like developing more local friendly module as well as training. It is recommended that future research can be done with a larger scale study with diverse background of qualifications and preschool settings, too. Last but not least, regardless what kind of methods or skills that we want to instil the children, the best ingredient that need to be put is love, like these three teachers in this study.

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