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Title: Primary four students' development of writing ability through inquiry-based learning projects

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Abstract

LaMedica (1995) claimed that “encouraging the writing process in the primary grades may be difficult but it is important”. This paper reports on an effort that tried to stimulate Primary Four (P4) students’ writing through inquiry-based learning (IBL) projects.

The paper is part of a bigger research that examines the effectiveness of a collaborative approach that involves four kinds of teachers (General Studies, Library, Chinese Language, and Information Technology) in guiding P4 students through two phases of IBL projects with each lasting for 2-3 months from 2006-2007. Students worked on two chosen research topics for the IBL projects as part of their General Studies curriculum. The Chinese teachers assumed the responsibility of designing and assessing in-class and take-home assignments aimed at developing students’ reading and writing skills needed for the IBL projects. The collaborative efforts from the four kinds of teachers have proven to be effective in guiding students through their projects. Preliminary results show that the students’ writing ability (expository writing in particular) has been enhanced through the projects. Students this year also achieved higher grades in their General Studies group projects when compared to those who completed similar projects last year.

This paper will examine students’ in-class and take-home assignments for the Chinese course, as well as the General Studies group project reports. This paper may shed light on an integrative approach in teaching General Studies and Language (Chinese in particular).

1. Introduction

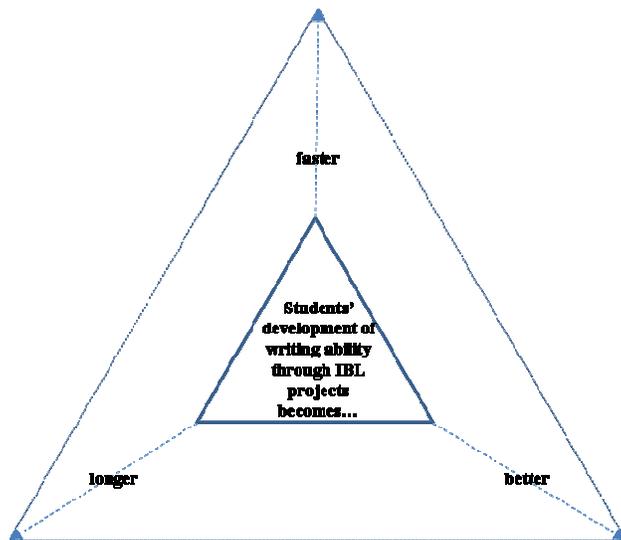
This paper is part of a bigger study that investigates a collaborative approach of three kinds of teachers (General Studies, Chinese, and Information Technology) and the school librarian in providing various kinds of support to primary 4 students' need for conducting their inquiry-based learning (IBL) projects. Students went through two General Studies' group projects with each lasting for two to three months. The main theme for the first project was "The Earth" and the second "History of Hong Kong and Mainland China" under which students chose a sub area to work on.

General Studies teachers focused on teaching research skills (e.g. formulating essential questions and organizing data gathered for the projects). IT teachers helped enhancing students' IT literacy (e.g. skills of using Microsoft Excel and PowerPoint) while the school librarian assisted in sharpening students' information literacy skills such as doing searches on WiseNews and in the public library catalog. Chinese teachers in the meantime helped students develop the necessary reading and writing abilities to complete their projects.

This collaborative teaching approach has proven to be effective in leading students to achieve a high quality of final written reports and presentations at the end of each phase in means such as drama and PowerPoint presentations for the two IBL projects. Under this approach, primary 4 students this year achieved much higher quality in the General Studies projects when compared to students of last year – an increase of about 40% higher points were given by the General Studies teachers this year (Chu, Lo, Chow, Mak, Ho, & Tsang, 2007). Besides, this approach was also effective in helping the students improve in various skills and abilities, for example, information literacy and reading skills (Chu, Tang, Chow, & Tse, 2007).

This paper will focus on the role of the Chinese teachers in the students' inquiry learning projects and the instructional design they created in equipping students' reading and writing abilities needed for the projects. An analysis of students' in-class and take-home work will also be a focus of this article, which indicates whether students' writing ability has improved in terms of writing longer, faster and better. A model of students' development in writing ability and its relationship to IBL projects is created (Figure 1). It suggests that as students are able to write longer articles in a shorter period of time, while simultaneously improve the quality of their writing, as evident in the obtaining of higher grades, they will be improving their writing ability. This can be done by engaging students in topics that they enjoy through the IBL projects.

Figure 1. A model of students' development of writing ability in relation to IBL projects



2. Literature review

The Education Bureau (2007) defines IBL as “a student-centered approach which helps students to integrate generic skills, knowledge and values in the learning of General Studies. In the inquiry process, students are active constructors of knowledge and the teacher is a facilitator of learning. Instead of the teacher giving the right answers, students have to raise questions, find their own answers and look for the necessary information. They are engaged in identifying problems, collecting information and solving the problems they encounter.”

A key distinction of IBL from traditional rote learning is that instead of teachers directly telling students everything, students actively raise questions, search for relevant information and provide answers by themselves so that they would be able to create their own knowledge and address real-life problems. The potential benefits of IBL which bases on students' questioning have been considerably revealed in literatures. Dewey who considered inquiry teaching to be letting students learn from direct experience, suggested that IBL would allow teachers and students to integrate knowledge across disciplines, cultivate students' spontaneous curiosity and facilitate the development of learning that respects the intellectual growth and age-specific concerns of students (Dow, 1999). In addition, IBL is a way of learning that encourages in-depth thinking and investigation and thus enhances students' incentive to quest for knowledge (Harada & Yoshina, 2004).

A number of factors leading to failure and success in writing are also identified in past research. A lack of real meaning in students' writing experience and separation of writing from reading are common reasons for poor writing to which attention should be paid when

devising a new training approach for writing (Bassett, DeVine, Perry, & Rueth, 2001). On the other hand, there are various factors favorable to the development of children's writing abilities. Examples are cross-curricular writing, regularly scheduled guidance of the writing process, free choice of topics (Bassett et al., 2001), and at-home writing (Jewell & Tichenor, 1994).

Although there are various studies on the implications of IBL on students' learning, few focus on its effects on students' Chinese writing ability over time or how different subject teachers can work together to sharpen students' writing skills. In particular, there is a literature gap in the specific role of Chinese Language teachers in this collaborative teaching approach.

In view of the above review, this study, which involved four kinds of teaching staff¹ supporting the IBL's activities of students, aims to investigate the effects of a cross-curricular IBL model on the development of writing ability.

3. Research methods

3.1. Research question

The main research questions of this paper include:

1. An investigation of the effects of IBL projects on writing abilities over time.
2. An examination of whether students were writing longer, faster, and better during the period of the IBL projects.

3.2. Sampling

All four classes of P4 students at a local primary school participated, where each class had approximately 30-40 students.

3.3. Instructional design

The instructional design involved two phases of IBL projects with lessons/tasks offered by four kinds of teaching staff. In phase 1, a maximum of seven in-class assignments and seven take-home assignments were assigned to the participants. In phase 2, a maximum of six in-class assignments and seven take-home assignments were assigned. For each in-class assignment, students were given an article related to the main theme of the phase. They were asked to underline the key sentences in the article, and write a summary of the article and their opinions in 100-150 words. However, some students were unable to finish their assignments during their 50-minute lesson, and had to finish their assignments at home. For each take-home assignment, students were required to write a research journal in 150-200

¹ Teaching staff - General Studies teachers, Chinese language teachers, the IT teacher, and the school librarian.

words. They could write a summary on any articles related to the project theme that they read in the past one week, opinions on the articles, or daily life experiences related to the main theme of the phase. However, some students were assigned fewer assignments at the discretion of their teachers. The total number of assignments that were actually collected in phase 1 and 2 are shown in Table 1.

Table 1. In-class exercises and homework collected for each class in the two phases.²

	In-Class Exercise Phase 1	In-Class Exercise Phase 2	Homework Phase 1	Homework Phase 2
Class E ³	37	37	37	35
Class F	36	36	36	36
Class G	9	8	0	0
Class H	25	24	21	25
Total	107	105	94	96

3.4 Data analysis

To examine the effects of writing abilities through the IBL model, the assignment grades and the length of writing from the entire group of participating students were measured. In terms of grades, each assignment that was submitted would be rated by grades ranging from A through D. In terms of length of the writing, these assignments were assessed by the number of lines, with each line estimated to consist of 15 words including punctuation and spaces. Writing abilities were hence measured through assignment grades and the length of writing.

In terms of length of writings, the following quantitative measurements were analyzed:

- 1) Average length of the first and last in-class and take-home assignments of each student;
- 2) Average length of writing of the entire body of P4 students in the two phases; and
- 3) Differences and similarities on the length of writing among the four classes.

In terms of assignment grades, the following quantitative measurements were used:

- 4) Average grades of the first two and last two in-class assignments of each student;
- 5) Average grades of the first and last take-home assignments of each student;
- 6) Average grades of the entire body of P4 students in the two phases; and
- 7) Differences and similarities on grades among the four classes.

² The figures were slightly different for the data on students' grades because students' grades were not available in some of the exercises and homework.

³ To protect the privacy of the respondents, the class names have been changed.

On one hand, Wilcoxon signed tests were used to compare the length of writing among assignments and the students' average lengths of writings between the two phases. On the other hand, dependent-t tests were performed for comparing the grades among the students and their average grades between the two phases. With regard to the comparisons among the four classes, Mann-Whitney tests were performed. In addition, correlation analysis was done to explore the relationship between students' length of writing and their grades in assignments. A 5% level of significance is used in all statistical tests, and the analysis was performed using the SPSS statistics software (SPSS for windows version 15.0).

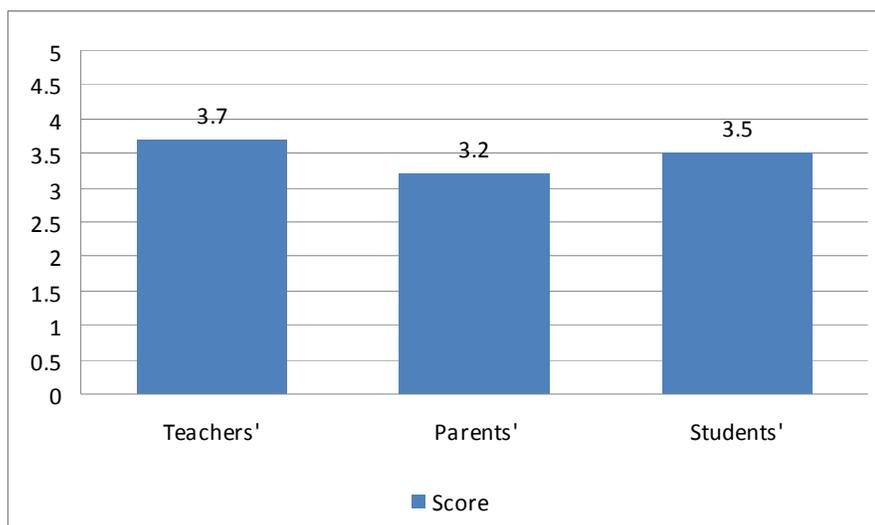
4. Findings

This section will first reveal the overall perception of the Chinese teachers, parents and students about students' improvement in writing ability. Then it will discuss the role of the Chinese teachers in the IBL projects and examine students' improvement in their writing abilities in terms of whether they were able to (1) write longer articles; (2) write faster; and (3) write better articles.

4.1 Perceptions of students' improvement in writing ability

As shown in Figure 2, the Chinese teachers, parents and students reported an overall favorable perception about students' improvement in writing ability on the IBL projects.

Figure 1. Perceptions of the Chinese teachers, parents and students about students' improvement in writing ability in the inquiry-based project⁴.



Note: The three parties were answering the question “Does the IBL project help you (the student) improve in writing ability?” according to a scale of 1-5, with 1 as ‘the lowest’ and 5 as ‘the highest’.

4.2 The role of Chinese teachers in students' IBL projects

- A supporting and helping role – Taught and guided students on the skills they needed to complete their IBL projects, e.g. skills of identifying key points from readings, writing summary and using appropriate vocabulary.
- Aroused students' interest in learning e.g. facilitated group discussion to assure their incentive towards active participation in their learning.
- Assessed students' performance in writing and the development of the skills throughout the two phases.

4.3 Students' improvement in writing longer and faster

In this section, the length of students' writing was analyzed to investigate whether students were able to write longer and faster.

4.3.1 In-class exercises

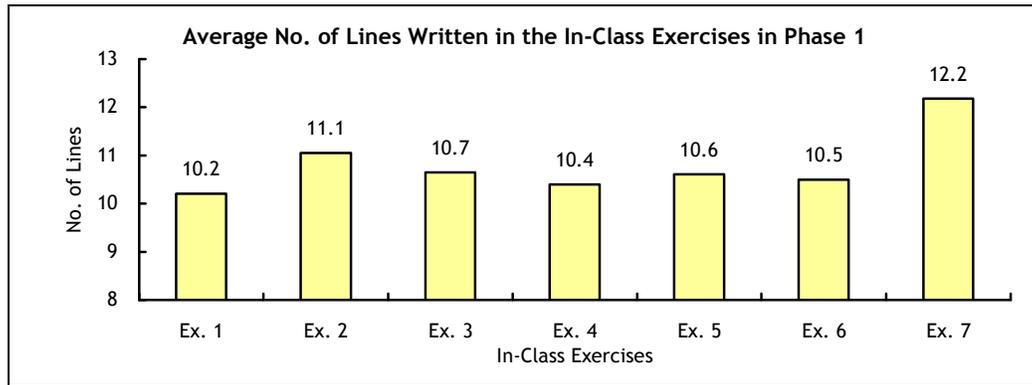
4.3.1.1 In-class exercises – phase 1

Figure 3 illustrates the average number of lines written by all students in their in-class exercises in phase 1. The overall trend in the length of writing went up in phase 1. The average number of lines for the last assignment was significantly higher than the first assignment in the same phase as shown by Wilcoxon signed rank test ($p < 0.01$). In other

⁴ The survey was conducted shortly after the completion of the first IBL project.

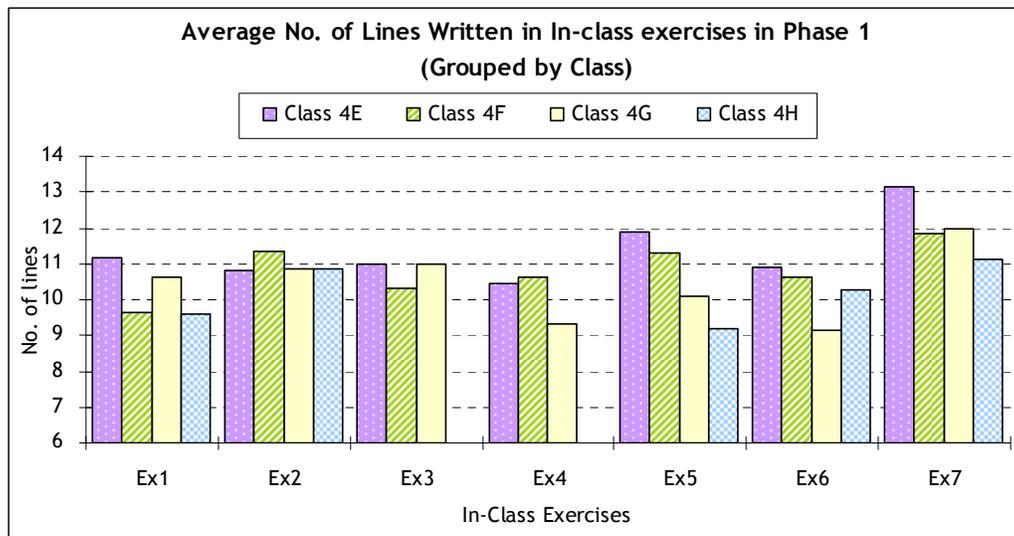
words, the results show that there was an increase in the length of students' writing in in-class exercises in phase 1, which may imply for an increase in the ability of students writing longer in length in a fixed period of time.

Figure 3. Average number of lines written by students in all the four classes in their Phase 1 in-class exercises.



The trend of length of writing for each class in the in-class exercises in phase 1 is shown in Figure 4. It appears that the length of writing for Classes 4E and 4F increased from the first to the last exercise. On the other hand, Classes 4G and 4H also showed an overall increasing trend, but there was a minor drop in the average length in exercises 4 and 5.

Figure 4. Average number of lines written by students in each of the four classes in their Phase 1 in-class exercises

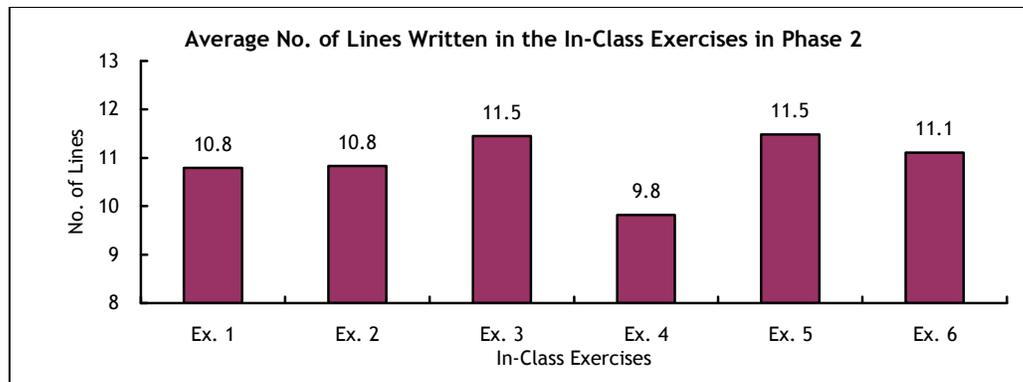


Note: Data for exercises 3 and 4 for Class 4H was not available for analysis.

4.3.1.2 In-class exercises – phase 2

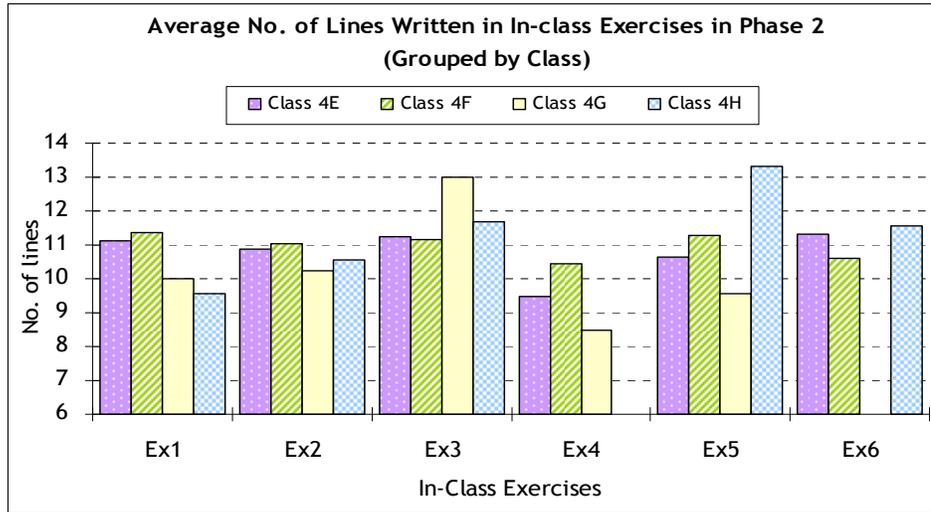
Figure 5 describes the average number of lines written by students in their in-class exercises in phase 2. An increasing trend in the average number of lines written by students was also shown in phase 2, even though Wilcoxon signed rank test did not show a significant difference between the average number of lines of the first and the last exercises ($p = 0.929$). There was also a drop in the length of writing in exercise 4 as compared with the other exercises. Teachers reported that students had many similar exercises starting from phase 1, so they started to lose interest in doing the in-class exercises in phase 2. This is a possible reason that contributed the slight drop in exercise 4.

Figure 5. Average number of lines written by students in all the four classes in their Phase 2 in-class exercises



As shown in Figure 6, each class seemed to have different trends in their length of writing in the in-class exercises in phase 2. The length of writing in all the exercises for Classes 4E and 4F was similar, except for exercise 4. There was an increase in the length of writing at the beginning followed by a decrease towards the end for Classes 4G and 4H. The drop in exercise 4 as mentioned earlier appeared in all classes (except for Class 4H where data was not available).

Figure 6. Average number of lines written by students in each of the four classes in their Phase 2 in-class exercises

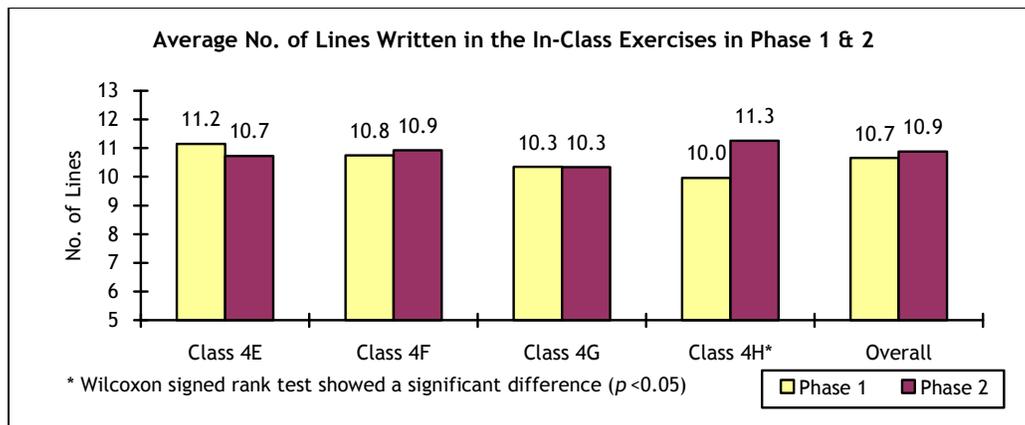


Note: Data for Exercise 4 of Class 4H and Exercise 6 of Class 4G were not available for analysis.

4.3.1.3 A comparison of the two phases and among the four classes

The length of writing in the in-class exercises in the two phases on average is shown in Figure 7. The average number of lines written in phase 1 and 2 were compared by Wilcoxon signed rank test. It should be noted that shorter time was given to students to work on their exercises in phase 2 than in phase 1. However, the overall average length of writing in phase 1 and 2 were not significantly different ($p=0.191$). Moreover, students of Class 4H wrote on average significantly more words in phase 2 than in phase 1 ($p=0.001$). The results imply that students learnt to write a desired number of words (or more) with a shorter working time through the IBL. Given a fixed period of working time, it seems that the students who had shorter writing at the beginning showed greater improvement in their length of writing than the students who wrote longer at first.

Figure 7. Average number of lines written in the in-class exercises in the two phases



Differences among the four classes in the in-class exercises were tested by Mann-Whitney tests. Table 2 shows a comparison between the average number of lines in the in-class exercises among the classes in phase 1 and 2. It was found that Class 4H had significantly shorter writing than Class 4E and 4F in phase 1. Class 4H appeared to have shorter writing on average than the other classes. However, no significant difference among the four classes was shown in phase 2. This could be explained by improvement in Class 4H students' ability to write longer articles in phase 2 as mentioned above.

Table 2. Comparison of average number of lines written by students in their in-class exercises among the four classes

Phase	Classes	<i>p</i> -value	Significant (*)/ Non-Significant (ns)
Phase 1	4E & 4F	0.612	ns
	4E & 4G	0.459	ns
	4E & 4H	0.024	*
	4F & 4G	0.586	ns
	4F & 4H	0.033	*
	4G & 4H	0.397	ns
Phase 2	4E & 4F	0.783	ns
	4E & 4G	0.988	ns
	4E & 4H	0.097	ns
	4F & 4G	0.709	ns
	4F & 4H	0.541	ns
	4G & 4H	0.273	ns

Note: * *p*-value < 0.05 is considered as significantly different among comparing groups by Mann-Whitney test.

4.3.2 Homework assignments

4.3.2.1 Homework assignments – phase 1

There was less time pressure for students to do their homework when compared with in-class exercises. Figure 8 shows a slight increase in students' writing length in homework in Phase 1. An increasing trend appeared in all the four classes, except for Class 4G where data was missing (Figure 9).

Figure 8. Average number of lines written by students in all the four classes in their Phase 1 homework.

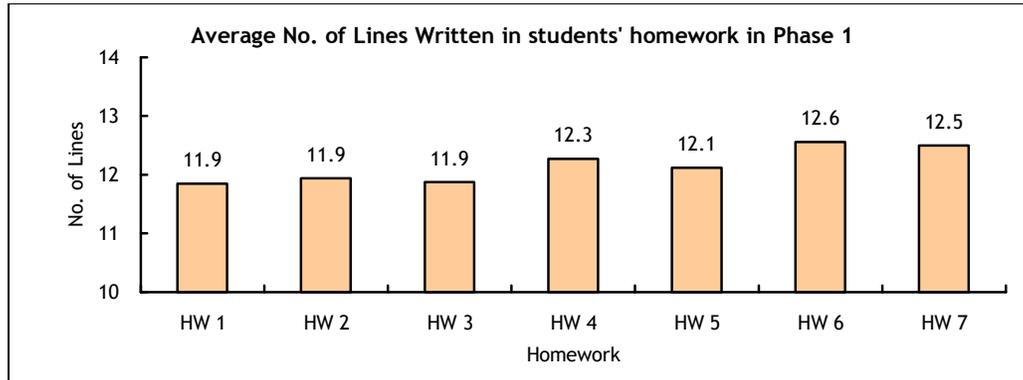
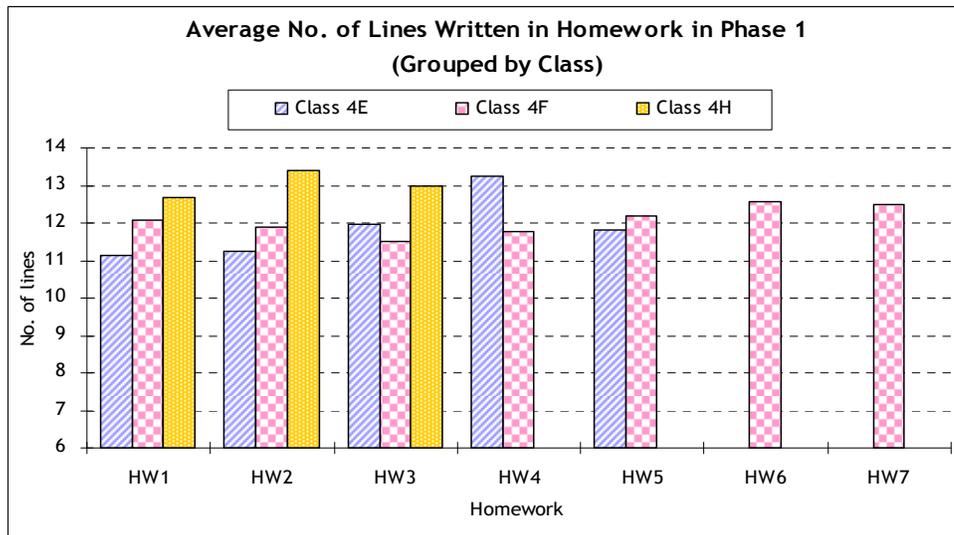


Figure 9. Average number of lines written by students in each of the four classes in their Phase 1 homework



Note: Some of the students' homework in phase 1 was not available for analysis, and data is only available for Class 4E, 4F, and 4H, but not for Class 4G.

4.3.2.2 Homework assignments – phase 2

In contrast to phase 1, an overall decreasing trend in the length of homework is found in phase 2, as shown in Figure 10. More specifically, the decreasing trend is only shown in Classes 4E and 4F, but not in Class 4H, as shown in Figure 11. One of the possible reasons for the decrease is the decline of students' interest as mentioned earlier.

Figure 10. Average number of lines written by students in all the four classes in their Phase 2 homework.

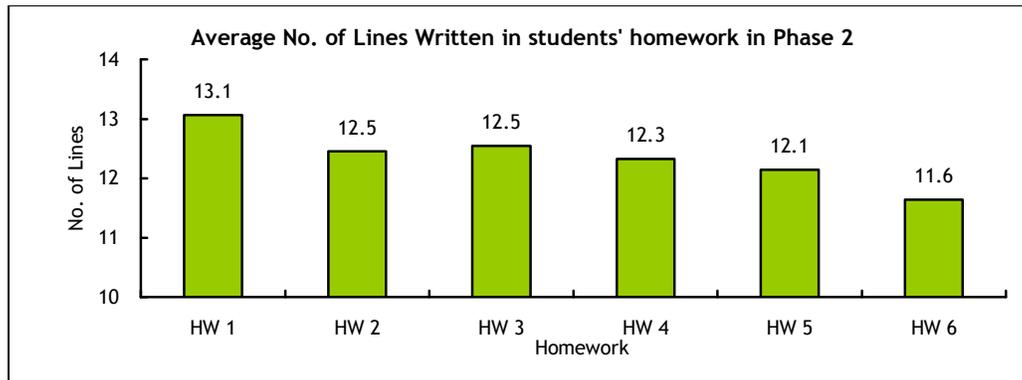
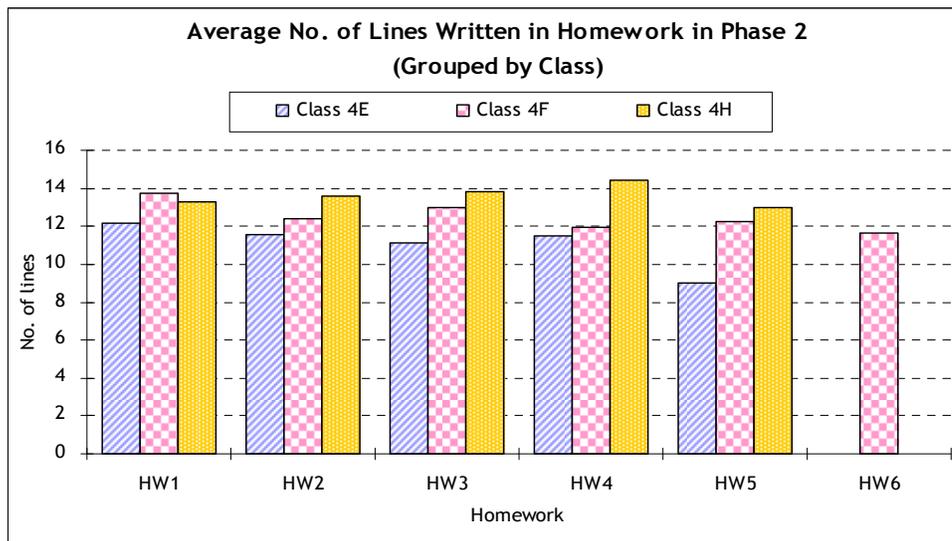


Figure 11. Average number of lines written by students in each of the four classes in their Phase 2 homework



Note: Some of the students' homework in phase 2 was not available for analysis, and data is only available for Class 4E, 4F, and 4H, but not for Class 4G.

4.3.2.3 A comparison of the two phases and among the four classes

A comparison between the average lengths of writing in homework for the two phases is shown in Figure 12. In general, the length of writing in homework was significantly longer in phase 2 than in phase 1 as shown by Wilcoxon signed rank test ($p=0.037$). This could mean that students had acquired the ability to write more in their homework.

Figure 12. Average number of lines written by students in their homework in the two phases

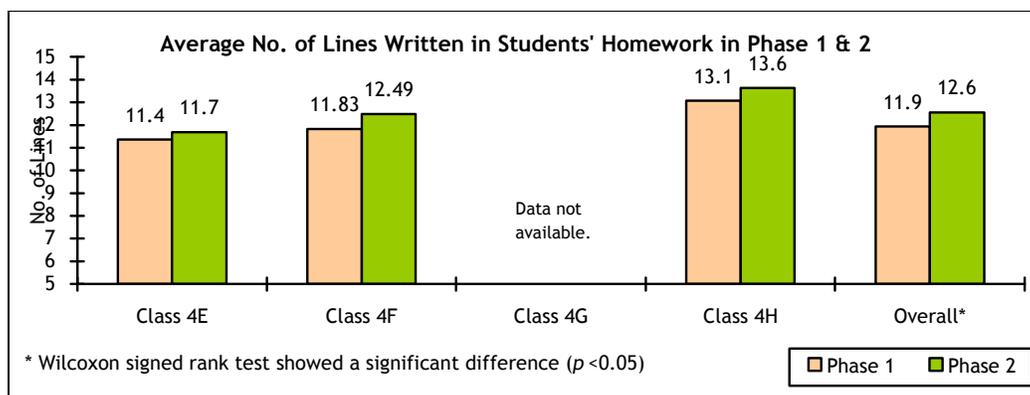


Table 3 describes the results of Mann-Whitney test that compares students' length of writing in their homework among three classes (4E, 4F and 4H). The writing length of homework was similar for Classes 4E and 4F in both phases. 4H students wrote significantly more than 4E students in their homework in the two phases. The length of writing in Class 4H was also essentially longer than Class 4F. However, the difference was only significant in phase 2 but not in phase 1.

Table 3. Comparison of average number of lines written by students in their homework among three classes⁵.

Phase	Classes	<i>p</i> -value	Significant (*)/ Non-Significant (ns)
Phase 1	4E & 4F	0.302	ns
	4E & 4H	0.017	*
	4F & 4H	0.072	ns
Phase 2	4E & 4F	0.202	ns
	4E & 4H	0.003	*
	4F & 4H	0.039	*

Note: * *p*-value < 0.05 is considered as significantly different among comparing groups by Mann-Whitney test.

To summarize, there was an increasing trend in the length of writing in the in-class exercises in the two phases, even though the extent of increase was smaller in phase 2 than in phase 1. Overall, students were able to write longer in phase 2 than in phase 1 in the in-class exercises. Class 4H wrote significantly shorter articles than Classes 4E and 4F in the in-class exercises in phase 1, but such a difference was not found in phase 2. This may be due to the fact that the Chinese teacher of 4H required her students to complete all in-class exercises in class⁶, but the

⁵ Homework of Class 4G was not available for analysis.

⁶ Chinese teacher of 4H said that students who could not complete the in-class exercises during her

other teachers allowed their students to continue the in-class exercises at home if they could not finish the assignment in-class. And Chinese teacher of 4H said that by phase 2, very few students could not complete the exercises in-class and also that they were able to write longer articles with shorter time. It has mentioned earlier that students had less time to do their in-class exercises in phase 2 because of watching a related video for their exercises.

Regarding the homework assignment, there was an increasing trend in the length of writing in phase 1, but a declining trend was observed in phase 2. Despite the decreasing trend, the overall length of writing in phase 2 was slightly longer than in phase 1. It was found that students of Class 4H wrote longer in their homework than other classes did in the two phases.

In fact, the above findings correspond to the comments of some of the Chinese Language and General Studies teachers that students in general wrote longer articles as they did a better job in elaborating their ideas that enriched the content of their writing.

4.4 Students' improvement in writing better articles

The above analysis indicated students' development in writing ability throughout the IBL project in terms of writing length and pace. The following sections attempt to investigate if students also demonstrated an improvement in writing better articles.

4.4.1 In-class exercises

4.4.1.1 In-class exercises – phase 1

The average grades of the four classes of the in-class exercises in phase 1 are shown in Figure 13⁷. In phase 1, a dependent t-test shows that the average grade for the last assignment was significantly higher ($p < 0.01$) than the average of their first assignment. It was also shown that difference between the averages of the first two assignments (Ex1 and Ex2) and the last two assignments (Ex 6 and Ex7) were significantly different ($p < 0.01$) in phase 1. The results imply that on average the students were able to produce higher quality of writing at the end of this phase than they did at the beginning of the study.

class were allowed to use 10-15 minutes of the next class (on the same day) to finish it. And the teacher of the next class agreed with this arrangement.

⁷ Students' grades in the in-class exercises and homework were re-coded in the analysis, in which grade 'A' = 4; grade 'B' = 3; grade 'C' = 2; and grade 'D' = 1.

Figure 13. Average grades of in-class exercises in all the four classes in phase 1

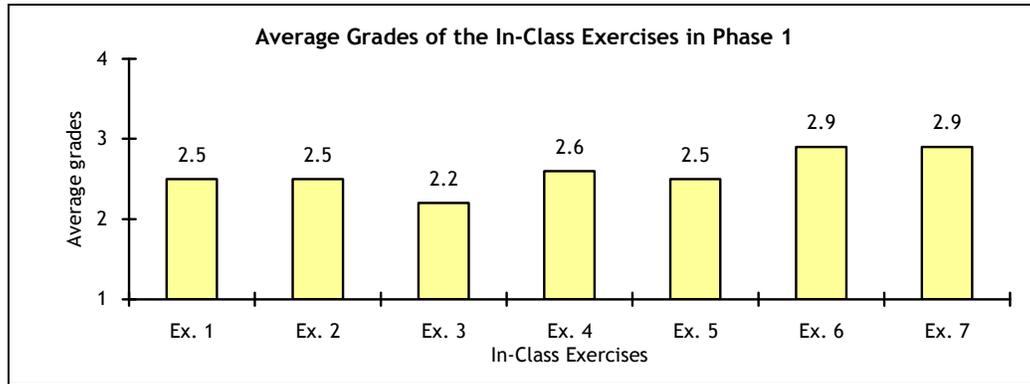
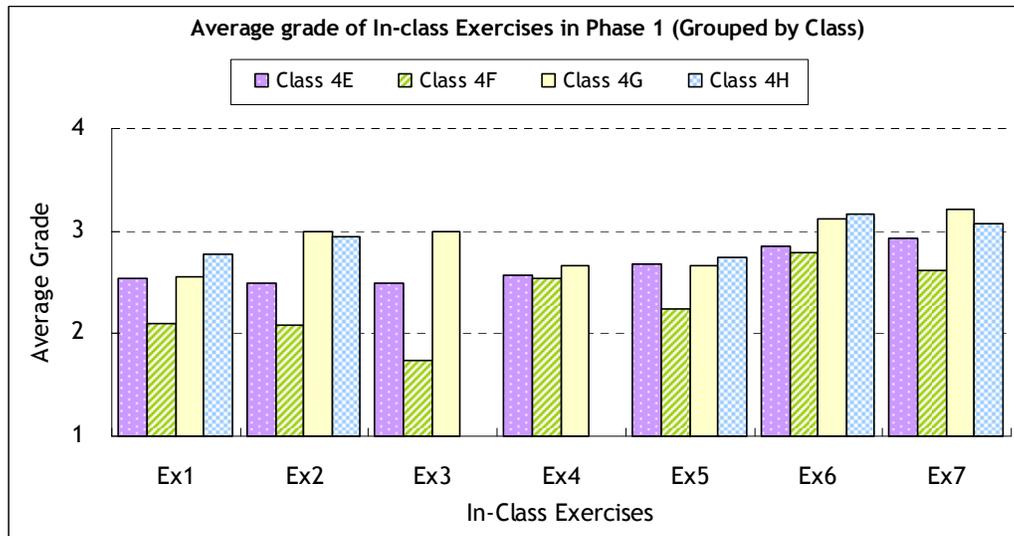


Figure 14 shows the grade variations for each class in the in-class exercises in phase 1, and it shows a J-curve with a minor drop in the average grade after the first exercise (or the first few exercises) for all the four classes before the overall average grades increased again.

Figure 14. Class average of in-class exercises in phase 1

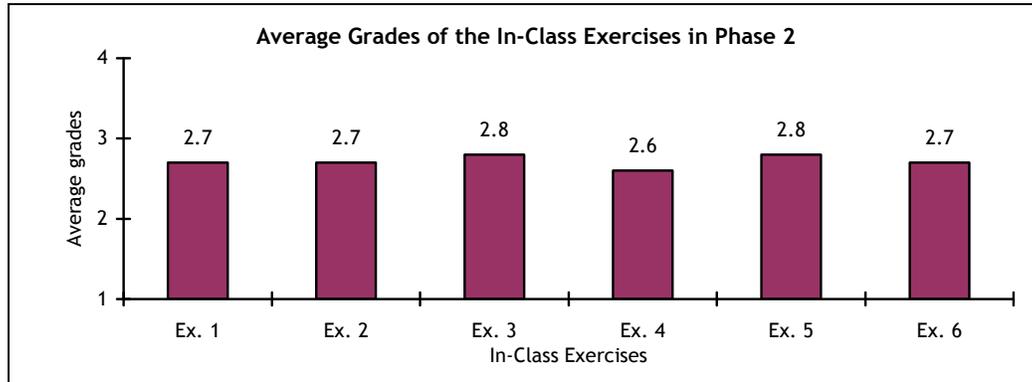


4.4.1.2 In-class exercises – phase 2

Figure 15 shows the average grades of in-class exercises for the four classes in phase 2. In this phase, the average grade exhibits an overall increasing trend, except that it peaked at the second last exercise then it dropped slightly at the last exercise. Despite an overall increasing trend on the average grade, the rise was not as significant as the one exhibited in phase 1. A dependent t-test shows that the difference between the first and the last assignment was statistically insignificant. The results imply that on average the students were able to produce higher quality of writing at the end of this phase than they did at the beginning of the phase,

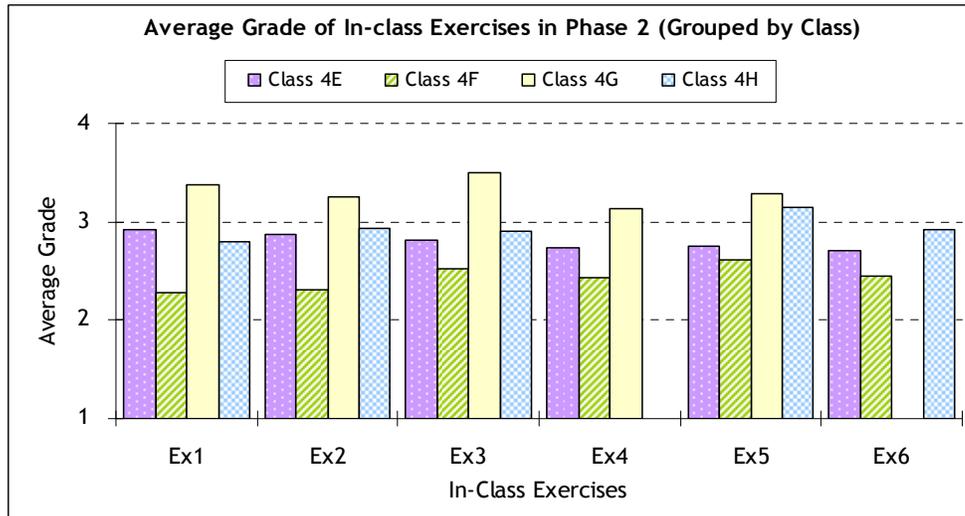
but the improvement was not as significant as they exhibited in phase 1.

Figure 15. Average grades of in-class exercises in all the four classes in phase 2



In terms of grade variations in phase 2, Figure 16 shows that there was no uniform trend among the four classes. Classes 4E and 4G had an overall decreasing trend, whereas class 4F and 4H had a slightly increasing trend.

Figure 16. Class average grades of in-class exercises in phase 2

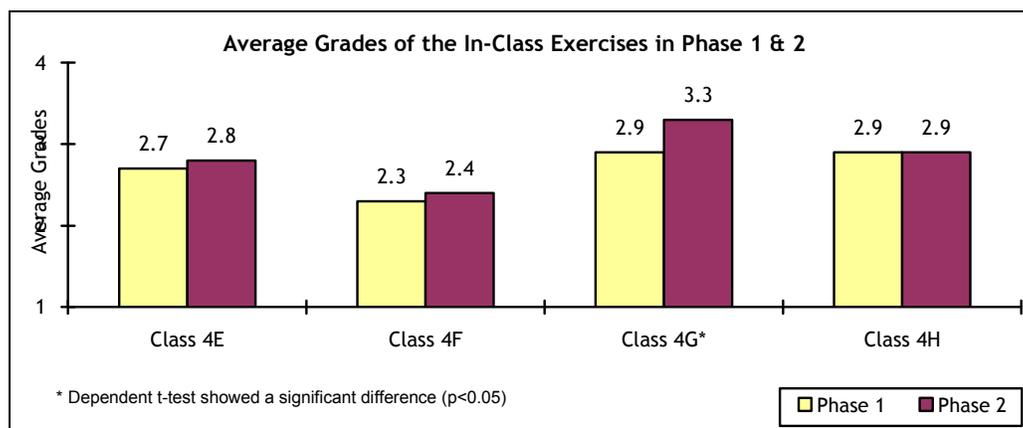


4.4.1.3 A comparison of the two phases and among the four classes

The average grades of all the in-class exercises (seven from phase 1 and six from phase 2) are shown in Figure 17. It should be noted that shorter time was given to students in phase 2, but the overall grade averages were higher in phase 2 than in phase 1 in three out of the four classes (Classes 4E, 4F, and 4G). The exception, Class 4H, did not improve in their grade average from phase 1 to phase 2, but it did not drop either. It may also be noteworthy that Class 4G had the highest grade average to begin with in phase 1, and the class had the most

significant improvement between phases in terms of grades average from phase 1 to phase 2 as well. The class ended up having the highest class average in phase 2. In addition, Classes 4E, 4F, and 4G exhibited statistically significant differences on class averages between phase 1 and phase 2, where $p = 0.0016$, 0.0088 , and 0.0125 respectively.

Figure 17. Average grades of in-class exercises in the two phases



Differences among the four classes in the in-class exercises were tested by the Mann-Whitney tests, and the results are tabulated on Table 4. It was found that Class 4F had a significantly lower grade than Classes 4E, 4G and 4H in phase 1. In addition, Class 4E had significantly lower grade than Class 4H in phase 1. In phase 2, Classes 4E and 4H was the only pair that had an overall grade statistically insignificant from each other.

Table 4. Comparison of grade average in In-class exercises among the four classes

Phases	Classes	p -value	Significant (*)/ Non-significant (ns)
Phase 1	4E & 4F	0.015	*
	4E & 4G	0.338	ns
	4E & 4H	0.033	*
	4F & 4G	0.027	*
	4F & 4H	0.000	*
	4G & 4H	0.489	ns
Phase 2	4E & 4F	0.014	*
	4E & 4G	0.008	*
	4E & 4H	0.070	ns
	4F & 4G	0.000	*
	4F & 4H	0.001	*
	4G & 4H	0.025	*

Note: * p -value < 0.05 is considered as significantly different among comparing groups by Mann-Whitney test.

4.4.2 Homework

4.4.2.1 Homework-phase 1

The average grades of the take-home exercises from the three classes (no data from Class 4G) in phase 1 are illustrated in Figure 18 indicates that there was an overall upward trend in the average grades of the homework in phase 1. Moreover, the average grade for the last assignment was higher than the first assignment. Although a dependent t-test shows that the difference was not statistically significant, a .5 point (19%) increase being shown in the figure is still impressive. The result implies that on average students improved, although not significantly, in their quality of writing over time through homework assignments in phase 1.

Figure 18. Average grades of homework in all the four classes in phase 1

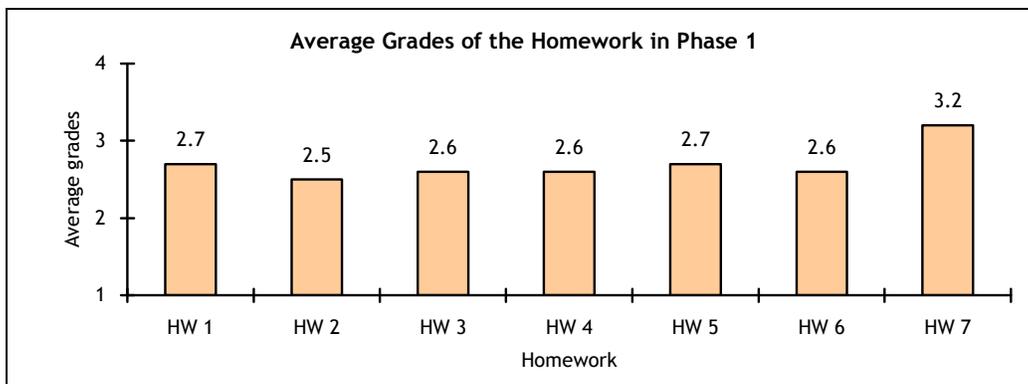
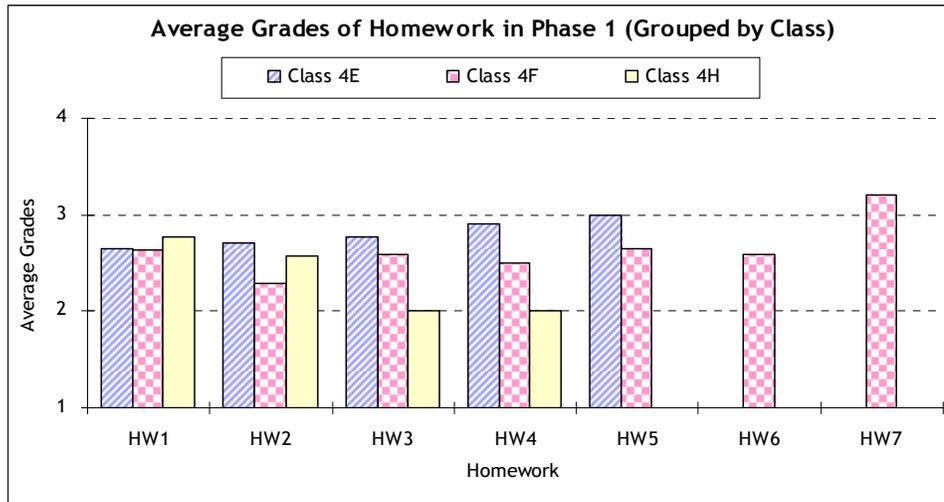


Figure 19 shows the grade variation for each class in homework assignments in phase 1, and it does not display a uniform trend among the classes. Specifically, Class 4E shows an increasing trend over time, Class 4F exhibited a J-curve, while Class 4H had a decreasing trend.

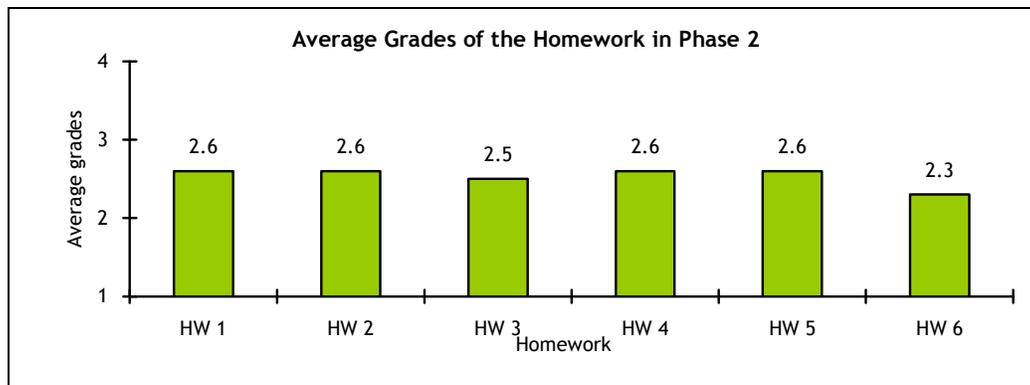
Figure 19. Class average grades of homework in phase 1



4.4.2.2 Homework-phase 2

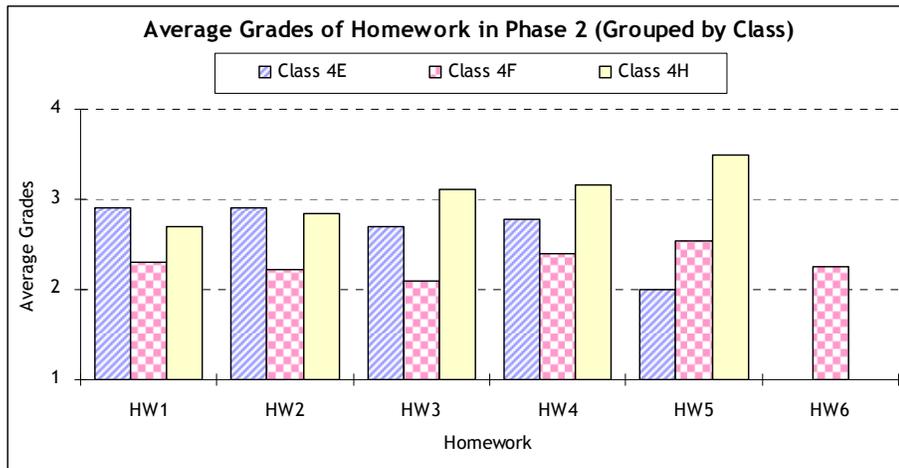
The average grades of the four classes in phase 2 can be found in Figure 20. In this phase, the average grade exhibits only small variations over time, but had a relative dive at the last assignment. Despite the dive, a dependent t-test confirms that the difference between the first and the last homework assignment was not statistically significant in this phase. The result implies that on average, students were not able to produce higher quality of writing over time through take-home assignments.

Figure 20. Average grades of homework in all the four classes in phase 2



In terms of grade variation in phase 2, Figure 21 shows that there was no uniform trend among the four classes either. Specifically, Class 4E had small variations in the first four assignments but then a drop on average grade in their last assignment. Class 4F did not exhibit obvious increasing or decreasing trend over time; whereas for Class 4H, it was an obvious increasing trend.

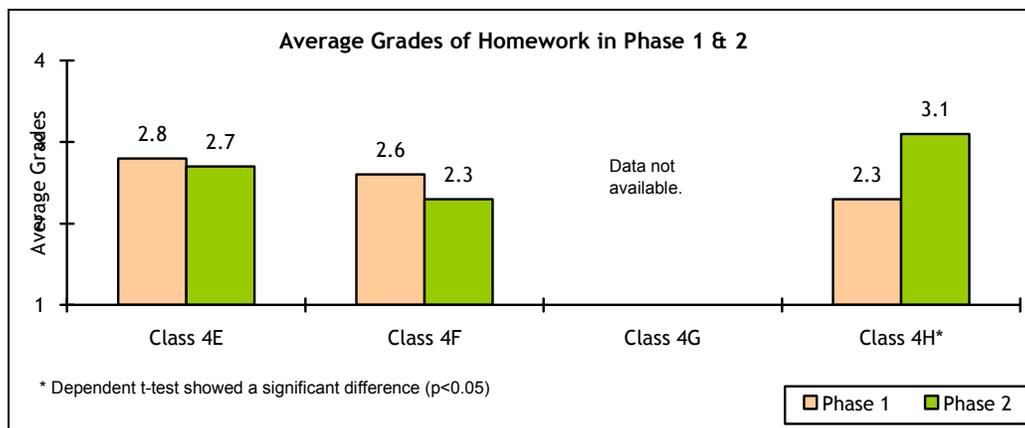
Figure 21. Class average grades of homework in phase 2



4.4.2.3 A comparison of the two phases and among the four classes

The average grades of all the homework assignments are shown in Figure 22. It was found that both Classes 4E and 4F had lower scores in phase 2 than in phase 1, whereas Class 4H had a significant grade improvement in phase 2. When tested by dependent t-test, Class 4F was the only class that exhibited statistically significant difference on class average between phase 1 and phase 2 ($p < 0.001$). The results imply that a significant proportion of students from Class 4F were producing lower quality of writing at the end of phase 2 than they did from phase 1; whereas, not a statistically significant proportion of students from Class 4H were able to receive better grades from their assignments in phase 2. Nevertheless, those who did improve their grades considerably. There was less time pressure for students to do their assignments at home comparing to in-class exercises. Yet, in contrast to phase 1, not all students were able to write better as a result of the lower time constraint.

Figure 22. Average grades of homework in the two phases



Differences among the four classes in homework assignments were tested by the Mann-Whitney tests, and the results are tabulated on Table 5. It was found that differences among the overall grades of classes were statistically insignificant among one another in phase 1. In phase 2, Class 4F had an overall grade that was statistically significant from both 4E and 4H.

Table 5. Comparison of grade average in Homework assignments among the four classes⁸

Phases	Classes	<i>p</i> -value	Significant (*)/ Non-significant (ns)
Phase 1	4E & 4F	0.103	ns
	4E & 4H	0.375	ns
	4F & 4H	0.516	ns
Phase 2	4E & 4F	0.000	*
	4E & 4H	0.701	ns
	4F & 4H	0.003	*

Note: * *p*-value < 0.05 is considered as significantly different among comparing groups by Mann-Whitney test.

In view of the above findings, it can be concluded that students produced high quality of writing on average in the in-class exercises in the two phases, in which the improvement was more notable in phase 1 than in phase 2. While students improved a bit in their quality of writing in their homework in phase 1, a decline was found in phase 2. Differences among classes were found in the in-class exercises and homework in phase 2, but not in homework in phase 1.

4.5 Correlation between length of writing and grades

Correlation analysis was conducted to explore the relationship between length of writing and grades in the in-class exercises and homework. Table 6 shows the results of correlation analysis for the in-class exercises. It was found that there was an overall significant substantial correlation in the in-class exercises in phase 1 and a significant moderate correlation in phase 2. Significant correlations were obtained for all classes in both phases, except for Class 4G in phase 1. More specifically, the correlation in phase 1 was moderate for Classes 4E and 4G, but substantial for Class 4F, and high for Class 4H. Compared with phase 1, the correlation was even stronger for Classes 4E, 4F, and 4H in phase 2, but weaker for Class 4H.

⁸ Homework of Class 4G was not available for analysis.

Table 6. Correlation between length of writing and grades in the in-class exercises

	Correlation between length of writing and grades:			
	Phase 1		Phase 2	
		Co-efficient r (p-value)		Co-efficient r (p-value)
Class 4E	Moderate	0.412 (<0.05)*	Substantial	0.622 (<0.01)*
Class 4F	Substantial	0.642 (<0.01)*	Substantial	0.657 (<0.01)*
Class 4G	Moderate	0.424 (0.256)	Substantial	0.735 (<0.05)*
Class 4H	High	0.808 (<0.01)*	Moderate	0.596 (<0.01)*
Overall	Substantial	0.656 (<0.01)*	Moderate	0.547 (<0.01)*

Note: * Significant correlation shown with p-value < 0.05.

The classification of correlation levels is defined by Ravid (1994).

The correlations between length of writing and grades in homework are shown in Table 7. An overall moderate correlation was also exhibited for homework. The significant moderate to substantial positive correlation could be found for Classes 4E and 4F in both phases, but the correlation was insignificant for Class 4H. In general, the results of correlation analysis imply that as students write longer, they will also achieve a higher grade in their in-class exercises / homework.

Table 7. Correlation between length of writing and grades in the homework

	Correlation between length of writing and grades:			
	Phase 1		Phase 2	
		Co-efficient r (p-value)		Co-efficient r (p-value)
Class 4E	Substantial	0.625 (<0.01)*	Substantial	0.633 (<0.01)*
Class 4F	Substantial	0.640 (<0.01)*	Moderate	0.496 (<0.05)*
Class 4G	Data not available		Data not available	
Class 4H	Low	0.241 (0.280)	Low	-0.161 (0.451)
Overall	Moderate	0.493 (<0.01)*	Moderate	0.365 (<0.01)*

Note: * Significant correlation shown with p-value < 0.05

5. Interviewing teachers

A telephone interview was conducted with each of the Chinese and General Studies teachers regarding students' writing ability this year (2006-07) as compared to P4 students last year (2005-06). Most Chinese teachers commented that students this year overall have improved their writing ability by 20-40% when compared to students in the same grade level a year ago. All General Studies teachers said that students' writing ability, shown by the writing reports for their IBL projects, have improved also by 20-40% when compared to students a year ago. All teachers championed the integrative approach that promotes a partnership of the General

Studies and Chinese teachers as this collaboration has resulted in a noted improvement of students' writing ability for both courses. As one Chinese teacher said, "I agree that it is hard for the General Studies teacher to teach six groups of students in a class on the group projects alone. It would be much better if there is assistance from other subject teachers, such as the language teacher. The General Studies teacher trains students in the searching of information, and organizing skills, whereas the Chinese teachers teach students the writing skills. The collaboration can help students learn faster and get more assistance."

6. Conclusion and implications

This case study demonstrated that the collaboration between General Studies and Language courses (Chinese in this study) to guide students through IBL projects is an effective approach to develop students' writing ability. On one hand, students were equipped with the writing ability they needed for their IBL projects. On the other hand, they were also able to develop their writing ability to fulfill the requirement of their Chinese course.

Students' writing ability was objectively measured by their length of writing and their grades in their in-class exercises and homework done in the two IBL projects. Through the analysis on students' length of writing and their grades in the assignments, it was found that students were generally able to write faster, longer and better through the two phases of IBL projects. Differences in students' development of writing abilities among classes were observed. It was also noted that students who wrote longer tended to achieve a better quality of writing. The school has reflected on the success of the IBL model, and is now continuing the project with one phase. The teachers have diversified the reading exercises in view of the possible decline of interest of some students after working with similar materials. A blend of text with video is found to be suitable and interesting contents for the students.

This study shows that an integrative approach of teaching and learning has proven to be effective between General Studies and Language (Chinese in this case) courses. The implication is that more exploration is needed regarding the integration of other subjects beyond these two as they may also bring in noted improvement for students' learning. For example, the bigger research behind this study – the approach that involves four kinds of teachers (General Studies, Library, Chinese Language, and Information Technology) in guiding students through IBL projects.

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