



A Writing Skill Development Program for Children with Autism Using Visual Perception Strategies

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Abstract

Background and Aim: The objectives of this research are: (1) to develop a basic Thai consonant writing skill training program for children with autism using visual perception strategies, implemented through Construct 2, a 2D game development engine; and (2) to evaluate the content and multimedia appropriateness of the program by experts.

Materials and methods: The research instruments included: (1) a basic Thai consonant writing skill training program for children with autism using visual perception strategies, and (2) an expert evaluation form assessing the appropriateness of the program's content and multimedia. The statistics used for data analysis were percentages, means, and standard deviation.

Results: The research findings revealed that: (1) the basic Thai consonant writing skill training program for children with autism using visual perception strategies was successfully developed for practical use ($M = 4.23$, $S.D. = 0.40$); and (2) experts rated the quality of the program's content and multimedia as high.

Conclusion: The core objective of this program is to develop basic Thai consonant writing skills in children with autism through activities specifically designed to suit the unique characteristics of this group. The goal is to support the development of writing abilities, which are fundamental to broader learning. Overall, the program is designed to meet the specific needs of children with autism by integrating principles from psychology, learning theory, and technology to systematically and effectively enhance their Thai consonant writing skills.

Keywords: Autistic Children; Writing Skill Training; Basic Thai Consonants; Visual Perception; Educational Technology; Construct 2; Multimedia Learning

Introduction

Autism Spectrum Disorder (ASD) is a developmental disorder characterized by challenges in three main areas: (1) social communication, (2) social interaction across multiple contexts, and (3) restricted and repetitive behaviors. These difficulties result in abnormal patterns in communication, socialization, and behavior. Individuals with ASD may display symptoms ranging from severe to mild across these areas, and some may even exhibit exceptional abilities in specific domains. This variability places autism on a spectrum from high to low severity (Treesoon, T., & Sanrattana, U., 2019). These challenges can lead to limitations in daily living. In the context of school, children are expected to engage in communication, build relationships, participate in group activities, and develop academic skills—listening, speaking, reading, writing, and critical thinking—within the educational system. Writing, in particular, is a complex skill that integrates many abilities and often serves as a substitute for verbal expression. Therefore, writing is both essential and significant. Students with ASD who struggle with writing may face communication difficulties, leading to misinterpretations of their needs or intentions (Treesoon, A., & Janthagarngul, W., 2022). This aligns with Thailand's National Education Plan (2017–2036), which emphasizes equity, participation, and access to education for all learners, particularly those with special needs (Office of the Education Council, 2017).

Construct 2 is a popular game engine used in the field of education. It is user-friendly and allows for efficient game development. As a low-code development tool, it is particularly suitable for learners without programming skills (Watcharapongkasem, W., et al., 2024). Construct 2 is widely used for creating basic 2D games and is popular among beginner developers. The engine uses an event-based command system,



making it easy to control game logic and flow (Dobroskok, I., et al., 2020). A review of the literature shows that technological and communication advancements have made it necessary for educational systems to integrate computers into new forms of teaching and learning, with a focus on learner-centered approaches. The use of computers supports self-directed learning and facilitates access to knowledge beyond the classroom. Based on this, the researcher developed the idea of creating a basic Thai consonant writing training program for children with autism using visual perception strategies. The program begins with practicing fundamental Thai consonants. This approach aligns with the research of Manomai-Udom, S. (2020), who suggested that enhancing the writing ability of students with special needs helps foster writing skills, encourages orderly and structured work habits aligned with Thai language writing principles, and promotes both confidence and a sense of accomplishment in learners. Therefore, the research team designed and developed the program to suit the specific needs of children with special needs by applying visual perception strategies to enhance basic Thai consonant writing skills. This not only supports learning in a way that is contextually appropriate but also helps prepare students for inclusive education in environments suited to their abilities. Additionally, it contributes to the exploration and development of more effective instructional tools and methods.

Objectives

1. To develop a basic Thai consonant writing skill training program for children with autism using visual perception strategies.
2. To evaluate the content and multimedia appropriateness of the program by experts for the basic Thai consonant writing skill training program designed for children with autism using visual perception strategies.

Hypothesis

1. A basic Thai consonant writing skill training program for children with autism using visual perception strategies was developed.
2. Experts evaluated the content and multimedia appropriateness of the basic Thai consonant writing skill training program for children with autism using visual perception strategies as being at a high level.

Literature review

Visual Perception Strategies

Visual perception or visual strategies focus on learning through the use of the sense of sight to perceive and process information. This approach is particularly important for individuals with special needs, especially those with autism. Wansed, S. (2009) explained that learning through visual perception is a process of changing behavior, cognitive structures, and mental processes that arise from visual perception. Individuals with autism often learn well by remembering images of real objects, photographs, drawings, symbols, and logos. These visuals help stimulate abstract thinking and develop new concepts built upon prior experiences.

Visual perception is a method that stimulates the brain to process information more completely and supports cognitive processes by helping individuals translate their thoughts into visual forms. Visual imagery strategies are simple yet effective activities designed to build foundational knowledge and enhance cognitive skills through the use of visual details. According to Bondy and Frost (2003), children with autism learn effectively through meaningful visual images and are able to retain these images better than spoken words. This is because spoken language is fleeting and often quickly forgotten by children with autism, whereas meaningful images can serve as memory aids and support communication. This visual approach benefits learning in the following ways (Suwetwethi D., 2019): 1) Stimulates student thinking through simple visuals (Visual Note-taking) 2) Uses images to support storytelling (Visual Aid for Storytelling) 3) Aids idea generation through imagery (Visual Facilitation) 4) Enhances teachers' instruction (Visual Accelerated Classroom) Numerous studies have confirmed that children with autism learn more effectively

through visual perception and tend to think in images rather than in language (West, K. L., 2019). Therefore, visual-based learning strategies are an effective approach to promoting learning, especially in communication and writing, which are fundamental skills for social interaction and daily life (Phyathai Hospital, 2020; Beery, K. E. et al., 2011).

Similarly, Sripanchat, C., et al. (2021) stated that visual perception strategies can be applied in teaching through the use of media such as pictures, schedules, symbols, and diagrams to define learning steps, rules, and conditions. This helps promote appropriate behavior in learners, especially among children with autism.

Research by Mathipikhai, P., et al. (2021), which studied the reduction of elopement behavior in children with autism using visual perception-based learning support media, found that this approach effectively stopped undesirable behaviors. This demonstrates the potential of visual media in behavior management and enhancing learner safety.

Sripanchat, C. (2023) found that using visual learning media helps develop basic skills in children with autism, such as sitting still, making eye contact, following simple instructions, and expressing needs using images. These outcomes align with the goals of Individualized Education Programs (IEPs).

Additionally, Siengdee, K., & Bunjantuek, A. (2023) emphasized the appropriateness of visual learning strategies in promoting the development of children with autism. They regard it as a technique that supports behavior, communication, and comprehensive learning.

From the above literature review, it is clear that learning through visual perception not only enhances the learning skills of individuals with autism but also plays a significant role in behavior modification and holistic development. Therefore, it is an important approach that should be continuously applied and developed in individualized education.

Conceptual Framework

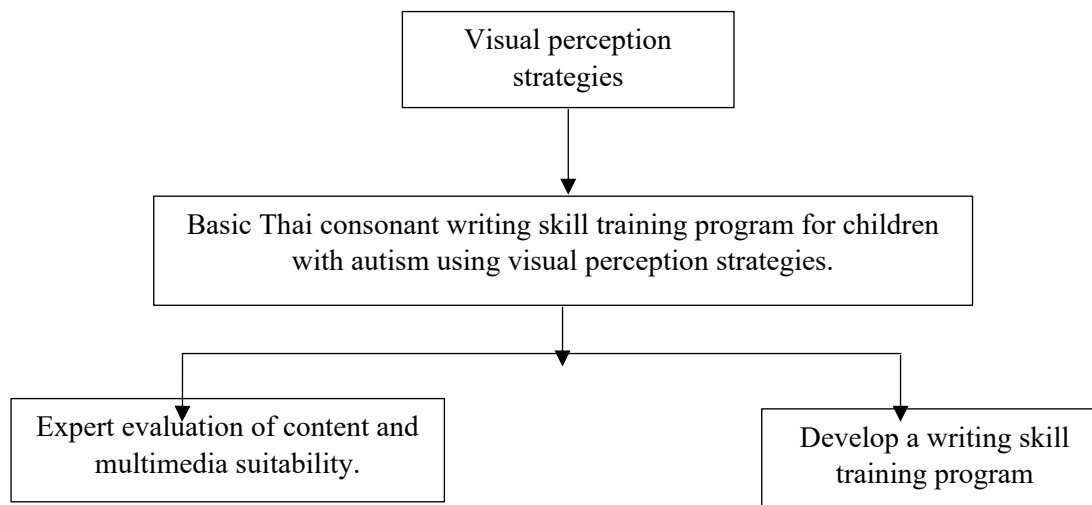


Figure 1 Conceptual Framework

Methodology

This research focuses on developing a basic Thai consonant writing skill training program for children with autism using visual perception strategies. The study is divided into six main parts, including:

1. Variables used in the study

1.1 Independent variable: The basic Thai consonant writing skill training program for children with autism using visual perception strategies.

1.2 Dependent variable: The appropriateness of the content and multimedia as evaluated by experts.

2. Program Development

Develop content for training to write Thai consonants suitable for children with autism using Construct 2, a program for creating two-dimensional games (2D Game Engine). Construct 2 is designed to be user-friendly and does not require prior programming knowledge. Users can develop games through drag-and-drop functionality, allowing them to add various objects and define events (event-based system) to control the game's behavior. This program is suitable for beginners, students, and independent game developers who want to create games quickly and efficiently. Construct 2 supports exporting games in HTML5 format, which can be played directly on web browsers without additional installation. It can also be adapted for different platforms such as Windows, Android, and iOS through conversion with other supplementary software. (Kamcharoen, P., & Phonnikornkij, W., 2020; Chaisuwan, A., 2021).

3. Program Appropriateness Evaluation

Content: Accuracy, suitability according to developmental sequence, and alignment with the characteristics of children with autism. This was verified by calculating the consistency of satisfaction questionnaires, with appropriateness values ranging from 0.67 to 1.00.

4. Evaluation

Experts assessed the appropriateness of the content and multimedia of the basic Thai consonant writing skill training program for children with autism using visual perception strategies.

5. Data Collection and Analysis

5.1 Sample Group: Selected using a purposive sampling method

Three experts in content and multimedia, each with at least 10 years of experience in teaching computer-related subjects.

5.2 Research Procedures

5.2.1 Explain the purpose and rationale of the appropriateness questionnaire to the experts.

5.2.2 The researcher allows the experts to test the program. After the experts have completed using the program, the researcher asks them to complete the evaluation form and collects the data on program appropriateness.

6. Summarize the results and write the research report.

Research Procedures

The research process consists of the following four steps:

1. Develop a basic Thai consonant writing skill training program for children with autism using visual perception strategies.

2. Evaluate the appropriateness of content and multimedia by multimedia experts.

3. Collect data and analyze results.

4. Summarize findings and write the research report.

Data Analysis

Data were collected from the sample group using a questionnaire on the appropriateness of content and multimedia. The collected data were analyzed using statistical measures such as mean and standard deviation. The interpretation criteria are as follows (Jeekratok K, 2021).

4.51 – 5.00 means Very Appropriate / Very Satisfied

3.51 – 4.50 means Highly Appropriate / Highly Satisfied

2.51 – 3.50 means Moderately Appropriate / Moderately Satisfied

1.51 – 2.50 means Slightly Appropriate / Slightly Satisfied

1.00 – 1.50 means Least Appropriate / Least Satisfied

Results

The research results can be divided into two aspects as follows:

Aspect 1: A basic Thai consonant writing skill training program for children with autism using visual perception strategies.

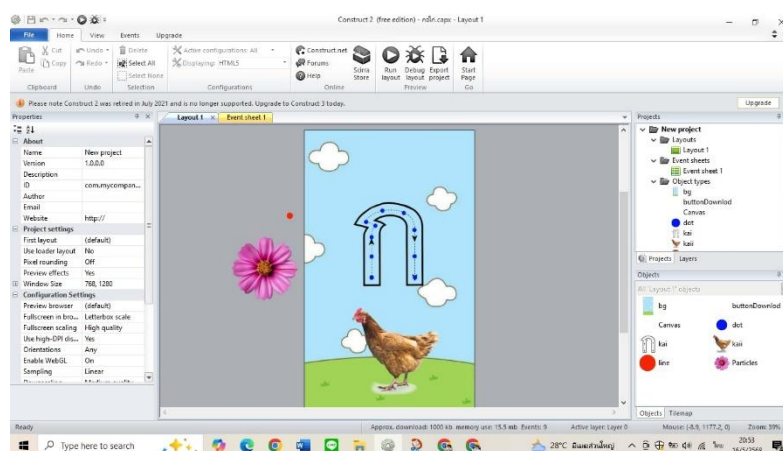


Figure 2 Writing Skills Training Program 1

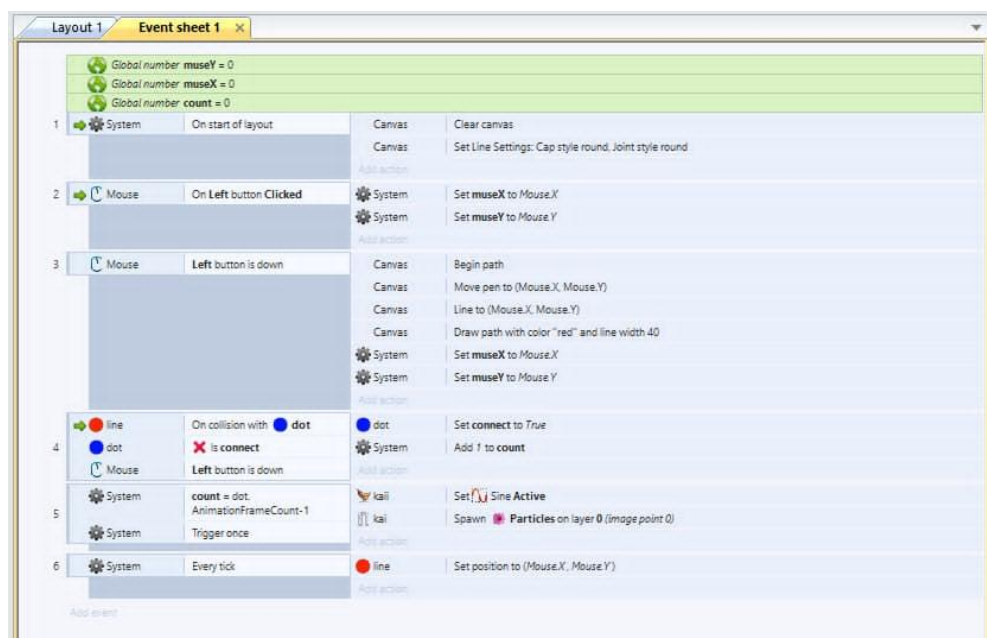


Figure 3 Writing Skills Training Program 2

The program includes 6 main event steps: starting the layout, setting the variables for mouse movement, assigning points to match the current mouse position, incrementing the variable by 1, connecting the points, checking conditions for correctness, and continuously positioning the object to follow the mouse cursor.

Aspect 2: The evaluation of the content and multimedia suitability of the basic Thai consonant writing skill training program for children with autism using visual perception strategies by experts is shown in Table 1 as follows.

Table 1 Evaluation of content and multimedia suitability by experts for the basic Thai consonant writing skill training program for children with autism using visual perception strategies.

Items	M	SD	Sequence	Interpretation
Performance Efficiency				
The system's ability to assist learners	3.33	0.58	3	Medium
The ability of the lesson to stimulate interest at the initial stage	3.33	0.58	3	Medium



Items	M	SD	Sequence	Interpretation
The ability of the lesson to deliver content effectively	4.33	0.58	2	High
The ability of the lesson in the application phase	5.00	0.00	1	Highest
Overall performance efficiency	4.00	0.29		High
Program Functionality Testing				
Ease of program installation	3.33	0.58	4	Medium
Ease of program use	4.33	0.58	2	High
Program processing speed	5.00	0.00	1	Highest
Graphic rendering speed	4.00	1.00	3	High
Accuracy of program functionality	5.00	0.00	1	Highest
Overall assessment of program functionality testing	4.33	0.32		High
Content Aspect				
Alignment with the objectives	4.33	0.58	2	High
Accuracy of the content	5.00	0.00	1	Highest
Appropriateness of content sequencing	4.33	0.58	2	High
Appropriateness of content grouping	4.33	0.58	2	High
Overall content aspect	4.50	0.29		High
Usability Testing Aspect				
Appropriateness of background images	3.33	0.58	4	Medium
Clarity of on-screen text	3.67	1.15	3	High
Appropriateness of the font size presented	5.00	0.00	1	Highest
Appropriateness of the font style used	5.00	0.00	1	Highest
Overall appropriateness of color usage	3.67	1.15	3	High
Appropriateness of instructions for using the program	3.67	1.15	3	High
Appropriateness of interactions within the program	4.67	0.58	2	Highest
Overview of usability testing	4.14	0.52		High
Overall summary of all aspects	4.23	0.40		High

From Table 1, it was found that experts evaluated the suitability of content and multimedia for developing the basic Thai consonant writing skill training program for autistic children using visual perception strategies. The overall rating was at a high level ($M = 4.23$, $S.D. = 0.40$). When considering each aspect:

Performance efficiency was rated overall as high ($M = 4.00$, $S.D. = 0.29$), with the highest mean score for the lesson's ability in the application stage ($M = 5.00$, $S.D. = 0.00$).

Program functionality testing was rated overall as high ($M = 4.33$, $S.D. = 0.32$), with the highest mean scores for program operation speed and accuracy ($M = 5.00$ and 5.00 , respectively).

The content was rated overall as high ($M = 4.50$, $SD = 0.29$), with the highest mean score for content accuracy ($M = 5.00$, $SD = 0.00$).

Usability testing was rated overall as high ($M = 4.14$, $S.D. = 0.52$), with the highest mean score for the appropriateness of font style usage ($M = 5.00$, $S.D. = 0.00$).

Discussions

This research involved the process of developing a basic Thai consonant writing skill training program for autistic children using visual perception strategies. The study was conducted according to the designed plan, aligned with the objectives, as follows:

1. The basic Thai consonant writing skill training program for autistic children using visual perception strategies is considered an effective tool to promote the learning development of this group of children. This aligns with the findings of Sripanchat C. (2023), who found that learning through visual perception is an appropriate learning medium for autistic children because it can significantly help modify thinking processes and stimulate concept formation in their brains. Additionally, Treesoon, A., & Janthagarngul, W. (2022) highlighted the importance of using media that helps students become interested



in learning by employing visual learning strategies. These emphasize the use of symbols, pictures, and vocabulary, practicing pronunciation, memorizing words, speaking in sentences, and then writing vocabulary, phrases, and sentences, with the sequence chosen from what students like to things close to them. Positive reinforcement is also applied, along with creating an environment with minimal distractions. Visual perception and mental imagery play a crucial role in linking prior experiences, making learning more effective.

2. The evaluation of the content suitability and multimedia components of the basic Thai consonant writing skill training program for autistic children using visual perception strategies showed that the overall assessment by experts was at a high level. This is because the program's design and development thoroughly considered the learning challenges of autistic children by applying task analysis principles to break down the skills to be trained before developing a program tailored to the target group. The program development process was systematic and meticulous at every step, with continuous feedback from experts used to improve and enhance its effectiveness. These results align with the research of Rattanathirawan P., et al. (2022), which states that media or programs developed through a systematic analysis process can significantly promote the learning development of autistic children, especially when the media supports practical training and is not overly complex for the children. Additionally, this corresponds with the concept of Apicella F., et al. (2020), which emphasizes that the strengths of autistic children lie in perceiving and learning from concrete visual information. Therefore, the use of clear visual images or components is essential in media or programs designed for this group, as it helps children understand the relationships between images and effectively link them to the learning process.

Recommendations

1. Agencies responsible for caring for autistic children or teachers can use this developed Thai consonant writing skill training program as a supplementary tool in teaching and learning to effectively promote the writing development of autistic children.

2. Parents and caregivers of autistic children should use the writing skill training program consistently, as this will help ensure sustainable learning that aligns with the children's real-life contexts.

Recommendations for Applying the Research Findings

1. The basic Thai consonant writing skills training program for children with autism, using visual perception strategies, should be applied in teaching activities for children with autism to systematically enhance their writing skills. This is because the program has been designed to suit the learning characteristics of children with autism, who focus on perceiving visual and concrete stimuli.

2. Parents or caregivers of children with autism can use the program for practice activities at home to create continuity in learning and to promote collaborative development between school and family, which will help build the child's confidence and enable effective development of writing skills.

3. The research indicates that designing media using visual perception enhances learning for children with autism. Therefore, this approach should be applied in developing other related programs or media, such as life skills training, social skills, or preparation for higher-level learning.

Suggestions for Future Research

1. It is recommended to add interactive functions or immediate feedback systems to stimulate motivation and enhance more personalized learning.

2. Future research could expand the sample group to cover a wider range of ages, genders, and levels of impairment to assess the program's suitability in diverse contexts.

3. A comparative study on the effectiveness of this program versus other training methods should be conducted to demonstrate the differences and advantages of using visual perception techniques.

4. A longitudinal study is suggested to examine whether the program can sustainably promote the writing development of children with autism over time.

References

Apicella, F., Costanzo, V., & Purpura, G. (2020). Are early visual behavior impairments involved in the onset of autism spectrum disorders? *European Journal of Pediatrics*, 179, 225–234.
<https://doi.org/10.1007/s00431-019-03562-x>



- Beery, K. E., Buktenica, N. A., & Beery, N. A. (2011). *Developmental test of visual-motor integration. Encyclopedia of Child Behavior and Development*. https://doi.org/10.1007/978-0-387-79061-9_834
- Bondy, A. S., & Frost, L. A. (2003). *A Picture's Worth: PECS and Other Visual Communication Strategies in Autism*. Bethesda, MD: Woodbine House.
- Chaisuwan, A. (2021). The creation of animation for developing into a 2D animation cartoon series "The Wonderful Fruits". *Journal of Research and Innovation in Science and Technology*, 2(3), 14–24.
- Dobroskok, I., Rzhavska, N., Ayyıldız, H., Zaimova, D., & Zheliazkov, G. (2020). Game development software tools in higher educational institutions: Experience of Ukraine, Turkey, and Bulgaria. *Inf tehnol i zasobi navčannâ*, 78(4), 90–104. <http://dx.doi.org/10.33407/itlt.v78i4.3370>
- Jeekratok, K. (2021). *Development and production of electronic instructional media*. Udon Thani: Udon Thani Rajabhat University.
- Kamcharoen, P., & Phonnikornkij, W. (2020). The study of digital media usage behavior and digital literacy skills of early elementary school students. *Journal of Social Communication Innovation*, 8(1), 54–65.
- Manomai-Udom, S. (2020). The Development of Thai Consonant Writing Ability for Mildly Intellectually Disabled Primary School Students Using Tracing Books with the Fernald Method. (Master's thesis). Srinakharinwirot University.
- Mathipikhai, P., Prairo, P., & Kasangam, Y. (2021). Evaluation of the early childhood education curriculum for children with special needs at the Special Education Center, Udon Thani Province, B.E. 2564 (2021). Udon Thani: Special Education Center, Udon Thani Province.
- Office of the Education Council. (2017). *National Education Plan B.E. 2560–2579 (2017–2036)*. Bangkok: Office of the Education Council.
- Phyathai Hospital. (2020). Writing and child brain development. Retrieved from <https://www.phyathai.com/>
- Rattanathirawan, P., Chaladpaet, C., & Peerakajorn, C. (2022). Magic media for special children: An evaluation report on the use of storytelling by parents and early childhood teachers for the development of children with autism. *Rajanukul Journal*, 34(2), 59–68. <https://he03.tci-thaijo.org/index.php/RJJ/article/view/1028>
- Siengdee, K., & Bunjantuek, A. (2023). Learning experience providing using multisensory music activities to develop early childhood learning achievements. *Journal of Nisitwang*, 25(2), 75–80. <https://so06.tci-thaijo.org/index.php/jonw/article/view/265131>
- Sripanchat, C. (2023). The teeth brushing practices with the storybook pictures for the students with autism. *Journals Northeastern University*, 14(1), 286–294. <https://so04.tci-thaijo.org/index.php/neuarj/article/view/267861>
- Sripanchat, C., et al. (2021). Curriculum for developing self-help skills in daily routines for kindergarten students with autism spectrum disorder. Khon Kaen: Autism Research and Service Institute, Khon Kaen University.
- Suwetwethi, D. (2019). *Kid-hen-pen-phap hai kan wat phap sang kan rien ru [Visual Thinking: How Drawing Creates Learning]*. Bangkok: Thai Health Promotion Foundation (ThaiHealth).
- Treesoon, A., & Jantagarn, W. (2022). The Development Of Interpretive Writing For Students With Autism Spectrum Disorder Using A Love-Writing Learning Kit. *Journal of Research and Development in Special Education Faculty of Education*, 11(2), 66–75.
- Treesoon, T., & Sanrattana, U. (2019). Using Tablets To Develop Oral Communication Of Students With Autism In Collaboration Of Teachers And Parents. *Journal of Research and Development in Special Education*, 8(2), 11–23.
- Wansed, S. (2009). *Development of autistic individuals' potential using visual-based learning support materials*. Khon Kaen: Khlang Nana Wittaya Publishing.
- Watcharapongkasem, W., Somsamer, A., & Chadarattanathiti, P. (2024). Development of software to model particle dynamics within the Construct 2 game engine for educational purposes in senior high school. *Animation Game Digital Media and Technology Journal*, 1(2), 71–87. <https://li02.tci-thaijo.org/index.php/animationGDTJ/article/view/933>
- West, K. L. (2019). Infant motor development in autism spectrum disorder: A synthesis and meta-analysis. *Child Development*, 90(6), 2053–2070. <https://doi.org/10.1111/cdev.13086>