Assessment on the Science Reading Comprehension of Sixth Grade and Seventh Grade Students

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Abstract: This study aims to probe into the effects of the Dynamic Assessment for Reading Comprehension on Science (DARCS) on sixth grade and seventh grade students' reading performance and reading awareness. The subjects of this study were 410 sixth grade and seventh grade students in elementary school and in a junior high school in southern Taiwan. By random sampling, they were divided into two groups, the dynamic assessment group and the control group. This study conducted reading experiment by quasi-experimental design.

Keywords: Dynamic assessment, graduated prompting assessment, reading comprehension of science

Introduction

Reading is one of the means to absorb knowledge. In Taiwan, under the pressure of teaching schedule and limitation of time, many junior high school teachers neglect reading instruction. The test-oriented instruction causes most of the students to be lack of interest in reading and the strategy of reading comprehension. Grade 7 is the students' first year in junior high school education after finishing primary school education. The students are entering adolescence and experiencing mental and physical change. The instructional environment is different from what they have in primary school. For instance, science textbooks of primary school usually introduce scientific concepts with more pictures and fewer descriptions; hence, the students often read the textbooks easily as reading the comic books. The science articles in the science textbooks of junior high schools are mostly in texts without clear definitions of scientific terms [1]. Science teachers only aim to help the students enhance the skills in the test and neglect the instruction of science textbooks reading. Thus, the students lack the interest in reading and reading comprehension skills

Different from the narration in literature, novels and stories, science textbooks are mostly expository texts and there are unique grammar and figures of speech in the articles. They emphasize logic coherence and causal relationship. The scientific terms are used to describe and explain natural phenomenon. Scientific language is adopted to show scientific arguments, scientific theories, scientific approaches, etc. The grammar is different from daily terms. Science textbooks are difficult for the students who are used to reading narrative texts. According to the perspective of information processing theory [2], reading comprehension must be based on the readers' comprehension of the meanings of texts. The readers read the texts line by line, and confirm every word by the information in

short-term memory. According to the sentence structure and context, they comprehend the meanings of articles. Based on the prior knowledge in long-term memory, the readers absorb the meanings in the articles, develop their own views and have critical thinking.

Dynamic Assessment (DA) aims to overcome the limitations of conventional measurement (i.e., paper based test) which cannot provide examinee instant feedbacks based on their abilities. Graduated prompting assessment is one kind of dynamic assessment which is based on Vygotsky's Zone of Proximal Development (ZPD) [3]. When students encounter difficulties in the learning process, the teachers help (scaffolding) the students with the necessary supports to discover and solve the problems. With these supports, the students will eventually independently solve the problems and apply the new ability to the solution to new problems.

With rich Online web resources and prevalence of school computer education, the students mostly have the computer and internet skills. This study adopts online system and dynamic assessment with progressive clues and allows the students to have progressive clues and repeated reading according to their responses in reading comprehension tests. It might enhance their science reading comprehension and reading perception.

Theoretical models of this study are below:
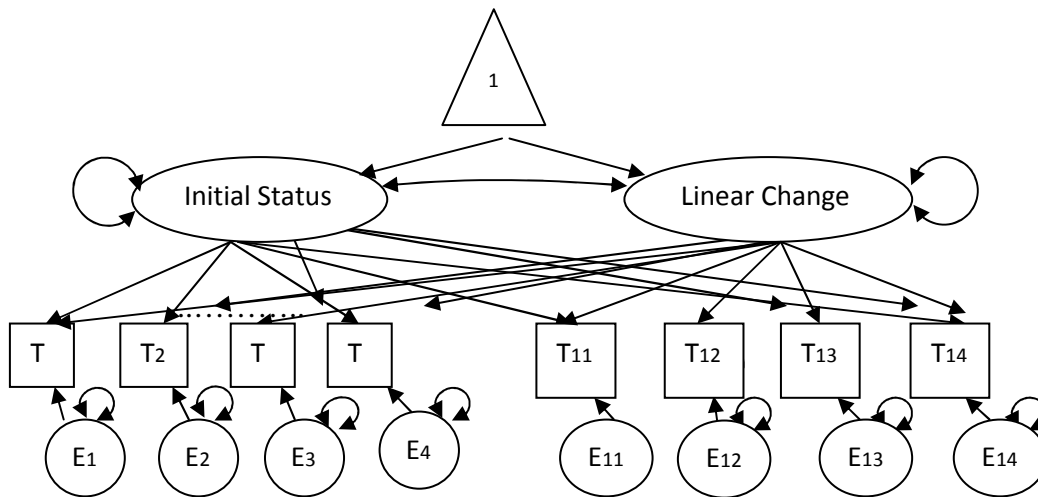
The research questions are shown as follows:
(1)How does the students' science reading comprehension change?
(2)What patterns of the students' reading and answering to the follow-up items?

1. Methods

This study conducted quasi-experimental design and probed into the changes of sixth grade and seventh grade students' science reading comprehension and their answers to the science reading tests.

1.1 Research Samples

This study used convent sampling to sixth grade and seventh grade students of a county (city) in southern Taiwan. Most of the students live in the urban area. Their parents' occupations included public servants, businessmen, labor, etc. The students mainly use Mandarin or Taiwanese as language. The students were from 14 classes, and all students in these classes participated in the study, totaling 410 students. By random sampling, they were divided into two groups, with 205 students in the dynamic assessment group and 205 students in the control group for DARCS instructional experiment.

1.2 Research Tools

1.2.1 Dynamic Assessment for Reading Comprehension on Science (DARCS)

DARCS is the online assessment teaching material of science reading comprehension, developed by Wang and Lin [4]. The reading material includes four themes: biology, physics, earth science and ecological environment. There are totally 14 science reading texts and 69 test questions. Reading comprehension test questions refer to four dimensions: identification of scientific terms, reasoning, making inference, and recognizing main idea. Following the test questions was prompts, from abstract to specific. After answering all follow-up items, the reading performance report showing the reader's reading time, responsive time and scores as feedbacks. Internal consistency (Cronbach α) of DARCS tool was .84 for grade 5 version and .85 for grade 6 version. As to test-retest reliability of total test, the fifth grade is .82 and the sixth grade is .83. Dimensions of RCST are the same as DARCS. Thus, this measurement treats RCST as the external criterion of DARCS. The IRT discrimination (value a) of the DARCS was 1.11 and difficulty (value b) was .52, and guess rate (value c) was 0.23.

1.2.2 Reading Comprehension of Science Test (RCST)

RCST is developed by Wang et al. [5] and it includes two versions of tests for Grade 4 and Grade 6 of primary schools. According to the requirement, this study selected the test for Grade 6. The articles are the descriptions, including the scientific knowledge of science history, physics, earth science, etc. Dimensions of science reading literacy measured by RCST include identification of scientific terms, recognizing the main idea, reasoning, and making inference. There are totally 6 articles and 26 questions. Internal consistency coefficient of total test of Grade 6 of RCST is .80; test-retest reliability of total test is .76; discrimination indices is .72 and it can effectively recognize the subjects' capabilities. Difficulty indices is 1.17 and it is suitable for the students with medium and high levels. The subjects of this study are seventh grade students. After the start of the semester, the experiment is launched. Thus, it fits the tool of this study.

1.2.3 Index of Science Reading Awareness (ISRA)

ISRA of Chinese version is the Index of Science Reading Awareness proposed by Yore et al. [2] and translated by Wang, Chen, Fang, and Chou [6]. It measures the interactive reading. There are two models in ISRA: Model I is the science-specific model, including Science ready (SR), Science text (ST) and Reading strategies (RS). Model II is the metacognition model, including Declarative knowledge (DK), Procedural knowledge (PK) and Conditional knowledge (CK). The 3 dimensions of Model I and 3 dimensions of Model II are related. There are 9 reading factors, including 63 reading items. Internal consistency (Cronbach α) of dimensions of ISRA in Chinese version is 0.37~0.66 and total reliability is 0.75.

1.3 Research Procedures

This study includes experimental treatments and test. Research procedures are shown below:
(1) Pretest: RCST and ISRA pretests were conducted on both experimental group and control group before reading training.
(2) First stage of reading training, the experimental group f DARCS assessment and the

control group receives 2 pieces of reading tests on paper for successive 3 weeks.

(3)　Middle test: RCST mid-test is conducted on experimental group and control group.

(4)　Second stage of reading training, the experimental group and the control group receive 2 pieces of DARCS assessment and the control group receives 2 pieces of reading tests on paper for successive 4 weeks.

(5)　Posttest: RCST and ISRA posttests are conducted on the experimental group and the control group.

(6)　Three weeks after the posttest, the experimental group and the control group have RCST retention test.

1.4 Data processing

A confirmatory structural equation modeling (SEM) was conducted to test the hypothesized latent growth model of change in the level of science reading comprehension and science reading awareness. AMOS 18 was used to examine corresponding structural coefficients and goodness-of fit statistics.

2. Discussion

This study probed into the effects and changes of science reading comprehension of seventh grade students after receiving DARCS reading training by comparing to the paper reading group. The results of factor comparison between the two groups may provide insights for reading psychology, science education and suggestions for embedding reading in science instruction.

Acknowledgements

References

[1]　Wang, J. R. (2007). Students' thinking and alternative conceptions of transport systems in plants: A follow-up study. *International Journal of Science and Mathematics Education, 5*(2), 307-328.

[2]　Yore, L. D., Craig, M. T., & Maguire, T. O. (1998) Index of science reading awareness: An interactive-constructive model, test verification, and grades 4-8 results. *Journal of Research in Science Teaching, 35*(1), 27-51.

[3]　Campione, J. C., & Brown, A. L., (1987). Linking dynamic assessment with school achievement. In C. S. Lidz (Eds.), *Dynamic assessment: An interactional approach to evaluate learning potential.* (pp. 82-115). New York: The Guilford Press.

[4]　Wang, J. R., & Lin, S. W., (2012, May). Pilot study of using formative assessment e-learning environment for science reading comprehension. *The Global Chinese Conference on Computers in Education (GCCCE)*, Kenting, Taiwan.

[5]　Wang, J. R., Chen, S. F., Tsay, R. F., Chou, C. T., Lin, S. W., & Kao, H. L. (2012). Developing a test for assessing elementary students' comprehension of science texts. *International Journal of Science and Mathematics Education, 10*, 955-973.

[6]　Wang, J. R., Chen, S. F., Fang, I., & Chou, C. T.,（2012）*Comparison of Taiwanese and Canadian students' metacognitive awareness of science reading, text, and strategies.* Manuscript submitted for publication.