

The effect of Computer-Assisted Instruction on developing attitudes of fourth graders towards persons with visual impairment

Supanath Atavutpakorn

Student

Ratchasuda Collage, Mahidol University

Putthamonthon 4, Salaya, Nakhon Pathom, THAILAND

sublime_sage@hotmail.com

www.rs.mahidol.ac.th

ABSTRACT

The purposes of this research were: 1) to compare attitudes of fourth graders towards persons with visual impairment before and after using Computer-Assisted Instruction (CAI), 2) to compare attitudes of fourth graders towards persons with visual impairment between using CAI and conventional teaching method (knowledge sheet), and 3) to study and compare retention of the attitudes of fourth graders towards persons with visual impairment between using CAI and conventional teaching method. The research methodology was quasi-experimental design. The participants were 77 fourth graders from a school in Bangkok Area Office. The samples were purposive sampled and comprised of two groups: an experimental group (39 students) and a controlled group (38 students). The experimental group participated in one hour per week of CAI for 2 weeks. The research findings were: 1) There were no significant differences in the pre-test and post-test of the experimental group. 2) There were no significant differences in the post-test of the experimental group and the controlled group and, 3) There were significant differences of the retention of attitudes towards visual impairment of the experimental group and the controlled group.

Keywords: Computer-Assisted Instruction, Attitude, Persons with visual impairment

1. INTRODUCTION

The lack of positive attitude towards persons with disability is one of the barriers to independent living in person with disability life. Attitudes affect persons with disability, making it difficult for them to participate in community and live independently. Attitude is feeling, belief and trend to behave consistency towards persons with disability from society (Waranusantinukul, 2003) Conversely, positive attitude is formed by correct comprehension of people with disability. Therefore, there is the need to develop knowledge and comprehension about persons with disability to enable society to form positive attitude towards disability (Jitrawanichkul, 1999).

Inclusive education is the education for all, including all types of person in order to learn together. It starts from registration and provides special services depending on individual needs (Chonthanon, 2001). At present, Thailand has tended to make inclusive education daily practice in schools. The Department of Empowerment of person with disability's report about persons with disability situation in Thailand, dated September 15th, 2017 (The Ministry of Social Development and Human Security, 2017)) found that visual impairment is the disability that was ranked 3 out of from 8 disability types (10.35% from all). The first rank is a physical disability, the second is hearing impairment. It means that students have more chance to meet students with visual impairment in school.

Positive attitude towards disability in students help them to behave towards persons with disability in a better way (Sherill, 2004). Interaction makes acceptance altogether then, a person with the disability can live with people in society, has a chance to develop academic and social development and have well-being life and quality of life (Cook & Semmel, 1999 Cutts & Sigafoos, 2001). Conversely, negative attitude toward disability among students make inclusive difficult to accomplish its goals (Christensen, 1996; Rousso, 2003 and Yaker, 1988). Attitudes create barrier for developing a person with disability and for making an inclusive society so an activity that develops positive attitude towards disability is very essential. (McGregor, 2003)

In the present, Thailand focuses on developing positive attitude towards persons with disability. Government department that is associated with this agenda is the Ministry of Social Development and Human Security and Ministry of Education. These two departments inform to work on attitude towards disability below.

The Ministry of Social Development and Human Security (2011) focus on developing attitudes towards disability in a Plan for improving the quality of Person with disability's life (issue 4: 2012–2016). The fifth strategy is to improve positive attitude towards disability and person with disability as indicated below.

“1) to improve knowledge comprehension and consciousness about humanity, ability, independent living, right and duty of persons with disability.

2) to improve and promote associated department to provide activity on developing a positive attitude toward disability, persons with disability, helper, and family of person with disability.

3) to improve the social activity types in every aspect to promote the ability of person with disability.

4) to improve the types and the methods in order to change paradigm about persons with disability from charity-based society to right-based society for the person with disability.

5) to add the knowledge about disability and persons with disability in an all-level and all-system curriculum.

6) to establish and promote social communication department in order to communicate about persons with disability publicly and effectively.”

The fifth goal of core curriculum year 2008 by the Ministry of Education (2008) informs that they emphasized students having consciousness for Thai culture and wisdom conservation, environmental conservation, public mind for making benefits and good things in society and living happiness. According to this goal, the part that is associated with developing an attitude towards disability and persons with disability was showed in the indicator p2/3 that “behave to accept differences on ideas beliefs, and other acts without bias.”

Santrock (2002) informed that 7-year to 11-year-old children have an ability to form attitude by Concrete Operational Thought Stage. The pivot is the ability to view in other people. This study focused on the fourth graders. (the level for 10-year to 12-year old student). These students were ready to study about disability and persons with disability and according to Conan & Budoff (1983), They informed that visual, hearing and physical impairments are easier to comprehend than other disabilities. This study only focused on visual impairment.

Lindsay and Edwards (2013) synthesized many pieces of research about developing the attitude towards disability in school, they summarized that there are many activities to improve attitude towards person with disability such as giving information about disability, videos, dramas, movies, puppet show, discussion, storytelling, simulations, structured interaction, and activity in school. In my opinion, there are limitations on some activities above. These activities are hard to be publicized because they need to have a teacher or an expert who expertise on disability in order to

apply these activities. This study focused on Computer-Assisted instruction (CAI) to develop the attitude towards person with disability as the reasons below.

Computer-Assisted Instruction (CAI) is a computer program that makes student learned (Sanchaiphrom, 2010). Students can study the content and interact with learning activities via media (Laohacharatsaeng, 1998) and various interactions (Sanguankaew, 1991). All contents and interactions are well-organized (Puworrawan, 1991) and are presented in the appropriated way for individuals (Calderone, 1994) in order to achieve the planned objectives (Sanchaiphrom, 2010).

CAI is a media that is different from other media on developing attitude towards person with disability. Students can learn by themselves. It gains attention from programming techniques, reinforcement system, and multimedia presentations. Moreover, there is not dangerous like a real-life situation. It is adjustable on contents, ways and speed control in learning. This media is appropriate among differences in class. It saves simulation-tool cost. It can be easier to learn because the producer can cut off the complex details. And the last is this media can be publicized easily and no expert required in use. This media is well-designed and well-organized. (Khakhunthod, 2008) In addition, many pieces of research found that CAI can develop the attitude. (Bilbai, 2014, Lasoff, 1981, and Ward, 1986) but there is no CAI for developing an attitude towards disability in Thailand.

As aforementioned above, Because of the benefits of CAI, the essentials of developing an attitude towards persons with visual impairment and the lacking of CAI that improve attitude towards disability, This study focused on the effects on developing attitude towards persons with visual impairment in the fourth graders.

2. METHODOLOGY/MAIN CONTENT

2.1 Population and Sample

This study is a quasi-experimental design. Population is the fourth graders from Bangkhae Province in Bangkok, Thailand. The sample in this study is a total of 80 fourth graders who studied on grade 4 from Bangkhae Province Bangkok. The criteria for selecting the school are 1. The school must have more than 80 fourth graders. 2. The school must have a ready-used computer room. After that, we use purposive sampling. The first group is the experimental group and the second is the controlled group. The experimental group will use CAI and the controlled group will use the conventional method. The student who does not participate in all 3-time activity will be eliminated from this research. The result is there was 77 from 80 who are in this research.

2.2 Research Tools

This study has two tools. The first is CAI that the author develops from the literature review. (Developing CAI and Attitude Change Theory) and the second is a questionnaire that the authors adapt from other researches as detail below.

2.2.1 Computer-Assisted Instruction

Author-made CAI had 2 chapters. In one chapter, The CAI is developed to present contents via comics with captions and sounds for the first part of the CAI (50%) and to present the activity (interaction and simulation) for the last part (50%).

The first chapter is about manner uses for living with a person with visual impairment and the activity is a decision-making practice appropriately with the situation which a person with visual impairment are participated in.

The second chapter is about how a person with visual impairment learned and the activity is a simulation of being visually impaired. Students have to be partially blind by seeing the test partially and answer the test in braille.



Figure 1. Presenting contents via comics with captions and sounds in CAI.



Figure 2. Interactive activity on decision making in CAI.



Figure 3. Simulation of being visually impaired in CAI.

This tool was approved for content validity by two experts who have a visual impairment and have passed structure validity by an educational technology expert. The author improved the CAI such as changing the language from academic language to spoken language in order to be natural and easy to understand, reordering the content to make clear comprehension and add the timer for simulation activity to let participants compare the result etc. The pilot study showed that every student understood all contents in this CAI. They could do the activities and they realized that person with visual impairment had to use time more than others.

2.2.2 Questionnaire

Attitude towards persons with visual impairment questionnaire was adapted from Chedoke–Mcmaster Attitude Toward Children with handicapped scale: CATCH scale (Rosenbaum et al,

1986) and The Acceptance Scale (Voeltz, 1980). The author used the question that was only accepted by the experts. This tool was divided into two parts.

The first part is personal information and the second part is the attitude towards a person with visual impairment. This part was the 5-scale questionnaire. The 37 questions are divided into 3 components. (10 questions for the cognitive component, 11 questions for the affective components and 16 questions for the behavioral component). All question has been approved by 3 experts in content validity (IOC = 0.5–1.0) and the reliability index from the pilot group is 0.87 (Good). After initial analysis, the average attitude towards persons with visual impairment is 26.17 and SD = 3.24.

2.2.3 Method of data collection

- Study literature review about developing attitude towards person with disability & CAI.
- Send a research proposal to be approved by committee for research ethics of Mahidol University.
- Develop a CAI by Macromedia Flash and develop an instrument, questionnaire for measuring attitude towards person with visual impairment and test for validity and reliability by the experts.
- Select the school by purposive sampling as quoted above.
- Inform details of this research to selected school.
- Select date, time, and place for research and give documents about research ethics such as consent sheet, information sheet for students and their parents.
- Prepare the computer room in order to apply the CAI.
- On the experiment day, author keeps the documents from participants then let them start doing the questionnaire for pretest.
- For experimental group, participants had to use CAI for 2 times then do the 2nd time questionnaire and the 3rd time questionnaire for after 4 week passed for Controlled group, participants had to use knowledge sheet for 2 times then also do the 2nd time questionnaire and the 3rd time questionnaire for after 4 week passed like the experimental group.

2.3 Analysis of data

Data were analyzed by using descriptive statistics and analytical statistics to compare the average attitude towards persons with visual impairment of the fourth graders by t-test.

3. RESULTS AND DISCUSSIONS

This research had 2 limitations from lacking of time and budget. These two factors affect the research quality as 2 reasons: First, Author-made CAI was designed in order to share knowledge and experiences in fundamental aspect but it could not release all actual doubts, and the second was the purposive sampling method could not generate a representative sample because author focused on school readiness in order to using CAI and to collect the data. For the future study, the researcher should design CAI based on releasing the participant group's actual doubt and use the sampling method to generate a representative result.

3.1 Statistical result

A study on attitude towards a person with visual impairment was found that the average as the Table 1.

Table 1. Average and standard deviation of attitude towards person with visual impairment

Attitude towards persons with visual impairment	Experimental group	Controlled group
	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Before giving treatment	26.11±4.34	27.80±5.03
After giving treatment	26.38±4.67	26.79±5.47
After giving treatment 4 weeks	25.27±4.55	24.83±5.55

The attitude towards person with visual impairment before using CAI was 26.11 and the after is 26.38. After comparing the average attitude towards person with visual impairment between before and after using CAI, The result shows that the attitude before using CAI is not different with after using CAI in a statistically significant way at reliability level of 95% as Table 2.

Table 2. T-test for comparing attitude towards person with visual impairment between before and after using CAI (N = 39)

Group	\bar{x}	SD	t	p-value
Before	26.11	4.34	-0.50	0.62
After	26.38	4.67		

The attitude towards person with visual impairment after using CAI was 26.38 and the group that use conventional method is 26.79. After comparing the average attitude towards person with visual impairment between after using CAI and conventional method, the results show that the attitude after using CAI is not different with after using conventional method in a statistically significant way at reliability level of 95% as Table 3.

Table 3. T-test for comparing attitude towards person with visual impairment after treatment between using CAI and conventional method

Group	\bar{x}	SD	t	p-value
Experimental group – CAI	26.38	4.67	0.347	0.73
Controlled Group – Conventional method	26.79	5.47		

After comparing the average attitude towards person with visual impairment within group after using treatment and after using treatment for 4 weeks, the results show that the attitude after using conventional method is different with after using conventional method for 4 weeks in a statistically significant way at reliability level of 95% as Table 4.

Table 4. T-test for comparing attitude towards person with visual impairment between after treatment and after treatment for 4 weeks

Group	\bar{x}	SD	t	p-value
Experimental group – CAI				
After treatment	26.38	4.67	1.43	0.16
After treatment for 4 weeks	25.27	4.55		
Controlled Group – Conventional method				
After treatment	26.79	5.47	2.74	0.009*
After treatment for 4 weeks	24.83	5.55		

3.2 *Discussions*

As the result above, the average attitude towards a person with visual impairment are not different in a statistically significant way at a reliability level of 95% in all groups. they may occur because the reasons as discussed below.

Only positive–attitude treatment –Author selected the positive experiences of persons with disability and reduced the negative experiences in CAI. For example, using comic character instead of a real person with disability to deleted the bad appearance of persons with disability and did not make CAI under the charity–based paradigm but did it in the right–based paradigm. For Example, emphasize what the persons with disability can do and how chance and appropriated help can make long–term benefits for them. As Kaewkungwan (2003) quoted, Human has a chance to perceive the stimuli via all channel at the same time. But if they received incompletely on the essential part, the learning process will not be completed and Chandem & Chandem (1978) suggested that attitude changing process should be a process that completely gives both positive and negative experiences to participants, the attitude will be changed. Moreover, According to Petty R.E., Cacioppo J.T. (2012), if participants did not have a motivation to process the information about an attitude object, their attitude will be changed temporarily. In contradictory, if they have a motivation to process the information rationally and elaborately by arguments from positive and negative messages. Their attitude will be changed. To sum up, Both positive and negative experiences can develop an attitude toward person with disability.

Author–made CAI cannot release all doubt for students –The questionnaire was developed to measure affective, behavioral and cognitive components of attitude towards persons with visual impairment. Because of doubt and unconfident, participants could not apply the attitude in order to respond properly to the new situation. They may be confused to decide what should they do so the answer had a trend to be neutral as show in raw data. (from positive to neutral). According to Sax (1980), Attitude has a level of intensity and direction with continuity. (Strongly agree, agree, neutral, disagree, and strongly disagree) so it could be possible that CAI can make more neutral attitude and according to skeptic people in Theory of persuasive communication, skeptic persons are persons that know both positive and negative experiences but cannot decide how direction should they behave. As same as Laws & Kelly (2005) findings, Participants with released doubt or prior misconception can be develop attitudes towards disability. To change this persons' attitude, the first thing is releasing doubt. If not, they will have a neutral attitude.

CAI is lacking on a strongly sentimental part–even if the content was valid by expert approving. This topic was overlooked by author and furthermore, the author selected the contents only positive experiences as above. This may make participants realized that persons with disability did not meet the barriers and need special help from society. In another way, if society did not help them. How are they? Do they live badly? How do they feel? The content could not make strong feeling happen enough for participants. According to Chandem & Chandem (1978), Emotional part can improve attitude. Taunting by story or movie can change the attitude. And according to Shaver, Curtis, Jesunathadas & Strong (1987), The content which uses in an activity that improves attitude must persuade the participants. Moreover, According to Hong et al (2014) found that if participants had positive attitudes towards disability, they will be curious and eager to learn about disability automatically. Our CAI cannot make participants feel in both positive and negative ways, when they are lack of curiosity, cognitive component of attitude may be not developed.

The author–made CAI cannot be added some essential activities to develop an attitude towards person with disability when compare with other activity set in the same kind of research. CAI is a new method that was no researcher do it before and it is the only method that does not use an

expert in the activity. As Muangman (1999) quoted that an advantage of CAI is it decreases the expert-lacking problem. CAI can apply all the time without any experts. The author focused on this advantage so this study raised CAI to develop an attitude as above. However, comparing

with other methods, the finding is CAI cannot be added some essential activities to develop an attitude towards persons with disability as below.

Sentimental receiving and evaluating – Author-made CAI can be added contents and activities but cannot receive or evaluate the human feeling. So author-made CAI could do only giving the new experiences to participants. According to McGuire (1969) and Hilgard (1962), To change the attitude, group discussion for exchanging idea and making mutual summary are essential parts for members to perceive and to confirm. The teacher has a duty to release doubt and emphasizes the importance of attitude change. (Rubin & McNeil, 1981) These two quotes promoted that using experts as facilitators of group discussion for exchanging idea and making mutual summary is appropriated for improving attitude.

Add the real person with disability to the same level of communication—the author-made CAI cannot replace the real person. According to Yazbeck et al (2004) and Sullivan & Masters (2014), To develop an attitude towards disability, the interaction between persons with disability and others have to be in the same level of communication. Both of them have to be a listener and a speaker at the same time without someone who was with authority above another.

The content is not essential enough for students – Because the content that was used in this research is about manner for living with persons with visual impairment and how the visually impaired person learn. These contents are lowly associated with students. The students did not learned with person with visual impairment and they had no chance to meet them in daily living so they cannot realized that these contents and attitudes are essential or be associated with them. They may not have mutual feeling or understand clearly. As Cairns & McClatchey (2013) quoted, by experience factor, participants who was in inclusive school can be developed attitudes towards disability easier than participants who was not. According to Petty & Cacioppo (2012), If you want to change someone's attitude constantly, they should be associated with that things before. Then, Giving the chance to determine the information elaborately, their attitude can be changed.

The duration for doing activity is not enough – This research only takes time 1 hour a week for two weeks. (Both experimental group and controlled group) There are possibly to shows that the duration for these activities are not enough. As Sherill (2004) informed, Activities that provide to improve attitude towards disability should occur continuously to change their attitudes.

By the reasons above, author conclude that both author-made CAI and conventional method are obviously not enough to develop on attitude towards person with visual impairment.

Attitude towards person with visual impairment of experimental group are more retentive than controlled group this difference may occurs from the effectiveness of method. Author can discussed for 3 reasons below.

Multimedia, When we compared two methods in this research, The same parts are content and picture but the different parts, CAI was with presenting via picture caption sound and activity with feedback but the conventional method was only with picture and text. So multimedia promotes learning perception in many ways that are better for individual needs. According to Laohacharadsaeng (1998), CAI is suitable for differentiated learners, both fast and slow learners. And according to Tomlinson (2014), Content presenting via text and sound in the same time is differentiated instruction is an instruction that suitable for individual needs.

Gain attention, as mention aboved, CAI is a multimedia with color, sound, interesting story, and continuous interaction so it can gain attention from students better than others. According to

Fenrich (2005), Color and sound in multimedia can gain more attention than conventional method. These attributes are an advantage of CAI in case of effectiveness.

Activity and feedback, CAI consisted of simulation activity. Students can practice deciding in the various situations. There are 2 advantages, The benefit from activity and feedback. As Gagne (1985) quoted that responding to CAI can help learners remember better than only listening and according to Ison et al (2010), the best way to improve attitude towards disability is cognitive behavioral approach and Blecha & Haynes (2019) told that simulation helps transfer learning. Students can use the knowledge from lessons to apply in the new situation. Moreover, Narciss (2008) supported that feedback is beneficial for learning in three functions: First, the cognitive function, Feedback fulfilled the uncompleted answer, corrected the wrong component, clarified the student's answer and make the knowledge connected completely. Second, Metacognitive function, Feedback rearranged the steps to find the answer, defined the wrong component and leaded students for self-evaluation and the last, motivational function, Feedback clarified the result, facilitated the thought and make self-efficacy, so effective feedback can releasing doubt and lead to make student retentively comprehend.

By the 3 benefits of CAI above, author concluded that author-made CAI is more effective than the conventional method in order to retentively develop attitude toward person with visual impairment.

4. CONCLUSIONS

In conclusion, Computer-assisted instruction to develop attitude towards persons with visual impairment for fourth graders should have 9 attributes: correct content, easy to understand, persuasive ability, multimedia, various interactions, provide quality feedback, appropriated-level of lesson control, adapted for individuals and more than 1 time use. Each attribute effects to the attitude level. However, the author-made CAI didn't work as we expected. The content must be very strongly relevant to all participants. Both positive and negative parts should be presented emotionally. All doubts should be released by making the same level of communication between persons with disability and others in order to exchange an idea, make mutual feeling and summary. There are many ways to develop attitude towards person with visual impairment. CAI may be a part of activities to develop this attitude individually. Author suggests readers to use many activities effectively and continuously because developing attitudes take time and use many essential parts as above.

5. REFERENCES

- Bilbai, S. (2014). rūpbāp kēm khōmphiutē praphēt sūam botbāt tām nāokhit kān rīanrū thāng sangkhom thī mī tō čhētakhati phāsā Thai khōng nakrīan Thai Mutsalim nai phūrnthī sām čhangwat chāidāen phāk tai [Computer Role-Playing Game Model Based on Social Learning toward Thai Language Attitudes of Thai Muslim Students in Three Southern Border Provinces] (Doctoral Thesis, Kasetsart University)
- Blecha, B & Haynes. (2019). Teaching with Simulations. Retrieved Jan 30, 2019, from <http://serc.carleton.edu/sp/library/simulations/index.html>.
- Cairns, B., & McClatchey, K. (2013). Comparing children's attitudes towards disability. *British Journal of Special Education*, 40(3), 124–129.
- Calderone, B.A. (1994). *Computer Assisted instruction: Learning attitude and model instruction*. Melbourne, Florida: Addison–Wesley.
- Chandem, S. & Chandem, S. (1978). *čhittawitthayā nai hōng rīan* [Psychology in classroom] Bangkok: Odean store

- Chonthanon, B. (2001). *kānsuksā bāprian rūam*. ‘ēkkasān prakōp kānsōn rāiwichā kānsuksā bāprian rūam [Inclusive education], Bangkok: Suan Dusit Rajabhat University
- Christensen, C. (1996). Disabled, Handicapped or disordered: ‘What’s in a name?’. In: F.R.C Christensen, ed. *Disability and the dilemmas of education and justice*. Buckingham: Open University Press; 63–77.
- Conant, S., & Budoff, M. (1983). Patterns of awareness in children’s understanding of disabilities. *Mental Retardation*, 21(3), 119.
- Cook, B.G., & Semmel, M.I. (1999). Peer acceptance of included students with disabilities as a function of severity of disability and classroom composition. *Journal of Special Education*, 33, 50–61.
- Cutts, S., & Sigafos, J. (2001). Social competence and peer interactions of students with intellectual disability in an inclusive high school. *Journal of Intellectual & Developmental Disability*, 26, 127–141.
- Fenrich, P. (2005). *Creating instructional multimedia solutions: Practical guidelines for the real world*. Informing Science.
- Gagne, R.M. (1985). *The Conditions of Learning* (4th). New York: Holt, Rinehart & Winston.
- Hilgard, E. R. (1962). *Introduction to Psychology*. New York: Harcourt Brace & World.
- Hong, S. Y., Kwon, K. A., & Jeon, H. J. (2014). Children’s attitudes towards peers with disabilities: Associations with personal and parental factors. *Infant and Child Development*, 23(2), 170–193.
- Ison, N., McIntyre, S., Rothery, S., Smithers–Sheedy, H., Goldsmith, S., Parsonage, S., & Foy, L. (2010). ‘Just like you’: A disability awareness programme for children that enhanced knowledge, attitudes and acceptance: Pilot study findings. *Developmental Neurorehabilitation*, 13(5), 360–368.
- Jitrawanichkul, S. (1999). *kānsuksā phruttikam khwām sonchai læ khwām tōngkān nai kānpētrap sū khōng khon tābōt nai khēt Krung Thēp Mahā Nakhōn* [Media Exposure, interests and needs of the blind in Bangkok] (Master’s Thesis, Chulalongkorn University)
- Kaewkungwan, S. (2003). *thritsadī chittawitthayā*. [Psychology Theory (10th ed.)] Bangkok: Morchaoban
- Khakhunthod, S. (2008) *kānphatthanā botrian khōmphiutē chūai sōn rūpbāp kān chamlōng rūang phūnthān ngān chūam kēt wichā ngān chūam læ lōha phān būrangton radap prakāsanīyabat wichāchīp* [The Development of simulation computer-assisted instruction entitled basic gas welding of welding and sheetmetal subject for vocational certificate students] (Master’s thesis, Nakhonratchasima Rajabhat University)
- Laohacharadsaeng, T. (1998). *khōmphiutē chūai sōn* [Computer-assisted instruction (2nd ed.)] Bangkok: Wongkamol Production
- Lasoff, E. M. (1981). *The effects of feedback in both computer–assisted instruction and programmed instruction on achievement and attitude*. Dissertation. University of Miami.
- Laws, G., & Kelly, E. (2005). The attitudes and friendship intentions of children in United Kingdom mainstream schools towards peers with physical or intellectual disabilities. *International Journal of Disability, Development and Education*, 52(2), 79–99.
- Lindsay, S., & Edwards, A. (2013). A systematic review of disability awareness interventions for children and youth. *Disability and rehabilitation*, 35(8), 623–646.
- McGregor, S.J. (2003). *Attitude of Students Towards Peers with Disabilities: The Effect of Including Students from an Education Support Centre in an Inclusive Middle School Setting*. Dissertation. Edith Cowan University.

- McGuire, W.J. (1969). *The handbook of social psychology: The nature of attitudes and attitude change*. Massachusetts: Ginn and Company.
- Ministry of Education, (2008). *laksūt kǎn klāng kǎnsuksā naphūn thān Phutthasakkarāt sōngphanhārōihāsip‘et [Core Curriculum for fundamental education (2008)]* Bangkok Thailand The Agriculture Union of Thailand
- Ministry of social development and human security (2011), *phǎn phatthanā khunnaphāp chīwit khonphikān hǎng chāt chabap thī sī Phō.Sō. sōngphanhārōihāsiphā sōngphanhārōihāsipkǎo [National Plan for developing quality of life in persons with disability No.4 (2012-2016)]*. Bangkok
- Ministry of social development and human security (2017), *rāingān khōmūn sathānakān dān khonphikān nai prathēt Thai pračhamdūran Kanyāyon sōngphanhārōihoksip [Situation Information Report in persons with disability in Thailand (Sep.2017)]*. Bangkok
- Muangman, P. (2001). *lakkān ‘ōk bǎp læ sāng botrīan khōmphiutē chūai sōn dūai prōkrēm Authorware Professional hā [Computer assisted instruction design principle and practice by Authorware Professional 5]* Pattani: Department of educational technology
- Narciss, S. (2008). Feedback strategies for interactive learning tasks. *Handbook of research on educational communications and technology*, 3, 125–144.
- Petty, R. E., & Cacioppo, J. T. (2012). *Communication and persuasion: Central and peripheral routes to attitude change*. Springer Science & Business Media.
- Puworrawan, Y. (1991). *kānchai maikhrō khōmphiutē chūai nai kān rīankānsōn [Microcomputer in education]* 116-121.
- Rosenbaum, P.L., Armstrong, R. W., & King, S.M. (1986). Children’s attitudes toward disabled peers: A self-report measure. *Journal of Pediatric Psychology*, 11(4), 517–530.
- Rouso, H. (2003). *Education for All: A gender and disability*, New York: UNESCO.
- Rubin, Z. and McNeil, E. (1981). *The psychology of being human*. London: Kingsport Press.
- Santrock, J. (2002). *A topical approach to lifespan development*. New York: McGraw–Hill.
- Sanchaiphrom, S. (2010). *kānchai botrīan khōmphiutē chūai sōn rūrang phruttikam thāngkān suksā samrap naksuksā thī rīan nai rāiwichā lakkān wat læ pramōenphon kān rīanrū mahāwitthayālai rāthaphat Chīang Mai [Using computer assisted instruction tiled behavior education for learners in Principles of learning measurement and evaluation course, Chiang Mai Rajabhat University]* (Master’s Thesis, Chiang Mai Rajabhat University)
- Sanguankaew, S. (1991). *nǎothāng kānphatthanā prōkrēm khōmphiutē chūai sōn [The approach to develop Computer assisted instruction]*, *Computer Review Journal*, 78, 173-176.
- Sax, G.S. (1980). *Principles of educational and psychological measurement and evaluation*. Wadsworth, Belmont, CA.
- Shaver, J.P., Curtis, C., Jesunathadas, J., & Strong, C. (1987). The modification of attitudes toward persons with handicaps: A comprehensive integrative review of research. *Final Report to the US Department of Education, Office of Special Education and Rehabilitative Services. Project*, (023CH50160).
- Sherill, C. (2004). *Adapted Physical Activity, Recreation and Sport: Crossdisciplinary and Lifespan*. 6th ed. Boston, MA: McGraw–Hill.
- Sullivan, E., & Masters Glidden, L. (2014). Changing attitudes toward disabilities through unified sports. *Intellectual and developmental disabilities*, 52(5), 367–378.
- Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners*. Ascd.

- Voeltz, L. M. (1980). Children's attitudes toward handicapped peers. *American Journal of Mental Deficiency*.
- Waranusantikul, S. (2003). *čhittawitthayā sangkhom: thritsadī læ kān prayuk* [Social Psychology: Theory and Practice] Bangkok: Se-education
- Ward, P.L. (1986). A comparison of computer-assisted and traditional drill and practice on elementary students' vocabulary knowledge and attitude toward reading instruction. Dissertation. University of Southern Mississippi.
- Yazbeck, M., McVilly, K., & Parmenter, T. R. (2004). Attitudes toward people with intellectual disabilities an Australian perspective. *Journal of Disability Policy Studies*, 15(2), 97–111.
- Yuker, H.E. (1988). The effects of contact on attitudes toward disabled persons: Some empirical generalisations. In Yuker H.E. (Eds), *Attitudes towards persons with disabilities* (pp.262–274.). New York: Springer Publishing Company.