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Writing with others in wiki: An investigation of student collaborative writing in English among Chinese secondary students

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Abstract

Wikis have become popular in the educational setting due to their potential to facilitate learning. It has increasingly been used in collaborative writing contexts; although in-depth explorations of the processes and interactions among students using wiki for collaborative writing projects is still lacking. This study aims to investigate how secondary school students in a Hong Kong school used wiki for collaborative writing. Data were obtained from analyzing the revision histories and the contents of the wiki pages. Results indicated that there was a tendency among students to add or edit the page contents rather than delete or organize them. Second, the use of wikis does not automatically guarantee the participation of all students in the writing process. Third, work is unevenly distributed among the group members. Fourth, evidence of collaboration was found in the comments and replies to the comments section. Theoretical and practical implications are discussed.

(character count with spaces excluding references and appendices: 31,862)

1. Introduction

Wikis have been gaining momentum and popularity in the educational field ever since they made their debut in the 1990s. Educators have seen in them a multitude of possibilities for teaching and learning. They have been embraced especially for their collaborative potential, with rapidly growing applications in group-based activities across disciplines and levels of study (see Caverly & Ward, 2008; Chu, 2010 for overviews). One particularly popular use of wikis is as a tool for collaborative writing (e.g., Parker & Chao, 2007; Woo, Chu, Ho, & Li, 2011). The use varies widely, ranging from story writing among students in the language classroom to group report writing in inquiry-based projects. The promise of wikis as a collaborative writing tool has started to attract the attention of researchers in recent years. An emergent body of research has been done on wiki-based collaborative writing, focusing on its design, implementation, and impact on student learning.

Despite these studies, there is still a dearth of in-depth knowledge about the processes and activities involved as students interact with each other when they write collaboratively on wikis. There is a need to address this gap given that an understanding of students' activites in the collaborative writing process can help instructors find ways to harness the power of wiki in enhancing student learning. This lack of understanding is the motivation for the present study.

This paper reports a case study of wiki-based collaborative writing among junior secondary school students in Hong Kong. It is exploratory in nature, The aim is to understand students' behavior in the process of collaborative writing on wikis. Based on data drawn from wikis' revision history and comment facilities, it seeks to identify and evaluate the activities of students in terms of participation and collaboration.

2. Literature review

Collaborative writing is broadly defined as a social act in which two or more people share responsibility for the creation of a single document (Bosley, 1989; Lowry, 2002). It is a complex and dynamic process consisting of five interrelated components: strategies, activities, document control, roles, and work modes (Lowry, Curtis, & Lowry, 2004; Posner & Baecker, 1993; Sharples, Goodlet, Beck, Wood, Plowman, & Evans, 1993). Strategies are the approaches collaborators use to partition and coordinate the writing of their shared documents. Activities cover the cognitive and behavioral actions writers engage in during the course of producing their collaborative works. Document control refers to the methods of

managing members' rights to access and change their joint documents. Roles are the duties and responsibilities individual collaborators take on over the writing process. Work modes concern the levels of physical proximity and synchronicity writers choose for their collaboration. Each component has potential impacts on the processes, products, and outcomes of collaborative writing.

Collaborative writing has long been used in a wide range of educational settings (e.g., Speck, Johnson, Dice, & Heaton, 1999). Its pedagogical value is rooted in social constructivist theories of learning. Grounded in the work of Vygotsky and Bruner, social constructivism perceives cognitive development as a socially situated process (Kim, 2001). Individuals build on their knowledge and skill through social interaction with more capable others, who provide them with the assistance they need to go beyond their existing levels of development. Such assistance is now commonly termed in the literature as "scaffolding", a metaphor introduced by Wood, Bruner, and Ross (1976). In a classroom context, scaffolding can be provided not only by teachers but also by peers. Research has shown that peers engaging in pair or group work are able to support each other in the processes of knowledge building (Lai & Law, 2006), critical thinking (Sharma & Hannafin, 2005), problem-solving (Fawcett & Garton, 2005), and language acquisition (Donato, 1994). Accordingly, learners should be given the opportunity to participate in activities that encourages social interaction. Collaborative writing is considered to be one of these activities.

The emergence of wikis has opened up new possibilities for the use of collaborative writing in teaching and learning. Designed to be a web-based collaboration tool, a wiki is a website where multiple users can directly create and edit the content of a single webpage through their web browsers (Leuf & Cunningham, 2001). Its functionality makes it a particularly promising tool for collaborative writing. Wikis equip users with synchronous access, version control, change tracking, and comment capacities. All of which are beneficial for collaborating writers (Noël & Robert, 2004). Easily accessible and functional, a wiki is seen as a viable tool to extend collaborative writing beyond the confines of the classroom. It provides a virtual platform for collaborating students to have immediate access to the latest version of their written work and a ubiquitous means of coordinating their writing efforts. Teachers can make use of the same platform to access every version of their developing work and offer support and scaffolding without the constraints of time and space. Thus, a wide variety of wiki-based collaborative writing projects have been conducted across subjects and

levels, exploring and experimenting with the educational potential of the online collaboration tool (Mader, 2006).

Research on the educational use of wikis in collaborative writing is still in its infancy. Most of the existing research seems to fall into two categories. The first category of research is prescriptive, with a focus on the pedagogical design, implementation and evaluation of wiki-based collaborative writing. For example, Hadjerrouit (2011) proposes a collaborative writing approach to wiki development based on rapid prototyping, and assesses the approach in a design-based study. Trentin (2009) formulates and tests in his research a quantitative method for evaluating students' individual contribution to a wiki-based collaborative writing project, using survey grids and ad hoc formulae to quantify the log data automatically recorded in a wiki. The second category of research is exploratory, with the general aim of observing and analyzing the interplay between learning and wikis' collaborating writing environment. It constitutes the majority of the current research, with active contributions from various fields of education. A review of this growing body of research has shown an intricate and dynamic picture of wiki-based collaborative writing in the classroom. Its findings have offered insights into the use of wikis in collaborative writing from three perspectives: students' perceptions, written products, and writing processes (e.g., Li et al., 2010; Woo et al., 2011).

A sizable amount of research has been conducted to investigate students' perceptions of the use of wikis in collaborative writing. Much of the research has shown that students tend to have a positive view of collaborative writing with wikis. Li, Chu, Ki, and Woo (2010) have carried out a case study to examine the attitudes and perceptions of primary four students in China towards wiki-based collaborative writing in a Chinese classroom. Using questionnaires and focus group interviews, they find that the students regard the use of wikis as beneficial for fostering writing motivation, group interaction, and reader awareness. Woo et al. (2011) have reported similar findings in their case study of primary five students in Hong Kong using wikis for English collaborative writing. The students in the study enjoy the wiki experience and consider wikis useful tools for facilitating better writing, team interaction, and group activities. Such positive perception is not limited to primary school students. Chao and Lo (2009) have studied the perceptions of wiki-based collaborative writing among EFL (English as a foreign language) university students in Taiwan. The majority of them agree that a wiki provides a supportive writing environment and a

collaborative platform for teamwork. Elola and Oskoz (2010) have also undertaken a study of Spanish majors at an American university to explore students' perceptions of the use of wikis in collaborative writing. They show that most of the students find wikis helpful in improving the content and structure of their writing, thus verifying the positive perceptions of students commonly reported in the literature.

In comparison, research is less conclusive on the effects of wiki-based collaborative writing on students' written products. There is still not enough research into the topic to make any significant generalizations. Nevertheless, a few studies have suggested that wikis have the potential to enhance the writing output of collaborating students. One of the studies has been conducted by Mak and Coniam (2008). Designed to be a collaborative writing programme in a Hong Kong secondary school, their study has investigated the writing a class of Year 7 ESL (English as a second language) students have done on wikis. The students' texts are evaluated by means of the amount of words and t-units, the length of the t-units, and the amount and types of writing change. The evaluation reveals that the students have produced longer and more coherent texts when writing collaboratively on wikis. Another study has been carried out by Liou and Lee (2011) in a university setting. Their study has examined the text a group of Taiwanese EFL college students have produced collaboratively and individually on wikis. Calculating the number and percentage of words, t-units, clauses, error-free t-units, and error-free clauses, they compare the collaboratively produced texts with the individually produced ones in terms of fluency, accuracy, and complexity. Although no substantial difference in complexity is found between the two, the comparison indicates that the texts collaboratively produced on wikis tend to be longer and more accurate.

Research is equally limited as to students' collaborative writing processes with wikis. Most available studies have been conducted in the fields of first and second language learning, with a common focus on the activities and interactions of learners in relation to different elements and stages of writing (Elola & Oskoz, 2010; Forte & Bruckman, 2007; Liou & Lee, 2011; Mak & Coniam, 2008). It is only recently that researchers have started to investigate how students act and interact in the collaborative writing environments of wikis. Leung and Chu (2009) have looked into the participation and collaboration of Hong Kong undergraduates in the process of writing their group projects on Media Wiki. Analyzing the group wikis' built-in history logs and discussion boards, their study concludes that the group members participate unevenly in group work and do not collaborate much in the writing

process. Judd, Kennedy, and Cropper (2010) have reached similar conclusions in their case study of the collaborative behavior among Australian university students in a wiki-based group writing task. They note that there is little evidence of collaboration, with only a minority of the students making most of the contributions and interacting with group members through page comments. Meishar-Tal and Gorsky (2010) have explored and identified the writing actions carried out by a group of graduate students at a university in Israel as they collaborate to build a glossary on a wiki. Using a refined taxonomy to categorize the actions performed on the wiki, their study reveals that the students mostly add content to the wiki but rarely delete the existing content.

It is evident that the literature on the educational use of wiki-based collaborative writing has been dominated by perception-based studies and empirical research at the university level. Very little work has been done to study students' activities and interactions within wikis' collaborative writing environment at the secondary level. The present study attempts to fill the research gap by examining how junior secondary school students engage in collaborative writing on wikis. Using qualitative and quantitative data derived from the students' wikis, it seeks to explore their participation and collaboration in the wiki-based writing process.

3. Methodology

3.1. Research Questions

The purpose of this study is to investigate how Hong Kong junior secondary school students participate and collaborate in wiki-based collaborative writing. It aims to answer four main questions:

1. What are the patterns of activities performed by the students?
2. What is the level and frequency of participation among the students?
3. How do the students distribute writing work among group members?
4. What is the degree of collaboration among the students?

3.2. Participants and Setting

The participants of the study were a class of 25 secondary one students in an all boy's school in Hong Kong. Students were required to conduct a group project as part of the liberal studies curriculum., in which the students can research on topics related to the themes of media, education, religion, sports, art, or information and communication technology. The students were organized into groups of five, one of whom served as the group leader. There

were a total of five groups of students in the study. All of them were guided and assisted by their liberal studies teacher in the course of the project.

Each group had to write a report on their project. They were instructed to use Google Sites, a wiki, to produce and present the written report. The wiki-based group report had to include twelve sections: (a) project cover, (b) title of the study, (c) acknowledgement, (d) table of contents, (e) background of study, (f) literature review, (g) research design and methodology, (h) research findings, data analysis and discussion, (i) conclusion, limitations and suggestions, (j) appendix, (k), group list with the assigned duties for each member, and (l) self-reflections. The students had the choice of writing their reports in English or Chinese, but they were encouraged to use English. All the wiki-based group reports examined in this study were written in English.

3.3. ***Data Collection and Analysis***

Data for this study were drawn directly from the students' wiki-based group reports. They consisted of two types of contributions students made to their group wikis in the process of collaborative writing. The first type covered the students' inputs into the contents of their written reports. The second type comprised the comments the students posted on their group wikis. The data on both types of student contributions were automatically recorded and made available on the students' group wikis by means of the built-in functions of Google Sites.

The inputs from individual students were accessed through the revision history function on each wiki. This function allowed direct access to all the previous versions of a wiki page and detailed each change made to the contents of the page. It provided three groups of data on the students' inputs: the name of the student making each change, the date and time a change was made, and the specific change in the content. The data were analyzed in two ways. First, they were quantified to assess how much and how often the students contributed to the contents of their wikis. Second, the changes each student made were categorized to identify what they commonly did in the process of collaborative writing on wikis. The categorization was based on a modified version of an action taxonomy developed by Meishar-Tal and Gorsky (2010). Derived from Pfeil, Zaphiris, and Ang's (2006) categories of changes, this taxonomy offered a hierarchical and cross-disciplinary model for classifying actions performed on wikis. A diagram of the modified taxonomy is illustrated in Figure 1.

Students' comments were all extracted from their respective group wikis. The comment function on wikis kept comprehensive records of the messages each group of students wrote and their replies on each wiki page. The extracted comments were analyzed to understand the degree of collaboration among the students. They were classified using a content analysis coding scheme adapted from the work of Judd, Kennedy, and Cropper (2010). The adapted scheme was comprised of six non-exclusive categories: content, form, work, individual, group, and reply. Details of each category are presented in Table 1.

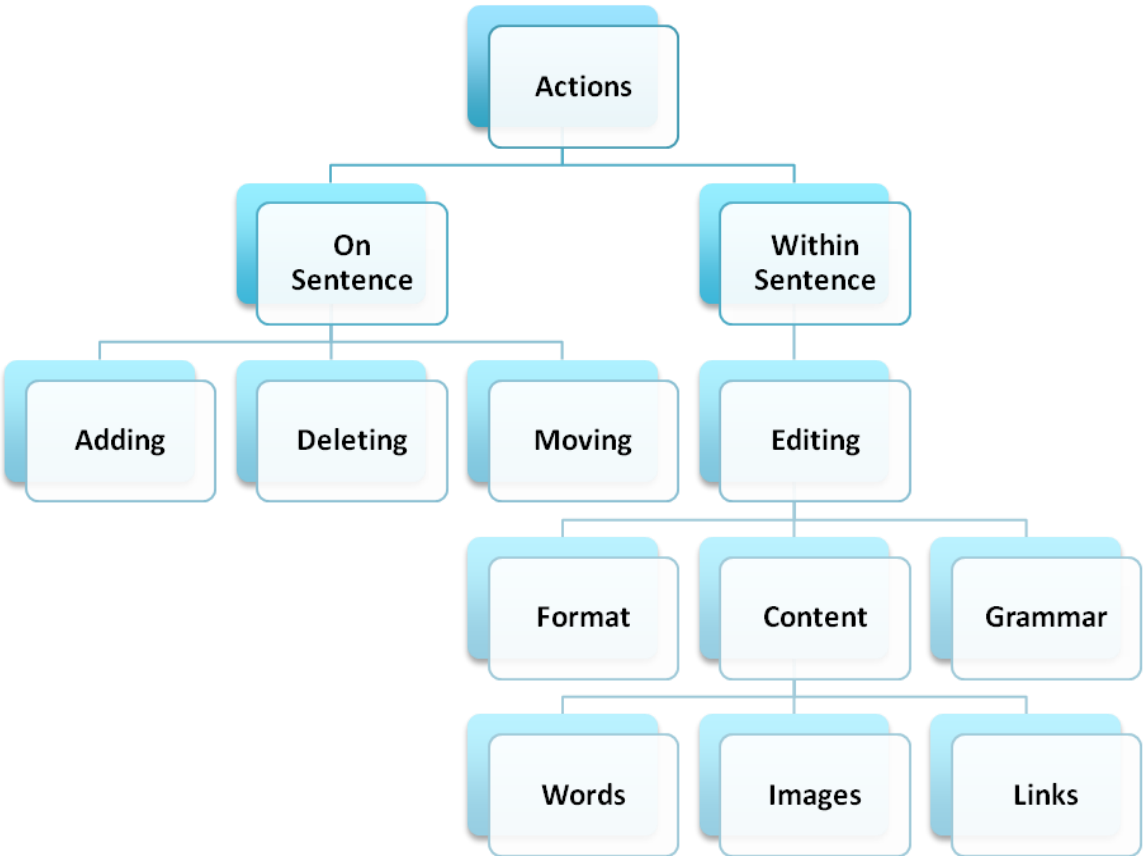


Figure 1. The modified version of Meishar-Tal and Gorsky's (2010) action taxonomy

Table 1. The categories of comments adapted from Judd, Kennedy, and Cropper (2010)

Category	Description
Content	A comment on the selection, organization, and presentation of ideas
Form	A comment on the mechanical aspects of writing, such as grammar, spelling, and format
Work	A comment on the communication and coordination of group work
Individual	A comment addressed to individual group members
Group	A comment addressed to the whole group
Reply	A comment written in response to another comment

4. Findings and discussion

4.1. Patterns of Activities on Wikis

The student's activities on their group wikis were characterized by the addition of sentences and the editorial change of words. What they did the most in the collaborative writing process was adding sentences, which constituted 33 percent of the total number of actions performed by the students. Another 29 percent were devoted to the revising acts of adding, deleting, and replacing words in the contents. Together these two types of actions made up more than 60 percent of the students' activities on wikis. Half of the remaining actions were changes made to the format of the wiki-based reports, which usually took the form of modifications in font style, size and color. The rest covered the other five types of students' actions, each of which comprised less than 10 percent of the total. The distribution of the eight different types of students' actions is illustrated in Figure 2. Generally, the same distribution was evident in the students' activities in individual groups, as demonstrated in Figure 3. This confirmed that the distribution represented the general patterns of activities among the students.

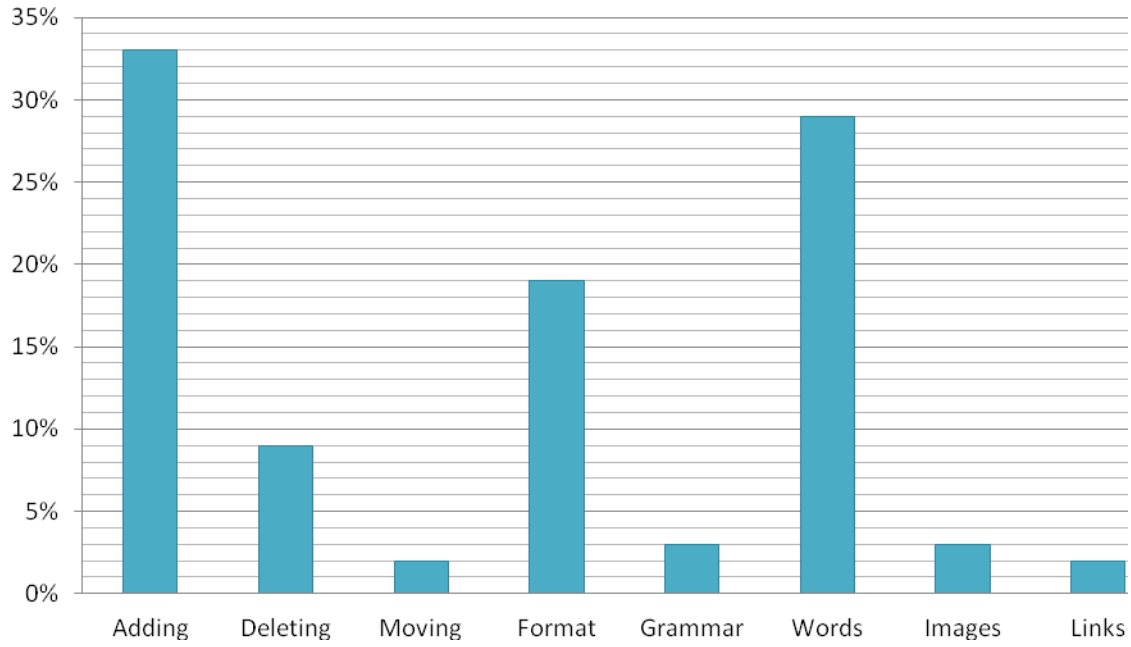
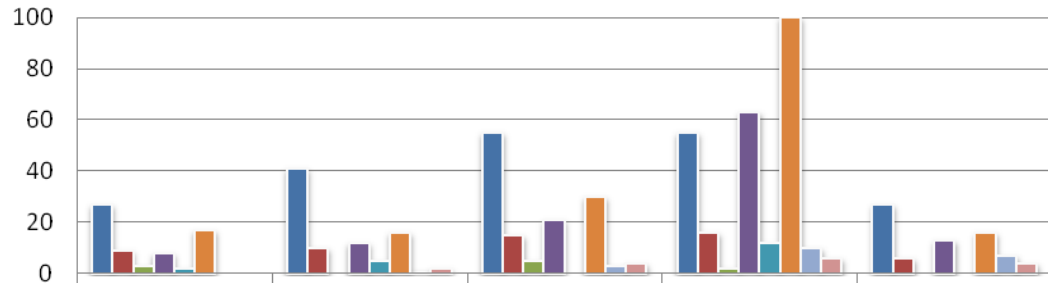


Figure 2. The distribution of the types of actions the students performed on wikis



	Group 1	Group 2	Group 3	Group 4	Group 5
Adding	27	41	55	55	27
Deleting	9	10	15	16	6
Moving	3	0	5	2	0
Format	8	12	21	63	13
Grammar	2	5	0	12	0
Words	17	16	30	100	16
Images	0	1	3	10	7
Links	0	2	4	6	4

Figure 3. The distribution of the types of students' actions in individual groups

The patterns of activities found among the students are consistent with previous studies on students' behavior in wiki-based collaborative writing (Leung & Chu, 2009; Li, Chu, Ki, & Woo, 2010; Mak & Coniam, 2008; Meishar-Tal & Gorsky, 2010). They show three activity tendencies, each of which is in accord with the findings reported in the

literature. First, there was a tendency among the students in the study to add rather than delete text in the process of collaborative writing on wikis. The same tendency has been noted by Leung and Chu (2009) and Meishar-Tal and Gorsky (2010) in their respective studies of university students. Second, when writing the wiki-based group reports, the students were inclined to focus their editing efforts on content instead of form. This verifies the observation Li, Chu, Ki, and Woo (2010) have made on the use of wikis by primary school students. Third, the students seldom edited their group wikis for grammatical errors. The relative absence of grammatical corrections corroborates a similar finding by Mak and Coniam (2008) in secondary school students.

One potential factor in the students' activity patterns is their socio-cultural and linguistic background. All the students in the study were Cantonese-speaking Chinese boys in the first year of their secondary education in Hong Kong. Opting to use English instead of Chinese, they engaged in wiki-based collaborative writing in a second language. Recent research has found that Chinese ESL (English as second language) learners tend to avoid making changes to each other's writing when they write collaboratively on wikis (Liou & Lee, 2011; Mak & Coniam, 2008). They rarely proofread, edit, and revise the work produced by their group members, particularly in terms of grammar, spelling, and punctuation. According to Mak and Coniam (2008), much of their avoidance is intentional, for they do not want to risk causing others to lose face by correcting their errors.

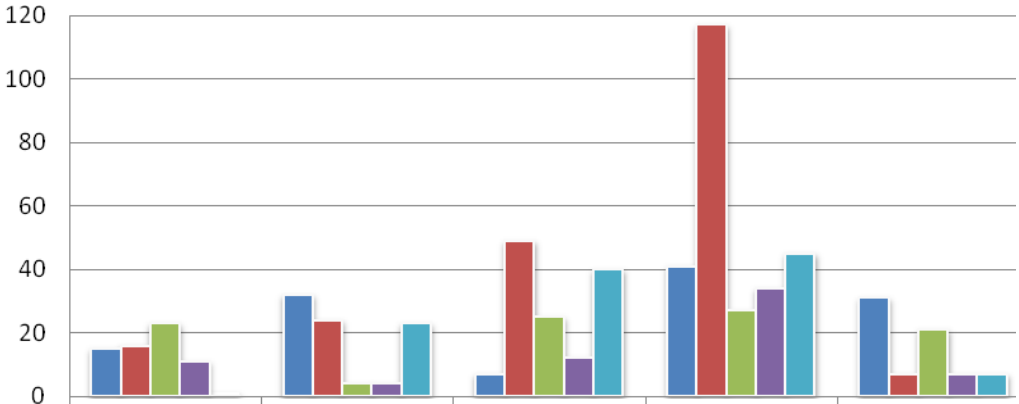
Another factor may lie in the orientation of the students towards the wiki-based collaborative writing task they were assigned to perform in the study. The group reports they wrote on wikis were the end products of their IES projects, which they were required to do in a liberal studies class. In such context, report writing was not viewed as a language task but as part of a subject-based research project. Accordingly, the students gave priority to the content over the form as they collaborated on their written reports. They focused their efforts on adding and editing text, but paid little attention to the mechanics of writing, as demonstrated in their activity tendencies.

4.2. ***Level and Frequency of Participation***

As shown in Figure 4, significant variation was observed in the level of participation among the 25 students. A total of 623 actions were performed on the students' group wikis. At the individual level, the mean was 24.92 actions per student, with a standard deviation of 23.64. At the group level, the mean was 124.6 actions per group, with a standard deviation of

82.18 The high standard deviations indicated that the level of students' participation varied widely among individuals and groups.

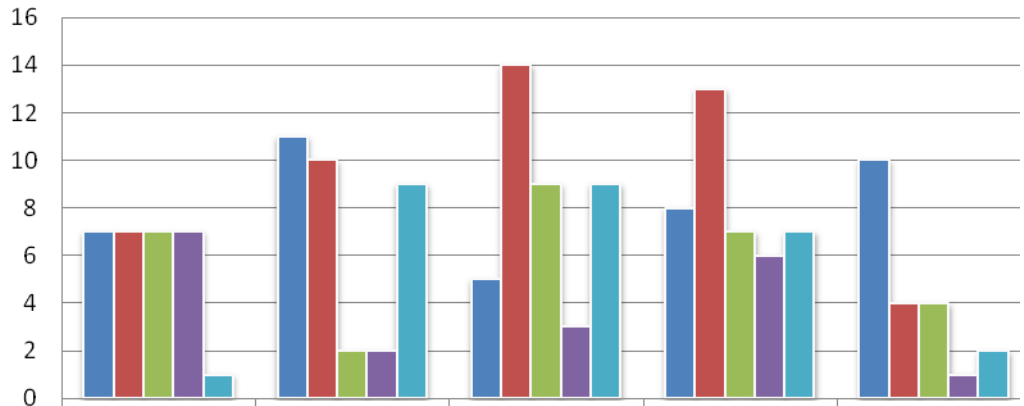
The frequency of participation was generally low among the students. Overall, the writing of each wiki-based group report lasted for three months. During that period, the number of days each student performed actions on their wiki was mostly in the single digits, as revealed in Figure 5. Only five of them barely made it into the double-digit range. The mean per student was 6.6 days, with a standard deviation of 3.62. A similar rate of participation was found in the monthly frequency of the students' actions on wikis. As seen in Figure 6, more than half of the students worked on their wiki-based group report less than once a month. However, it is also possible that the students worked on the wiki projects outside the wiki platform, which this study was not able to capture.



	Group 1	Group 2	Group 3	Group 4	Group 5
Student A*	15	32	7	41	31
Student B	16	24	49	117	7
Student C	23	4	25	27	21
Student D	11	4	12	34	7
Student E	1	23	40	45	7

* Group Leader

Figure 4. The amount of actions the students performed on wikis



	Group 1	Group 2	Group 3	Group 4	Group 5
Student A*	7	11	5	8	10
Student B	7	10	14	13	4
Student C	7	2	9	7	4
Student D	7	2	3	6	1
Student E	1	9	9	7	2

* Group Leader

Figure 5. The number of days the students performed actions on wikis

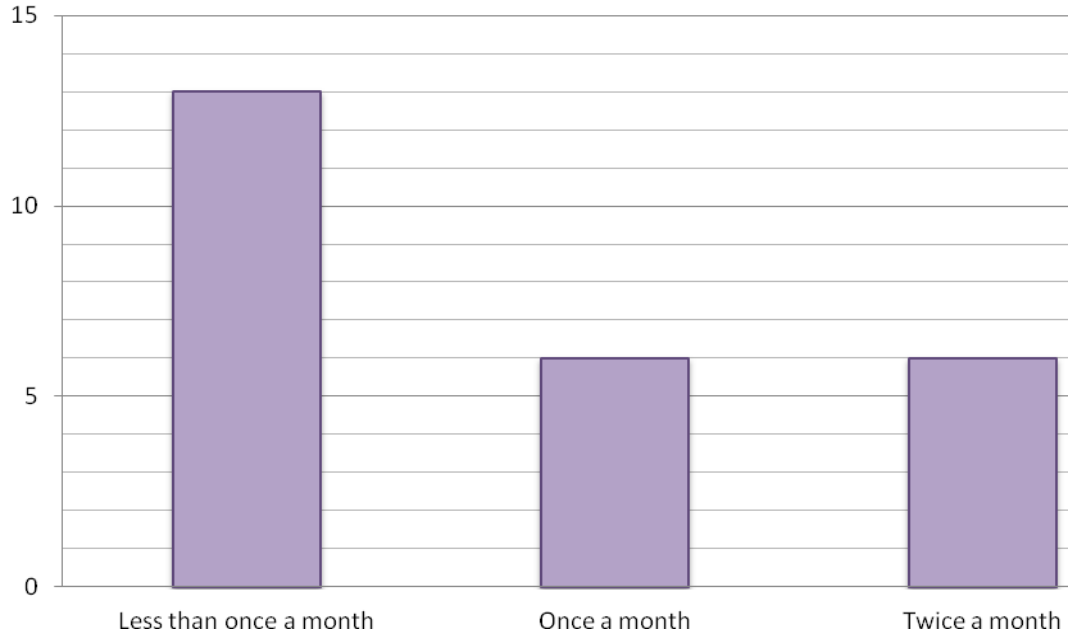


Figure 6. The monthly frequency of the students' actions on wikis

All the students in the study participated in the collaborative writing of the wiki-based project reports. However, their level and frequency of participation did not reveal strong

engagement in the writing process. Only a handful of the students made active and ample contributions to their group wikis, with the rest adding their little inputs on occasion. The overall participation of the students was evidently weak. This finding resembles the results of two other studies, in which a low degree of participation has been reported among university students using wikis for collaborative writing (Cole, 2009; Ebner, Kickmeier-Rust, & Holzinger, 2008). However, as mentioned earlier, it is possible that the students worked on their projects outside the wiki platform.

The level and frequency of the students' participation seem to be indicative of their practical application of wikis. The group wikis were designed as collaborative tools for writing and communicating online, with the purpose of facilitating participation and interaction in the process of collaborative writing. In practice, the students mainly utilized their group wikis as presentation platforms, where they displayed their work in progress or completed work for group members to read and comment on. Most of them were apt to contribute the majority of their inputs within a short period of time, mostly in the last month before the deadline. This reflects that the students used wikis more as a means of presenting their finished products than as a working tool during the report writing process. Alternatively, this may also show the tendency of students to procrastinate with regard to their work, thus resulting in the high rate of activity during the last month before the deadline (see Steel, 2007 for a review).

4.3. Work distribution

The writing of the wiki-based group report was not evenly distributed among the students in each group. As noted in Figure 4, there was considerable disparity among the five members in the amount of actions they performed on their group wiki. Two or three group members tended to contribute to more than 70 percent of the students' actions on each wiki. The same disproportion was also evident in the number of actions each student performed on individual sections of their group report. In three of the five groups, at least 75 percent of the report sections were the work of not more than three members. In the other groups, the percentage was up to 42 percent. The specific distribution of the students' actions in each report section is provided in Appendix A. With the exception of one group, the group leaders were found to be major contributors among group members. Their contributions were relatively large, both in terms of the number of actions they performed and the number of report sections they worked on.

The uneven work distribution within each group may be a consequence of their collaborative writing strategy on wikis. As defined by Lowry, Curtis, and Lowry (2004), the collaborative writing strategy of a group is the way in which group members distribute and coordinate the writing of a collective document. One common strategy is to split the writing into discrete units and assign group members to work on the separate units concurrently. Lowry and his colleagues name this strategy "parallel writing" and divide it into two types. The first type is horizontal-division writing, in which group members are tasked with particular sections of a shared document. The second type is stratified-division writing, in which group members are assigned specific roles based on their capacities. The collaborative writing strategy adopted by the student groups in the study appeared to be a combination of both types of parallel writing. Almost all the groups split up the writing of their wiki-based group reports, with one or more students responsible for each of the required sections. Some of the students seemed to take up more than one role within their own groups, serving interchangeably as writers, editors, and reviewers during the report writing process. Those students were usually but not necessarily the group leaders. In addition, the distributed writing was only part of the division of labor in each group. As evident from the work distribution tables on their group wikis, the group members divided among themselves the workloads for the whole IES projects, which included not only the written reports but also questionnaires, interviews, and presentations. All these may explain why the students did not contribute evenly to the writing of their wiki-based group reports.

4.4. Degree of Collaboration

A certain degree of collaboration was exhibited among the students in the process of writing. There was evidence of the group members interacting and communicating for their group report in the comments they left on various pages of their wiki. The five groups of students posted a total of 178 comments, with an average of 35.6 comments per group. Figure 7 shows the distribution of the students' comments among the six non-exclusive categories. The two major categories were "content" and "group", each of which constituted more than 50 percent of all comments. This overall distribution was fairly similar to the specific distribution in individual groups. Figure 8 displays the group-specific distribution, detailing the number of the students' comments under each category. "Content" was the top category in almost all the groups, and "group" was ranked first in three groups. The prevalence of the

two categories was an indication that the students engaged in online communication to exchange ideas for their group reports. The comment distribution among the members in each group is given in Appendix B for reference.

It is important to note that the students' comments do not provide a complete picture of their collaboration in the wiki-based report writing process. As they collaborated on their group reports, they used more than the comment facility on wikis to interact and communicate with their group members. The comments on the group wikis indicate that the students made use of telephones and emails to support their collaborative writing on wikis. Each group was also given classroom time to work on their report, meeting face to face regularly in their liberal studies lessons. The collaborative activities the students engaged in through those blended means of interaction and communication were not included in the present analysis. Thus, the degree of collaboration reported in this study should be treated with great caution. It is simply indicative of the extent to which the students collaborated with each other by means of the comment function on wikis.

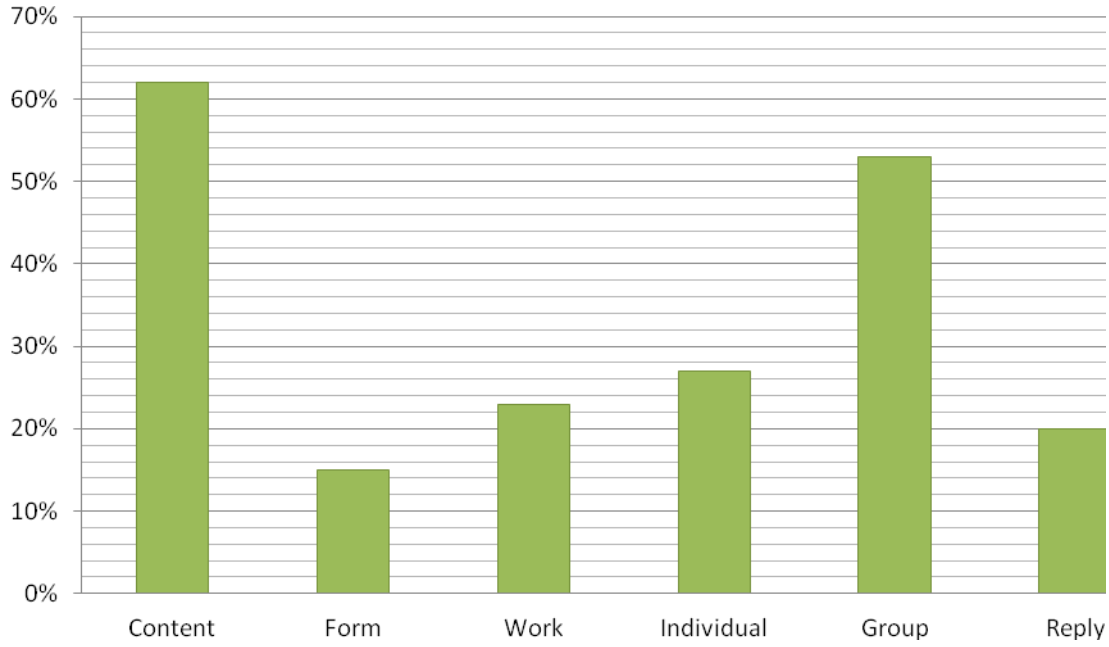
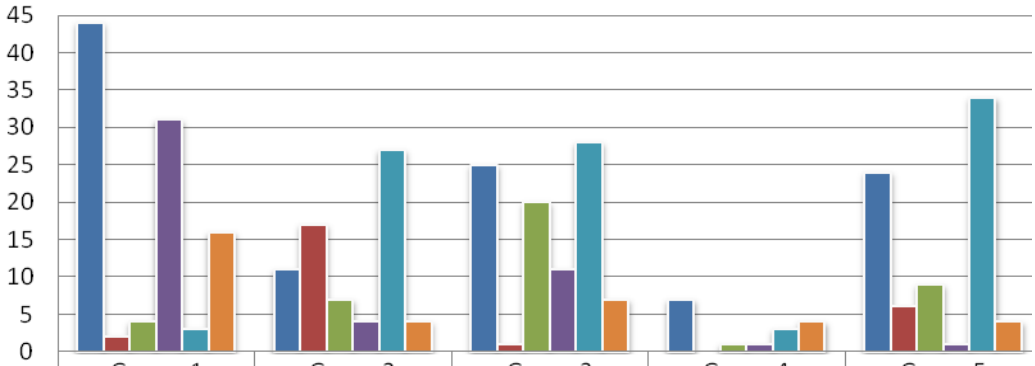


Figure 7. The distribution of the students' comments among the six categories



	Group 1	Group 2	Group 3	Group 4	Group 5
Content	44	11	25	7	24
Form	2	17	1	0	6
Work	4	7	20	1	9
Individual	31	4	11	1	1
Group	3	27	28	3	34
Reply	16	4	7	4	4

Figure 8. The distribution of the students' comments in individual groups

5. Conclusion

This study examined the participation and collaboration of Hong Kong secondary students in wiki-based collaborative writing. There are four main findings. First, there is a strong tendency among the students to add or edit the wikis' contents rather than delete or organize them. Second, the application of wikis in collaborative writing does not necessarily guarantee the participation of the students in the writing process. Third, the collaborating students do not distribute the writing work on wikis evenly among themselves. Fourth, collaboration is evident in the comments posted on wikis.

The study has its limitations. It is not generalizable, for its sample is too small and homogeneous to be representative of the population of secondary school students in Hong Kong. It is also prone to personal bias and error, as the data were coded and analyzed by a sole researcher. Future work could utilize more coders in order to improve the reliability and validity of the study.

In spite of these limitations, the study has practical implications for both educators and researchers in the design, implementation, and use of wiki-based collaborative writing in the classroom. This study provides insights into the behavior of students in the collaborative writing environment of wikis, showcasing its learning potential and possible pitfalls. A pratical possible implication of the study is the need for teachers to encourage all students to participate in the group project such that the leader does not take on most of the

responsibilities. A study by Leung and Chu (2009) has suggested that taking into account individual student contribution in grading students in group work might be a possible way to remedy this. Another issue is the need for teachers to discourage procrastination and last-minute jobs by the students. Teachers may set short-term and mid-term deadlines for their students (e.g., set deadlines for completing certain parts of the project) instead of just having one deadline for the whole project (see Ariely & Wertenbroch, 2002). Alternatively, teachers can also let students set their own deadlines which may also inhibit procrastination in the completion of group projects (Roberts, Fulton, & Semb, 1988).

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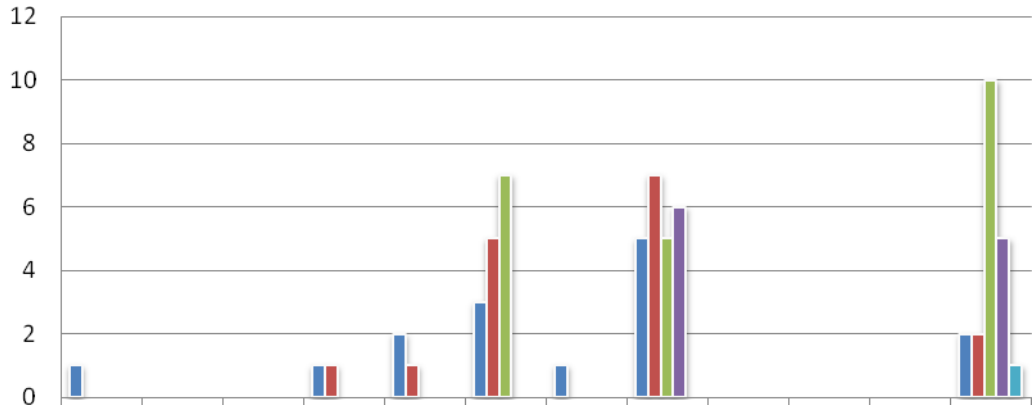
Appendix A

The distribution of the students' actions on each section of the wiki-based group report

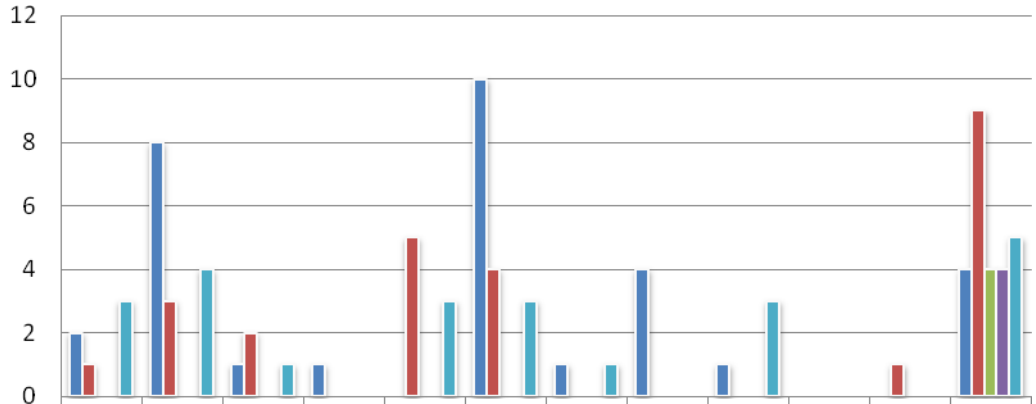
Group 1



	Sec. A	Sec. B	Sec. C	Sec. D	Sec. E	Sec. F	Sec. G	Sec. H	Sec. I	Sec. J	Sec. K	Sec. L
Student A*	1	0	0	1	2	3	1	5	0	0	0	2
Student B	0	0	0	1	1	5	0	7	0	0	0	2
Student C	0	0	0	0	0	7	0	5	0	0	0	10
Student D	0	0	0	0	0	0	0	6	0	0	0	5
Student E	0	0	0	0	0	0	0	0	0	0	0	1

* Group Leader

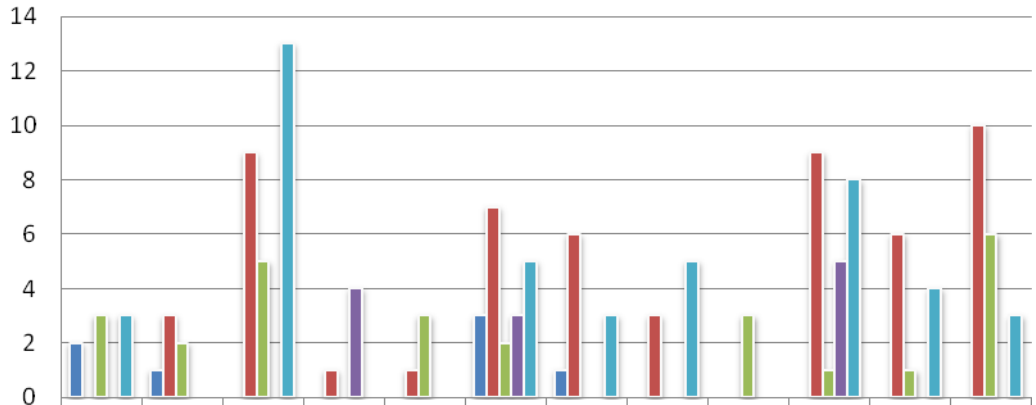
Group 2



	Sec. A	Sec. B	Sec. C	Sec. D	Sec. E	Sec. F	Sec. G	Sec. H	Sec. I	Sec. J	Sec. K	Sec. L
Student A*	2	8	1	1	0	10	1	4	1	0	0	4
Student B	1	3	2	0	5	4	0	0	0	0	1	9
Student C	0	0	0	0	0	0	0	0	0	0	0	4
Student D	0	0	0	0	0	0	0	0	0	0	0	4
Student E	3	4	1	0	3	3	1	0	3	0	0	5

* Group Leader

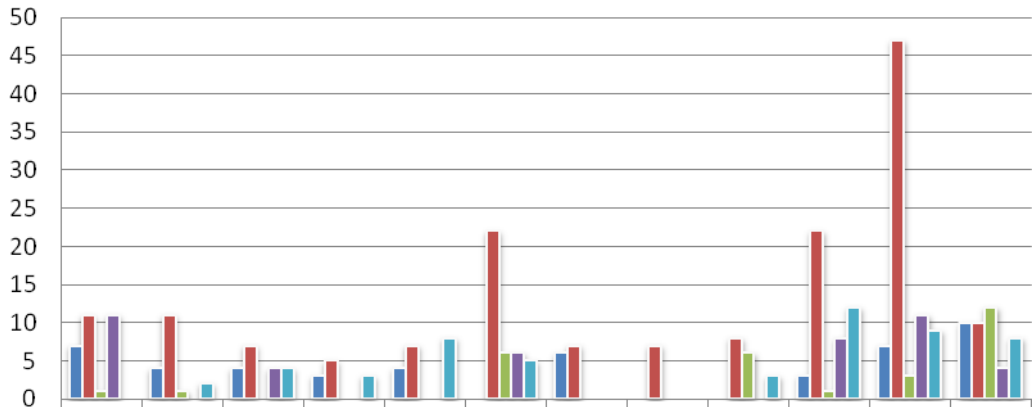
Group 3



	Sec. A	Sec. B	Sec. C	Sec. D	Sec. E	Sec. F	Sec. G	Sec. H	Sec. I	Sec. J	Sec. K	Sec. L
Student A*	2	1	0	0	0	3	1	0	0	0	0	0
Student B	0	3	9	1	1	7	6	3	0	9	6	10
Student C	3	2	5	0	3	2	0	0	3	1	1	6
Student D	0	0	0	4	0	3	0	0	0	5	0	0
Student E	3	0	13	0	0	5	3	5	0	8	4	3

* Group Leader

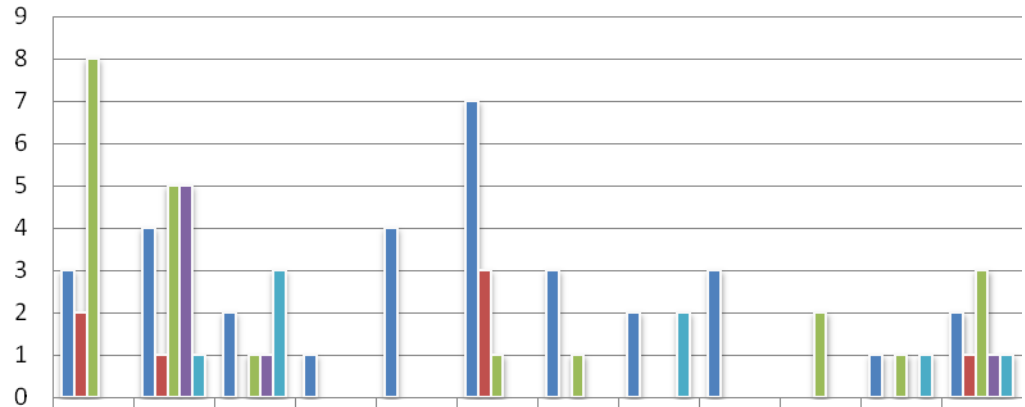
Group 4



	Sec. A	Sec. B	Sec. C	Sec. D	Sec. E	Sec. F	Sec. G	Sec. H	Sec. I	Sec. J	Sec. K	Sec. L
Student A*	7	4	4	3	4	0	6	0	0	3	7	10
Student B	11	11	7	5	7	22	7	7	8	22	47	10
Student C	1	1	0	0	0	6	0	0	6	1	3	12
Student D	11	0	4	0	0	6	0	0	0	8	11	4
Student E	0	2	4	3	8	5	0	0	3	12	9	8

* Group Leader

Group 5



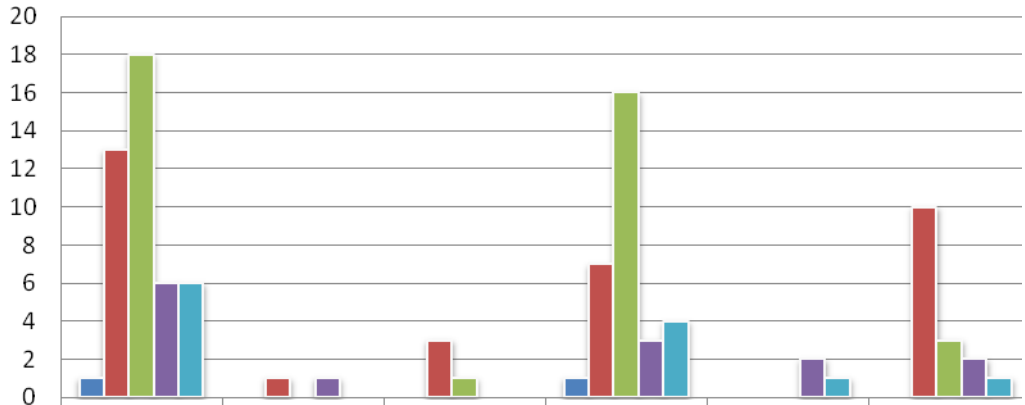
	Sec. A	Sec. B	Sec. C	Sec. D	Sec. E	Sec. F	Sec. G	Sec. H	Sec. I	Sec. J	Sec. K	Sec. L
Student A*	3	4	2	1	4	7	3	2	3	0	1	2
Student B	2	1	0	0	0	3	0	0	0	0	0	1
Student C	8	5	1	0	0	1	1	0	0	2	1	3
Student D	0	5	1	0	0	0	0	0	0	0	0	1
Student E	0	1	3	0	0	0	0	2	0	0	1	1

* Group Leader

Appendix B

The distribution of the students' comments among the members in each group

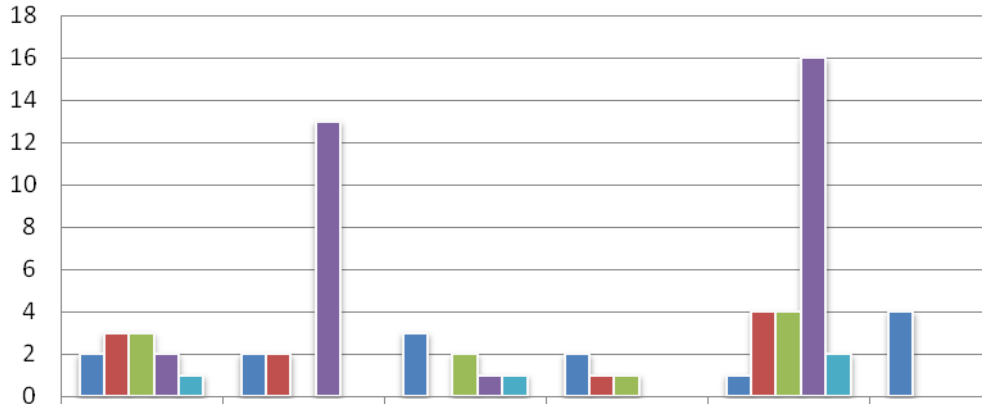
Group 1



	Content	Form	Work	Individual	Group	Reply
Student A*	1	0	0	1	0	0
Student B	13	1	3	7	0	10
Student C	18	0	1	16	0	3
Student D	6	1	0	3	2	2
Student E	6	0	0	4	1	1

* Group Leader

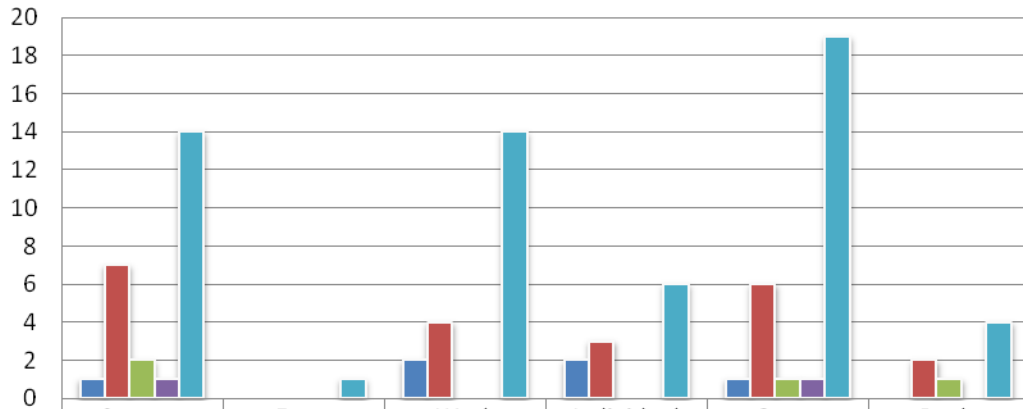
Group 2



	Content	Form	Work	Individual	Group	Reply
Student A*	2	2	3	2	1	4
Student B	3	2	0	1	4	0
Student C	3	0	2	1	4	0
Student D	2	13	1	0	16	0
Student E	1	0	1	0	2	0

* Group Leader

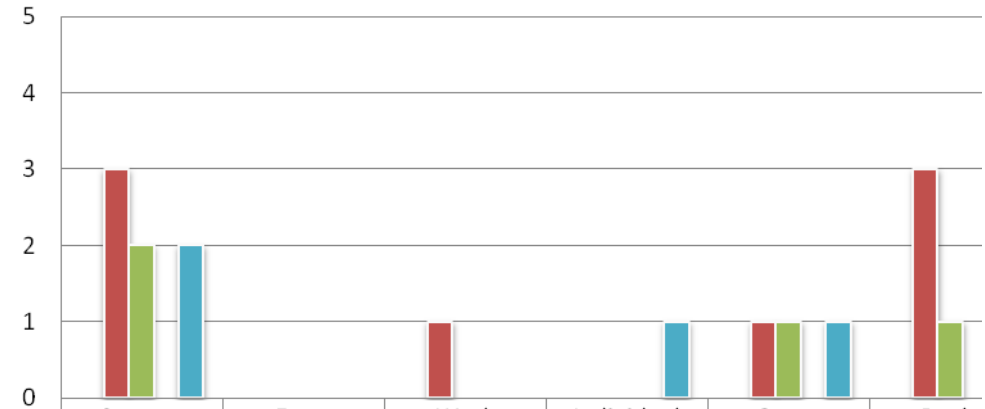
Group 3



	Content	Form	Work	Individual	Group	Reply
Student A*	1	0	2	2	1	0
Student B	7	0	4	3	6	2
Student C	2	0	0	0	1	1
Student D	1	0	0	0	1	0
Student E	14	1	14	6	19	4

* Group Leader

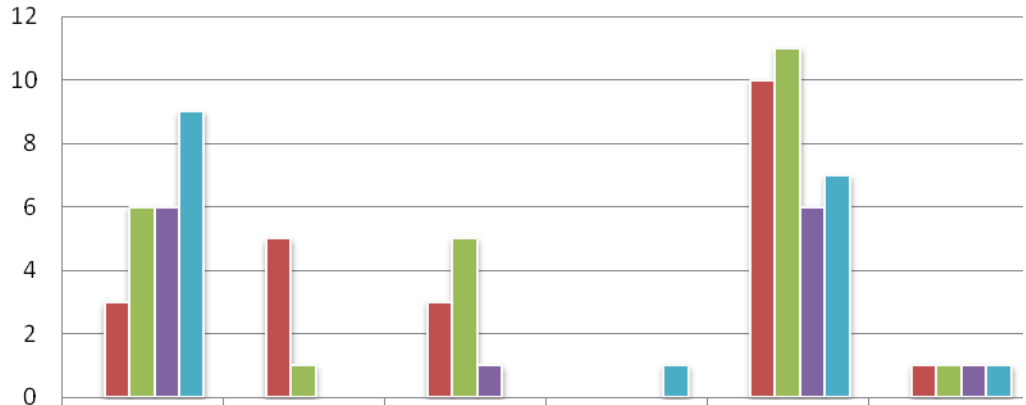
Group 4



	Content	Form	Work	Individual	Group	Reply
Student A*	0	0	0	0	0	0
Student B	3	0	1	0	1	3
Student C	2	0	0	0	1	1
Student D	0	0	0	0	0	0
Student E	2	0	0	1	1	0

* Group Leader

Group 5



	Content	Form	Work	Individual	Group	Reply
Student A*	0	0	0	0	0	0
Student B	3	5	3	0	10	1
Student C	6	1	5	0	11	1
Student D	6	0	1	0	6	1
Student E	9	0	0	1	7	1

* Group Leader