Plagiarism-Free Inquiry Project-Based Learning with UPCC Pedagogy

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ABSTRACT
(U)nderstanding plagiarism, learning about (P)araphrasing and related skills, generating proper (C)itations with an online citation tool and doing originality (C)heck with an online tool (UPCC) is a pedagogy developed by Chu and his colleagues (2014, 2015) to help students avoid plagiarism. The UPCC pedagogy incorporates teaching the ethical use of information, an important facet of information literacy, into inquiry project-based learning (PjBL), a pedagogical approach that demands students to demonstrate high order information literacy. This study, adopting a mixed-methods design, evaluates the effectiveness of UPCC by comparing the plagiarism behavior of two cohorts of junior secondary students in their PjBL projects with and without the implementation of the pedagogy. In addition, upon the completion of their projects, the 2015 cohort completed a survey that evaluates their knowledge of plagiarism, and assesses the extent to which they endorse the helpfulness of the UPCC in domains including instructional support; understanding plagiarism; paraphrasing, synthesizing and summarizing; generating appropriate citations; and originality self-check. Students and teachers also participated in focus group interviews to further elaborate on their perceptions on the UPCC pedagogy. A trend in reduced plagiarism behavior was observed after the implementation of UPCC, and students expressed a generally positive perception on UPCC as an effective anti-plagiarism pedagogy. Quantitative and qualitative data showed that students who had better knowledge of plagiarism held a significantly more positive perception on the effectiveness of UPCC than those who showed poorer understanding of plagiarism. This may indicate that further refinement of UPCC is needed to cater for learner diversity and enhance students’ motivation.

Keywords

Plagiarism-free, inquiry project-based learning, information literacy, digital literacy

INTRODUCTION
Plagiarism has become an alarming issue in the information age (Ercegovac & Richardson, 2004). In recent years, two government ministers from Germany, a minister from Taiwan, a US Senator and a Canadian School Board’s education director were respectively accused of committing plagiarism which jeopardized their career (The Guardian, 2013; The BBC, 2013; Pidd, 2011; Rushowy, 2013). In 2013, twenty-six students were disqualified from the Hong Kong Diploma of Secondary Education Examination for plagiarizing in school projects (South China Morning Post, 2012). With the ubiquitous use of computers and the internet for school work, and a lack of awareness of what constitutes plagiarism; students could easily become offenders of this academic misconduct both intentionally and unintentionally. Identical answers and assignments written beyond the ability of students are not a rare sight in education institutions (Aggarwal, 2013). It has been suggested that, in order to ensure conscious and ethical learning, students should be well informed of what plagiarism is, the steps that they can take to curb plagiarism as well as the potential consequences of plagiarism (Lau, Yuen & Park, 2013). Based on the areas identified from the literature, the authors have developed the UPCC pedagogy (Chu et al., 2014, 2015) with the aim to educate students about plagiarism and introduce effective and user-friendly anti-plagiarism tools. This study attempts to evaluate the effectiveness of the UPCC pedagogy developed by Chu (2014, 2015) by comparing two groups of students who carried out their PjBL projects with and without the UPCC intervention.

LITERATURE REVIEW
Inquiry Project-based Learning (PjBL) and Information Literacy (IL)
Inquiry PjBL is a student-centred approach that promotes independent learning (Bell, 2010; Chu et al., 2011a). In Hong Kong, inquiry PjBL has been incorporated into the primary school General Studies (GS) curriculum (Chu et al., 2012), and the secondary school Liberal Studies (LS) curriculum (Chu et al. 2011b). Students ask open-ended questions in PjBL in order to investigate real-world problems (Bell, 2010). Through PjBL, students learn to...
make decisions and construct knowledge (Chu et al., 2011a) through actively searching, integrating and assimilating information relevant to their project areas.

Owing to the research-heavy nature of inquiry PjBL, it has been found beneficial in enhancing upper primary and junior secondary students' information literacy (IL) levels, reading abilities, and research skills (Chu, 2009). The use of technology further amplifies such beneficial outcomes (Banyard, Underwood & Twiner, 2006). The IL skills in research planning, data collection and reconstruction of information are the basic steps of each inquiry project that students need to learn (Chu et al., 2011a; Bell, 2010). Providing the vast amount of information required to be processed by students in PjBL, this learning methodology appears to be a perfect platform for the teaching of the ethical and responsible use of information.

**Plagiarism in Project-based Learning**
Plagiarism is a type of academic misconduct, generally recognised as “… using another’s words or ideas without appropriate attribution or without following citation conventions” (Gallant, 2008, p.10). Variations in plagiarism include direct copying, copying with minor alterations, omitting citations and patch-writing (Mcgregor & Williamson, 2005; Pecorari, 2003; Walker, 2010). Although inquiry PjBL has the potential to produce desirable learning outcomes for students, students are found to commit plagiarism in the inquiry process frequently and extensively. For example, in Hong Kong, even in an academically strong local school, 13 out of 15 junior secondary student teams were found to plagiarize in their Liberal Studies group projects (Yeung, Chu & Chu, 2012). In one study, a quarter of university-level business students were found to plagiarise (Walker, 2010) and another study found that over 50% of the participating students did not reference paraphrased or copied work (Elander et al., 2010).

Student awareness of plagiarism was found to be low at both secondary and tertiary level (Gullifer & Tyson, 2014; Yeung, Chu & Chu, 2012). Often, plagiarism is blamed on easy access to the Internet, which offers convenience for users to take any available resources for free (Evering & Moorman, 2012). With the use of the internet as a primary knowledge source, PjBL learning is often plagued by plagiarism. Students can access and share information easily from internet search engines such as Google and Yahoo. It is commonplace to copy from the internet without citing its original source, and there is a common misconception among students that free-of-charge searchable information is also free-of-copyright (Yeung, Chu & Chu, 2012).

Understanding plagiarism, learning about Paraphrasing and related skills, generating proper Citations with an online citation tool and doing originality Check with an online tool in helping students avoid plagiarism (UPCC)
UPCC was developed by Chu and his colleagues (2014, 2015) in collaboration with a number of secondary schools and was refined through three academic years from 2013 to 2015. The aim of UPCC pedagogy is to help students (1) understand plagiarism, (2) learn the boundaries and consequences of plagiarism, (3) become able to paraphrase, synthesize and summarize information, (4) become able to make proper citations, and (5) become able to check their own work for originality. Ultimately, the UPCC pedagogy aims to help students develop confidence to produce plagiarism-free work. In order to achieve the ultimate goals of UPCC, students have to be equipped with sufficient language skills (e.g., paraphrasing information), IT skills (e.g., using online tools for citation making and originality check), and adequate knowledge on plagiarism. Provided the interdisciplinary nature of the UPCC pedagogy, a collaborative teaching model has been adopted.

Figure 1 depicts one possibility of how the UPCC pedagogy could be adopted for plagiarism-free inquiry project-based learning (Chu, 2009). School administrators, curriculum leaders and inquiry PjBL experts were involved to maximize the support provided to teachers in carrying out the pedagogy. Different subject teachers formed a collaborative teaching team by taking charge of different aspects of the UPCC respectively. To help students produce accurate citations, teacher-librarians taught students how to use citation generators (Citationmachine.net, 2015). With the aim of giving students an opportunity to self-check their writing for plagiarism before submission, teacher-librarians also introduced originality checkers (SmallSeoTools.com, 2010). To tackle the prevailing problems of students copying large chunks of information, making only minimal changes to wordings, language teachers taught students to adapt sources of information for use in their projects through paraphrasing, synthesizing and summarizing the text. ICT teachers taught students to make use of collaborative online platforms to work on their projects, hence provides the feasibility of peer checking on the citations and references. The inquiry project teachers helped to implement the overall anti-plagiarism pedagogy by supervising students’ group projects and monitoring their ethical use of information. It is worth to note that while four different teachers were involved in this proposed model, the UPCC pedagogy does not put emphasis on a rigid and clear division of labor among teachers. Instead, the UPCC focuses on the expertise of a teacher in terms of various skill sets students have to acquire through the pedagogy.
**Understanding plagiarism in UPCC**

Effective intervention methods to help students understand plagiarism include lectures and tutorials, simple paraphrasing and citation exercises, as well as collaborative learning to put these skills to use (Asunka, 2011; Evering & Moorman, 2012; Pecorari, 2003). The basis for plagiarism-free work was holistic understanding of plagiarism, students’ collaborative effort in group projects, and awareness of the serious penalties (Asunka, 2011).

Williamson and McGregor (2011) have shown that students’ plagiarism levels decreased by explicitly requiring eleventh-grade (F.5) students to acknowledge sources. Therefore, an essential part of the UPCC focuses on the explicit teaching of anti-plagiarism skills and knowledge. The UPCC strategies targeting at enhancing students’ understanding on plagiarism include (1) teaching IL deliberately through lectures conducted by trained teachers, (2) teaching students how to use citation machines to cite sources from the internet, and (3) providing video training on the use of online self-check tools to avoid plagiarism. To maximize the effectiveness of UPCC, it is key that teachers involved have to be familiarized with the knowledge of plagiarism before they help students acquire the ability. The research team delivered training workshops for the teachers involved to help them understand the implementation of UPCC before the commencement of the project.

**Paraphrasing in UPCC**

After attaining a good understanding on plagiarism, students need to practice ‘Paraphrasing’, ‘Synthesizing’ and ‘Summarizing’ to present ideas in their own words to avoid committing plagiarism (Roig, 1999). In UPCC, it is advisable that the skills be taught by language teachers, after which the students may refine these skills for use in their projects under the supervision of inquiry learning teachers.

**Citing in UPCC**

Previous studies have found that students fared worse in the domain of ethical use of information in comparison to other IL domains such as identifying potential source of information and evaluating the source of information (Siu, 2014). When junior secondary students completed their IL assignments, only around 40% could make accurate citations according to the required formatting style when quoting these sources (Siu, 2014). Such figures suggest that scaffolding measures on making correct citations are critical in reducing plagiarism cases among students.

To scaffold and monitor students’ ethical use of information, a social media platform was built by the research team on PBworks, where students work collaboratively on their group projects. Wiki keeps track of all modification records, making the working process highly transparent to both students and teachers, hence allows an easy option for peer checking and teacher supervision. In addition, as PBworks is an online working platform, it facilitated the use of Citation Machine and Originality Self-Check Tool, which are both operated online.

On top of an online wiki platform, the use of citation software will help students generate citations in proper format. In UPCC, students were taught to use Citation Machine (Citationmachine.net, 2015), an online referencing tool that helps to generate bibliographical citations in appropriate formats, including the American Psychological Association (APA) style.

The use of Citation Machine provides students with a straightforward and convenient way of making accurate
citations, hence reducing the possibility of plagiarism committed owing to the inconsistent formatting styles. The

Checking in UPCC
To provide students with a more objective self-check tool for plagiarism, students were also taught to check their own work for originality before submission through entering sections of text in Small SEO Tools (SmallSeoTools.com, 2010), a free online software that generates a percentage score for sections of text based on a comparison with Google search results. However, the Small SEO Tools interface has a word limit and is only suitable for analyzing small blocks of text. To analyze an entire essay or project text, an alternative is Plagiarisma (Plagiarisma.net, 2015), a fees-charging online tool that generates a percentage to indicate written text originality by comparing with Google and Yahoo Search results. When the originality percentage is less than 100%, blocks of suspected plagiarized text will be highlighted and listed in a table pointing towards its source.

RESEARCH GAP
Existing studies have primarily focused on the factors of plagiarism and the psychological aspects of why students plagiarize and their self-justifications (Sisti, 2007). Research on how teachers may take practical steps to help students avoid plagiarism with the use of online collaborative learning platforms in inquiry PjBL and IL has been lacking. This study aims to evaluate the outcomes of a plagiarism pedagogy in a junior secondary school setting.

The study compared students’ ability to avoid plagiarism before and after the implementation of the UPCC pedagogy in PjBL, in 2013 and 2015 respectively, as well as probing into the views of students and teachers regarding the effectiveness of UPCC. Through assessing the students’ plagiarism in written group projects and analysing the students’ and teachers’ views towards UPCC through a structured survey and focus group interviews, we aim to address the following research questions:

1. How effective was the UPCC in reducing plagiarism in junior secondary school student projects?
2. How did students and teachers experience and evaluate UPCC as an anti-plagiarism pedagogy in PjBL?

METHOD
Design and participants
A quantitative and qualitative mixed-methods approach was adopted in this study. This study includes two cohorts of students who underwent PjBL with and without the implementation of UPCC. In year 2012-2013, 64 groups comprising 260 students in 8 classes were asked to complete an inquiry group project without UPCC. In 2014-2015, another 88 groups comprising 354 students in 10 classes participated in the inquiry learning projects, with the implementation of UPCC. In the participating school, the UPCC framework was modified, with a Liberal Studies (LS) teacher taking charge of the roles originally dedicated to different subject teachers. All the participants were students in grades 7-9 (aged 11-13) from an elite government secondary school in Hong Kong. The UPCC program lasted for five months within the Liberal Studies (LS) subject curriculum, which required the completion of an online collaborative PjBL group project. Students participated in the project in groups of three to four. They were allowed to choose their own topics of interest, and were required to gather relevant information and write a detailed report in collaboration with other group members. In this study, students conducted their group projects on the PBworks site. The student projects were subjectively graded by the LS subject teachers according to a marking scheme (Appendix I), over a total score of 50.

Measures and Analysis

Project scores
The students’ written work submitted for the group project were collected from PBworks site, in the academic year 2012-2013 and 2014-2015. The student projects were marked and scored by the subject teacher according to a marking scheme with 20 items on the domains of aims and objectives, data collection, organization and analysis, conclusion and argumentation, suggestions and follow-up, written presentation, and oral presentation. The score for each item ranged from 1 (lowest) to 5 (highest), and the total score was 100. This was divided by 2 to suit the 50% course credit grade, which means the full score for the student projects was 50.

Originality check
To assess the degree of originality, the Chinese texts were entered to a plagiarism checking website, Plagiarisma (http://plagiarisma.net/), excluding references and hyperlinks. The students’ written work was also manually analyzed for mistakes in referencing by the research team, according to the American Psychological Association (APA) format (American Psychological Association, 2010). The Plagiarism Assessment Scale (Table 1) developed by Chu and his colleagues (Yeung, Chu & Chu, 2012) was used, and the originality scores and referencing mistakes were graded separately. The higher plagiarism level of the two measures was taken as the overall plagiarism level assigned to each group. For example, if a group had level 1 for their originality report, and level 3 for their referencing analysis, then their overall plagiarism would be level 3. The Plagiarism Assessment Scale levels achieved by student groups in 2013 and 2015 were compared with the Fishers’ Exact Test in SPSS version 20.0.
The student and teacher interview recordings were translated from Cantonese and transcribed into English text by a research assistant. The transcripts were qualitatively analyzed using content analysis (Holsti, 1969) in NVivo 8.0. The coding categories (see Table 7) were developed by coding the texts under themes related to the two proposed research questions. The transcripts were coded by two research assistants collaboratively. An inter-rater reliability test between two independent coders was done using NVivo 8.0. The average Kappa’s coefficient is 0.962.

### FINDINGS

**Assessing the PjBL group projects for plagiarism**

The numbers of groups that showed none (Level 1) or existing plagiarism (Level 2-4) in 2013 (without UPCC) and 2015 (with UPCC) were shown in Table 2. Descriptive statistics indicated a trend towards improvement in students’ anti-plagiarism behaviors between 2013 and 2015. As seen in Figure 2, the percentage of groups that showed no plagiarism behavior increased from 73.4% to 84%, whereas groups found with plagiarism (regardless of the level of seriousness) decreased from 26.6% to 16%.

| Levels | Frequency (groups) | %  | Frequency (groups) | %  |
|--------|--------------------|----|--------------------|----|
| 1 - None | 47 | 73.4 | 74 | 84 |
| 2 - Minor | 11 | 17.2 | 7 | 8 |
| 3 - Moderate | 1 | 1.6 | 0 | 0 |
| 4 - Serious | 5 | 7.8 | 7 | 8 |

Table 2. Descriptive statistics for plagiarism levels
Students’ evaluation on UPCC as an anti-plagiarism pedagogy

The descriptive statistics of the survey for the complete data set are summarized in Table 3. We invited 354 students from the 2014-2015 cohort to do the survey, and received 347 completed samples. The mean score of each domain is higher than 4.2. On a scale of 1 to 6, this indicates that most students perceived UPCC positively as an effective anti-plagiarism pedagogy.

| Domain                                      | N    | Minimum | Maximum | Mean  | Std. Deviation |
|---------------------------------------------|------|---------|---------|-------|----------------|
| Instructional support on UPCC               | 347  | 1.00    | 6.00    | 4.607 | 0.893          |
| Understanding Plagiarism                    | 345  | 1.00    | 6.00    | 4.458 | 0.855          |
| Paraphrasing, synthesizing and summarizing  | 344  | 1.50    | 6.00    | 4.326 | 0.761          |
| Generating appropriate citations            | 343  | 1.00    | 6.00    | 4.226 | 0.875          |
| Originality self-check                      | 346  | 1.00    | 6.00    | 4.276 | 0.950          |

*Rated on a Likert scale from 1-6 (1=Strongly disagree; 6=Strongly agree); mid-point = 3.5

Table 3. Descriptive statistics for all surveyed students (Valid N=347) in the 2014-2015 cohort

In the survey, we included a multiple-choice question on plagiarism knowledge. The correct answer for the question was selecting all 6 options. Table 4 illustrates the trend of choices being made. Option A was the most popular choice of all (82.7%), and the least popular choice was option E (33.4%). In other words, more than 17% students still failed to choose even the most popular choice, and more than 66% of students failed to choose the least popular choice. This indicates that the students had plenty of room for improvement in their plagiarism knowledge despite the UPCC intervention. Table 4 also shows that only 21.2% of the students were able to choose all options and answered the question correctly, reflecting that the students’ understanding of plagiarism needs to be further developed.

| Q1. Which of the following is/are considered plagiarism? | Frequency | Percentage |
|----------------------------------------------------------|-----------|------------|
| A. Direct copying and pasting others’ work onto my paper as if it were my own work | 277       | 82.7%      |
| B. Using others’ ideas in my work after rephrasing the wordings without citation | 167       | 49.9%      |
| C. Submitting my friend’s work in my name                | 272       | 81.2%      |
| D. Using information my teacher taught me during lesson without citation | 143       | 42.7%      |
| E. Reusing my idea in exact wordings from a previous assignment without citation | 112       | 33.4%      |
| F. Using an idea from the internet with an unknown source as my own work | 275       | 82.1%      |

| Number of options (A-F) chosen | Frequency | Percentage |
|--------------------------------|-----------|------------|
| 0 option                       | 19        | 5.4%       |
| 1 option                       | 56        | 15.8%      |
| 2 options                      | 17        | 4.8%       |
| 3 options                      | 75        | 21.2%      |
| 4 options                      | 79        | 22.3%      |
| 5 options                      | 33        | 9.3%       |
| 6 options (correct answer)     | 75        | 21.2%      |

Table 4. Understanding plagiarism (Q1) frequency statistics
Basing on the results we obtained in Table 4, we selected and grouped the students who answered the plagiarism knowledge question correctly (the ‘Top 21%’ of the total sample); to compare with the group of students who answered the plagiarism question wrong by choosing only zero or one option out of the six (the ‘Bottom 21%’). Independent-sample t-tests were to compare their response to the survey. The descriptive statistics for the top 21% and bottom 21% data set are shown in Table 5. The table illustrates that the top 21% students rated the UPCC more positively than the bottom 21% students in all domains of the survey. We compared the ratings of top 21% and bottom 21% students in each survey domain with independent t-tests. With equality of variance assumed as indicated by Levene’s Test, t-tests indicated that the top 21% gave significantly more positive ratings than the bottom 21% students on five out of six domains of the survey (p<0.01), except the domain on Understanding Plagiarism, where no significant difference was found (p>0.05).

**Table 5. Top 21% & bottom 21% students’ survey domain statistics**

| Instructional support on UPCC | Top 21% | T-test significance |
|-------------------------------|---------|---------------------|
| **Mean**                      | 4.17    | 4.728               | **T** |
| **Std.Deviation**             | 1.033   | 0.911               |       |
| Understanding Plagiarism      | 4.19    | 4.509               | -      |
| Paraphrasing, synthesizing and summarizing | 4.087 | 4.493               | **T** |
| Generating appropriate citations | 3.878 | 4.360               | **T** |
| Originality self-check        | 3.945   | 4.420               | **T** |

**Table 6. Top 21% & bottom 21% students’ project score statistics**

| Bottom 21% (N=74) | Top 21% (N=75) | T-test significance |
|-------------------|----------------|---------------------|
| Project score (Full score=50) | 33.48 | 36.70 | t = -2.96, p = 0.004 |
| **Mean**          | 6.814          | 6.465               |       |
| **Std.Deviation** | 6.814          | 6.465               |       |

**Students’ and teachers’ perceptions on UPCC**

Content analysis of qualitative interview transcripts revealed that students and teachers’ experience of UPCC could be categorized as illustrated in Table 7. Under the over-arching theme ‘Perceived UPCC Effectiveness’, the salient topics of learning are collated under the Level 1 note ‘Learned Competency’. Under ‘Learned Competency’, students were able to articulate anti-plagiarism competencies learned from UPCC, which include a better understanding of the concept of plagiarism, use of paraphrasing, summarizing and synthesizing skills, using citation to support their ideas, generating the appropriate formats using Citation Machine, and checking for originality in their writing before submission using the web-based Small SEO Tools. It is worth noting that in ‘Learned Competency’, we identified a relevant theme named ‘Independent thinking and original writing’- an attribute that is rarely mentioned in definitions and conceptions of plagiarism, but central to the students’ ability to produce original work without committing plagiarism offences. Under ‘Independent thinking and original thinking’, students realized that UPCC helped them develop the skills to develop and articulate their own opinion based on learned information. Students appreciated that their project ‘is original’ when they use ‘first hand data’, ‘write (their) own comments’, and ‘do a reflection on information rather than copying the whole passage’.

The teachers, while regretting their lack of anti-plagiarism teaching experience and teaching materials, reported using examples to demonstrate how to avoid plagiarism, and remarked that UPCC benefitted both high and low scoring students. Echoing with our comparison between high achieving and low achieving students, teachers also pinpointed the lack of motivation among low scorers.

Students compared their own performance before and after the implementation of UPCC and generally spelled out the notable changes. Mostly, students felt that UPCC was clear and helped to enhance their understanding of plagiarism.
Some high achievers also reported the ability to generalize the learned skills to complete their projects in other subjects; for examples in their Integrated Science project. In particular, students in the best performing groups appeared to appreciate the usefulness and convenience brought by the online tools. In contrast, most of the low scorers admitted their reluctance to use any of the online tools when they wrote up their projects. Some students believed that anti-plagiarism techniques were more relevant to senior secondary students and were out of their own learning needs.

| Major categories | Level 1 nodes | Level 2 nodes (number of references) | Example References |
|------------------|---------------|--------------------------------------|--------------------|
| Perceived UPCC effectiveness | Learned competency | Paraphrasing, Summarizing, Synthesizing skills (67) | If we adopt a piece of information from Yahoo or Google, we would try to change some wordings. |
|                   |               | Citation skills (37)                  | We may not notice the details in citation without Citation Machine. |
|                   |               | Originality check (34)                | We have some websites to check for plagiarism, which help to generate a percentage of unique context. |
|                   |               | Understanding the concept of plagiarism (32) | Yes, we think we shouldn’t copy and paste. We should understand the whole thing, so we changed some of the words in the content. |
|                   |               | Independent thinking and original writing (12) | When we referenced detailed or supplementary information, we can use our own words to articulate the meaning and express our own opinion. |
| Perception by teacher or researchers | Benefits for students (2) | | I think all students gained a better understanding, which applies to not only the high scoring group but also the low scoring group. |
|                   | Lack of relevant teaching experience (2) | My teaching wasn’t systematic and I didn’t have adequate teaching materials. But next year I will try to have a more developed and systematic lecture. |
|                   | Teaching by demonstrations and examples (6) | I showed them what plagiarism is by presenting them with some examples. I also shared my own experience in the university. |
|                   | Low motivation among students (2) | The low scoring students have no interest in checking their project using the online checking tool. |
| Perception by students | Acquired better understanding on plagiarism (9) | UPCC helps us to avoid plagiarism. We understand more about plagiarism so we can avoid the careless mistakes. |
|                   | Generalizable learning (6) | Apart from LS, we also used the Citation Machine in the group project for the Integrated Science subject. |
|                   | Useful online tools (7) | The online checking tool helped us focus on the places with plagiarism, so that we could make amendments accordingly. |
|                   | Reluctant to use online tools (7) | We never used the Citation Machine to do the citation. |
|                   | Irrelevant to study needs (2) | Maybe we will use the concept more when we are senior students. Right now, we don’t need it. |

**Table 7. Categories for students and teachers’ experience of UPCC**

**DISCUSSION AND IMPLICATIONS**

The three-fold correlation among plagiarism behavior, students’ motivation and academic ability

The study results revealed an overall positive reception of UPCC by junior secondary students in all the survey domains including Instructional Support, Understanding of Plagiarism; Paraphrasing, summarizing and synthesizing; Making citations, and Checking for originality. The results also revealed a decreasing trend of plagiarism offenses before and after its implementation, with notable patterns of variation. After the UPCC was launched, the percentage of students who had no plagiarism offenses increased, and the percentage of students with minor and moderate plagiarism offenses decreased, which may reflect the beneficial effects of UPCC on most students’ ability to recognize and avoid plagiarism in their group projects.

However, it is worth to note that the percentage of serious plagiarism offences had only minimal change, before and after UPCC. We speculate that such pattern reflects an attitude problem among students with respect to learning and/or plagiarism. Such hypothesis is further supported with our comparative study on the perception of UPCC between the top and bottom performing students on the multiple-choice plagiarism knowledge test. Interestingly, there was a significant difference between the top 21% and bottom 21% students in terms of their project scores, with the top 21% students scoring at least 3 marks higher. What is more striking is that in the focus group interviews, the students who scored the least in the entire cohort made similar comments regarding their reluctance in following the UPCC strategies and using the suggested online anti-plagiarism tools. These findings seem to suggest that there is a complicated yet worth exploring association among students’ plagiarism behavior, academic performance and learning motivation. Future studies may explore their respective relationships with the severity of actual plagiarism offences and types of offences, so as to build a stronger evidence base to refine the content of UPCC.
Teachers’ awareness to the needs of low-performing students

Juxtaposing the quantitative findings and the qualitative findings, we observed that the bottom-performing students with poor understanding of plagiarism gave lower rating in the ‘Instructional Support’ domain, whereas the teachers, although acknowledged the lack of motivation in some students, failed to see it as an essential factor in their anti-plagiarism pedagogy. This may reveal that teachers may not fully realize the specific instructional needs of the bottom-performers or their obstacles in learning to avoid plagiarism. Further studies may explore the continual refinement of the UPCC pedagogy through a participatory design-based approach. A design-based research approach ensures that the pedagogy can be customized for students of different academic abilities, so that they can acquire a clear understanding of plagiarism, and be willing and able to produce original writing. Furthermore, it is also worth to explore the factors that determine students’ extent of learning from the UPCC pedagogy. For example, the model of collaborative teaching may be an institutional factor with impact on students’ learning. In the present study, the UPCC was a modified version of the suggested framework (Figure 1), with only one LS subject teacher overseeing all the four major areas of the pedagogy. Echoing with the teachers’ comments in the interviews that they lacked relevant teaching experience and materials, such adaptation of UPCC may be a constraint in helping students develop an anti-plagiarism mindset and knowledge.

Plagiarism, general learning skills, and culture

Studies in the literature have explored the key factors of effective anti-plagiarism pedagogy. It was found that deficits in some general learning skills, e.g. poor time management and lack of understanding of the task on hand (Craig & Dalton, 2014), may compromise the effectiveness of anti-plagiarism pedagogy. It is also important to acknowledge that although evidence points towards the merits of an anti-plagiarism UPCC pedagogy, plagiarism reflects not only students’ knowledge and skills, it is also affected by institutional and systemic factors. An educational paradigm that values assessment scores and correctness over the learning process may push the students towards plagiarizing from easily available sources to create a ‘model answer’ in a short time frame. On the contrary, a pedagogy that emphasizes a culture of honest inquiry through process-oriented PjBL harbors the potential to change the students’ perception of learning and their willingness to produce original work. A focus on understanding and knowledge co-construction reduces the need for copying, and eventually helps students develop a sense of academic ownership and responsibility.

CONCLUSION

Inquiry learning has become increasingly popular in primary and secondary schools. Educators face a growing challenge in developing pedagogies to build a solid foundation for proactive learning free of plagiarism, such that learners are able to synthesize previous research findings, articulate their original ideas as a result of creative thinking, and contribute to expanding the existing knowledge base. In this study, we introduced the UPCC pedagogy for PjBL with collaborative teaching to scaffold students’ learning, with an emphasis on the ethical use of information and reinforced by explicitly introducing the knowledge, tools and skills to avoid plagiarism. The study findings revealed that students had a generally positive reception of UPCC, and recorded a decreasing trend in plagiarism behavior subsequent to UPCC implementation. UPCC was effective in enhancing the students’ understanding of plagiarism and their application of anti-plagiarism skills, which was reflected in their group projects assessed for plagiarism behavior and their overall project scores. While this study provides evidence to support the effectiveness of UPCC, there are limitations to be addressed in future studies. Although we were able to compare students’ plagiarism behavior by inspecting their group projects before and after the implementation of UPCC, we could not compare students’ plagiarism knowledge and attitude as the survey was only administered post-UPCC. Further research is needed to explore the obstacles faced by a proportion of students who still found difficulty in producing plagiarism-free work, as well as exploring the possible ways to refine the UPCC pedagogy to cater for the needs of students with different learning abilities.

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**APPENDICES**

Appendix I [http://ickm2009.pbworks.com/f/Appendix%20I.pdf](http://ickm2009.pbworks.com/f/Appendix%20I.pdf)

Appendix II [http://ickm2009.pbworks.com/f/Appendix%20II.pdf](http://ickm2009.pbworks.com/f/Appendix%20II.pdf)

Appendix III [http://ickm2009.pbworks.com/f/Appendix%20III.pdf](http://ickm2009.pbworks.com/f/Appendix%20III.pdf)