Inquiry Project-Based Learning With a Partnership of Three Types of Teachers and the School Librarian

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Using an inquiry project-based learning (PBL) approach that involved the collaboration of three kinds of teachers (general studies, language, and information technology [IT]) and the librarian, primary 4 students from a Hong Kong school were guided through group projects. The effect of this approach was examined by comparing the project grades of students who took part in the inquiry PBL project with those of a control group. Surveys and interviews were conducted with students (N = 141), parents (N = 27), and teachers (N = 11). The comparison of group project grades revealed significantly higher scores for the inquiry PBL groups (p < 0.05). Surveys showed that students were perceived to have improved in eight dimensions of learning, with no significant differences (p > 0.05) between students, parents, and teachers. Students enjoyed the projects and perceived them to be relatively easy. Gender differences and academic abilities had no significant moderating effects on the learning dimensions. Examination of the approach showed the collaboration between the four teaching staff to be effective through the support of the school administration, an inquiry learning expert, and parents. On the other hand, the main limitation was the extra workload for the teachers. Nevertheless, the study participants and stakeholders all advocate the continued implementation of the approach.

Introduction

A considerable amount of research has indicated that inquiry-based learning (IBL) is a far more effective mode of learning than traditional rote learning (Harada & Yoshina, 2004a; Hu, Kuh, & Li, 2008; Donham, Bishop, Kuhlthau, & Oberg, 2001). Another body of research has indicated that project-based learning (PBL) has been shown to provide students with realistic and thought-provoking problem solving opportunities (Blumenfeld et al., 1991; David, 2008; Marx, Blumenfeld, Krajcik, & Soloway, 1997; Thomas, 2000). It has been shown that integrating IBL and PBL can be a promising learning approach (Krajcik et al., 1998). In this article, this integrated approach will be referred to as inquiry PBL.

In recent years, the Education Bureau (EDB) of the government of the Hong Kong Special Administrative Region (HKSAR) has incorporated IBL and PBL into its general studies (GS) curriculum for primary schools. In particular, five goals related to inquiry learning and PBL for primary 4 (P4) to primary 6 (P6) students have been outlined, which include the development of students’ basic knowledge, investigation skills, and problem-solving capabilities (EDB, 2002). The EDB stipulates that inquiry PBL aims at facilitating students’ independent learning capabilities and developing their generic skills and interpersonal relationships. It also enables students to connect knowledge, skills, values, and attitudes and to construct knowledge through a variety of learning experiences (EDB, 2001).

Despite the above-mentioned explicit goals from the EDB, effective implementation of inquiry PBL in the local primary school curriculum seems to be a concern. It appears that quite a number of students have only limited access to relevant databases for primary-level research and are not well-equipped with information technology (IT) skills. This could become a hindrance for effective implementation of inquiry PBL. For instance, only several of 635 local primary schools (EDB, 2007) are using WiseNews (May Lee, personal communication, September 7, 2006)—a news database that has been shown to be useful for local GS projects (Chow et al., 2007).

In the year preceding the implementation of this study, the author found that groups of P4 students in a local primary school, which was regarded as a leader in the use of IT in education, seemed to be lacking in effective IT skills. When students presented their project findings, one group had members hold up large sheets of paper for the entire presentation period, and the points shown on the sheets could only be seen by a limited number of students in the front rows. Another group managed to produce a PowerPoint file with about 20 slides but were able to cover only the first few slides within this article.

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In the HKSAR education system, P4 and P6 correspond to grade 4 and grade 6, respectively in the U.S. system.
FIG. 1. The inquiry project-based learning (PBL) model adopted for the general studies group projects.

their given presentation time. This suggests that either they were not the ones who produced the file or they were not able to use the presentation materials effectively.

Based on the observation that students seemed to lack certain resources, skills, and knowledge that they needed to do well in their inquiry PBL projects, a collaborative teaching approach was initiated by this research. This strategy involved bringing in different kinds of teaching staff to equip students with the necessary resources and skills. Previous research findings indicated that collaboration between different teachers promotes effective learning (Thousand, Villa, & Nevin, 2006; Schwab Learning of Charles and Helen Schwab Foundation, 2003), and that school librarians and teachers can work effectively together in guiding students’ inquiry PBL projects, with the aim of maximizing students’ learning support. Support, challenges, and feedback are needed by students to become self-directed learners (Silen & Uhlin, 2008). Furthermore, through the collaborative approach, students might also develop core skills and abilities in various dimensions as illustrated in Figure 1. This study also explores the issues and challenges encountered by students, teachers, and parents in the process of implementing such a teaching and learning model.

Literature Review

A considerable body of research has looked into inquiry-based and project-based learning, and this provides the basis for its sound implementation in different situations. This section discusses the salient concepts and principles related to...
the implementation of a collaborative inquiry PBL approach, including the factors that may contribute to effective learning.

**IBL Project**

Traditionally, teachers used a transmission approach to teaching, in which students learn by “copying word for word from a text or lecture and then reporting back, usually in the form of a test” (Kuhlthau, 1997, p. 710). Nowadays, however, many educators find the constructivist approach to be more effective, where students bring to school informal ideas and gradually develop them towards a structured set of concepts and procedures through the dynamics of experience (Kuhlthau, 2004; Singer & Moscovici, 2008).

One of the most prevalent methods of teaching and learning advocated by constructivist educators is IBL. The EDB of the HKSAR (2002) defines IBL as a student-centred approach that promotes the integration of skills, knowledge, and values in the learning of GS. In this approach, the teacher assumes the role of a facilitator of learning, and the students actively build their knowledge base. Students need to raise questions and find the answers through information searches. Problems that the students encounter are solved through a systematic method of collecting and analyzing information.

In their study of three schools that applied the IBL approach, Donham et al. (2001) found that the change from rote to inquiry learning clearly benefited all students in terms of authentic and meaningful learning regardless of their innate abilities. IBL may occur in the best manner through the implementation of projects (Wilhelm, Sherrod, & Walters, 2008). Project work is a strategy used in teaching children who have different learning styles, cultural and ethnic backgrounds, and ability levels, and it builds on students' individual strengths, allowing them to explore their interests in the framework of a defined curriculum (Railback, 2002). Projects can capture students’ interests, provoke serious thinking, and enable them to apply their knowledge in a problem-solving context (David, 2008). Project work also promotes a sense of responsibility in that students take charge of their own learning and develop a sense of ownership of topics that are personally relevant to them (Alloway et al., 1996).

In contrast to conventional, imposed tasks, inquiry learning has incorporated the idea of self-generated or semi-imposed tasks in which the student negotiates through a thematic and problem-based content (Harada & Yoshina, 2004a). Students have a stronger sense of ownership towards self-generated tasks as compared with imposed tasks (Gross, 1999). This is in line with Piaget’s concept of autonomous learning (1973), which requires children to discover relationships and ideas within the classroom through activities of interest to them. It has been noted that inquiry projects are completed well when the topics are of personal interest to the students (Alberta Learning, 2004). Kuhlthau et al. (2007) reaffirm this by stating that “the curriculum and the student’s world need to be closely aligned for deep personal learning to take place” (2007, p. 8). As such, to improve children’s school performance, it is important that assignments allow students to choose and personalize their work.

Vygotsky (1987) emphasized the importance of opportunities for active exploration and claimed that children learn new cognitive skills under the guidance of a more skilled person through scaffolding. In the classroom, teachers can assist children’s discovery by providing scaffolding in the form of posing questions, providing demonstrations, and generating hypotheses for explanations (Moran, 2007). Hmelo-Silver, Duncan, and Chinn (2007) suggested that such scaffolding is a key for students to learn in complex domains without an excessive cognitive load. In addition, the whole process has to be within the zone of proximal development of each child. In other words, the assigned tasks have to be too difficult for children to do them alone, but are nevertheless manageable if they are given guidance (Bee & Boyd, 2002; Rogoff, 1990; Vygotsky, 1987). In the process of information search, assistance is provided only when an information user is unable to complete a task alone or can do it with great difficulty (Kuhlthau, 2004).

**Information Technology Skills and Information Literacy**

Educators using inquiry PBL have explored opportunities offered, such as using computers and accessing information through the Internet, to promote significant learning among students (Owens, Hester, & Teale, 2002). As such, IT and information literacy skills are becoming key factors in effective learning. However, there is evidence indicating that primary school students may not have the IT skills to utilize technology effectively (Borgman, Hirsh, Walter, & Gallagher, 1995). Bowler, Large, and Rejiskind (2001) conducted studies to understand how Web-based information might contribute most effectively to class assignments undertaken by primary school students, and they found that many of them lacked basic IT skills. In fact, even teachers found it difficult to incorporate technology use in the classroom (Wallace, Kupperman, Krajcik, & Solloway, 2000). Students in different grades also appear to lack the necessary levels of information literacy to find relevant information and the skills they need to critically evaluate the information they find (Livingstone & Lynch, 2000; Salovaara, 2005; van Aalst, Fung, Li & Wong, 2007). In this respect, Chow et al. (2007) found in their study that a news database (WiseNews) was useful for primary students’ IBL projects. The results of the study suggested that P4 students were able to benefit from such a database by promoting effective information search skills and critical thinking.

**Collaborative Teaching Approach**

Research suggests that collaboration between different teachers promotes effective IBL. According to Thousand et al. (2006), when teachers collaborate in their planning and teaching, they are much better prepared to meet the needs of students with diverse backgrounds. Similarly, a study performed by Schwab Learning of the Charles and
Helen Schwab Foundation (2003) found that team teaching resulted in increased overall student achievement, fewer disruptive problems, less paperwork, an increased number of students qualifying for gifted and talented education services, and decreased referrals for behavioural problems.

Collaboration between teachers and librarians has been the focus of a number of studies (Chu, Chow, Tse, & Kuhlthau, 2008; Chu, Tse, et al., 2008; Konzal, 2001; Mokhtar & Majid, 2006; Montiel-Overall, 2008; Warmkessel & McCade, 1997). Librarians have taken a central role in developing information literacy within the context of regular curricula and have become more involved in student education (Montiel-Overall, 2008). Although there is much anecdotal evidence regarding successful teacher and librarian collaboration, there is scarce research that looks into the specific practice of teacher and librarian collaboration in elementary schools (Montiel-Overall, 2007). Although there are professional guidelines for librarians to promote collaborative work with teachers to develop students’ information literacy (AASL, 1998), further research is needed to examine the effect of these practices on the academic achievement of students. Inquiry learning has also gained emphasis in the more recent standards by the American Association of School Librarians (AASL) for the 21st-century learner (AASL, 2007). These standards suggest that inquiry provides a framework for learning in a complex information environment.

Other Factors Related to Inquiry Learning

Students’ emotional and motivational experiences, as well as their interpretations of curriculum events are also influential factors in effective learning (Morgan-Fleming & Doyle, 1997; Järvenoja & Järvelä, 2005). A wide range of emotions may be experienced by students in the context of learning and achievement (Frenzel, Pekrun, & Goetz, 2007). In information seeking, the Information Search Process (ISP) model by Kuhlthau (2004) also identified students’ feelings as an important component that evolves in the process of information search. Enjoyment of learning has been reported as one of the academic emotions experienced by students (Pekrun, Goetz, Titz, & Perry, 2002). It is categorized as an activity-related emotion (Frenzel et al., 2007) and is assumed to be present when the learning material is positively valued and when the activity is perceived as being sufficiently controllable by the self (Pekrun, 2006). Learning programs could also be evaluated according to their impact on students’ experience of enjoyment (Goetz, Hall, Frenzel, & Pekrun, 2006).

Differences in learning styles are also apparent between boys and girls. In examining the behavioral difference between genders, Gurian (2006) noted that girls tend to write more words than boys and include more sensory and emotive details. In their study on motivational beliefs and cognitive engagement in elementary school students, Metallidou and Vlachou (2007) found non-significant gender differences in motivation and search strategy. Search strategies and styles are instead linked to personality traits (Heinstrom, 2006). Information-seeking styles can be described along a dimension of exploration and specificity: People with open and competitive personalities tend to conduct exhaustive and flexible information searches, while those with motivated and conscientious personalities tend to conduct focused and deep information searches with conscious attention only to high-quality information (Heinstrom, 2005, 2006).

The innate academic abilities of students have also been explored as potential related factors in learning. In Cuevas, Lee, Hart, and Deaktor’s (2005) study, it was determined that an inquiry-based instructional intervention leads to an enhanced inquiry ability of all students “regardless of grade, achievement, gender, ethnicity, socioeconomic status, home language, and English proficiency” (p. 337).

Research Gap

Very few articles have discussed inquiry PBL for group projects at primary levels, especially in the Chinese milieu. Furthermore, studies on the collaborative work of different subject teachers with a school librarian and how they work together in equipping students with skills for inquiry learning, especially in a non-English speaking context, are limited. This study aims to address these gaps, by describing the effects of an intervention that utilizes the inquiry PBL approach, with the collaboration between a librarian and three kinds of teachers.

Research Methods

This study applied a mixed methods research design, employing both quantitative and qualitative methods to answer the research questions. The use of both methods in combination is expected to generate a better understanding of the research problem (Creswell, 2008).

Research Objectives

The study focused on the following objectives:

1. To compare the academic performance of the intervention group and a control group in IBL project work.
2. To measure five kinds of learning from an intervention program through eight dimensions of skills, abilities, and knowledge: subject knowledge, information literacy, IT skills, presentation skills, research skills, reading comprehension, writing ability, and social and communication skills.
3. To compare the three participant groups’ evaluations of student learning.
4. To explore student enjoyment, perceptions of difficulty, and support of the inquiry PBL model.
5. To explore the factors related to learning development.
6. To determine the moderating effects of gender and academic abilities on the eight dimensions of students’ learning.
7. To examine the collaboration reported by a four-member core team comprising two subject teachers, the librarian, and the IT teacher.
Instructional Design

In the years preceding this intervention, GS projects had been implemented under the direction of the GS teacher only. In response to the observations concerning students’ IT and information literacy needs mentioned in the introduction, the author of this article and the school principal provided guidance and leadership in bringing the teachers and the school librarian in this study to work together to guide the P4 students on projects that involved information research from printed and Internet sources. The study was based on the models and guidelines created by Harada and Yoshina (2004a, 2004b) and Kuhlthau (1997, 2003a, 1994) and was conducted over a period of 6 months.

Over the six months, students were asked to do two GS projects in two phases. The first phase covered a 10-week period (excluding the holidays), while the second phase lasted 9 weeks. In accordance with the EDB’s suggestions for P4 GS topics, the school’s planned curriculum included, The Earth (phase 1) and The History of Hong Kong and China (phase 2). The students were asked to choose specific topics under the two themes. It was deemed necessary to have students conduct two different research topics over the 6-month period because children tend to get bored given a single task over a prolonged period of time (Chu, Tang, Chow, & Tse, 2007). In the process of searching for information, the students were free to use any database or search engine that they had learnt about from the school librarian (e.g., WiseNews, public library catalogues) or any other sources that they had known previously (Chu, Chow, Luk, Cheung, & Sit, 2007). The grades for the two projects were not included in the final subject grades awarded to the students so as to minimize parents’ concern on how well their children had fared in the inquiry PBL projects.

Participants

This study involved three groups of participants: (a) students, (b) their parents, and (c) the teaching staff. One primary school in Hong Kong served as the site for this project. The principal of this school noted that approximately 60% of the students qualify for secondary schools in band one. All the students in the four P4 classes at this primary school participated (N = 142), and the mean number of students per class was 35.5 ± 1.29. The school assigned students to each class in such a way that there were equal representations of the different academic ranking groups. Thus, all classes had similar compositions of students in terms of academic abilities. The collaborating teaching staff included the school librarian, five GS teachers, four Chinese teachers, and the IT teacher (Table 2 summarizes their contributions to the implementation of the inquiry PBL). The students and the teaching staff filled out questionnaires after the program implementation. The teaching staffs as well as 27 parents who agreed to be interviewed by telephone were also interviewed.

Data Collection

The GS teachers evaluated the group projects of the collaborative inquiry PBL students, and the grades were compared with the project grades of the students who had followed the traditional approach the previous year. In the traditional approach, the group projects were supervised by the GS teachers themselves, without the support of a collaborative team. Furthermore, there was no participation on the part of an inquiry PBL expert, such as the author of this paper. The group of students who had done their projects with the traditional approach served as the control group. There were no significant differences (p > 0.05) between the general levels of GS ability of the two student groups at the beginning of their P4 year, indicating similar levels of abilities of the student groups prior to their projects.

In inquiry learning, students are engaged in five kinds of learning: curriculum content, information literacy, learning processes, literacy competencies, and social abilities (Kuhlthau et al., 2007). Eight dimensions representing some of the competencies of the five kinds of learning were identified and served as the dependent variables in this study. These are illustrated in Table 1. These were assessed through questionnaires that measured the improvements of the students as perceived by the three groups of participants. The questionnaires included a 5-point scale, where 1 referred to “no” improvements and 5 denoted “a lot” of improvement. All three participant groups answered the questions for dimensions one to six, but for dimensions seven and eight, only the students and teachers were asked for responses. Parents were not asked about their children’s presentation and research skills as they might not have adequate knowledge or observations of these aspects.

Enjoyment, perception of difficulty, and perception of support were also measured. Degree of student enjoyment was measured using a close-ended question, with a 5-point scale for answer options. A score of 5 indicated “very much so”, while a score of 1 indicated “not at all.” Various perceptions related to the IBL project were measured using a similar 5-point scale, with questions on project difficulty, helpfulness of project components, school support, and parental participation. Gender and academic abilities were considered moderating variables that might affect the students’ learning. Academic ability was determined on the basis of students’ rankings in the school. Students were divided into five ranking groups within a class, with the first group representing the highest academic ability and the last group the lowest.

In the secondary education system of HKSAR, students with above average academic abilities are in Band 1 schools, average academic abilities in Band 2 schools, and below average academic abilities in Band 3 schools. 

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3See Appendices for the questionnaires for parents and students. (The questionnaire for the teachers is not included in the Appendices as it is similar to the one for parents and students.)

4For the ratings in these 5-point scales, 3 denotes neutral, ratings > 3 are positive; whereas those < 3 are negative.
TABLE 1. Eight dimensions of skills, abilities, and knowledge for students’ improvement.

<table>
<thead>
<tr>
<th>Kind of learning</th>
<th>Dimension</th>
<th>Indicators of attainment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum content</td>
<td>1. Subject knowledge</td>
<td>A good understanding of the subject areas the students are researching, as well as a wider vocabulary in their chosen subject areas.</td>
</tr>
<tr>
<td>Information literacy</td>
<td>2. Information literacy</td>
<td>Students’ skills in searching for relevant information, in locating, evaluating, and making use of sources should be sharpened by their work on the projects, including a familiarity with a greater variety of sources.</td>
</tr>
<tr>
<td></td>
<td>3. IT skills</td>
<td>Familiarity with the writing pad for Chinese-input or a good knowledge of Chinese inputting methods; ability to use MS Excel in creating graphical presentation of data.</td>
</tr>
<tr>
<td>Literacy competence</td>
<td>4. Reading comprehension</td>
<td>Achieving a higher level of reading comprehension ability, which may be illustrated by an enhancement in identifying the main points of a passage.</td>
</tr>
<tr>
<td></td>
<td>5. Writing ability</td>
<td>Manifested by the ability to write faster, longer, and better (i.e., using a wider range of and more sophisticated vocabulary) by the end of the projects.</td>
</tr>
<tr>
<td>Social skills</td>
<td>6. Social and communication skills</td>
<td>Improved social skills such as sharing, listening, taking turns, and assisting others.</td>
</tr>
<tr>
<td>Learning how to learn</td>
<td>7. Presentation skills</td>
<td>Enhanced ability to present information in multimedia formats (e.g., MS Powerpoint), and formal presentation of project findings.</td>
</tr>
<tr>
<td></td>
<td>8. Research skills</td>
<td>Improved investigative skills and problem-solving capabilities, for instance, becoming more skilled in asking questions and organizing their ideas for the projects.</td>
</tr>
</tbody>
</table>

TABLE 2. Contributions of the collaborating teachers and librarian in the instructional design.

<table>
<thead>
<tr>
<th>Collaborator</th>
<th>Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>General studies teachers</td>
<td>Guided students through the inquiry-based learning projects by focusing on the subject aspect and research process of the projects; whether students were asking appropriate questions for the projects, and whether they were sensibly classifying information and selecting suitable materials to be included in their final written report and a project presentation, which could be in the form of PowerPoint, drama or cartoons, at the end of each phase.</td>
</tr>
<tr>
<td>Librarian</td>
<td>Ensured that students were well equipped with the necessary information literacy skills to search, locate, and make use of relevant information sources. She provided students with a range of resources in a variety of formats, including books, Web resources and newspaper clippings. In both phases, a few library sessions were offered to students to enhance their information literacy skills; one homework assignment related to information literacy for each phase was also given.</td>
</tr>
<tr>
<td>Language (Chinese) teachers</td>
<td>Focused on the development of the students’ reading comprehension and writing abilities. They devoted 50-minute weekly classes in phase 1 (7 sessions) and phase 2 (6 sessions) to helping students improve their reading and writing abilities. In each class session, an article related to the project theme would be given to the students, who would then practice underlining the article’s main points and writing some relevant remarks in class in both phases.</td>
</tr>
<tr>
<td>Information technology teacher</td>
<td>Equipped students with IT skills and spent time in a number of classes (25–30 minutes each), in both phases, teaching them the use of a Chinese hand-writing device, Chinese inputting methods, Microsoft PowerPoint, Microsoft Excel in plotting graphs, and other relevant IT skills.</td>
</tr>
</tbody>
</table>

Further data on the variables were obtained through semi-structured interviews with the parents. The teachers were also interviewed on their experience of the collaborative approach as a teaching strategy. Using open-ended questions, in-depth information was obtained regarding the teachers’ perceptions of the collaborative inquiry PBL projects. Transcripts of the interviews were sent to the interviewees for validation.

Data Analysis

The data from the questionnaires were analyzed using independent samples tests. Kolmogorov-Smirnov tests indicated questionable normality of data; thus, non-parametric methods were used to compare data sets with the three participant groups. Group project grades were compared using t-tests. The Mann-Whitney test was used to examine differences when comparing two participant groups, while the Kruskal-Wallis test was used to evaluate the differences when comparing three participant groups. Linear regression was done to determine the effects of enjoyment and perception of difficulty on the dimensions of learning. Statistical significance was set at \( p < 0.05 \). SPSS 16.0 was used for statistical analyses. Data from the semi-structured interviews were summarized through sequential analysis. Axial coding was done by using NVivo 7.0, where themes were identified and clustered.

Findings and Discussion

This section discusses the comparisons of project grades, and the eight dimensions of learning as reported by the students, teachers, and parents. The moderating
The students’ improvements in social and communication skills were further emphasized by the parents during the interviews (56% of the interviewees).\footnote{Open-ended questions were used in the interviews; thus, the themes identified from the answers of the participants are not standard responses expected from each.} Parent 11, for example, noted that the project helped the child learn to “communicate with classmates.”

Aside from the learning dimensions, one other aspect that improved, as identified by the parents in the interviews, was the child’s initiative to learn (26% of the interviewees). For instance, one child was reported to “take the initiative in doing the project and read information everyday” (Parent 15). Another parent noted that his child normally did not read newspapers but, because of the project, took the initiative to find related information from different sources, including newspapers (Parent 5). This observation was noted by the teachers in their interviews as well. The GS teacher, Chinese language teacher, and the librarian all reported that the students became more comfortable with self-directed learning. As the Chinese language teacher said, “students learn how to think in their own way and in a well structured way.”

A particularly interesting aspect that came out of the interviews is that six parents (22%) noted that the parent-child relationships had improved in the course of the inquiry PBL activity. It was reported as “improved communication between parents and child” (5 out of 29 parents) and as a “closer relationship between child and parents” (Parent 10).

Aside from the effects on the learning dimensions, the collaborative approach also had important effects on the teaching program of the school. One of the Chinese language teachers reported that the program had resulted in “some positive effects on curriculum development and integration between subjects as we decreased the overlapping topics, which made it more efficient for teachers.”

**Evaluation of Group Projects**

The project grades of the collaborative inquiry PBL group were compared with those of the control group. \textit{t}-tests showed statistically significant differences (\(p < 0.001\)), with the inquiry PBL group obtaining higher grades than the traditional group. Mean scores for the two groups are illustrated in Figure 2.

**Eight Dimensions of Learning**

The three participant groups all perceived the students’ learning dimensions to have improved, with the teachers generally rating the improvements higher than the students and the parents. For dimensions one to six, differences were tested between the three groups using the Kruskal Wallis test, and no significant differences were observed (\(p > 0.05\)). Differences were also tested between the teachers and the students’ ratings for dimensions seven and eight using the Mann Whitney test (\(p > 0.05\)), and no significant differences were observed. This indicates that the improvements of the students in these eight dimensions of learning were perceived to be similar by the teachers, parents, and the students themselves. Table 3 summarizes the ratings for each dimension of learning according to the three participant groups. The teachers and the students gave the highest rating for improvement of subject knowledge, whereas the parents rated information literacy improvement the highest.
TABLE 3. Mean of the participant groups’ rating responses for improvement in the eight dimensions of learning.

<table>
<thead>
<tr>
<th>Dimension of Learning</th>
<th>Teaching staff Mean/SD (N = 11)</th>
<th>Parents Mean/SD (N = 27)</th>
<th>Students Mean/SD (N = 141)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Information literacy&lt;sup&gt;a,b,e&lt;/sup&gt;</td>
<td>4 ± .63</td>
<td>3.74 ± .68</td>
<td>3.6 ± 1.12</td>
</tr>
<tr>
<td>2. Reading ability&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>3.91 ± .3</td>
<td>3.26 ± .99</td>
<td>3.48 ± 1.07</td>
</tr>
<tr>
<td>3. Writing ability&lt;sup&gt;a,c&lt;/sup&gt;</td>
<td>3.73 ± .65</td>
<td>3.18 ± 1.07</td>
<td>3.48 ± 1.11</td>
</tr>
<tr>
<td>4. IT skills&lt;sup&gt;b,h&lt;/sup&gt;</td>
<td>3.82 ± .6</td>
<td>3.37 ± 1.02</td>
<td>3.28 ± 1.21</td>
</tr>
<tr>
<td>5. Subject knowledge&lt;sup&gt;a,c,j&lt;/sup&gt;</td>
<td>4.18 ± .75</td>
<td>3.6 ± .96</td>
<td>3.88 ± 1.05</td>
</tr>
<tr>
<td>6. Social and communication skills&lt;sup&gt;a,d,f&lt;/sup&gt;</td>
<td>3.82 ± .75</td>
<td>3.4 ± .83</td>
<td>3.72 ± 1.1</td>
</tr>
<tr>
<td>7. Presentation skills&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4 ± .82</td>
<td>NA</td>
<td>3.4 ± 1.13</td>
</tr>
<tr>
<td>8. Research skills&lt;sup&gt;a,f,k&lt;/sup&gt;</td>
<td>3.5 ± 1.14</td>
<td>NA</td>
<td>3.6 ± .52</td>
</tr>
</tbody>
</table>

*The respondents answered according to a scale of 1–5 with reference to improvement in the dimensions, 1 (none) and 5 (a lot);<sup>a</sup>Sample size of parents = 26; <sup>b</sup>Sample size of parents = 25; <sup>c</sup>Sample size of parents = 15; <sup>d</sup>Sample size of parents = 24; <sup>e</sup>Sample size of students = 140; <sup>f</sup>Sample size of students = 135; <sup>k</sup>Sample size of students = 132; <sup>j</sup>Sample size of students = 133; <sup>i</sup>Sample size of students = 137; <sup>h</sup>Sample size of teaching staff = 10.

TABLE 4. Mean of the participant groups’ rating responses for their perception of tasks and support from the collaborative components.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Teaching staff Mean/SD (N = 11)</th>
<th>Parents Mean/SD (N = 27)</th>
<th>Students Mean/SD (N = 141)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Perceived difficulty/ease of project&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3 ± .82</td>
<td>3.5 ± .93</td>
<td>3.31 ± .99</td>
</tr>
<tr>
<td>2. Overall school support**&lt;sup&gt;a,b,c&lt;/sup&gt;</td>
<td>3.9 ± .57</td>
<td>3.26 ± .99</td>
<td>3.71 ± .69</td>
</tr>
<tr>
<td>3. Helpfulness of general studies assignments**</td>
<td>3.86 ± .38</td>
<td>NA</td>
<td>3.63 ± 1.17</td>
</tr>
<tr>
<td>4. Helpfulness of Chinese assignments**</td>
<td>4.43 ± .53</td>
<td>NA</td>
<td>3.67 ± 1.09</td>
</tr>
<tr>
<td>5. Helpfulness of research journals**</td>
<td>4.14 ± .69</td>
<td>NA</td>
<td>3.65 ± 1.01</td>
</tr>
<tr>
<td>6. Helpfulness of librarian**</td>
<td>4.29 ± .75</td>
<td>NA</td>
<td>3.58 ± 1.04</td>
</tr>
<tr>
<td>7. Helpfulness of IT teacher**</td>
<td>3.86 ± .69</td>
<td>NA</td>
<td>3.47 ± 1.27</td>
</tr>
</tbody>
</table>

*The respondents answered according to a scale of 1–5, 1 (very difficult) and 5 (very easy); **The respondents answered according to a scale of 1–5, 1 (not at all) and 5 (very much so);<sup>a</sup>Sample size of students = 140; <sup>b</sup>Sample size of parents = 24; <sup>g</sup>Sample size of teaching staff = 10.

with parents revealed that the children enjoyed the process of inquiry PBL when the assigned topic was interesting to them (7 out of 29 parents), and two parents reported that the children might not have enjoyed the project so much because the topic was not of interest to them. This highlights the importance of giving greater freedom for the students to choose the topics that are interesting to them. As Railsback (2002) pointed out, a key ingredient for PBL is that it is student-driven, challenging, and meaningful to the students.

A number of parents (4 out of 29) noted that the students enjoyed the information search process itself. The “process of finding relevant materials” (Parent 1) was enjoyable for the children. Parent 20 reported that his child would always search for information on the internet and immediately contact other group members for discussion. This may indicate that the information search process itself may provide a source of novelty and enjoyment for young children.

The students’ reported enjoyment of the project appears to have a linear relationship with five of the eight learning dimensions. Regression analysis showed that there are significant linear relations between level of enjoyment and information literacy ($p < 0.001$), reading ability ($p < 0.001$), writing ability ($p < 0.001$), subject knowledge ($p < 0.001$), and communication skills ($p < 0.001$). These findings imply that learning may be facilitated by activities that the students enjoy.

Perception of Difficulty and Support

The participants’ perceptions of the difficulty of the project were determined using a 5-point ordinal scale in which the higher end represented easy and the lower score represented difficult. The highest ratings were given by the parents and the lowest ratings were from the teachers. Both the parents and the students rated the tasks as easy, while the teacher’s ratings were in the middle of the scale, signifying a neutral perception. However, there were no significant differences between the group ratings ($p > 0.05$). The results discussed in this section are presented in Table 4.

When the students encountered difficulties, the main approach they took to overcome this was to ask other people such as their parents, siblings, or teachers; this was reported by 55% (16 out of 29) of the parents who were interviewed. Five other parents stated that their children responded to difficulties by doing Internet searches, and three parents noted that their children searched for solutions in books and newspapers. Both the GS and the Chinese language teachers noted that doing online searches was one of the difficulties reported.
by the students. This draws attention to the need to enhance student information literacy as a crucial factor in adopting the inquiry PBL approach (Silén & Uhlin, 2008).

Significant linear relationships were also identified between the level of difficulty and four of the learning dimensions. Higher ratings of ease of the project were related to reading ability \((p < 0.05)\), writing ability \((p < 0.05)\), IT skills \((p < 0.005)\), and presentation skills \((p < 0.05)\). These results imply that improvements in these learning dimensions may be facilitated by the students’ perceptions that the project is not too difficult.

All the participants perceived the overall support the school provided as sufficient. However, although the teaching staff considered that students had been given a high level of support, the parents gave relatively lower ratings and offered suggestions on how the school could further facilitate student learning, such as providing a venue for the students’ meetings and improving the IT skills support.

The teachers and students assessed the support of the different collaborative components in terms of helpfulness. Generally, the teachers gave higher ratings than the students. However, a significant difference was observed only in the helpfulness of the librarian \((p < 0.05)\). The teachers perceived the librarian’s contributions to the project to be more than the students, perhaps because only the teachers were aware of the librarian’s contributions (e.g., block loans of several hundred books from the central library, preparation of newspaper clippings). Other criteria yielded differences that were not significant \((p > 0.05)\). Table 4 shows the mean ratings given by the participants on the perceptions of difficulty, support, and collaborative components.

With regards to the amount of parental support, the parents and the students assessed this using a scale of 1 to 5, where the higher rating represents a lot of help. Both participant groups gave ratings that were edging towards the lower part of the scale (parents: 2.4 ± 1.06; students: 2.67 ± 1.39). No statistically significant differences were observed \((p > 0.05)\). Such findings indicate that both the parents and the children perceived that parental support was minimal and this facilitated independent learning of the students.

Interviews with parents showed that the most common method of parental support reported by the parents (12 out of 29 parents) was helping the children conduct information searches online. They also assisted in editing the text of the reports (4 out of 29 parents).

A number of parents mentioned some other interesting ways of supporting their children in the project. For example, two parents went on a trip to the countryside with their children to see certain kinds of insects and crustaceans. Another parent reported that the child requested to be brought to a museum to gain a better understanding of the history of Hong Kong and China.

**Moderating Factors—Academic Abilities and Gender**

To determine if different academic abilities played a role in students’ perceptions of the development of the eight dimensions of learning and perceptions of difficulty and support, 141 students were ranked on the basis of their overall class performance as provided by their school. They were divided into five groups within each class: if the class had 35 students, then seven students would be in each group, with the first group comprising the seven best performing students, the second group comprising those ranked as 8th through 14th; and so on. For the purpose of this section, data analysis includes only the first, third, and fifth groups; the second and fourth groups are intentionally excluded from the analysis. The total number of students involved in this part of the data analysis was therefore 84, with 21 students from each of the four classes and seven students from each rank.

The results of the Kruskal-Wallis test show that the students’ perceived improvements in learning were not affected by the level of academic ability. A significant statistical difference was identified only in the increased reading interest between the middle and lower ranks \((p < 0.01)\). These findings are consistent with those of Donham et al., (2001) in which students benefited from inquiry learning regardless of their innate abilities. Subsequent studies have also suggested that both high achievers and lower-tier students improve their skills by participating in inquiry PBL projects (Cuevas et al., 2005). Hmelo-Silver et al. (2007) pointed out the scarcity of information on how students’ academic abilities are related to the effects of inquiry PBL approach on learning. As far as this study shows, students do benefit from inquiry PBL, regardless of their academic abilities.

To determine if gender played a role in the studied variables, independent \(t\)-tests were performed to compare students’ scores between genders. A significant difference was noted only in the students’ perceptions of parental help \((p < 0.05)\), with the girls reporting greater assistance from their parents. This may be related to learning behavioral differences between the two genders in this age group in that boys strive for independence earlier compared with girls (Best, 1983), which may result in boys asking for relatively less help. No other significant differences were observed between genders. This suggests that the perceived improvements through the inquiry PBL were similar for boys and girls, and the effect of such a teaching and learning approach need not be different for girls and boys.

**Implementation of the Collaborative Teaching Approach**

The previous sections have discussed the effects of the collaborative teaching approach on the learning of the students, including the perceived support provided by the teachers and the librarian. This section discusses the details of implementing the new approach as reported by the stakeholders in the interviews. The stakeholders who were interviewed included the GS and Chinese language teachers, the chairs of the GS and Chinese departments, the librarian, the IT teacher, the curriculum development officer, and the principal.

**Enablers.** Enablers are the subtle elements that contribute to the success of the implementation of a collaborative teaching approach.
needed in conducting their inquiry PBL (Kuhlthau et al., 2007). In this study, several enablers were identified through an examination of the activities.

**Commitment and leadership of the school administration.** Initially, the principal had some reservation upon receiving the research author’s proposal to implement the collaborative teaching approach in guiding students through inquiry PBL. Despite the initial qualms, however, the principal took on the challenge and committed himself to the implementation of the project in the school. This is an important enabler, and the strong leadership of the administration was seen by the rest of the staff as one of the key factors in the successful implementation of the approach. In fact, the interviews specifically identified this as in the case of one teacher saying that “the leadership of the principal was a key factor.”

**Formal meetings for all stakeholders.** Several formal meetings were held for the stakeholders, which were essential for the research author to introduce the collaborative teaching approach in inquiry PBL. There was a need for the participating staff to gain familiarity with the new teaching method and appreciate the potential benefits of its implementation. The formal meetings responded to this need. One of the Chinese language teachers described the key factors for the success of this case as follows: “Everyone understands and agrees with the objectives of this collaborative teaching project.”

In these formal meetings, some of the teachers noted their anticipation that the collaborative teaching approach might increase their workload. However, at this point, it was emphasized that strategies might be employed to minimize the increase in work demands for the teachers. For instance, essay writing assignments in Chinese language courses might be integrated with the GS inquiry PBL topics so that the papers that the Chinese language teachers needed to mark would not be doubled.

The commitment of the school administration was also communicated to the rest of the stakeholders in the formal meetings. The principal exhibited enthusiasm for the new approach, which signified the conviction of the school leadership about the new approach.

**Formal meetings between the research author and each of the four kinds of teaching staff.** Individual formal meetings between the researcher and the different kinds of teachers were held to set the specific lesson plans and coverage of topics. Because these were done individually, each kind of teacher was assisted in different ways that were specific to his or her needs. For instance, to ease the teachers’ workload, the researcher assisted in sourcing articles to be used in Chinese lessons for developing students’ reading and writing abilities. In another case, the IT curriculum was revised such that PowerPoint, Excel, and Chinese keyboarding skills were included in the P4 lessons, instead of, as in the previous case, when these were taught only at the P5 level. These were introduced so that the students could gain the essential IT skills needed in conducting their inquiry PBL group work.

The role of the research author was highlighted by the teachers and may be considered an enabler. The interviews indicated that an important component in the project was the involvement of someone to “guide the whole process and knows how to execute the whole project,” which the research author provided for the team. Such role of an expert in IBL was also noted by Kuhlthau et al. (2007) as a valuable resource in the implementation of inquiry PBL.

**Informal meetings among the teaching staff.** Informal discussions between the teaching staff occurred at different stages of the project implementation. The GS teachers appeared to serve as the keystone, providing the point of communication between the team members. This is logical because the students’ projects were part of the GS course.

Apart from the initial discussions at the big formal meetings, the IT teacher did not have much interaction with the other teachers. This may be because there was not much need for further discussion once the revised IT curriculum for P4 students was determined. On the other hand, the librarian had more discussions with the GS teachers. These discussions identified what the librarian had to teach the students to equip them with the information literacy skills they needed to carry out their inquiry PBL assignments. Upon completion of the few library sessions in the beginning of the two projects, there was little need for the GS teachers and the librarian to confer further because the students have gained the necessary information literacy skills they needed.

There were more informal discussions between the GS and the Chinese language teachers because two kinds of the weekly Chinese assignments were closely related to the GS projects. First, students had to do about seven reading and writing exercises in the class for each of the two projects. The materials chosen for the exercises were related to the general theme of the GS projects of the students. In addition, students had to write about seven weekly research journals at home for each of the two projects. Because these two assignments are associated with both the Chinese and the GS courses, it is natural for the teachers to have more interactions to monitor the progress of the students in the implementation of inquiry PBL.

The stakeholders viewed the teachers in this series of collaborative activities as enablers. The cooperation between the teachers was noted in the interviews, such as, “the collective effort of all the teachers,” and even more explicitly: “The key factor [of the success] was that teachers were willing to sacrifice their time and willing to cooperate. We were aware that every task in the process was closely related to one another so we worked closely together.”

In previous studies, factors that enabled the success of such an approach included commitment to information literacy development, a constructivist view of learning, a team teaching approach, and well-designed assignments (Kuhlthau et al., 2007). These also appear to have been reported by the stakeholders in this study. An additional positive factor that was identified was the willingness of the students to learn...
Benefits for the teachers and the school administration. The teachers noted that the implementation of the new method provided more opportunities for them to communicate with each other. The GS and Chinese language teachers and the librarian all identified improved communication between the teaching staff as a benefit of the collaboration. Other positive aspects of the implementation that were identified by the GS and Chinese language teachers and the principal included integration of subject areas and an opportunity to determine effective teaching strategies.

Previous recommendations advocated a three-member team as the ideal core composition for the collaborative IBL approach (Kuhlthau et al., 2007). Based on the findings of this study, a four-member team approach also worked efficiently because of strong school administration leadership and commitment, a clear understanding of the approach among the stakeholders, cooperation of the teachers, and the contribution of an outside expert in IBL. The difficulty encountered in this case was the extra workload experienced by the stakeholders, despite the efforts by the team for it to be minimized.

The parents and teachers generally thought it was advisable to continue the implementation of inquiry PBL in their school. The parents indicated an affirmative response (25 out of 29 parents), and the reasons for this included the expected improvements in the students’ communication skills (4 out of 29 parents) and independence (3 out of 29 parents). The parents also noted that inquiry PBL could expose children to more reading materials (4 out of 29 parents) and promote an increased interest in different areas of studies (3 out of 29 parents). At the same time, the teachers reported that although the implementation of the program challenged them, such as “finding ways to finish all work within limited time” (IT teacher), they all supported the continuation of the program.

Limitations of the Study

The main limitation of this study is its post-intervention measure design. There are no comparisons from baseline that could be done as to the effects of the collaborative teaching approach on the learning dimensions. Further studies may be designed with pre-intervention and post-intervention measures using a within-subjects design. Nevertheless, a comparison was made between the group project grades of the inquiry PBL students and the grades of those who had followed the traditional approach. Another limitation is the use of a questionnaire that yields subjective data that are based on the perceptions of the different participant groups. Other outcome measures may be considered in further studies.

Conclusion and Implications

The study reported in this article indicates the effects and experiences of a collaborative approach involving three teachers and a school librarian in implementing inquiry PBL among P4 students. The project grades of the students who took part in the intervention were significantly higher than the grades of the control students. The participant students also reported that they had enjoyed doing the projects and found the tasks challenging. They made notable improvements in the eight dimensions of learning as perceived by teachers, parents, and students themselves. Data gained from interviews indicated aspects beyond the dimensions of learning that were reported to have improved as well, such as independence and self-confidence.

The perceived improvement in the dimensions of learning was not affected by the students’ gender. Furthermore, it appears that students with different academic abilities were all able to benefit from inquiry PBL. This, in particular, has important implications for improving the performance of students regardless of their academic abilities.

Inquiry PBL, as designed for this intervention (see Figure 1), focused on information search and research. The approach was carried out through the collaborative work of different kinds of teachers, as well as the necessary support from the principal, an expert in inquiry learning, and parents. As experienced in this study, a core team made up of two subject teachers, the librarian, and IT teacher could be effective. The factors contributing to the success of the program included the contributions from the supporting extended team members, as well as the willingness of the students to learn. On the other hand, the main inhibitory factor was the extra workload reported by the teachers.

If we go back to the five goals laid out by the Hong Kong Special Administrative Region Education Bureau mentioned at the beginning of this article, we can see that the reported case study helped students in the school to fulfil several of the goals laid down by the EDB for primary students: (a) conduct hands-on and minds-on inquiry with an open mind, (b) develop positive attitudes and values through learning experiences of various life events, (c) develop an awareness of their role in society and their national identity.
through understanding local society, Chinese history and culture, (d) connect what they have learnt in school to daily life through project learning, and (e) develop basic knowledge, investigative skills and problem-solving capabilities in science and technology. The topics worked on served to raise the awareness of their role in society and their national identity through understanding their local society, Chinese history, and culture. The P4 students appear to have made improvements in their academic abilities, including research skills, problem-solving skills, IT capabilities, reading and writing abilities, as well as interpersonal and communication skills. This is further validated by the grades, which were higher than those of the students who had not experienced a similar approach in the preceding year. The participating school also perceived that there were benefits the inquiry PBL approach for the school itself and continued this learning approach in its succeeding academic year, targeting the P5 and P6 students.

**Directions for Future Research**

During the course of the study, other factors were identified that could be further investigated, such as students’ self-confidence and independence. It would also be interesting to study how inquiry PBL works in different subjects. Moreover, further studies involving learning behavioural differences between gender and diverse cultures can also be carried out. Particularly in Hong Kong and other Asian countries, where ethnic minority students are fewer in numbers, useful lessons to be learned regarding the integration and performance expectation of these students through studies that look into cultural diversity as a factor. Finally, cross-cultural comparative studies may also yield interesting findings from the implementation of collaborative inquiry PBL in different countries.

**Acknowledgement**

This paper could not have been accomplished without the involvement and support of the principal, teaching staff, parents, and students engaged in the activities of the inquiry PBL projects. The writer is grateful to the above-mentioned parties for their cooperation and contribution during the process of data collection. The author would also like to thank Professor Carol Kuhlthau for her valuable advice on this research. The research discussed in this article was supported by two grants from the University of Hong Kong: “Seed Funding Programme for Basic Research” from the University of Hong Kong and “Faculty Research Fund” from the Faculty of Education.

**References**


Appendix A

A Study of the Implementation of the Inquiry-Learning Approach in Canossa Primary School’s P4 General Studies’ Projects

The telephone interview for parents of P4 students is described as follows.

Background

- The inquiry-based learning project is offered through the general studies course. To maximize the support that your child can obtain, we are bringing in the school librarian and teachers in Chinese and IT as well.
- In this project, the GS teacher will focus on guiding students to do the research, while the Chinese teacher will train students in reading and writing abilities. The school librarian and IT teacher will equip students with information literacy and IT skills needed.
- As you may have noted, your child needs to find three or more articles/books every week for this project and use them to write a research journal.

Questions

1. How much do you think your child enjoyed doing the inquiry-based learning project?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very much so</th>
</tr>
</thead>
</table>

2. From your perspective, how difficult did your child find the inquiry-based learning project?

<table>
<thead>
<tr>
<th>Very difficult</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very easy</th>
</tr>
</thead>
</table>

If your child did encounter difficulties, how did he/she manage to overcome them?

3. How much help did you offer your child when he/she was doing the project?

<table>
<thead>
<tr>
<th>None</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>A lot</th>
<th>5</th>
</tr>
</thead>
</table>

If any, what kind of help did you offer?

4. Did the project help your child improve in the following aspects?

<table>
<thead>
<tr>
<th>Aspect</th>
<th>None</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability in finding information (e.g., can find relevant articles/books more easily)</td>
<td></td>
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</tr>
<tr>
<td>Interest in reading (e.g., read more books/articles)</td>
<td></td>
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</tr>
<tr>
<td>Reading ability (e.g., read faster, can identify the main points of articles more quickly)</td>
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<tr>
<td>Writing ability (e.g., can write with a wider base of vocabularies)</td>
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<tr>
<td>Computer-related skills (e.g. PowerPoint, Chinese word processing)</td>
<td></td>
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<tr>
<td>Knowledge about the research topic</td>
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</tbody>
</table>
Improvement in other aspect(s) as a result of working on the project:

5. Did you find the overall support from school sufficient in equipping your child with the knowledge and skills to tackle the project? (e.g., the talk on inquiry-based learning for parents, broad loan from public library)

<table>
<thead>
<tr>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very much so</th>
<th>5</th>
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</table>

Comments?

6. Do you think that it is advisable for the school to continue to organize inquiry-based learning project/activity(s) for the students in the future?

Yes / No

Why or why not?

Appendix B

Inquiry-Based Learning at Canossa: Questionnaire for all P4 Students

Class: ________________
Name: ________________

Please answer the following questions based on your experiences from Phase I of the project.

1. What topic did your group work on for the inquiry-based learning project?

2. Did you enjoy working on the inquiry-based learning project?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very much so</th>
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</table>

3. How difficult did you find the inquiry learning project?

<table>
<thead>
<tr>
<th>Very difficult</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very easy</th>
<th>5</th>
</tr>
</thead>
</table>

4. How helpful did you find the assignments from general studies in equipping you to do the inquiry-based learning project?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very much so</th>
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</table>

5. Did you find the in-class assignments from Chinese studies helpful in improving your ability in reading comprehension?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very much so</th>
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Some parts of the questionnaire that are not related to this article are omitted.
6. Did you find the in-class assignments and the weekly research journals from Chinese studies helpful in improving your writing skills?

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<th>Not at all</th>
<th>1</th>
<th>2</th>
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<th>Very much so</th>
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7. How helpful did you find the teaching/guidance from the school librarian in equipping you with information literacy skills needed to find and evaluate relevant sources for your project?

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<tr>
<th>Not at all</th>
<th>1</th>
<th>2</th>
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<th>4</th>
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8. How helpful did you find the teaching/guidance from the IT teacher in equipping you with IT skills (keyboarding, the use of PowerPoint, etc.) you need for your project?

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<th>Not at all</th>
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<th>3</th>
<th>4</th>
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9. Did you find the overall support from school sufficient in equipping you with the knowledge and skills to tackle the project? (e.g., broad loan from public library and the joint class activities regarding this project)

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<th>Not at all</th>
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<th>3</th>
<th>4</th>
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10. How much help did your parents offer when you were working on your project?

| None | 1 | 2 | 3 | 4 | A lot | 5 |

11. Has the project helped you improve in the following aspects?

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<tr>
<th>Aspect</th>
<th>None</th>
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<td>Ability in finding information (e.g., can find relevant articles/books more easily)</td>
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<td>Reading ability (e.g., read faster, can identify the main points in articles more quickly)</td>
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<td>Writing ability (e.g., can write with a wider base of vocabularies)</td>
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<td>Computer related skills (e.g., PowerPoint, Chinese word processing)</td>
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<td>Communication skills with other students</td>
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<td>Presentation skills (Verbal)</td>
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<td>Research skills (e.g., ability to ask questions)</td>
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