Journal of Education Studies | Volume 46 Number 4 (October-December 2018) pages 1-17
Special Issue : Educational Technology and Communications

การส่งเสริมทักษะการอ่านและการคิดอย่างมีวิจารณญาณของนักเรียนชั้นประถมศึกษาปีที่ 6 ที่มีปัญหาทางการอ่านโดยใช้ระบบเสริมศักยภาพทางการอ่านบนฐานของมายด์ทูลตามข้อมูลเชิงหลักฐาน

Enhancement of Critical Reading and Critical Thinking Skills of Sixth Grade Students with Reading Difficulties by Using a Mindtool-Based Scaffolded Reading

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บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อ 1) ศึกษาและพัฒนาระบบเสริมศักยภาพทางการอ่านบนฐานของมายด์ทูลตามข้อมูลเชิงหลักฐาน 2) ศึกษาผลการใช้ระบบเสริมศักยภาพทางการอ่านบนฐานของมายด์ทูลตามข้อมูลเชิงหลักฐาน และ 3) นำเสนอระบบเสริมศักยภาพทางการอ่านบนฐานของมายด์ทูลตามข้อมูลเชิงหลักฐาน การดำเนินการวิจัยประกอบด้วย 3 ระยะ ได้แก่ ระยะที่ 1 การพัฒนากรอบแนวคิดในการวิจัย ระยะที่ 2 การพัฒนาระบบเสริมศักยภาพทางการอ่านบนฐานของมายด์ทูลตามข้อมูลเชิงหลักฐาน และระยะที่ 3 การนำเสนอระบบเสริมศักยภาพทางการอ่านบนฐานของมายด์ทูลตามข้อมูลเชิงหลักฐาน เครื่องมือที่ใช้ในการวิจัยประกอบด้วยแบบวิเคราะห์เนื้อหา แบบสอบถามความคิดเห็นที่มีต่อระบบฯ แบบบันทึกการมีส่วนร่วม ระบบเสริมศักยภาพทางการอ่านฯ บนระบบ LMS แบบทดสอบทักษะการอ่านพื้นฐาน 4 ทักษะ แบบทดสอบการอ่านเข้าใจความ แบบวัดความสามารถทางการคิดวิจารณญาณของคอร์แนลระดับ Z และแบบรับรองรูปแบบระบบที่พัฒนาขึ้น กลุ่มตัวอย่างในการทดลองใช้ระบบคือ นักเรียนชั้นประถมศึกษาปีที่ 6 ที่มีปัญหาทางการอ่านจำนวน 60 คน โดยใช้ระยะเวลาในการเรียนด้วยระบบฯ เป็นเวลา 10 สัปดาห์ ผลการวิจัยพบว่า 1) องค์ประกอบของระบบเสริมศักยภาพทางการอ่านบนฐานของมายด์ทูลประกอบด้วยองค์ประกอบ 4 องค์ประกอบ ได้แก่ การนำเข้า กระบวนการ ผลลัพธ์ และการให้ข้อมูลป้อนกลับ 2) ระดับการเสริมศักยภาพในระบบฯ มีลักษณะการลดระดับลง คือ นักเรียนที่มีระดับปัญหาทางการอ่านในระดับมากมีระดับปัญหาลดลงเป็นระดับกลาง นักเรียนที่มีระดับปัญหาทางการอ่านในระดับกลางมีระดับปัญหาลดลงเป็นระดับน้อย และนักเรียนที่มีระดับปัญหาทางการอ่านในระดับน้อยมีระดับปัญหาลดลงเป็นระดับความสามารถทางการอ่านในระดับชั้นเรียนปกติ 3) นักเรียนชั้นประถมศึกษาปีที่ 6 ที่มีปัญหา

ทางการอ่านที่ได้เข้าร่วมในระบบการเสริมศักยภาพทางการอ่านมีผลสัมฤทธิ์ทางการอ่านเพิ่มขึ้นในทักษะด้านที่มีปัญหา โดยพบว่าทักษะการอ่านพื้นฐานที่นักเรียนมีปัญหามีความสัมพันธ์กับทักษะการอ่านด้านอื่นๆ อย่างมีนัยสำคัญทางสถิติที่ระดับ .01 4) นักเรียนชั้นประถมศึกษาปีที่ 6 ที่มีปัญหาทางการอ่านที่ได้เข้าร่วมในระบบการเสริมศักยภาพทางการอ่านมีผลสัมฤทธิ์ทางการอ่านจับใจความ การอ่านอย่างมีวิจารณญาณ และการคิดอย่างมีวิจารณญาณสูงขึ้นอย่างมีนัยสำคัญทางสถิติที่ระดับ .05

คำสำคัญ: มายด์ทูล/ การเสริมศักยภาพ/ การช่วยเหลือบนข้อมูลเชิงหลักฐาน/ การอ่านอย่างมีวิจารณญาณ/การคิดอย่างมีวิจารณญาณ

ABSTRACT

This research were to 1) study and develop a mindtool-based scaffolded reading instruction system with evidence-based intervention, 2) study the results of implementing a mindtool-based scaffolded reading instruction system and 3) propose a mindtool-based scaffolded reading instruction system. There were three phases in the study; Phase 1: Development of research framework, Phase 2: Development of a mindtool-based scaffolded reading instruction system and Phase 3: Proposing a mindtool-based scaffolded reading instruction system. The research instruments were content analysis form, an opinion questionnaire, participation recording form, scaffolded reading instruction system on LMS, four basic reading skill tests, reading comprehension test, critical reading test, Cornell Critical Thinking Test Level Z, and the approval form for approving the developed scaffolded reading instruction system. The research subjects were 60 sixth grade students with reading difficulties. The subjects participated in the system for 10 weeks.

Research findings were as follows: 1) The components of a mindtool-based scaffolded reading instruction system consisted of 4 components that were Input, Process, Output, and Feedback. 2) The level of scaffolding in a mindtool-based scaffolded reading instruction system tended to be decreased one level of difficulty level, high reading difficulty level was

decreased to middle reading difficulty level, middle reading difficulty level was decreased to low reading difficulty level, and low reading difficulty level was decreased to classroom level. 3) The sixth grade students with reading difficulties who participated in a mindtool-based scaffolded reading instruction system had higher achievement in basic reading skills that was difficulty. The correlations between difficulty basic reading skill and other basic reading skills were found at .01 significance. 4) The sixth grade students with reading difficulties who participated in a mindtool-based scaffolded reading instruction system had higher achievement in reading comprehension, critical reading and critical thinking skills at .05 significance.

KEYWORDS: MINDTOOLS/ SCAFFOLDING/ EVIDENCE-BASED INTERVENTION/ CRITICAL READING/ CRITICAL THINKING

Introduction

Reading skills are important for the individuals since they foster comprehension in reading. It is performed both for pleasure and information. Reading comprehension is an important skill for students in studying every single subject and in almost every aspect of life. Students who struggle with reading comprehension may fall so far behind in school that they have limited opportunities as an adult.

From the learning achievement assessment in reading skill of third grade students by the Bureau of Education Testing in 2009, however, was found that about 7.22 percents (37,813 from 523,469 students) of Thai third grade students failed to meet criteria. Moreover, the result was assessed by the Office for National Education Standards and Quality Assessment (Public Organization) found that most of schools got the average scores in the fourth standard consisted of analytical thinking, synthetic thinking, critical thinking, creative thinking, and reflective thinking at the lowest level. As all above reasons it can be said that students are still lagging in problem-solving and thinking skills that is apparent at all levels of education (Carr, 1988). So it is

important that teacher recognize and respect the value of thinking skills and introduce them early on in the educational process (Carr, 1988).

Critical thinking is that mode of thinking — about any subject, content, or problem — in which the thinker improves the quality of his or her thinking by skillfully analyzing, assessing, and reconstructing it. Critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking. It presupposes assent to rigorous standards of excellence and mindful command of their use. It entails effective communication and problem-solving abilities, as well as a commitment to overcome our native egocentrism and sociocentrism. (The Critical Thinking Community, n.d.)

Critical thinking has 6 core skills that consists of subskills in each one. There are 1) Interpretation consists of Categorize, Decode significance and Clarify meaning, 2) Analysis consists of Examine ideas, Identify arguments and Identify reasons and claims, 3) Inference consists of Query evidence, Conjecture alternatives and Draw logically valid or justified conclusions, 4) Evaluation consists of Assess credibility of claims, Assess quality of arguments that were made using inductive or deductive reasoning, 5) Explanation consists of State results, Justify procedures and Present arguments and 6) Self-Regulation consists of Self-monitor and Self-correct. (Facione, 1990)

Critical reading is a deeper and more complex engagement with a text that readers have to involve in a process of analyzing, interpreting and, sometimes, evaluating. When reader read critically, they use their critical thinking skills to question both the text and their own reading of it. To read critically, readers do have to think critically. This involves analysis, interpretation, and evaluation. Each of these processes helps the readers to interact with the text in different ways: highlighting important points and examples, taking notes, testing answers to your questions, brainstorming, outlining, describing aspects of the text or argument, reflecting on your own reading and thinking, raising objections to the ideas or evidence presented, etc. (University of Toronto, n.d.)

However, there are differences between each learner in learning achievement, aptitude, learning style, etc, thus, in the traditional classroom learners often learn together in large group. It is not served to their needs and individual's difference especially in the difficulty students who have the problem in their learning that should be gained much more helps and suit approaches to support them to be successful.

Because of the importance of supporting for the students with difficulties, scaffolding is an instructional technique whereby the teacher models the desired learning strategy or task, then gradually shifts responsibility to the students. Scaffolding experiences can support and improve the performance of students before, during, and after reading. In addition, students who benefit from scaffolding better able to function as independent readers and to express ideas in a variety of ways.

Fuchs and Fuchs (2007) refer to three commonly described uses of Response To Intervention (RTI) are prediction of at-risk students; intervention for students with academic or behavioral difficulties; and determination of specific learning disabilities (SLD).

The National Joint Committee on Learning Disabilities (NJCLD), in its report introduces the benefits of RTI stating that is a key element of an RTI approach is the provision of early intervention when students first experience academic difficulties, with the goal of improving the achievement of all students, including those who may have LD (National Dissemination Center for Children with Disabilities, 2010). RTI was implemented to be the framework in this research, and also uses an evidence-based intervention in the way to help the students who have problems and difficulties in reading because it based on the authentic information from researches' results that shown the suitable way matched with those difficulties students. The results from the meta-analysis researches were used to consider being the way of solving reading difficulties.

To serve the students' needs and individual differences, especially for some students who are struggle, bringing technology into traditional classroom to be supplement material is a good to support learning or remedy. It is also more relevant and serves to learners' learning style and progress. So it can be said that the difficulties of implementing reading strategy instruction in classrooms may be reduced with the assistance of information technology. There are generally several advantages of incorporating computers in reading instruction (Lynch, Fawcett, & Nicolson, 2000; Mathes, Torgesen, & Allor, 2001 cited in Yao-Ting Sung et al., 2008). Furthermore, operating independently with computers relieves teachers from some of the burden and giving students more opportunities to learn independently.

Mindtools are computer applications that, when used by learners to represent what they know, necessarily engage them in critical thinking about the content they are studying (Jonassen, 1996). Mindtools scaffold different forms of reasoning about content. That is, they require students to think about what they know in different, meaningful ways. Students cannot use Mindtools as learning strategies without thinking deeply about what they are studying.

Mindtools are categorized into 5 types (Jonassen, 1996; Jonassen, Carr & Yueh ,1998) as follows; 1) Semantic Organization Tools: Database program, Semantic networks, 2) Dynamic Modeling Tools: Spreadsheets, microworlds, 3) Information Interpretation Tools: search engine, hypermedia, weblog, 4) Knowledge Construction Tools: Hypermedia, Blog and 5) Conversation and Collaborative Tools: instant messaging, email, forum, webboard.

Developing learning materials or system that can be used to enhance critical reading and critical thinking skills of reading difficulties students, especially can be used upon the ability and need of each learner, is important and necessary to do. A mindtool-based scaffolded reading instruction system with evidence-based intervention to enhance critical reading and critical thinking skills of sixth grade students with reading difficulties is a way that can serve all purposes above. The short flowchart of this system was shown as below.

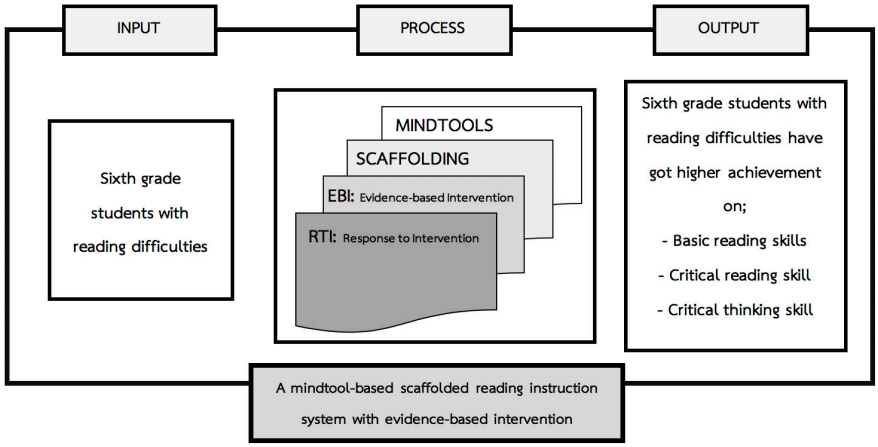

Figure 1 The framework of a mindtool-based scaffolded reading instruction system with evidence-based intervention to enhance critical reading and critical thinking skills of sixth grade students with reading difficulties

The Study

This research was to develop a mindtool-based scaffolded reading instruction system with evidence-based intervention to enhance critical reading and critical thinking skills of sixth grade students with reading difficulties. The research methodology consists of three phases as follows:

Phase 1: The researcher studied on researches and documents from educational electronics databases about Vygotsky theory, scaffolding, reading instruction, reading difficulties, Response To Intervention model, evidence-based intervention, mindtools, critical reading skills, and critical thinking skills to develop the research framework. Analyzing and synthesizing all of content were conducted to conclude which one of reading interventions suited for each basic reading skills, as well as, what kinds of mindtool that appropriated to be used for each reading interventions, and reading difficulties levels. Then the confirmations and approves of appropriateness of the framework, lesson plans, and mindtool from 4 reading experts, 3 critical thinking skill experts, and 3 educational technology experts were gained.

The experts in reading agreed that the reading interventions, selected from the result of evidence-based intervention research using meta-analysis method (Edmonds & et.al., 2009), for each basic reading skill should be; Structural/ Word analysis for Word study, Repeated reading for Fluency, Multiple-Strategy for Comprehension, and Semantic mapping for Vocabulary.

The critical thinking skill and educational technology experts agreed that the mindtools using for each basic reading skill, reading interventions, and also 3 reading difficulties levels (High, Medium, and Low levels).

Phase 2: The researcher developed a prototype of a mindtool-based scaffolded reading instruction system with evidence-based intervention from the research framework and research basic information in phase 1 that consisted of reading instruction using 3-Tiered Model, the reading interventions based on research evidences, the levels of scaffolding, the levels of reading difficulties, critical reading and critical thinking skills, as well as each type of mindtool. Then the opinions on the prototype from 3 educational technology experts, 2 reading experts, and 2 critical thinking skill experts by using focus group technique were analyzed. The research instrument in this step was the opinion survey questionnaire. Next step was developing the system by creating contents, practices, assessment forms, and embedding mindtool softwares on CMS and tried out to prove the efficiency of system with the sixth grade students who got reading difficulties and was similar to the research sample group. Then the system was revised and edited to make it completely before launching in the experiment.

When started the experiment, all sixth grade students, participated in reading comprehension classroom in the first week. All of them were evaluated by using screening assessment to find out who got the reading difficulties. After that, they were assessed again to study each student's problem by using 4 basic reading skill tests, reading comprehension test, critical reading test, Cornell critical thinking test level X, and Reading behavior assessment to diagnose the reading problem, level of critical reading and critical thinking, and reading behavior to collect 60 reading difficulties students,

who had difficulties in reading in high, medium, and low level in each reading skills, in sample group. The experiment started with bringing each one into the suitable level of scaffolding and mindtool. They did pre-test before his/her basic reading skill practices, and used appropriate mindtool while he/she was doing reading practice. Taking post-test was done after completing all procedures. The practice were done for 3 hours a week in 10 weeks.

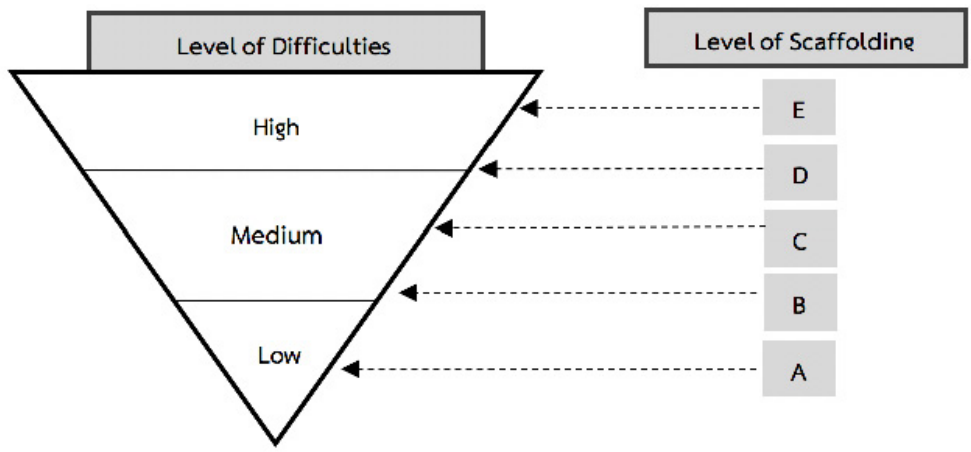

Figure 2 Level of scaffolding for each Level of reading difficulty in a mindtool-based scaffolded reading instruction system with evidence-based intervention

While they were scaffolded by using mindtools in the system, they got the tools that suited with theirs reading level in each skill. The scaffolding levels were sorted in order of the assistance (Beed, Hawkins & Roller, 1991) from most to least as follows;

- Level E: Teacher modeling. Teachers completely act as modeling with explanation such as using video to model reading strategy with narration.

- Level D: Inviting student performance. Teachers act as modeling with explanation combined with students' participation such as students implement mindtools in their reading with helping from teachers.

- Level C: Cueing specific elements. Teachers cue students by giving

some narrations about specific elements of reading process.

- Level B: Cueing specific strategies. Teachers cue students by giving some specific strategies of reading to help students able to do their tasks such as some guidelines to cue how to find out main idea in paragraph.

- Level A: Providing general cues. Teachers support students in reading at least by asking question or providing cueing. Students use mindtools by themselves.

Last step, gathering data and information from all log files and the results from assessments was done. Analyzed the results by measuring the differences between pre- and post-tests in 4 basic reading skills, reading comprehension skill, critical reading and critical thinking skills. Then the researcher made a research summary.

Phase 3: Proposing model of a mindtool-based scaffolded reading instruction system with evidence-based intervention by validating system. Researcher gathered results of IOC (index of congruence) from 5 experts in educational technology and 1 expert in reading and critical thinking skills. The model of a mindtool-based scaffolded reading instruction system with evidence-based intervention had 4 components that consisted of 1) Input, 2) Process, 3) Output, and 4) Feedback. The first component was Input that included with Instructional objectives, Instructors as facilitators, Students and Instructional environment. The second one was Process. It based on 3-tiered model that were Tier 1: Classroom, Tier 2: A mindtool-based scaffolded reading instruction system with evidence-based intervention that was the heart of the process and Tier 3: Specialists that was the part for students who were the special needs and had severe problem in reading so they had to join in the specific program.

The process of this model started from evaluating students' reading comprehension skills called Outcome Assessment. Then making a Screening assessment was a step to consider who had to go to participate in a mindtool-based scaffolded reading instruction system. After that the students who had any problems in 4 reading skills, word study, fluency, reading

comprehension and vocabulary, were evaluated by taking Diagnostic Assessment to specify reading skill they were struggling with. The students in each reading skill problems were divided in 3 groups that were High-level reading difficulties, Medium-level reading difficulties and Low-level reading difficulties. All of them received the scaffolding suited with theirs difficulties in order from most to least such as getting scaffolding from level E to level A or level C to level A till they got better and could do well in reading skill they struggling with before.

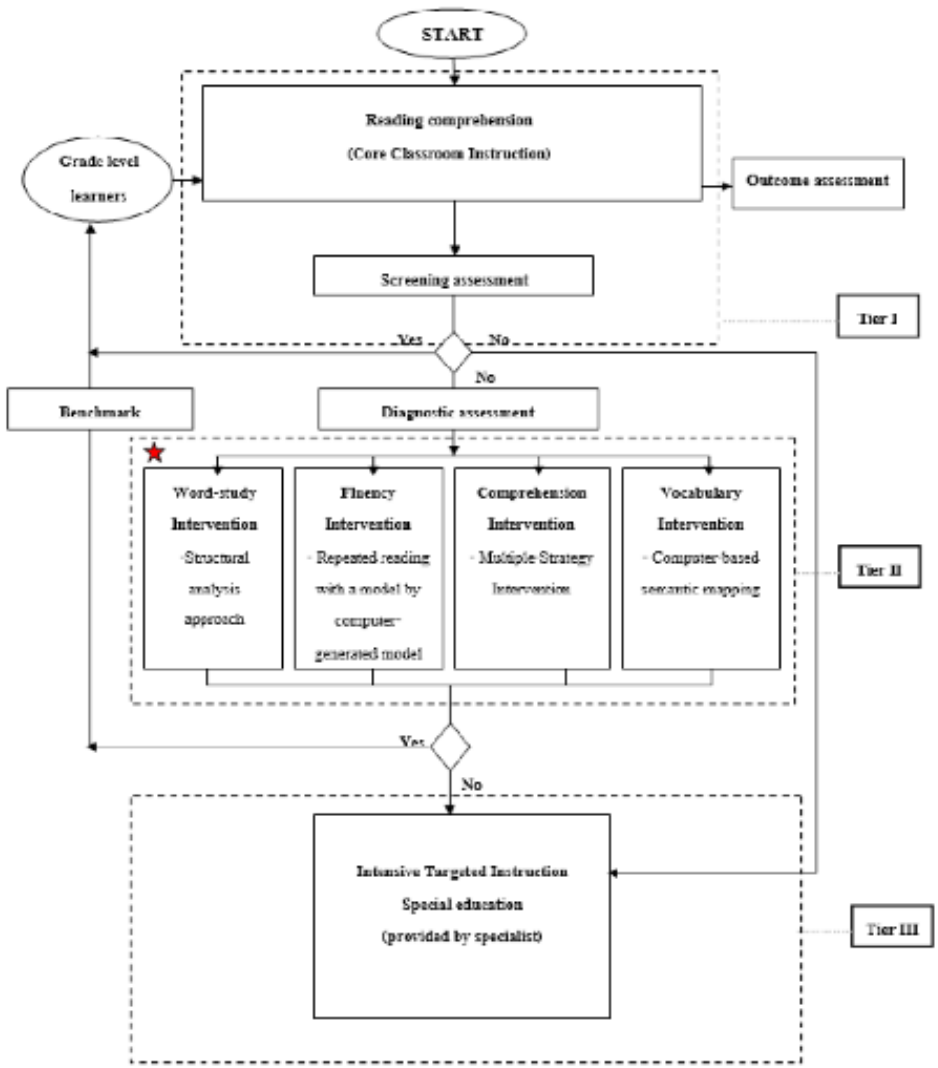

Figure 3 : Flowchart of a mindtool-based scaffolded reading instruction system with evidence-based intervention

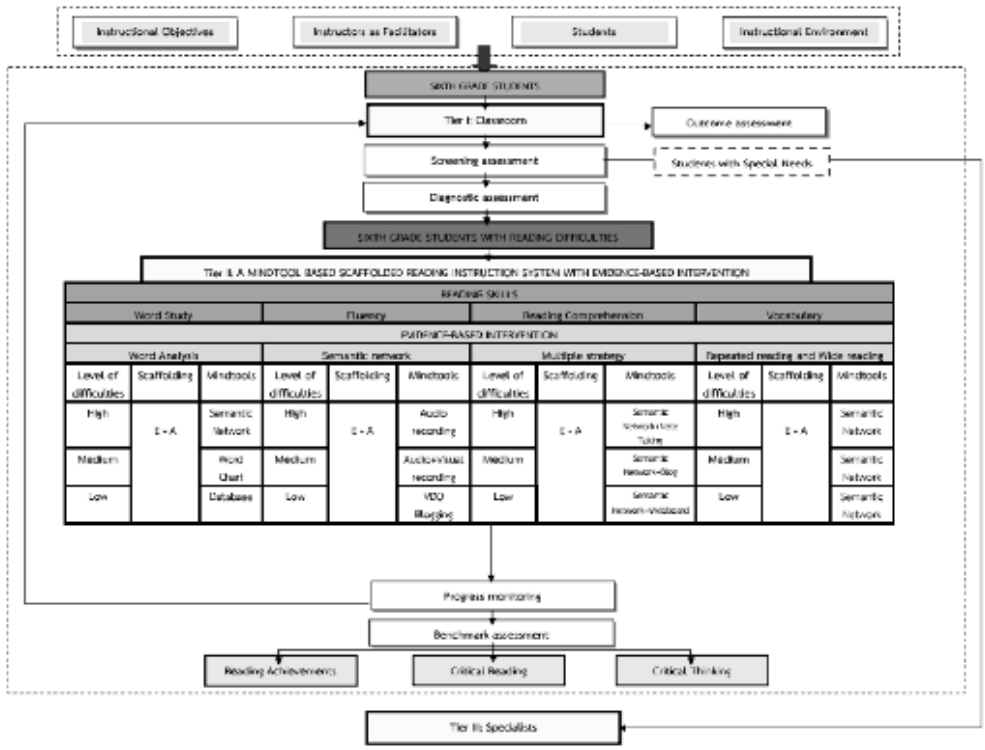

Figure 4 A mindtool-based scaffolded reading instruction system with evidence-based intervention to enhance critical reading and critical thinking skills of sixth grade students with reading difficulties

Findings

The finding of this research is gathered just only from the first phase. So the results were:

1. The components of a mindtool-based scaffolded reading instruction system with evidence-based intervention consisted of 4 components that were 1) Input, 2) Process, 3) Output, and 4) Feedback.

2. The sixth grade students with reading difficulties who participated in a mindtool-based scaffolded reading instruction system with evidence-based intervention had higher achievement in basic reading skill that was struggling. The correlations between difficulty basic reading skill and other basic reading skills were significantly at .01 level.

3. The sixth grade students with reading difficulties who participated in a mindtool-based scaffolded reading instruction system with evidence-based intervention had post-test scores in reading comprehension, critical reading and critical thinking skills that were significantly higher than pre-test scores at .05 level.

4. The levels of scaffolding in a mindtool-based scaffolded reading instruction system with evidence-based intervention that students received were decreased step by step, from level E to level D, C, B and A. The reading difficulty was decreased from high level to the medium level and the low level as well. And the low level of reading difficulty was decreased to classroom level finally.

5. The six experts in Educational Technology, reading and thinking fields approved and confirmed that mindtool-based scaffolded reading instruction system with evidence-based intervention was efficient and suitable for sixth grade students with reading difficulties.

Discussion

A mindtool-based scaffolded reading instruction system with evidence-based intervention can develop reading skills of students who have difficulties in reading because of many reasons such as this system was based on scaffolding that was designed on a principle in Sociocultural Theory of Vygotsky. Scaffolding can be devided at 4 phases (Byrnes, 2001), consisted of Modeling, Imitation, Scaffold Removing, and Dependence. Scaffolding, that given during the reading process, will be withdrawn whenever students be able to complete the reading tasks by themselves. Moreover the system also implemented mindtool that is cognitive tool to scaffold and encourage students think while they were reading. Mindtools are computer applications that used by learners to represent what they know and engage them in critical thinking about the content they are studying (Jonassen, 1996). So students not only read words or texts but they also think critically while they used mindtool to help them understand the meaning of reading.

In this system also implemented the principle of Response to Intervention (RTI) which is a multi-tiered approach to help struggling learners. It is a comprehensive early detection and prevention strategy that identifies struggling students and assists them before they fall behind. Each tier provides increasingly targeted and intensive instruction. The student's progress is closely and continually monitored. In all tiers, student progress is monitored and summative assessment is used to evaluate student outcomes. These characteristic was implemented to design the system that can be informed instructional decisions and judgments related to continuation at the current intervention tier in a more or less intensive tier. Consistent to Simmons et al. (2008) stated that an underlying assumption of RTI is that there is a window of opportunity wherein reading difficulty is more easily altered by instruction and risk of later reading difficulty is likewise minimized. In addition, Evidence-based intervention (EBI) is an important concept that brought into this system to help students who were reading difficulties to enhance their reading skills. Edmonds et al. (2009) conducted a synthesis to address the efficacy of reading interventions that include instruction in decoding, fluency, vocabulary, or comprehension, alone or in combination, on the reading comprehension outcomes of secondary students (Grades 6–12) with reading difficulties and reading disabilities. A subset of studies from this synthesis (13 studies) met criteria for a meta-analysis, yielding an effect size (ES) of 0.89 for the weighted average of the difference in comprehension outcomes between treatment and comparison students. The synthesis demonstrated that many intervention types, including multi-component (e.g., vocabulary, comprehension), comprehension strategy instruction, fluency, and even word-level interventions, were associated with improved comprehension outcomes, providing an optimistic view of the overall effects of targeting secondary students with reading difficulties for further reading intervention. For the above reasons, a mindtool-based scaffolded reading instruction system with evidence-based intervention can be a tool that used to enhance reading and also critical thinking for the reading difficulties students.

Recommendations

1. Making schedules for all students who have reading difficulties to participate in the system consistently.

2. Making evaluation continuously by using various evaluation tools to consider about learning progress and development.

3. Preparing and training teachers to use mindtool and technology tools to support students' reading.

4. Making collaboration between teachers in Thai language or reading teacher and librarian to implement this system with reading difficulties students.

Conclusions

Development of the learning material operated on computer that can be used to enhance critical reading and critical thinking skills of reading difficulties students is needed in many schools because of students' lagging in critical reading and critical thinking skills in nowadays. A mindtool-based scaffolded reading instruction system with evidence-based intervention can be used to enhance critical reading and critical thinking skills of students with reading difficulties because this system can give the suitable support to each student who has difficulties. Moreover, they can learn and get the support from scaffolding in the system by their self-pace learning, and also get the appropriated mindtool for their jobs. However, to develop an effective learning system for the students with reading difficulties, a consideration on selecting the right intervention to solve the problem of each skill is the first important job to do. Choosing for the proper learning materials, such as mindtool, is so necessary evenly.

Acknowledgements

This research was supported by a PhD Scholarships from The Office of the Higher Education Commission, Thailand, and a grant from The 90th Anniversary of Chulalongkorn University Fund (Ratchadaphiseksomphot Endowment Fund).

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