Chapter 12
Measuring Chinese Reading Comprehension Online with SmartReading Diagnostic Assessment of Chinese Competence in International School Learners

Jia-Fei Hong, Yao-Ting Sung, and Tun-Yu Hsu

Abstract This study adopted an online platform SmartReading Diagnostic Assessment of Chinese Competence (DACC) to examine Chinese reading comprehension in learners' reading ability development at an international school. In DACC, five dimensions were testified: vocabulary, literal comprehension, contextual integration, inferential comprehension, and analysis and evaluation. The results showed that the students from the three international schools scored the lowest on vocabulary recognition and the highest score on literal comprehension. The scores for both contextual integration and analysis and evaluation are equally high, indicating that despite not comprehending all the words in the article, the students' reasoning and analytical abilities have been significantly enhanced by their overall education in reading. It also means that students can analyze the meaning and choose the correct answer without relying on understanding all the new vocabulary.

Keywords SmartReading · DACC · Reading comprehension

12.1 Introduction

12.1.1 Reading Literacy

Reading literacy is the foundation for students to learn all subjects and one of the core literacies. It is also an important ability for students to participate in social life (Ho & Lau, 2018). It has important value and significance for cultivating students' creativity. Reading literacy is also an important indicator of a country's soft power,

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and it has become an important factor related to the development and competitiveness of the country and individuals (Li, 2018). Therefore, in recent years, a series of international assessments have taken reading as one of the main contents of their tests. For example, when the International Educational Achievement Evaluation Association (IEA) was launching its large-scale international test TIMSS, it also launched the International Reading Literacy Progress Research Project (PIRLS). The International Student Evaluation Program (PISA) of the Organization for Economic Cooperation and Development (OECD) regards reading as one of its three major areas of assessment (Schleicher, 2019). The National Assessment of Educational Progress (NAEP) in the United States, the Standard Achievement Test Evaluation Project (SATS) in the United Kingdom, and the National Assessment of Educational Progress (NAP) in Australia also regard reading as the main subject of the national education evaluation.

Different reading assessments have different definitions of reading literacy. PIRLS defines reading literacy as "the ability to understand and use those written language forms required by society and/or valued by the individual". It believes that readers can construct meaning from texts in a variety of forms. They read to learn, to participate in communities of readers in school and everyday life, and for enjoyment (Mullis et al., 2016). PISA 2018 defined reading literacy as understanding, using, evaluating, reflecting on, and engaging with texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society. PISA 2018 also collected extensive data on students' attitudes and well-being (Schleicher, 2019). No matter what kind of definition it is, cultivating and developing students' reading literacy is an inevitable choice for lifelong ability cultivation.

12.1.2 Reading Assessment

In view of the importance of reading ability, internationally renowned evaluation items all regard reading ability as an important content of the evaluation. However, in previous studies, the Chinese reading test system and its reading ability evaluation indicators are rarely discussed. Therefore, this article uses the Diagnostic Assessment of Chinese Competence (DACC) in the SmartReading platform as a research test tool. The Diagnostic Assessment of Chinese Competence (DACC) is a tool that can efficiently and precisely identify a student's reading level and monitor their progress over an extended period of time.

With the cooperation of AI and question bank, combined with modern test theory and technology. DACC can simultaneously evaluate the overall reading ability and the ability of vocabulary, literal comprehension, contextual integration, inferential comprehension, and analysis and evaluation.

The DACC test results provide a normative reference, and the test taker's results will be compared with those of students in the same grade to understand their relative performance. After the SmartReading platform assesses the reading ability of learners through an adaptive reading test, it will recommend books suitable for the learner's level. After the learners choose books of interest, they can further establish their own

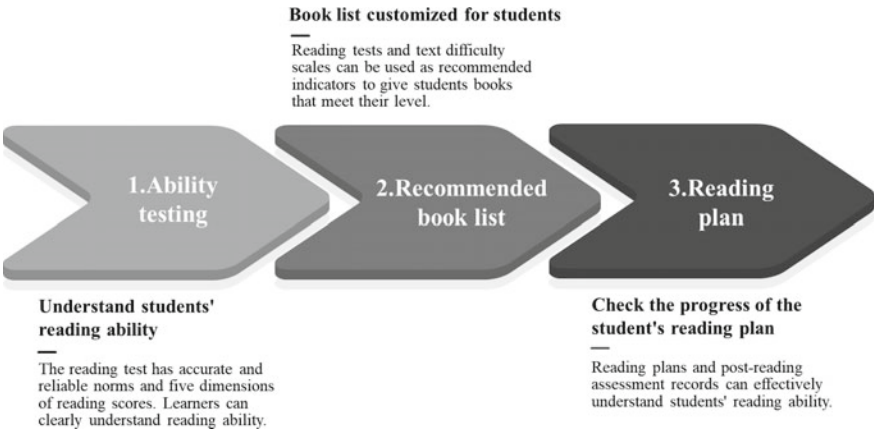

Fig. 12.1 Three steps of SmartReading Platform

reading plan, record their reading status in a systematic way and gradually cultivate the habit of reading.

12.1.3 SmartReading Platform

Our study measured students' reading comprehension with "SmartReading", an AI-powered platform developed by a team of psychologists, linguists, and computer scientists at the National Taiwan Normal University. Based on reading learning theory, the question bank and norms established in the platform can not only accurately measure the reading comprehension ability of students, but also grade various reading materials according to their difficulty. Students can use online tests to assess the five major reading abilities, including: vocabulary, literal comprehension, contextual integration, inferential comprehension, analysis, and evaluation skills in about 35 min. After the test, the platform will recommend a book list suitable for students to read. It can also assist teachers to combine teaching strategies to guide students to a deeper and broader reading plan (Fig. 12.1).

12.1.4 IB

The International Baccalaureate (IB) international course focuses on providing students with high-quality international education through a wide range of content, comprehensive courses, and challenging assessments. The courses aim to help children aged 3–19 develop intellectual, physical, emotional, and social ability. (International Baccalaureate, 2021a, 2021b).

The IB international curriculum is not based on a single education model of a certain country. It absorbs the essence of the education philosophy of various countries in the world, and integrates the curriculum advantages of all countries in the world. Through its own innovation, it has successively established the Diploma Programme (DP), the Middle Years Programme (MYP), and the Primary Years Programme (PYP). In recent years, the IB has also established the Career-related Programme (CP). The four major programs are independent of each other and integrated into each other. This is the unique feature of the IB International Course which is different from other international courses. Their common educational purpose is to cultivate young people who like to explore, are knowledgeable, and caring. Also, to make them a proactive, caring, and respectful lifelong learners of different cultures, the ultimate goal is to create a better and more peaceful world.

The IB philosophy focuses on five core skills to strengthen and cultivate students' theoretical study and application, as shown in Fig. 12.2.

The five core skills are:

1. Thinking skills. Emphasizing reflection and criticism of problems, and expecting students to use their existing knowledge to solve the problems they face.
2. Communication skills. Including students' understanding, observation, and interpersonal interaction of texts.

Fig. 12.2 Approaches to learning skills

3. Social skills. IB emphasizes co-learning. Its core spirit is high-frequency cooperation and interaction. Therefore, whether students can show respect for multiple values, express ideas in a timely manner, and be willing to help each other are all taken into consideration.
4. Self-management skills. This ability is not limited to the mediation of emotions, but also includes the ability to organize and integrate information, as well as the ability to manage life and time allocation. Because the maturity of the individual is closely related to the ability to control and assume responsibility.
5. Research skills. This skill is to train students to observe, collect, experiment, verify, organize, interpret, display, and other abilities related to research topics.

Under thinking skills, IB also emphasizes that students must be able to generate ideas (e.g., the use of brain-storming), to generate arguments (e.g., logical progression of arguments, challenging arguments), to solve problem (e.g., identifying problems, planning, evaluating solutions to problems and so on), and to think creatively (e.g., generating ideas, multiple perspectives) (Swartz & McGuinness, 2014a, 2014b).

In addition, under IB International Education, a teacher uses a generic thinking vocabulary like "explain why", "predict", "compare and contrast", "analyse". And teacher may put students into discussion groups in which they engage in these types of thinking in the course of the discussion. Students might be provoked with challenging stimulus material, through reading or a case study, or being presented with some challenging social issues to discuss in which different viewpoints are likely to be expressed, like capital punishment or global warming (Swartz & McGuinness, 2014a, 2014b).

Reading Comprehension includes many abilities, such as making predictions, questioning, inference making, making a conclusion, synthesizing information, recognizing the passage of main text idea, summary, and analysis of the text (Maria et al., 2021). Through the above-mentioned abilities cultivated under international education, students can develop better logical thinking skills, and then improve their overall reading comprehension skills.

12.2 Research Questions

Based on the above findings and introduction, the purpose of this study is to investigate the overall average reading performance of students under the international education framework, as well as the performance of students in five different reading dimensions in DACC. It is hoped that through data analysis, we can see the reading ability of students under the international education system, as well as their better and weaker reading performance. Therefore, this research will explore the following questions:

1. The overall average reading performance of fifth-grade students under the international education framework?

Table 12.1 Data collection time and the number of students taking the test

School	A		B		C	
Data collection time	2020	2021	2020	2021	2020	2021
Number of students	66	68	173	177	9	18

2. What is the performance of the students in the fifth grade of the international school in the five aspects of reading performance (vocabulary, literal comprehension, context integration, reasoning comprehension, analysis, and evaluation)? Is there any pattern?

12.3 Research Methods

12.3.1 Participants

In this study, students from three international schools were selected as the research objects. The data collection period is from 2019 to 2021. A total of 511 data were collected this time (Table 12.1).

12.3.2 Instrument

This research uses the "Diagnostic Assessment of Chinese Competence" (DACC). This assessment tool is based on international tests, using advanced assessment techniques, and adopting an adaptability test model to develop a comprehensive set of an evaluation tool for diagnosing the performance of students' reading ability.

The test content covers common reading materials from elementary schools to junior high schools, suitable for learners of all levels. In addition to measuring students' overall reading ability, the test also provides a diagnosis and classification of students' ability.

Based on the development of reading psychology theory, the reading ability is divided into five dimensions (the ability of vocabulary, literal comprehension, contextual integration, inferential comprehension, and analysis and evaluation). In terms of the test content, provide rich and diverse materials (such as daily conversations and Internet information, etc.), and make good use of various forms of text (such as graphics, tables, letters, etc.) to make the context of the question close to the real-life experience of the students. With detailed diagnosis and learning suggestions, students can grasp their own advantages and discover their reading ability to be strengthened, so that learners can plan their learning process wisely.

After students complete the test, the DACC report will be displayed on the SmartReading platform. In DACC report (Fig. 12.3), the performance of learners

in the five reading dimensions and the performance compared to the norm reference grade level will be displayed. The upper part is the basic information of learners and the three standards of comprehensive reading comprehension scores, including (from the left column to the right column): comprehensive reading comprehension scores, normative reference grade average scores, and DACC grades.

The quality of DACC test questions is controlled by a scientific process. It has been tested by a large number of users. The total number of test subjects has exceeded tens of thousands of times. In addition, it has also passed the review of experts in the field of Chinese language and reading teaching. The reason above are the reasons that make the quality of DACC's examination questions excellent and well-recognized.

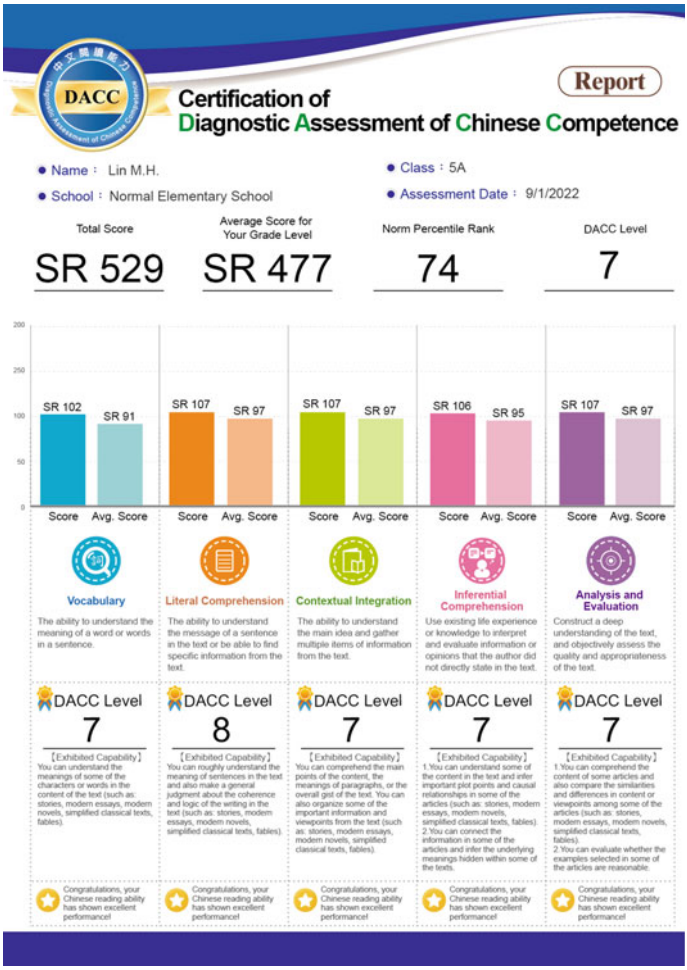

Fig. 12.3 DACC report

The next section will introduce the DACC performance data of all 511 students and the quantitative results of this study.

12.3.3 Data Analysis

In terms of overall Chinese reading comprehension scores, the reading scores of the students from the three international schools are higher than the norm scores, and the reading scores of the five reading dimensions are also higher than the norm. School A has an overall average score of 498, and School B and C have test average scores of 488 and 489, respectively. In terms of vocabulary comprehension, students in School B performed the best, and the remaining four reading dimensions (surface textual understanding, textual integration, inferential understanding, analysis, and evaluation) were all performed best by students from School A (Fig. 12.4; Table 12.2).

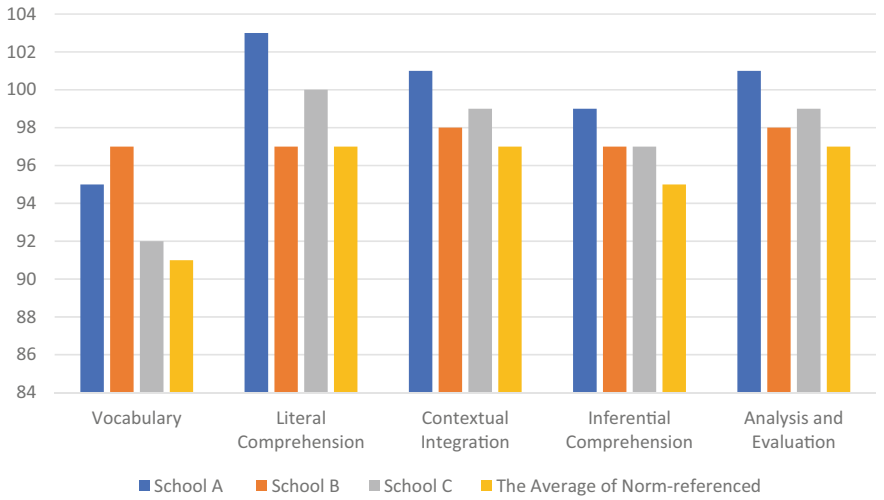

Fig. 12.4 Students performance of five dimensions

Table 12.2 The Overall Reading Comprehension Performance (ORCP)

School	Average score	Vocabulary	Literal comprehension	Contextual integration	Inferential comprehension	Analysis and evaluation
A	498	95	103	101	99	101
B	488	97	97	98	97	98
C	487	92	100	99	97	99
The Average of Norm-referenced	477	91	97	97	95	97

12.4 Discussion

Today, there is no doubt how language and thought are related. Language is used to represent thoughts in any individual's mind. This can be investigated in skills where the major concern is comprehension such as reading and listening comprehension (Yousefi & Mohammadi, 2016). This study analyzes the reading performance of students in three international schools. Reading performance is divided into five test dimensions: vocabulary, literal comprehension, contextual integration, inferential comprehension, and analysis and evaluation. The students from the three international schools scored the lowest on word recognition and the highest score on literal comprehension. The scores for both contextual integration and analysis and evaluation are equally high, indicating that despite not comprehending all the words in the article, students' reasoning and analytical abilities are more prominent. It also means that students can analyze the meaning and choose the correct answer without relying on understanding all the new vocabulary.

Inquiry Questions

1. What are the five test dimensions of the online platform SmartReading Diagnostic Assessment of Chinese Competence (DACC) mentioned in this article?
2. What are some ways to improve reading skills?
3. What do you think is the connection between reading ability and thinking?

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