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Knowledge Extraction of Thai Children Development Program Using Developmental Surveillance and Promotion and the Executive Functions
การสกัดความรู้พัฒนาการเด็กไทยจากคู่มือเฝ้าระวังและส่งเสริมพัฒนาการเด็กและการจัดการตนเองขั้นสูง

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Abstract

The purpose of this research is to 1) extract the assessment data from the Developmental Surveillance and Promotion Manual (DSPM) that contributes to the development and training of Executive Function (EF) skills, 2) create indicators of Thai children's development by extracting knowledge from EF construction and 3) integrate knowledge extracted from the DSPM and the EF development indicator to provide data that can be applied in the future using qualitative research and presenting the extracted knowledge to 30 experts to certify the effectiveness and quality of the data. This research used descriptive qualitative to interpret the data. The data was analyzed by using the description of a certain phenomenon and the research findings were summarized as follows: 1) Regarding the extracts from the DSPM that contributed to the development and training of EF skills, the experts agreed that issues with gender should be ruled out 1 item. There were 27 items in total 2) concerning creative indicators, the developmental indicator of cognitive skills were at a high level, and all skill groupings had high levels of quality and precision. 3) In the presentation and

assurance of the quality of the data extraction, the opinions of the experts were quite similar, that is the extracted knowledge has acceptable and effective qualities, which can be further developed as a body of knowledge in the development of tools to identify and promote quality child development.

Keywords: Knowledge Extraction, Thai Children Development, Developmental Surveillance and Promotion Manual, Executive Function

บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อ 1) สกัดข้อมูลการประเมินจากคู่มือเฝ้าระวังและส่งเสริมพัฒนาการเด็ก (DSPM) ที่มีส่วนช่วยในการพัฒนาและทักษะการจัดการตนเองขั้นสูง (EF) 2) สร้างตัวชี้วัดพัฒนาการเด็กไทยโดยใช้ความรู้จากทักษะการจัดการตนเองขั้นสูง และ 3) บูรณาการความรู้ที่ได้จากคู่มือเฝ้าระวังและส่งเสริมพัฒนาการเด็ก และเครื่องมือตัวชี้วัดการจัดการตนเองขั้นสูง เพื่อเป็นองค์ความรู้ที่สามารถนำไปต่อยอดในการใช้งานในอนาคต การวิจัยครั้งนี้เป็นการวิจัยเชิงคุณภาพโดยนำเสนอองค์ความรู้ที่สกัดแล้วให้ผู้เชี่ยวชาญจำนวน 30 คน รับรองประสิทธิภาพและคุณภาพของข้อมูล การวิจัยครั้งนี้ใช้เชิงพรรณนาในการตีความของข้อมูล วิเคราะห์ข้อมูลโดยใช้คำอธิบายของปรากฏการณ์หนึ่ง ๆ และสรุปผลการวิจัยได้ดังนี้ 1) เกี่ยวกับการสกัดข้อมูลการประเมินจากคู่มือเฝ้าระวังและส่งเสริมพัฒนาการเด็ก ที่มีส่วนช่วยในการพัฒนาและทักษะการจัดการตนเองขั้นสูง ผู้เชี่ยวชาญเห็นพ้องต้องกันว่าควรตัดประเด็นเรื่องเพศออก 1 รายการ และเหลือทั้งหมด 27 รายการ 2) สำหรับเครื่องมือและตัวชี้วัดที่สร้างขึ้น ตัวชี้วัดการพัฒนาการของทักษะการรู้คิดอยู่ในระดับสูง และการจัดกลุ่มทักษะทั้งหมดมีคุณภาพและความแม่นยำในระดับสูง 3) ในการนำเสนอและรับรองคุณภาพการสกัดข้อมูล ผู้เชี่ยวชาญมีความคิดเห็นค่อนข้างคล้ายคลึงกัน กล่าวคือ องค์ความรู้ที่สกัดออกมามีคุณภาพเป็นที่ยอมรับและมีประสิทธิภาพดี สามารถนำไป พัฒนาต่อยอดเป็นองค์ความรู้ในการพัฒนาเครื่องมือ เพื่อระบุและส่งเสริมพัฒนาการเด็กที่มีคุณภาพ

คำสำคัญ: การสกัดความรู้, พัฒนาการเด็กไทย, คู่มือเฝ้าระวังและส่งเสริมพัฒนาการเด็ก, การจัดการตนเองขั้นสูง

Introduction

Children begin learning from birth and experience significant growth and development during their early years, influenced by their environment, support systems, and relationships. Their development from infancy to age 8 is both rapid and

cumulative. Early learning and development serve as a foundation for future learning, and consistent exposure to high-quality learning experiences as they age supports continued growth and achievement (Allen & Kelly, 2015). According to the National Institute of Child Health Development's 2017 study, many parents and guardians are still unaware of screening and child development promotion. The screening handbook was received by 56.1 percent of the parents or careers. According to the report, 65.1per cent of child carers were interviewed by a public health officer or teacher, and many parents or carers did not know about the Developmental Surveillance and Promotion Manual. Forty-one (41) percent, followed by 32.9 percent who knew and used it, and 26.2 percent who knew but never used it. Regarding a report, a survey conducted in honor of Her Royal Highness Princess Maha Chakri Sirindhorn Princess Maha Chakri Sirindhorn, Her Royal Highness, shows that there are still many children in Thailand with suspected delayed development, and the number continues to rise each year. According to the graph, children with suspected delayed development in 2015, 2016, and 2017 were as high as 1 percent, 13.7 percent, and 16 percent, respectively (Kanchana, 2015). Also, the Department of Health conducted a survey of the state of early childhood development in Thailand in 2014 and discovered that children aged 0-2 years had delayed development in social and self-help areas and 8.3 percent, language and usage (Thonghem & Pattanapongthon, 2015).

More importantly, child development is an important concern for adults, especially in children from birth to 5 years, and should pay close attention to monitoring the development of each age group. Parents should be concerned about their children's development and learning at each age level because it is critical to becoming mature adults. A child's development's critical aspects are grouped into the Developmental Surveillance and Promotion Manual (DSPM) and Executive Functions (EF). DSPM is an age-based record of monitoring and early childhood development promotion. It will evaluate five areas: (1) Gross motor (GM) development of movement. (2) Fine Motor (FM) development in the improvement of fine motor abilities and intellect. (3) Receptive Language (RL) is the process through which language understanding is developed. (4) Expressive Language (EL) refers to language growth use. (5) Personal and Social (PS) development is the growth of self-help and society.

The Center for Neuroscience Research and the National Institute for Child and Family Development measured EF in 2,965 children aged 2 to 6 years in an October 2016 paper on the development of executive thinking skills in early life, 30% had less executive thinking behavior difficulties than the cutoff. That is, these children will struggle with self-direction, will act recklessly, will be irritable, will be readily distracted, and will be unable to complete challenging activities. Children with these long-term behavioral issues have challenges in school, jobs, and social interaction, as well as the possibility of encountering additional social difficulties. Worldwide research found that children with poor EF development had lower wages, were four times more likely to have a criminal record, and were three times more likely to use drugs than children with strong EF development. They are also more likely to become a single parent twice. As a result, more than 30% of Thai children who have delayed EF development should not be neglected (Noppakhun, 2018). Based on the neurobiological research on EF, it may be advantageous to investigate physiological and behavioral indicators of children's engagement and responsiveness to different teaching approaches and learning activities (Huttenlocher, 2002). The EF skills experience an especially rapid transformation during early childhood, roughly from ages 2 to 6, the preschool period may present a valuable opportunity for the cultivation of these skills through targeted scaffolding and support at the optimal times (Zelazo et al., 2017).

This research has found 1) raising quality children is still a significant issue in Thailand, as moms and people raising children lack the necessary knowledge, attitudes, and parenting techniques (Kajornrungsilp, 1995). Most parents will utilize their own experiences and beliefs to drive their parenting practices, such as the belief that assisting a child in everything indicates the parent's love of life, a life philosophy, an example of a style of thinking, or a way of looking at life. 2) Parents lay the groundwork for their children's learning environments. There are social issues because children cling to people they regard as problem-solvers rather than spending time with them. This is due to the child's weak problem-solving abilities, sluggish thinking, and inability to think in different ways, read books slowly, and take responsibility. This is regarded as a weakness of the family institution in raising children, generating serious

difficulties in society. 3) There are only a few researchers that can investigate the situation of Thai children in some professions by using some technologies that can develop children's knowledge. Even though these studies already provide some special tools or some new technologies, they are correlational in nature; thus, the causality question remains unanswered. 4) Numerous technologies and media enable new moms to obtain knowledge from various sources. The data is got rapidly via smartphones, but it is not known whether that data will be available. Furthermore, 5) such material may not be controlled, and when utilized to raise children, it may be inappropriate for their children. In light of these gaps in the current research, they are essential for understanding how such interactions can positively influence children's development.

Correspondingly, the three research questions proposed and addressed in this study are: "1. What is the extract assessment data from the DSPM that contributes to the development and training of EF skills?", "2. What are the tools and indicators of Thai children's development by extracting knowledge from EF construction?.", and "3. What research tools and indicators could integrate knowledge extracted from the DSPM and the EF development indicator tool to provide data that can be applied in the future?". From the above-mentioned and to address these research questions, the researchers established and constructed such a system to assist in assessing the growth of each child so that parents may utilize it to increase the child's development. Furthermore, the researchers discovered the relevance of child development due to the concerns mentioned above since it is a vital age in the formation of adulthood. They also want new parents to have access to the correct information to help them properly develop their children through tools that are simple to use, convenient, quick, and can accurately assess the development of each child including guidelines for enhancing the development of children based on their age. Data quality and accuracy assurance results from data extraction from the DSPM and EF can promote and monitor children's development for parents and carers that are effectively and age-appropriate. Therefore, the knowledge base for the development of assessment tools promotes and monitors child development for parents and caregivers that are effective and age-appropriate would be the benefited from this research.

Objectives

1. To extract the assessment data from the Developmental Surveillance and Promotion Manual (DSPM) that contributes to the development and training of Executive Function (EF) skills.

2. To create indicators of Thai children's development by extracting knowledge from EF construction.

3. To integrate knowledge extracted from the DSPM and the EF development indicator tool to provide data that can be applied in the future.

Research Methodology

1. Research Design This research was qualitative research. It was used as an approach to the qualitative study because the result of the analysis was the description of a certain phenomenon. The researchers investigated the rules for analyzing and recognizing Thai children's development which is based on the DSPM, a child development screening tool. The system analyzed the child's progress as “developmental maturity” or “suspicious delay” and the research instructions for developing higher- level brain talents based on the EF theory. The researchers extracted such data from the SECI model using structural models (Figure 1) The SECI Model: a diagram that depicts the relationship of knowledge convergence between tacit and explicit knowledge in four phases to improve knowledge continuously. This is because the cycle begins with exchanging knowledge (Socialization) and then extracting knowledge from others (Externalization), knowledge acquisition (Combination), knowledge embedding (Internalization), and looping back to the first procedure. to make knowledge management a long-term habit (Nonaka & Takeuchi, 1995). The researchers presented this information to professionals to analyze the quality of both the questions used to assess and identify the child's development. The efficiency of the evaluations was proven by the quality of the assessment confidence measures and functional validity. To apply such knowledge in the creation and development of assessment tools and guidelines to encourage the development of a prototype instrument for assessing and recognizing Thai children’s development in the future it was approved by the expert.

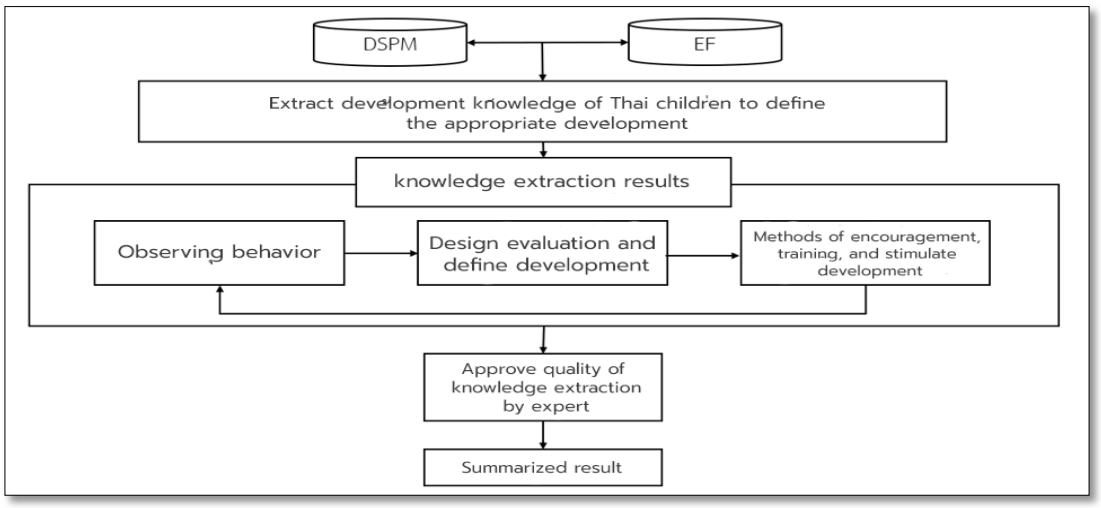

Figure 1 Design, Develop Tools, and Test Usability

2. Target The target in this study were 30 child development experts who have more than 3 years of experience in doctor, child care in hospitals, clinics, or related organizations, or early childhood teacher and agreed to participate in this research program. However, purposive sampling is where the researchers selected a sample based on the needs of the research and that has been chosen to nominate or recruit people who are characterized by recommendations from related individuals or entities (Snowball Sampling).

3. Tools Used in Research Assessment: (Evaluation and Certification of the Efficiency of Knowledge Extraction and Indicators) were the tools used in this research. To certify the quality of child development indicators data by extracting the data between DSPM and EF by a panel of experts. It consists of 3 parts: 1) to ensure the quality of information extraction of DSPM which partially helps to develop EF, 2) to ensure the quality of EF , and 3) to ensure the quality of merged information of DSPM and EF. The information relates to this assessment as follows:

The instrument consisted of 2 parts: 1) Data collection using Rating Scale format with a scale set from 5(highest) to 1(lowest) (Srisaat, 2010). 2) Data collection in matrix format.

The rating scale format cover to two assessments:

1) Assessment form to certify the quality and suitability of use in Knowledge extraction from DSPM The assessment questionnaire covers all 5 skills of

knowledge extraction, consisting of Gross motor Fine Motor, Receptive Language, Expressive Language, Personal and Social, total 28 items

2) Assessment form to certify quality and accuracy of executive function (EF) indicators. The assessment form covers all 3 aspects of knowledge extraction, totaling 61 items, consisting of 1) Basic skills group 17 items. 2) Self-direction skills group 29 items 3) Practice skills group 15 items.

The matrix format applies to one assessments:

1) Assessment and opinion form on the integration of Knowledge extracted from DSPM and executive function To determine which information extracted from DSPM knowledge can indicate which executive function skills by designation matrix table in the Y-axis is the information extracted from DSPM and the X-axis is the indication from executive function indicators. After that researchers and experts give opinions and consider the skills in DSPM (Y axis) contribute to the indicators of executive function (X axis) in which aspect by marking in the matrix table. When experts complete their opinions, the researcher will analyze the data and summarize the results.

4. Data Collection This research received a certificate of exemption from The Mae Fah Luang University Ethics Committee on Human Research (MFU EC) COE: 122/2022 Protocol No. EC 22112-13, target participating in this research project were provided with detailed information about the project and researchers questionnaire or Tools used in research the processes for ensuring the quality of information were as follows: 1) Gather evaluation data and DSPM data to identify suitable development. 2) Create an evaluation of EF talents in three skill groups: fundamental skills, self-directed skills, and creative skills. In the group of practical skills, there is in each of the 61 items a 5-level estimate scale type indicator 3) Data extraction from the manual on recognizing appropriate development and the information on the DSPM for skills at each age total 28 items. 4) Create an assessment form in the Matrix format by combining knowledge gained.5) check the correctness and suitability of the techniques for encouraging early childhood development and the substance of the Executive Thinking Skills Scale questions. Suggest to the adviser that the completeness of the content, style, and language used be considered. Then bring the

assessment form to make changes based on the recommendations. 6) Presented to the target audience of 30 experts to ensure the quality of knowledge extraction and the effectiveness of indicators. It also gave an opinion on the integration of the two parts of knowledge to create a new body of knowledge and may be a base for creating quality tools in the future. 7) Gather information and review expert opinions and validate for analyzing and summarizing results

5. Data Analysis The researchers confirmed the accuracy of the data. However, after collecting and analyzing the data, the researchers used descriptive qualitative to read the data. The researchers confirmed the accuracy of the data. The information was given to the advisers for further verification to bring the information to a conclusion of all three objectives of this research to ensure the quality of EF, to ensure the quality of information extraction of DSPM which partially helps to develop EF and ensure the quality of merged information of DSPM and EF.

Research Results

Part 1 This study's findings were derived from 28 DSPM elements that contribute to developing EF skills to validate and improve the content. The researchers will choose the skills certified by experts with an average of level 3 or higher. The certification results are shown in Table 1.

Table 1 DSPM Acceptance Data Extraction Contributing to EF Development

Development part	Number of DSPM	Number of Extractions	Expert Selected	Expert Cut off
Gross motor	24	1	1	0
Fine Motor	25	5	5	0
Receptive Language	22	5	5	0
Expressive Language	22	9	9	0
Personal and Social	23	8	7	1
Total	**116**	**28**	**27**	**1**

Based on the interviews with the experts, there was a consensus on the data extracted from DSPM to assist in assessing EF was appropriate as a body of knowledge to assess child development. However, one point that should be ruled out was an issue with gender which the experts considered to be a sensitive point and should be discarded in their assessment. Therefore, the experts agreed that the issue of gender should be omitted.

Analysis results from Table 2 Check the accuracy and suitability of the data extraction from the DSPM of 28 considered results as follows: 1) An appropriate Skills List for assessment and "selected" by the experts. There were 27 items in total. Expressive Language was selected as the highest score, followed by Personal and Social, and Fine Motor and Receptive Language with the same score respectively. 2) Appropriate Skills List for assessment, with 1 item considered "Cut off" by the researcher.

Part 2 Expert Quality Assurance of EF Indicators. The investigation and construction of 61 EF yielded the following results: 1) Basic skills group 17 items. 2) Self-direction skills group 29 items 3) Practice skills group 15 items. The researchers proposed to the experts that the quality of the indicators be verified. That the tool's quality and precision are satisfactory.

Table 2 Certify the Quality Indicators which Indicate the Basic Skills Group's Quality

Skill Group	Number of indicators	Quality AVG.	Quality and Accuracy	Considered Result
Working Memory	5	4.01	Accurate	Selected 5 Item
Inhibitory Control	7	4.21	Accurate	Selected 7 Item
Shifting/Cognitive Flexibility	5	4.14	Accurate	Selected 7 Item

Table 3 Examination to Certify the Quality Indicators for the Quality of Self-Directing Groups

Skill Group	Number of indicators	Quality AVG.	Quality and Accuracy	Considered Result
Focus/Attention	10	4.13	Accurate	Selected 10 Item
Emotional Control	9	4.15	Accurate	Selected 9 Item
Self-Monitoring	10	4.26	Accurate	Selected 10 Item

Table 4 Examination to Certify the Quality Indicators for the Quality of Performance.

Skill Group	Number of indicators	Quality AVG.	Quality and Accuracy	Considered Result
Initiating	5	4.03	Accurate	Selected 5 Item
Planning and Organizing	5	4.06	Accurate	Selected 5 Item
Goal-Directed Persistence	5	4.10	Accurate	Selected 5 Item

According to the data analysis results in Tables 2–4, experts rated the quality and correctness of the design of EF indicators at this time as follows: 1) Basic skills group, the average score of 4.12 points and 17 items chosen with Inhibitory Control and Shifting/Cognitive Flexibility at the highest scores. 2) In the group of self-direction skills, the average score of 4.18 points and 29 items were chosen with Focus/Attention and Self-Monitoring at the highest scores. Also, 3) in the group of performance, the average score of 4.06 points, 15 items were chosen with Initiating, Planning and Organizing, and Goal-Directed Persistence at the highest and the same scores. Based on these findings, we may be confident that the developmental indicators of cognitive skills are at a high level. All skill groupings have high levels of quality and precision.

Part 3 Data from the DSPM and the EF. The researchers integrated the extracted DSPM data (Part 1) and Executive Function (Part 2) Gathered together to assess executive function competency through the use of DSPM skills from three skill groups: 1. Basic Skills 1) Working memory 2) Inhibitory Control 3) Shifting/Cognitive Flexibility,

2. Self-direction skills 1) Focus/Attention 2) Emotional Control 3) Self-Monitoring, and 3. Practical Skills 1) Initiating 2) Planning and Organizing 3) Goal-Directed Persistence The research data is then presented.

Discussion

The research is titled “Knowledge Extraction of Thai Children Development Program Using Developmental Surveillance, Promotion, and Executive Functions”. The research results can be discussed as follows:

1. The results of Thai children’s situations in numerous domains from the use of the DSPM and the study of the work of the higher levels of the brain were derived from 28 DSPM elements that contribute to developing EF skills to validate and improve the content. There were 27 items in total with Expressive Language selected as the highest score. The results were like this because, at a young age, a child typically uses many words, and we can help a child develop their expressive language skills by adding one or two words or word phrases onto what they say. For example, if a child says “thank you” we may model, “Yes!” However, these results indicated to Finegood & Blair (2017) and Quistberg & Mueller (2020) that the emergence of executive functions across childhood is partially organized by children’s relationships with other individuals and with caregivers in particular. Considering that the intervention of executive functions is more effective than cognitive games, it can be concluded that the components of executive functions such as working memory, planning, and mental organization are very closely related to Akyurek & Bumin (2019) and Hoskyn, Iarocci, & Young (2017).

2. The results of creating tools and indicators of Thai children's development and Thai children’s delivery methods by extracting knowledge from DSPM and EF were the basic skills group with Inhibitory Control and Shifting/Cognitive Flexibility at the highest scores. The group of self-direction skills with Focus/Attention and Self-Monitoring had the highest scores. Also, group performance with Initiating, Planning, Organizing, and Goal-Directed Persistence had the highest scores. This means the developmental indicators of cognitive skills were at a high level, and all skill groupings had high levels of quality and precision. The results were like this because the experts recognised that EF is a

complex cognitive control process that enables self-directed behaviour towards a goal and sequences of actions associated with it (Nejati et al., 2020). This result was also associated with research by Wood et al. (2016) who considered a brain region that has been related to inhibitory control and shifting or cognitive flexibility.

3. The result of integrating knowledge extracted from the DSPM and the EF development indicator tool to provide data that can be applied in the future, the effective and age- appropriate was gathered together to assess executive function competency through the use of DSPM skills like basic skills, self- direction skills, and practical skills. However, accepting DSPM extraction helped develop EF researchers and experts consider 27 items. With these DSPM skills, a child can differentiate differences in sounds, interpret them and grasp their meanings. He or she can turn to expressive language as a verbal communication of intention which is associated with the research of (Kanchana, 2015), (Kotchabhakdi, 1995), (Sirithongthaworn & Isaranarug, 2015). However, the results of this research show that developing knowledge as a basis for the development of children with developmental language disorders would have the largest social communication outcomes (Roberts, Curtis, Sone & Hampton, 2019).

Suggestions and Future Work

Based on the research findings, the knowledge extraction of Thai children's development program to detect an appropriate children' s development stage using DSPM and EF. It developed tools for identifying Thai children's development and how to promote age- appropriate development and indicators of Executive Function in all aspects which were discovered to be of high quality and standard, but also for expert views and opinions. As a result, the researcher should bring tested information and methods and put them to use with the target group to determine their usefulness with the capacity and quality to continue to improve.

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