CHAPTER 3

Methodology

Chapter 3 focuses on the method of the study such as study design, sample size calculation, inclusion-exclusion criteria, instrument, data collection, and data analysis along with the study are presented for the three main phases of this study.

3.1 Scope of the research

This research focused on occupational therapy assessment and intervention for Thai children with learning disabilities. The occupational therapy assessment procedures studies in this research targeted information processing that were identified by Stage One and Stage Two of the PRPP System of Task Analysis: Thai Version. While the occupational therapy intervention procedures focused on Stage Two of the PRPP System of Task Analysis: Thai Version which is a cognitive task analysis.

3.2 Plan and research methodology

This research focused on assessment and intervention of information processing or cognitive strategies deficits in Thai children with learning disabilities. The research also studied the relationship between information processing strategy application and social competence in this children group. To fulfill the research questions, the research was divided into three phases. The detail of research questions, research design, population and sample, instruments, research location, data collection procedure, and data analysis method of each study phase is stated as below.

3.3 Phase One : Exploratory study of information processing strategy application on Academic and Play activities identified by the PRPP System: Thai Version in Thai children with learning disabilities

3.3.1 Research questions

1) What levels of task mastery do Thai children with learning disabilities demonstrate while performing activities of Academic and Play activities as measured by Stage One Analysis of the PRPP System: Thai Version?

2) What are information processing strategy application errors found during the performance of Academic and Play activities in Thai children with learning disabilities as identified by Stage Two Analysis of the PRPP System: Thai Version?

3.3.2 Research design

The research design of this study was a non-experimental, exploratory study which examined the errors of information processing strategies application found in the sample of Thai children with learning disabilities.

3.3.3 Population

The population in this study phase was Thai children with learning disabilities who lived in Chiang Mai province. All of these had received occupational therapy services in the Rajanagarindra Institute of Child Development, Chiang Mai province. They were studying in Chiang Mai province.

3.3.4 Sample

Thirty children, male and female, diagnosed with LD were recruited by purposive sampling method. The age of participants at the commencement

of the study was 9 years or above. All of these were studying in the order of grade level from Prathom 4 to Prathom 6. The inclusion criteria were;

1) Children could communicate without visual, hearing, and speaking impairments. These impairments could be traced back on the client's personal clinical profile.

2) Their parent had to agree to sign an informed consent to participate in study, exclusion criteria was the participants that could not complete the assessment.

3.3.5 Instruments

The instrument used in this study was the PRPP System: Thai Version (Munkhetvit, 2005). It is divided into Stage One Analysis and Stage Two Analysis (Chapparo & Ranka, 2005) (for detail of the PRPP System, refer to Chapter 2; section 2.2.6-2.2.7)

3.3.6 Data collection procedures

1) The proposal was sent to the Ethics Committee of the Faculty of Associated Medical Sciences, Chiang Mai University for approval.

2) The researcher asked for permission from Director of the Rajanagarindra Institute of Child Development, Chiang Mai province. The aim for permission was to access the lists of name and school of children with LD who accessed service. The list of schools in this study was presented in Appendix C

3) After that the researcher asked for permission from Directors of each school and contacted teachers who work with special need children.

4) Thirty children with learning disabilities were recruited according to the criteria in section 3.3.4. Their parents had to agree to sign an informed consent.

5) All participants were asked to perform four assessment activities including Academic activities; reading comprehension and written expression and Play activities; cognitive game, movement activity, competitive play.

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6) The criteria for specifying activities to detect information processing strategy application were based on the PRPP System of Task Analysis (Chapparo & Ranka, 2005). The assessment activities should be considered as important and meaningful for the children's daily life. The children must be familiar with the material and equipment used in the activities, or have participated in the activities before. Lastly, the activities are able to be divided into task steps, and must be diverse based on the abilities and limitations of the children. However the target group may have different skills, therefore, some activities are different for some people but they can be quite easy for others. As a result the activity ordering will be specified case by case.

Moreover the assessment activities selected for data collection were based on the performance areas of the Occupational Therapy Practice Framework: Domain and Process (3rd Edition) in school aged children (AOTA, 2014), those of activities of Education and Play areas and were informed by cognition information processing theory development. Task expectation was generally based on the required performance for each order of grade level. The concept of justification for the assessment activities is explained in Figure 3.1.

7) The researcher had a list of activity assessments and these activities were chosen by participants according to their interests.

8) The performance was videotaped during the assessment process by the researcher and research assistant who was an occupational therapist.

9) The researcher systematically observed video footages of performance, and gave scores according to the PRPP System: Thai Version in the Stage One and Stage Two Analysis.

Stage One scores, expressed as percentages, provided data on the levels of mastery against teacher expectations of mastery for each task attempted. Scores were based on error versus error free performance and scored in the areas of accuracy, repetition, omission and timing. A score of 100 % was set as the criterion score for each task which was

within the capability of typically developing children. Criterion performance in Stage One of the PRPP System was measured against what was expected of the individual within a set environment (Chapparo & Ranka, 2003). Individual tasks for each stage of data collection were broken down into operationally defined steps, or steps that were expected for successful task completion. A percentage score was calculated for each separate task as well as a total percentage score across all tasks completed during each data set.

The Stage Two analysis provided a total PRPP score comprised of Quadrant, Subquadrant scores and individual *Descriptor* scores. The total PRPP System score and the Quadrant scores, Perceive, Recall, Plan and Perform, were used for analysis in this study as they reflected the broader areas of information processing strategy application that were the focus of this study. The total PRPP System Quadrant, Subquadrant, and individual *Descriptor* scores were all converted to total percentages so that analysis and comparisons could be achieved.
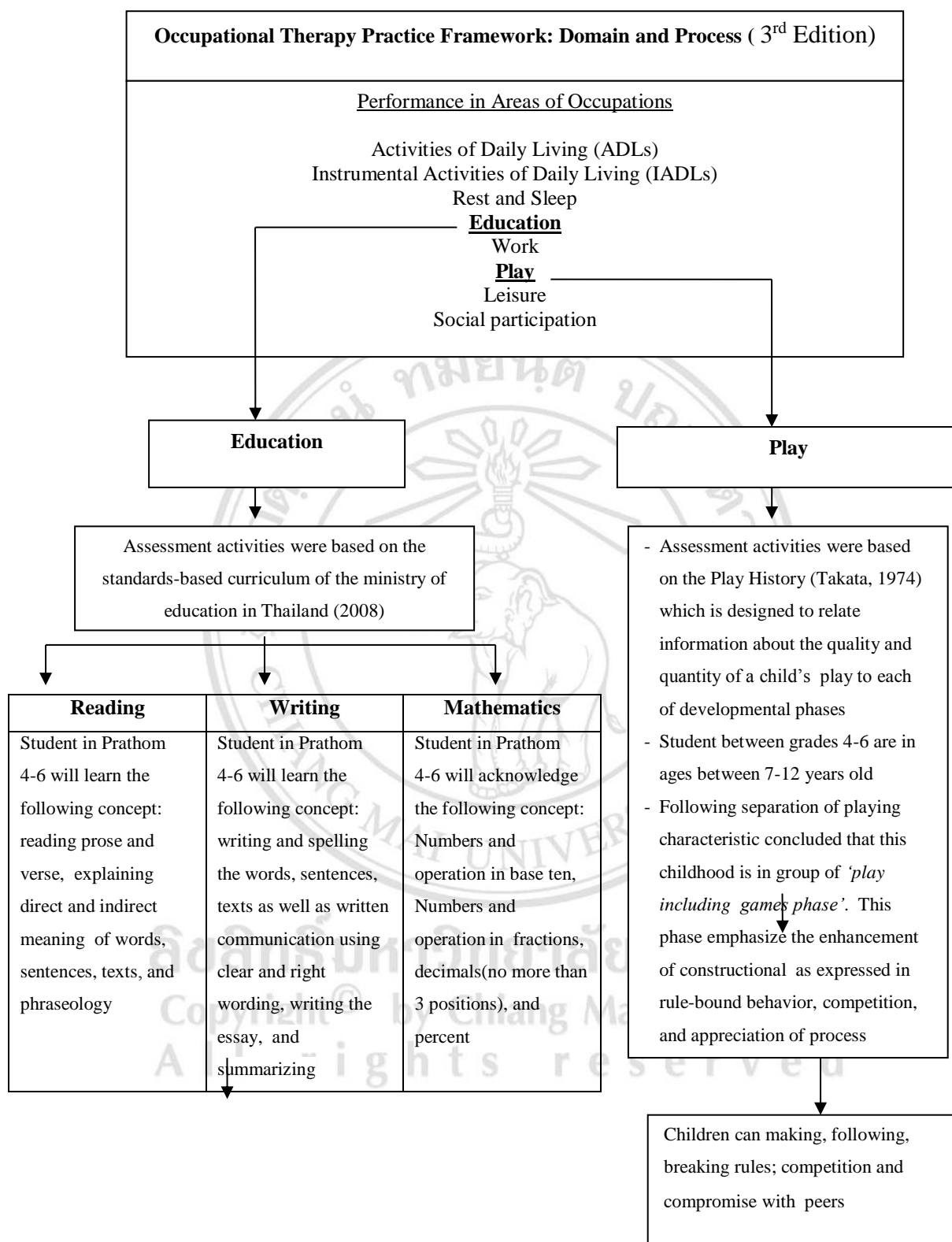
Occupational Therapy Practice Framework: Domain and Process (3rd Edition)

Performance in Areas of Occupations

Activities of Daily Living (ADLs)
Instrumental Activities of Daily Living (IADLs)
Rest and Sleep
Education
Work
Play
Leisure
Social participation

Education

Play

Assessment activities were based on the standards-based curriculum of the ministry of education in Thailand (2008)

- Assessment activities were based on the Play History (Takata, 1974) which is designed to relate information about the quality and quantity of a child's play to each of developmental phases
- Student between grades 4-6 are in ages between 7-12 years old
- Following separation of playing characteristic concluded that this childhood is in group of *'play including games phase'*. This phase emphasize the enhancement of constructional as expressed in rule-bound behavior, competition, and appreciation of process

Reading	**Writing**	**Mathematics**
Student in Prathom 4-6 will learn the following concept: reading prose and verse, explaining direct and indirect meaning of words, sentences, texts, and phraseology	Student in Prathom 4-6 will learn the following concept: writing and spelling the words, sentences, texts as well as written communication using clear and right wording, writing the essay, and summarizing	Student in Prathom 4-6 will acknowledge the following concept: Numbers and operation in base ten, Numbers and operation in fractions, decimals(no more than 3 positions), and percent

Children can making, following, breaking rules; competition and compromise with peers

Figure 3.1 The concept of justification for the assessment activities

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Table 3.1 List of the assessment activities

Performance area	Type of LD	Assessment activities		
		Prathom 4	**Prathom 5**	**Prathom 6**
Academic	LD in reading	- reading prose and verse - explaining meaning of words, sentences, texts, and phraseology - reading the stories and the answer questions in time	- reading prose and verse - explaining meaning of words, sentences, and texts which are the narrative and descriptive - reading the stories and the answer questions in time	- reading prose and verse - explaining meaning of words, sentences, and texts which are the phraseology - reading the stories and the answer questions in time
	LD in writing	- copying sentences - making the complete sentences - writing the sentences by dictation	- copying sentences - making the complete sentences - summarizing the stories	- copying sentences - making the complete sentences - writing essay
	LD in mathematic	- comparing and sequencing fractions and decimals (1 position) - plus, minus, multiply and divide the numbers in base ten - converting fractions, decimals and percents	- comparing and sequencing fractions and decimals (2 positions) - plus, minus, multiply and divide the decimals (2 positions) - converting fractions, decimals and percents	- comparing and sequencing fractions and decimals (3 positions) - plus, minus, multiply and divide the decimals (3 positions) - converting fractions, decimals and percents

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Table 3.1 List of the assessment activities (cont'd)

Performance area	Type of LD	Assessment activities	
		Type of games	List of games
Play	All type of LD	cognitive games	- Puzzle - Jigsaw - Maze
		movement activities	- Searching the treasures on the map - Bouncing the ball with two hand in a zigzag manner and throw the ball into the basket
		competitive plays	- Domino - Bingo - Stacking

3.3.7 Data analysis

The scores obtained from Stage One Analysis of the PRPP System: Thai Version were analyzed using descriptive statistics to identify the means, standard deviations and percentiles for performance mastery and cognitive errors. While the scores obtained from Stage Two Analysis of the PRPP System: Thai Version were analyzed using descriptive statistics. The mean Quadrant, Subquadrant, and individual *Descriptor* scores were computed by using descriptive statistics to identify group means, standard deviations and percentage scores.

3.4   Phase Two: Relationship between information processing strategy during the Academic activity and social   competence ability in Thai children with learning disabilities

The second phase of this study was the study of relationship between information processing strategy and social   competence ability in Thai children with learning disabilities which included two main processes.   The first process was to study of psychometric property of the Social Competence Scale (SCS): Thai Version.   In this process, the original version of the SCS was translated from English into Thai using the back translations method. After that, the SCS: Thai Version was evaluated for intra-rater reliability.   The second process was to study the relationship between information processing strategy and social competence.

3.4.1 Study of psychometric property of the Social Competence Scale (SCS): Thai Version

1)   Translation of the SCS to Thai Version

The SCS both Parent and Teacher Version were translated from English into Thai. The aim of this process was to achieve different language versions of the English instrument that were conceptually equivalent in each of the target cultures. The instrument should be equally natural and acceptable and should practically perform in the same way. As a result, the researcher used the back translations method that had been described by the World Health Organization (WHO) with the following steps (WHO, 2011).

1.1)   The researcher asked permission for translation from the Fast Track Project Technical Report of Pennsylvania State University, USA, the SCS developer.

1.2)   The original version of the SCS was translated from English into Thai using forward-translations procedure. This process used two translators. Both of them were the lecturer in department of Occupational Therapy.   They were specialized in English

language and experienced in the clinical practice. One of them was specialized in pediatric field (Listed in Appendix D).

1.3) The SCS was translated back to English by two independent translators. One was the lecturer in department of Occupational Therapy. The other was a Thai salary man working in Las Vegas, United States of America (Listed in Appendix D).

1.4) The SCS: Thai version was trialed on the parents and teachers of five children from the population in section 3.3.3.

1.5) In order to accomplish the final version of the SCS in the Thai language, the researcher summarized problems that found during pre-testing and modify this assessment.

2) Intra-rater reliability study of SCS: Thai Version

2.1) Sample

Ten children with LD from the population in section 3.3.3 were recruited by purposive sampling method. Their ten parents and ten teachers were chosen to establish intra-rater reliability of the SCS: Thai Version in this study because of their ability and opportunity to observe the participants in social tasks over a prolonged period of time, and across multiple social situations within daily life (Wight & Chapparo, 2008)

2.2) Instrument

The SCS: Thai Version was used in this study. This assessment includes two versions. The first one is for the teacher, consisting of 25 questions that fall into three components, including, 1) Prosocial and Communication Skills, 2) Emotion Regulation Skills and 3) Academic Behavior Skills. The second test is for the parent, consisting of 12 questions that fall into two components, including, 1) Prosocial and Communication Skills, 2) Emotion Regulation Skills. The five-point Likert scale is

applied to a scoring test such that 0 = not at all, 1 = a little, 2 = moderately well, 3 = well, and 4 = very well

2.3) Data collection procedures

Ten parents and ten teachers from school in the lists (mention in section 3.3.6) were recruited to complete the questionnaires of the SCS: Thai Version twice with a 2 week interval in order to establish intra-rater reliability of the SCS: Thai Version.

2.4) Data analysis

The data was analyzed using Spearman's Rank correlation coefficient to determine the degree of reliability.

3.4.2 Relationship between information processing strategy during the Academic activity and social competence

1) Research question

"Does information processing strategy during the Academic activity as assessed by the PRPP System: Thai Version relate to the social competence as assessed by the SCS: Thai Version?"

2) Research design

This study phase was a correlation research that aimed to identify the relationship between information processing strategy during the Academic activity and social competence using the PRPP System: Thai Version and the SCS: Thai Version.

3) Sample

Thirty children with learning disabilities (n=30) and their teachers (n=21) were recruited by purposive sampling method to the study. Inclusion and exclusion criteria were the same as mentioned in Phase One

4) **Instruments**

The research instruments used in this study phase were the PRPP System: Thai Version (refer to section 2.2.6-2.2.7) and the SCS: Thai Version (refer to section 2.3.5). Although the SCS has two versions, this research focused on the perspective of teachers and used only the teacher version.

5) **Data collection procedures**

5.1) Thirty children with learning disabilities from Phase One study (n=30) and their teachers (n=21) were recruited to the study.

5.2) All of the samples agreed to sign an informed consent to participate in the study.

5.3) The PRPP System: Thai Version Stage Two Analysis was administered to all children and the researcher observed while performing the Academic activity (reading comprehension and written expression) as described in section 3.3.6. The performances of the participants were videotaped during assessment.

5.4) The videotaped performances were assessed by the researcher. The PRPP Stage Two Analysis scores (3-2-1) was entered for each of thirty four descriptors for each task assessed for each children.

5.5) All teachers completed a full assessment of the SCS: Thai Version.

6) **Data analysis**

Pearson product-moment correlations was used to determine the relationship between the information processing strategies as measured by the PRPP System: Thai Version and the social competence as measured by the SCS: Thai Version.

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3.5 Phase Three: The effect of the combination of the PRPP of intervention and the 4QM of facilitated learning on information processing strategies application during the Academic activity in Thai children with learning disabilities

3.5.1 Research question

"How effective is the combination of the PRPP of intervention and the 4QM of facilitated learning program on improving application of information processing strategies during the Academic activity in Thai children with learning disabilities?"

3.5.2 Research design

This study phase employed a two-grouped, random selection, pre-post test experimental design with the random assignment to the experimental group (n=10) or the control group (n=10).

3.5.3 Sample

Twenty children with LD were recruited based on the population in Phase One and were randomly allocated to the experimental group (n=10) or the control group (n=10). The assessor was blinded to group assignment.

3.5.4 Instrument

1) The PRPP System: Thai Version was used as the outcome measurement.

2) The PRPP of intervention and the 4QM of facilitated learning program were used as the intervention program in this study.

As for the PRPP of intervention, it broadens the traditional focus of programmed learning and behavioral task analysis by augmenting information processing strategies upon the cognitive process being employed while learning. Intervention sessions specifically targeted application of information processing strategies using graded prompts, progressing from content free meta-prompts to more specific content based behavioral prompts. Patients learnt to apply *Stopping, Sensing, Thinking,* and *Doing* strategies to their performance across various

occupational tasks.   The PRPP Core intervention strategies are explained in Table 3.2.

In case of the 4 QM of facilitated learning program, the therapist work backward from Quadrant 4 to Quadrant 1 to determine where to begin the intervention. For example, with a child learning to play Bingo and he/she is challenged by searching and discriminating sensory aspects of objects (Descriptors of Perceive Quadrant in PRPP System). Firstly the child try to do it by himself/herself (Quadrant4). The therapist might ask, 'What could he/she do to remind himself/herself if she forgets the sequence of game?' (Quadrant 3). Next, the therapist might ask, 'What would he/she do if he/she was internalizing her self-prompting strategies?' (Fading strategy). After that, the therapist might ask, 'What could I say if he/she forgets him/her prompts?' (Orienting strategy). Subsequently, the therapist might ask, 'What will I do to help the child to decide what to do if the child doesn't use self-prompting?' (Quadrant 1). Finally, the therapist might ask, 'What could I do if he/she is reluctant to attempt to task without direct prompting?' (Leading strategies)

To understand how the PRPP of intervention together with the 4QM was implemented in this study, the example of using this program is showed in Table 3.3.

Table 3.2 PRPP Core Intervention Strategies (Chapparo & Ranka, 2007)

Strategy	Definition
Intervention goal is task mastery	- Expected outcome is improved functional performance in everyday tasks required by the person's occupational roles and context. - Intervention success is measured by increased functional performance.
Application of evidence based principle of systematic instruction	- Goal of intervention is clear to client. - Least to most prompt hierarchy is used. - Multiple opportunities for practice of the task and target cognitive strategy are offered and performance errors are prevented. - Learning occurs across natural contexts to promote generalization. - Feedback is specific to task mastery and the cognitive strategy that is the target of intervention.
Cognitive strategies are behaviorally defined and measurable	- Strategies required for task performance are identified using the PRPP System of Task Analysis and their effectiveness measured before and throughout intervention.
'Chunking' of strategies across all PRPP Quadrants is planned	- Starting with *'Stop'*, one or two strategies are targeted from each processing quadrant for *'Sense'*(Perceive Quadrant), *'Think'* (Recall and Plan Quadrants), and *'Do'* (Perform Quadrant). - Single descriptors are not used. - A line of processing required for the task mirror the definition of arrows in the centre of the PRPP System of Task Analysis.
Focus of intervention is on application of cognitive strategies (descriptors) to real-world performance	- The descriptor behaviors form the verbal, physical or visual prompts given during performance. - The therapist acts as a cognitive mediator. - The patient is taught to self-instruct in the strategies.

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Table 3.3 The example of using the combination of the PRPP of intervention and the 4QM approach for Academic activity (reading comprehension and written expression)

Strategies of PRPP Intervention	Strategies of 4QM	Target Quadrant of PRPP	Target Descriptor of PRPP
Stop/Attend	-Feedback (Quadrant 2) "Uh-oh, I think there's problem" "Look at the worksheet"	Perceive	Modulate Maintains
Sense	-Verbal self-instruction (Quadrant 3) Child talks aloud while preparing to fill out appropriate words in the blank to complete the sentence "That doesn't seem right. What went wrong there? What else could you fill out? Maybe another words"	Perceive	Matches
Think	-Lower order questions (Quadrant 1) "What did you do last time?" "What do you do next?" - Higher order questions (Quadrant 2) "What might be the problem here?" "Why did that happen?" "How could you do it correctly?"	Recall Plan	Recall Steps Analyses Judges
Do	-Feedback (Quadrant 2) "Keep going until complete"	Perform	Flow Continue

3.5.5 Data collection procedures

1) After informed consent was obtained from participant's parents, all participants performed the Academic activities (reading comprehension and written expression) Each child was asked to read the passages which were designed for students among fourth- to sixth - grade reading level. Then the child filled in the appropriate words in the blank to complete the sentences and article. Finally, the child was asked to answer the questions that followed. The criteria for specifying these activities were based on the PRPP System of Task Analysis (Chapparo & Ranka, 2005). The reading comprehension and written expression tasks were selected in the assessment process as they were considered important and meaningful for the participants' roles as students.

2) The occupational therapist who was a blind assessor gave the scores to the participants using the PRPP System: Thai Version. This occupational therapist was trained to use the PRPP System: Thai Version. Scores obtained from this stage were pre-test scores.

3) After that, all participants were randomly assigned to the experimental group (n=10) or the control group (n=10). Participants in the intervention group (n=10) received the intervention twice a week for 6 weeks. Each treatment sessions took approximately 50 minutes. The control group received conventional intervention from occupational therapists in the Rajanagarindra Institute of Child Development, Chiang Mai province, Thailand only. The conventional intervention included visual perception training program, sensory integration program or other cognitive training programs and took less than two sessions per week.

4) After the intervention period was over, all participants in both groups were re-assessed using the PRPP System: Thai Version by the same assessor. Scores obtained from this stage were post-test scores.

3.5.6 Data analysis

1) The pre-test and post-test scores obtained from Stage Two Analysis of the PRPP System: Thai Version were computed to compare disparity between the intervention and the control group using the Mann-Whitney U Test. The significant level will set at .05.

2) The pre-test and post-test scores obtained from Stage Two Analysis of the PRPP System: Thai Version were computed to compare disparity within group using the Wilcoxon Signed-Ranks Test. The significant level will set at .05.

3) Effect sizes (ES) for mean differences were calculated by calculating for non-parametric tests (Woodrow, 2014):

Mann-Whitney:

r = Z/square root of N where N = total number of cases will have Z values reported

Wilcoxon signed-ranks test:

r= Z/square root of N where N=number of observations of two times points

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PHASE I	PHASE II	PHASE III

PHASE I

30 children with LD were recruited criteria (n=30) & their parents had to agree to sign an informed consent

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All participants were asked to perform 4 assessment activities including: Academic activity, cognitive game, movement activity, and competitive play

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The performance was videotaped during the assessment process

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Researcher systematically observed video footages of performance, and gave scores according to *the PRPP System: Thai Version in the Stage One and Stage Two Analysis*

PHASE II

Translation of SCS to Thai Version

↓

Intra-rater reliability study of SCS: Thai Version

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30 children with LD from Phase I (n=30) and their teachers (n=21) were recruited criteria

↓

All teachers completed a full assessment of *the SCS: Thai Version*

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Pearson product-moment correlation was used to determine the relationship between *the PRPP System: Thai Version (Only Stage Two) & SCS: Thai Version (Only Teacher Version)*

PHASE III

20 children with LD from Phase I (n=20) were recruited criteria

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Pre-test by using PRPP System: Thai Version

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Control Group (n=10)	Experimental Group (n=10)

↓

receive PRPP of intervention & 4QM for 6 weeks

↓

Post-test by using PRPP System: Thai Version

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Mann-Whitney U Test was used to compare disparity *Between Group*

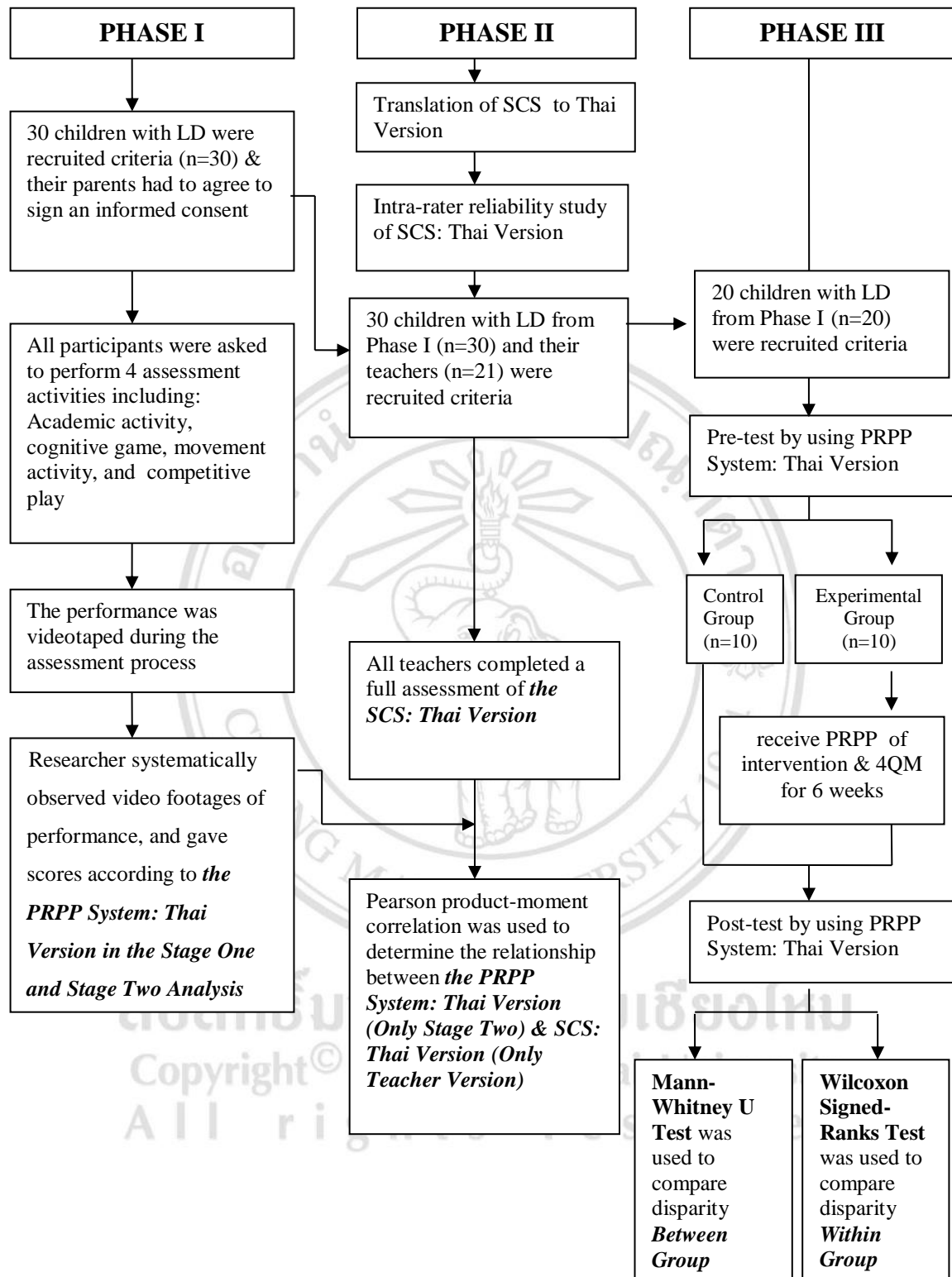**Wilcoxon Signed-Ranks Test** was used to compare disparity *Within Group*

Figure 3.2 Summary of research methodology of each phase