Title	Fostering interest in reading and strengthening reading comprehension ability of primary school students using a children's literature e-quiz bank on the cloud
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Fostering interest in reading and enhancing reading comprehension ability of primary school students using a children's literature e-quiz bank on the cloud

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Abstract: Reading proficiency and frequency is directly and positively related to students' academic performance. An online e-quiz bank of children literature, Reading Battle, is developed to enhance students' reading comprehension ability and interest in reading. Students are invited to read from a collection of children literature then attempt quizzes on the e-quiz bank to evaluate their understanding on the texts. The quizzing process is gamified into a "challenge" for their peers. This article presents the project's implementation in a Hong Kong primary school over 2 academic years, and discusses findings on the e-quiz platform's effectiveness. Survey and interview with students and teachers show that there is a perceived improvement in students' reading comprehension ability and related grades in school assessments, and that gamification of reading books and taking comprehension quizzes has effectively fostered students' interest in reading.

Keywords: Reading interest, reading comprehension ability, primary education, e-quiz bank

1. Background

Studies have been shown proficient and frequent readers tend to perform well academically (Baker & Wigfield, 1999; Loh & Tse, 2009; Applegate & Applegate, 2010), And that sub-optimal reading proficiency has been found to hinder their ability in Reading to Learn, and in the long run, impede their lifelong learning potential (Schoenbach, Greenleaf, & Murphy, 2012). Given the potential benefits of strengthening students' reading comprehension skills and the drawbacks of not doing so, the development of reading proficiency is of vital importance to the growth of primary school students' scholastic performance.

Teacher librarians and teachers nowadays have at their disposal various computing facilities and mobile technology, both of which could be utilized to support teaching and learning (López, 2010). Taking advantage of technological developments, teacher librarians and teachers have more effective means to ensure students have actually read the books and grasped the contents of the texts, which might not always be the case if teacher librarians and teachers employed the traditional way of asking students to keep a record of the books they have read. One of the ICT-supported methods requires students to demonstrate their level of understanding of a book through attempting post-reading questions online (Sadaghiani, 2012). The computer-graded quizzes save teachers' time on face-to-face evaluations of students' comprehension abilities, and grading of their reading reports. Teacher librarians and teachers can monitor students' development of reading comprehension skills at ease (Richards-Babb, Drelick, Henry, & Robertson-Honecker, 2011). With the above benefits, an interactive e-quiz cloud service with an award scheme as an added incentive was developed to help engage students in reading, and quantitatively gauge their level of understanding of the texts read.

Reading schemes for Hong Kong primary school students

Although Hong Kong primary school students have performed well in international reading tests (PIRLS 2011 – ranking 1st among 45 participating countries / regions [Mullis et al., 2012], PIRLS 2006 – ranking 2nd among 45 participating countries / regions [Baer et al., 2007]; PIRLS 2001 – ranking 14th among 35 participating countries / regions [Ogle et al., 2003]), it is not easy for students to remain "competitive" since other regions, for example Singapore and Taiwan, have put in a lot of effort into enhancing the reading ability of their students. To maintain and advance Hong Kong students' competitive edge, it is important to come up with effective and interesting methods to strengthen their reading skills.

There are a number of reading programmes available to Hong Kong primary schools students. The then Education Department has started implementing extensive reading schemes in 1995 to train up the reading proficiency of upper primary school students (Education Department, 1999). The schemes were extended to cover Primary 1 to Secondary 5 levels since 1997 (Education Bureau, 2013). Students could read extracurricular books during class time, and complete the corresponding activity cards (Education Department, 1999). The activity cards were developed by the Education Department in the early years; however, such efforts were not sustained after 1999. The schemes are still in place as of today, which mainly involve an annual school subsidy to replenish the library collection but without the support of learning resources such as activity cards.

There is also a number of local as well as overseas reading schemes. Local reading programmes, for example 中文百達通[1] and 每日一篇網上閱讀計劃[2], require students to read short passages online with post-reading questions. Students become accustomed to short readings and post-reading questions through daily practices. The Oxford Reading Tree, developed overseas, is a mature English reading programme which nonetheless covers titles from only one publisher. Another scheme created overseas is called Battle of the Books, which supports a limited number of books – only 20 books each year for local schools (Hong Kong Battle of the Books, 2015). This booklist may pose limitations on catering for the interest of the vast student population in Hong Kong.

Developing a quiz database to supplement children's literary experience

The above-mentioned e-reading schemes focus on reading short passages online. Compared to the more time-consuming practice of reading an entire book, these schemes offer convenient everyday reading comprehension exercises that train students to look for information in a piece of text. However, reading books for literary experience cannot be ignored. It is just as important to encourage students to read for literary experience so as to foster their love for books. A fruitful literary experience involves immersing in a book's virtual environment and reaching a state of flow when drawn deeply into a story line (Schaeffer & Antonioli, 2013). During this process, students weave an intricate network of information into a meaningful story line, and utilize an assortment of cognitive skills unconsciously to immerse themselves in the virtual environment (Nikolajeva, 2010). These may include attending to the structure of the text type, activating prior knowledge, making inferences about character's motives, being sensitive to the situation the characters encounter, and to the way characters respond to challenges (Hoyt, Davis, Olson, & Boswell, 2011). The reading of books can be a motivating and engaging journey, but the drawback is that the activity provides nothing for teacher librarians and teachers judge students'

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[1] See http://web2.chinese100.hk/index.php for details of the reading scheme.
[2] See http://www.prof-ho.com/reading/ for details of the reading scheme.

level of engagement, unless they produce meaningful output after reading. As a solution, quizzes are believed to be effective since scaffolded questioning has been found to significantly improve students' reading comprehension (Chen et al., 2011), and successfully implemented e-quizzes have been shown to support learning in the study of Souza and Bingham (2006). Hence, the present project "Reading Battle" aims to develop a quiz database to scaffold students' reading experience, and to help evaluate and automate the monitoring of their reading comprehension level.

Scaffolded questioning

The "Scaffolded Reading Experience" (SR) used to guide the "Reading Battle" project is an instructional framework proposed by Graves and Graves (2003) for reading. It is a flexible lesson plan designed for a specific learning situation, consisting of a set of activities before, during and after reading specifically planned to help students become proficient readers. Pre-reading activities may include pre-reading questioning, predicting, and activating background knowledge. During-reading activities may take the form of silent reading, reading to students or oral reading by students. Post-reading activities include answering comprehension questions, having discussions and responding to writing exercises. Different combinations of such practices can be adopted by teacher librarians and teachers, depending on the needs of students, the reading text selection, and their purposes (Clark & Graves, 2005). Scaffolded questioning significantly improves students' level of reading comprehension (Chen et al, 2011).

2. Project implementation

It was the second academic year that the primary school under discussion participated in the Reading Battle project (for findings from the first year of implementation, see Wu et al, 2014) For the academic year of 2014-2015, a total of 394 students from 1 local school in primary 2 to primary 4 (aged 6-10) as participants. The project aimed to foster students' reading interest in both Chinese and English, improve their reading comprehension ability, and cultivate their autonomy in learning. With these aims in mind, participating students were invited to read books on cross-curricular subjects, then take online quizzes on the "reading battle" platform, a fun, interactive, and personalised learning experience. Their performances in quizzes were recorded to review their progress and to fine-tune the programme.

The project was implemented in three stages. Stage one involved a series of preparation to get teachers, parents, and students ready for the implementation of the project. Details of project preparation will be discussed shortly. Stage two featured training in the Language Laboratory, technical instructions to ensure each and every student had the necessary software to access the e-quiz platform at home, and to integrate Reading Battle into a repertoire of school reading programmes. Stage three involved activity planning for the academic year of 2014-15, including the selection of reading materials across the curriculum, supplying participants with a parent-child reading record (a reading list with book IDs), as well as the launch of two reading programmes – the School Rewarding Scheme and the Holiday Reading Programme. Data from the 2014-15 implementation are analysed in the following results section.

Collaboration between school stakeholders and project team

The project involved collaboration between the teaching librarian, IT coordinator, various subject panel teachers including Chinese, English, General Studies, Music, and Physical Education, as well as P.2 to P.4 class teachers and subject teachers. Together with the school's Principal and middle managers' support, the teacher librarian and teachers collaborated to create a cross-

curricular reading programme with interesting reading materials. The teacher librarian and teachers maintained regular communication with each other for progress report and evaluation, and kept in touch with the project team from the university through PBworks and face-to-face meetings. The teacher librarian and teachers were interested in students' reading behaviour and the books' level of difficulty, their participation in the project, as well as their reading abilities and interest.

In implementation stage 1, the teacher librarian and teachers were briefed on the introduction of e-quiz in the upcoming academic year. Pre-tests were carried out in July 2013 and Feb 2014 to test students reading abilities prior to the intervention. The school middle managers and the teacher librarian discussed how the Reading to Learn activity should be carried out – whether students should complete the quizzes at school or to take the quizzes at home. The latter option was adopted as it aligned with the school emphasis on students' learning autonomy.

Stage two of the project aimed to get students and parents ready for the project. The project was also promoted to students through regular Campus TV broadcasts during morning assemblies about the e-quiz platform's operation, as well as competitions with attractive prizes, and promotional videos of school-based Reading Battle awards. They also have access to information through links to a demonstration of the platform's usage on the school's website, and digital learning page of school handbook. Books were made more accessible by establishing a Reading Battle Book Collection in the school library, and a digitalised library system with book borrowing record. As parental support was essential to the project's implementation, they were informed of the project through the school library newsletter, and a detailed school circular providing details of the project and technical instructions on how to install the appropriate web browser (Google Chrome) to access the e-quiz platform. The circular proved useful as most students were unfamiliar with Google Chrome, but two weeks into project implementation, around 95% of students successfully installed the web browser at home with the school's support.

Stage three of the project spans over the academic year of 2014-15. Reading materials were selected across the curriculum, recommended by subject teachers after considering students' needs in each subject. Two reading schemes were launched: the School Rewarding Scheme and the Holiday Reading Programme. It is the school and the project team's belief that every child is a winner, therefore the project not only honoured individual success, but also acknowledged importances of individual growth: two ranking systems "term score ranking" and "improvement score ranking" were set up to cater for different objectives of learning. The teacher librarian and teachers continued communication with parents to ensure students received the necessary support.

Throughout the implementation of Reading Battle, data was collected on student performance and behaviour. Students' performances, in terms of score, in quizzes were logged by the system, which generated reports available for easy download via the teacher version of user interface. The report in spreadsheet format included students' term scores, total score, average score of all quizzes taken, and number of books read. Detailed reports containing individual students' performance on each question was also available. The scores could be compared on a class level, interclass level, and interschool level. Such reports provided the teacher librarian, teachers and the project team with data for quantitative analysis of students' improvement. Also, student behaviour when they use Reading Battle at school were observed. A survey was conducted in May 2015 to collect students' views on the project's effect on their reading ability and interest. Other than the teacher librarian, a number of students, teachers, and parents were interviewed for their opinions on their experience as participants.

3. Results

Reading Battle has proved both effective in its objectives and popular among users. Survey results show that students believed they improved in reading ability and reading interest. The teacher librarian and teachers also noted that the project was helpful in understanding students' reading and learning needs, and that it enhanced collegiality and mutual support among colleagues.

Improvement in reading ability

Ninety four percent of students agreed that Reading Battle was effective in improving their reading comprehension skills (see Figure 1). A closer look at the survey results may suggest that lower primary students perceived an improvement after participating in the project, with 100% of the Primary 2 students and almost all (98%) Primary 3 students answered positively to the question. Another question asked was whether student thought they scored better grades in reading comprehension homework or assessments in the second semester, almost one year since their participation in the project. Eighty three percent of students across the three forms answered positively. Again, the percentage of Primary 2 students agreeing that they performed better in terms of grades is the highest among the three cohorts.

The teacher librarian and teachers also observed significant improvement in male students' reading comprehension abilities. In contrast to their experience of female students having more outstanding performance than male students with regards to reading, there was at least one male student occupy the top three places in Reading Battle's interclass rankings most of the time. As the total score of Reading Battle accumulates as users take quizzes and correctly answer the questions, a high ranking indicates good performance in quizzes as well as a high number of quizzes taken, which means the student has read many books and has successfully digested the contents. The teacher librarian and teachers attributed male students' improvement to our next point of discussion – the attractive gamified design of Reading Battle, which stimulates students' interest in reading.

Reading Battle's effectiveness in improving reading ability as perceived by students
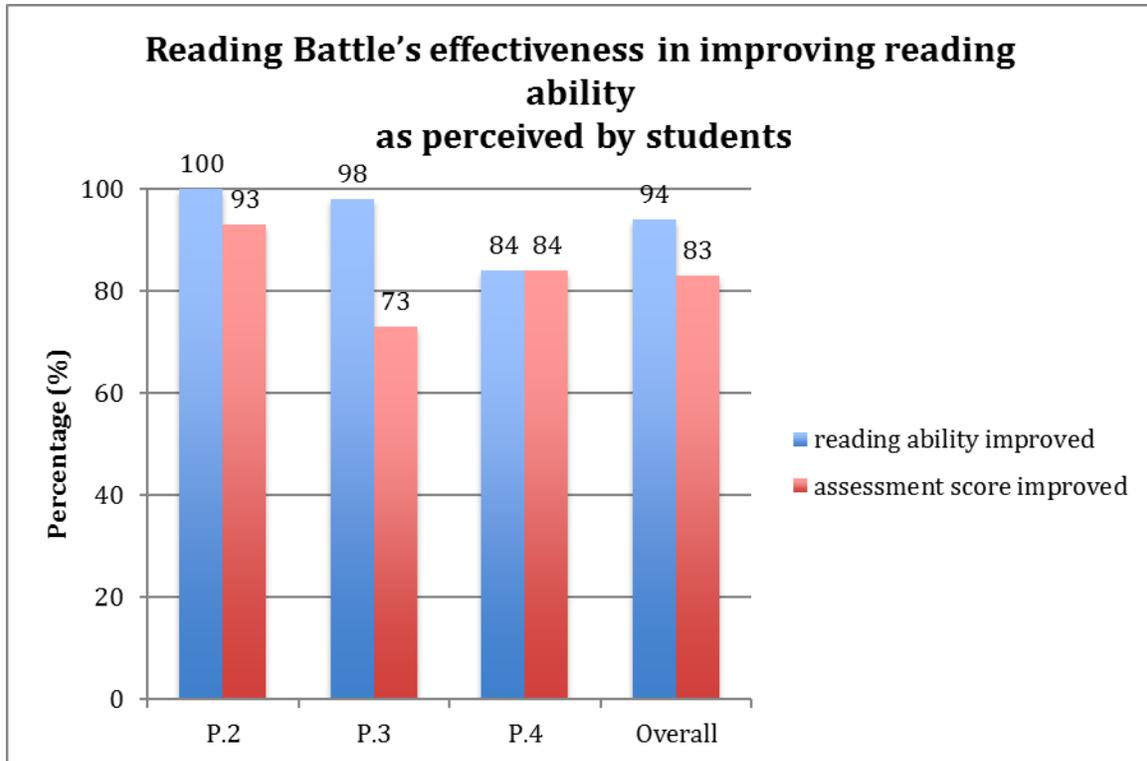
Figure 1. Survey results on Reading Battle's effectiveness in improving reading ability

Reading Battle stimulated reading interest

Over its two years of implementation, Reading Battle has twice been voted "Top Ten Best Websites of the Year" by students. Its high popularity is not without reason: 84% of students thought that Reading Battle enhanced their interest in reading. According to teacher librarian and teacher observation, in the initial stage of the project, student participated in Reading Battle because of the external stimulation of e-badges which they earned by reading and taking quizzes. Striving to earn e-badges, students read an increased number of books over a short period of time, during which they developed an interest and habit of reading. Indeed, 94% of students considered the children literature collection in Reading Battle interesting. By gamifying the learning process, Reading Battle has turned external stimulation of prizes into students' own internal motivation to read and learn.
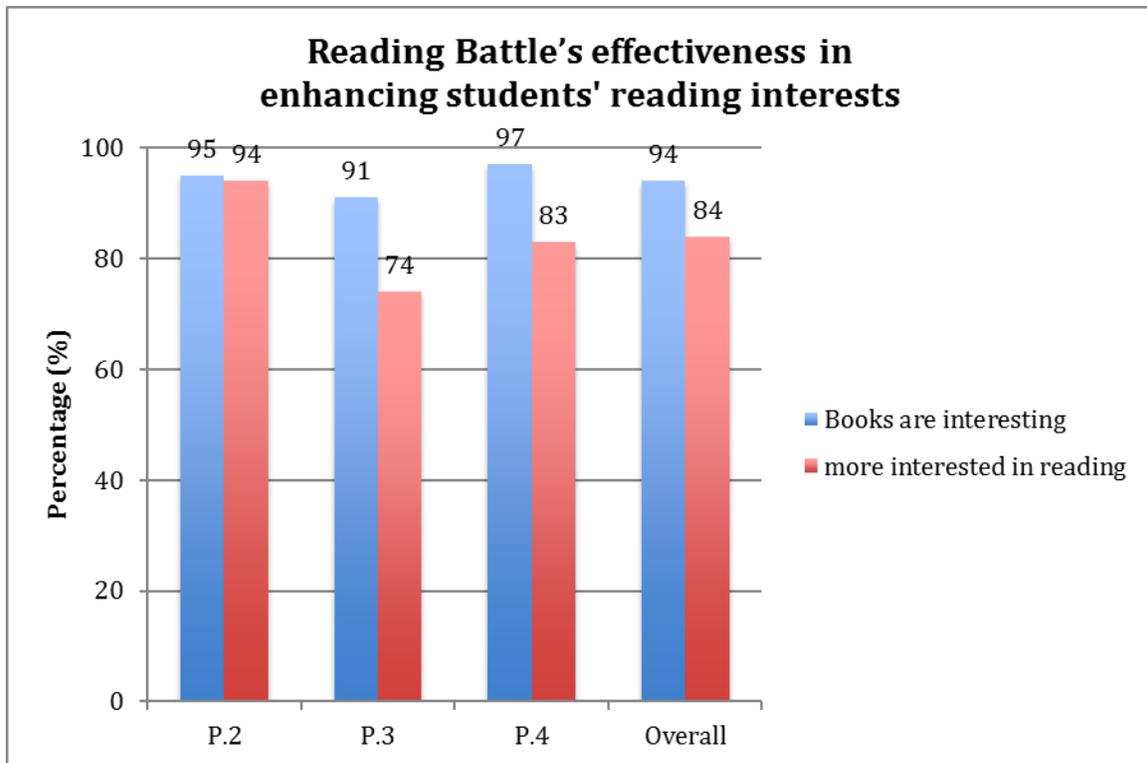
Figure 2. Survey results on Reading Battle's effectiveness in enhancing students' reading interests

Teacher's perspective

Reading Battle was not only met with students' praises, but also positively received by the teachers. First, the project provided teacher librarians and teachers with data and information to understand students reading and learning needs. For reading needs, teacher librarians and teachers could gain insight into types of books that were popular among students, based on the title's read count and rating given by students. As for learning needs, an example would be students in different forms needed support in different aspects. As participation in Reading Battle was done online – a mode that gave student high autonomy in their learning – the teacher librarian and teachers have discovered that students in lower forms more often required technical support, whereas students in higher forms needed reminders instead.

Another finding is that the project enhanced collegiality and mutual support. With the project being run in a cross-curriculum mode, teacher librarians and teachers collaborated to provide students with a carefully chosen collection of children literature. The process has stimulated teacher librarians and teachers to reflect on issues such as how to develop students reading ability using information technology, how to foster students' self-motivation to read, as well as the prerequisites for autonomous learning. These questions has transformed teacher librarians' role in the promotion of reading from didactic teachers to learners then to the role of collaborative leaders. It was important that teacher librarians ~~they~~ embraced the changes with open minds in order to keep up with the latest developments in library and information science for the pursuit of excellence in the digital era.

4. Conclusion

With the belief that students who read well perform well academically, Reading Battle was implemented to develop primary school students' reading ability and interest using a motivate-scaffold-monitor framework. After two years of implementation, the teacher librarian, teachers involved and the project team have applied the collected data in learning and teaching, highlighting the importance of maintaining communication with school stakeholders, and keeping the process supervised throughout the implementation. The project was positively received by students, the teacher librarian and teachers as it effectively improved reading ability and interesting in reading, as supported the highly. Students perceived an improvement in their reading ability, as well as their scores in reading comprehension tasks or assessments. They also thought the books interesting and the project effective in enhancing their interest in reading. Teacher librarian and teacher observation suggested students did improve, and that Reading Battle was successful because its gamified learning process helped developed students' internal motivation in reading. The findings suggest that Reading Battle is effective in boosting students' academic performance through reading. By widening the database of e-quizzes, the programme could be extended and benefit more students.

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