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Effects of a Hybrid Training for Plagiarism Prevention Module on Plagiarism-free Academic Writing in Higher Education

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ABSTRACT: Previous research has looked into educational approaches to prevent plagiarism in academic writing, yielding insights into how plagiarism can be avoided. However, plagiarism remains a major problem in the education sector. We designed a training module that includes a customised Online Scaffolding Writing System (OSWS) to help faculty teach undergraduates how to avoid committing plagiarism in their academic writing. A quasi-experimental design was used to analyse the plagiarism-related perceptions and behavioural changes of 121 undergraduate students and to test the effects of the new module on students' academic writing. The experimental group performed significantly better than the control group in terms of decreasing the extent of plagiarism in their writing (with a mean decrease from a moderate to minor level of plagiarism), and improving their writing quality (with a mean increase of 18 percentage points in writing scores). Furthermore, more than 95% of the students in the experimental group and their instructor reported that they valued the benefits of adopting the training module in class, and almost 90% of them expressed high levels of satisfaction with the learning they had obtained from the OSWS. This study also provides insights into how the new training module can be implemented across disciplines.

Keywords: Plagiarism, Hybrid training, Academic writing, Online Scaffolding Writing System (OSWS)

1. Introduction

Plagiarism is the act of appropriating others' ideas, language or writing without proper acknowledgement (Vessal & Habibzadeh, 2007) and is a major problem in higher education (Eaton, 2021). The increasing prevalence of plagiarism on campus endangers the academic integrity of educational institutions and poses a threat to the quality of higher education (Hopp & Speil, 2021). As such, many institutions around the world have adopted various policies to punish those who commit plagiarism; these policies include informal or formal warnings, grade penalties, suspension, or expulsion (Tremayne & Curtis, 2021). However, plagiarism prevention in higher education is markedly different from that in other fields, and it is unwise to punish student plagiarists without educating them on the topic (Mphahlele & McKenna, 2019). Furthermore, empirical studies have demonstrated that punitive policies work by instilling in students the fear of being caught, but fail to help students learn from their mistakes (Parks et al., 2018). Studies have also provided robust evidence that undergraduates typically commit plagiarism unintentionally and that the expulsion of student plagiarists could deprive them of the opportunity to be educated about plagiarism prevention (Pecorari & Shaw, 2018; Zhang & Tang, 2021).

Thus far, researchers have generally agreed that all relevant stakeholders should participate in efforts to curb plagiarism (Uzun & Kilis, 2020), and a substantial amount of empirical studies have produced a rich array of evidence to support the design of instructional materials, instruments, and strategies for plagiarism prevention in higher education (Lee et al., 2016; Tindall & Curtis, 2020). Information and communication technologies (ICTs) have also been harnessed to address plagiarism, such as through the use of plagiarism detection software (PDS) and/or ICT-supported anti-plagiarism instruction (Batane, 2010).

However, the increase in the number of reported plagiarism cases on campuses worldwide indicates that the problem of plagiarism has not yet been solved (Roller, 2018). Researchers have discovered that previous educational approaches have focused only on the act of plagiarism and have neglected students' learning needs for anti-plagiarism instruction (Pàmies et al., 2020). Some researchers have suggested approaches that they consider more responsive to students' learning needs, such as teaching students about plagiarism prevention in academic writing to facilitate plagiarism-related learning conditions and experiences (Hu & Lei, 2016). According to Hofer et al. (2012), plagiarism is a typical threshold concept in students' academic writing practise. That is, students' poor understanding of plagiarism may affect their critical analysis and understanding of the

literature and thereby hamper their writing; by contrast, students' rich understanding of plagiarism could give them a transformative understanding of academic writing and help them to construct individual knowledge on and skills in plagiarism-free academic writing. Therefore, teaching plagiarism prevention is an essential component of teaching academic writing.

However, there are gaps in this area that need to be addressed. Although researchers have high expectations of academic writing instruction, there is a lack of empirical research exploring how to orchestrate the teaching of plagiarism prevention in academic writing contexts. Moreover, the literature has rarely discussed the possibilities afforded by ICT in scaffolding plagiarism prevention instruction and learning (instead of detecting plagiarism). To fill these research gaps, we designed a Hybrid Training for Plagiarism Prevention (HTPP) module applicable to academic writing, where "hybrid" refers to a combination of face-to-face and online teaching. The online teaching component of HTPP is supported by a customised ICT tool, i.e., the Online Scaffolding Writing System (OSWS). We performed a quasi-experimental study to determine the ability of this new module to help undergraduate students generate plagiarism-free academic writing and to determine how useful the students and their instructor found the new module: experimental group students finished writing assignments with the proposed module, whereas the control group students finished the same writing assignments without the module. The following research questions (RQs) were addressed in this study.

RQ1: What are the effects of the HTPP module on the students' perceptions of plagiarism?
RQ2: What are the effects of the HTPP module on the students' writing performance, in terms of their writing quality and the level of plagiarism in their writing?
RQ3: What are the students' and their instructor's perceptions of the HTPP module?

2. Literature review

The following paragraphs provide an overview of previous research on plagiarism prevention in higher education and anti-plagiarism instruction in academic writing, which illustrates the rationale of the current study.

2.1. Subverting plagiarism in higher education

Plagiarism is a serious problem among university students worldwide (Roller, 2018). Researchers from different disciplines have investigated this phenomenon and have recommended various approaches to prevent it (de Maio et al., 2020; Parks et al., 2018). This study classifies the current instructional solutions as follows: detect to punish, detect to evaluate, and educate to learn.

The "detect to punish" solution is frequently used by many universities when dealing with plagiarism. For example, according to a survey of 93 institutions in the UK, 143 students were expelled from campus because of plagiarism (Attwood, 2008). In 2019, two of China's most prestigious universities, Tsinghua University and Peking University, announced that they would expel students for plagiarism (Xinhua, 2019). However, some researchers have argued that the dismissal of student plagiarists might not be an appropriate solution (Schinkel, 2015); some have even suggested that such a harsh punishment might have an overall negative impact (Davies & Howard, 2016), a view that has been supported by empirical findings. For instance, Abasi and Graves (2008) found that some students over-cited in their manuscripts, i.e., included a string of references for each sentence, in the hope of reducing the likelihood that their work would be flagged for plagiarism. This indicates how the fear of punishment may push students to focus on strategies for escaping punishment rather than on improving their ability to write plagiarism-free pieces.

"Detect to evaluate" is another common approach that is adopted by faculty members to help them distinguish between students' original contributions and borrowed ideas. For instance, Mostert and Snowball (2013) reported that PDS may help detect plagiarism and that it provides evidence to faculty members to allow them to take instructional measures. However, others argued that the functional design of PDS may be faulty in that it uses text matching to identify plagiarism, which decreases its validity in interpreting the extent of plagiarism in a written piece (Mphahlele & McKenna, 2019).

Unlike the above two plagiarism-prevention methods, which are reactive, the "educate to learn" approach addresses the problem in a proactive manner. It consists of information science instructors providing information ethics courses for students (Liu & Yang, 2012) and instructors assigned to writing centres educating students about procedures related to anti-plagiarism (Chu et al., 2021). Blum (2011) stated that plagiarism is a mere

symptom of a larger educational problem, which, if so, means it is essential to prioritise the educate to learn approach. From this, it can be inferred that the educational problem underlying plagiarism deserves due attention from researchers to improve the efficacy of anti-plagiarism measures.

2.2. Teaching anti-plagiarism in academic writing

Academic writing is at the heart of university undergraduates' study programmes. Students may encounter various difficulties related to academic writing, among which plagiarism is the most common (Löfström et al., 2017). In a survey conducted by the International Center for Academic Integrity across five American universities, 25.1% of undergraduates admitted using unauthorised electronic resources when completing their papers or other written assignments (International Center for Academic Integrity, n.d.). There is also concern that the number of plagiarism cases may continue to increase if students do not receive timely and appropriate instructional support (Harris et al., 2020). The increasing incidence of plagiarism highlights the urgent need to teach students how to avoid committing plagiarism in academic writing. Such instruction can usually be provided by writing instructors, other faculty members, or a collaboration of faculty members and librarians (Awasthi, 2019).

Plagiarism prevention instruction in academic writing comprises two parts: instruction on plagiarism and instruction on how to cite sources and thus avoid committing plagiarism when writing (Pecorari & Petrić, 2014). Educational interventions may include discussions of plagiarism cases from specific disciplines (Brown & Janssen, 2017) or instructions regarding the writing skills needed to avoid plagiarism (Du, 2019). However, some limitations remain unaddressed. For instance, in one study, although most students could define plagiarism, few could identify plagiarised texts (Leung & Cheng, 2017). This is attributable to faculty's one-sided understanding of plagiarism (Greenberger et al., 2016). Plagiarism prevention has been thought to be easily taught in a traditional in-class way by faculties (Myers, 2018); however, it is difficult to teach because it requires an understanding of why students plagiarise in addition to how they perceive and cope with plagiarism (Peled et al., 2019).

A few studies have highlighted some of the additional limitations to current anti-plagiarism instruction from faculties' perspectives. For example, a multi-institution writing project was conducted to help writing faculty deliver instruction on plagiarism-free writing to American undergraduates (Jamieson, 2017). However, although the project urged writing faculty to care about each students' behavioural characteristics in writing practise and provide corresponding face-to-face instruction, some faculty were reluctant to do so because they felt it was too time-consuming and labour-intensive. Moreover, some writing professionals and subject experts have reported that their teaching of writing skills to prevent plagiarism mainly relied on their own writing experiences, which indicated that the quality of this teaching largely depended on these instructors' own knowledge and experiences (Tomaš, 2010; Huang, 2017).

The literature review presented above provides several key insights and highlights research gaps. First, students cannot easily gain practical knowledge about plagiarism if their faculty has a one-sided understanding of plagiarism and adopts the traditional in-class approach of instruction. Second, traditional instruction on plagiarism prevention in academic writing is labour-intensive and time-consuming. Third, previous instruction has been designed for students in classroom settings, which limits the time students have to practise their anti-plagiarism skills. To fill these gaps, the HTPP module was designed and tested in the current study to help on-campus instructors teach students how to produce plagiarism-free academic writing.

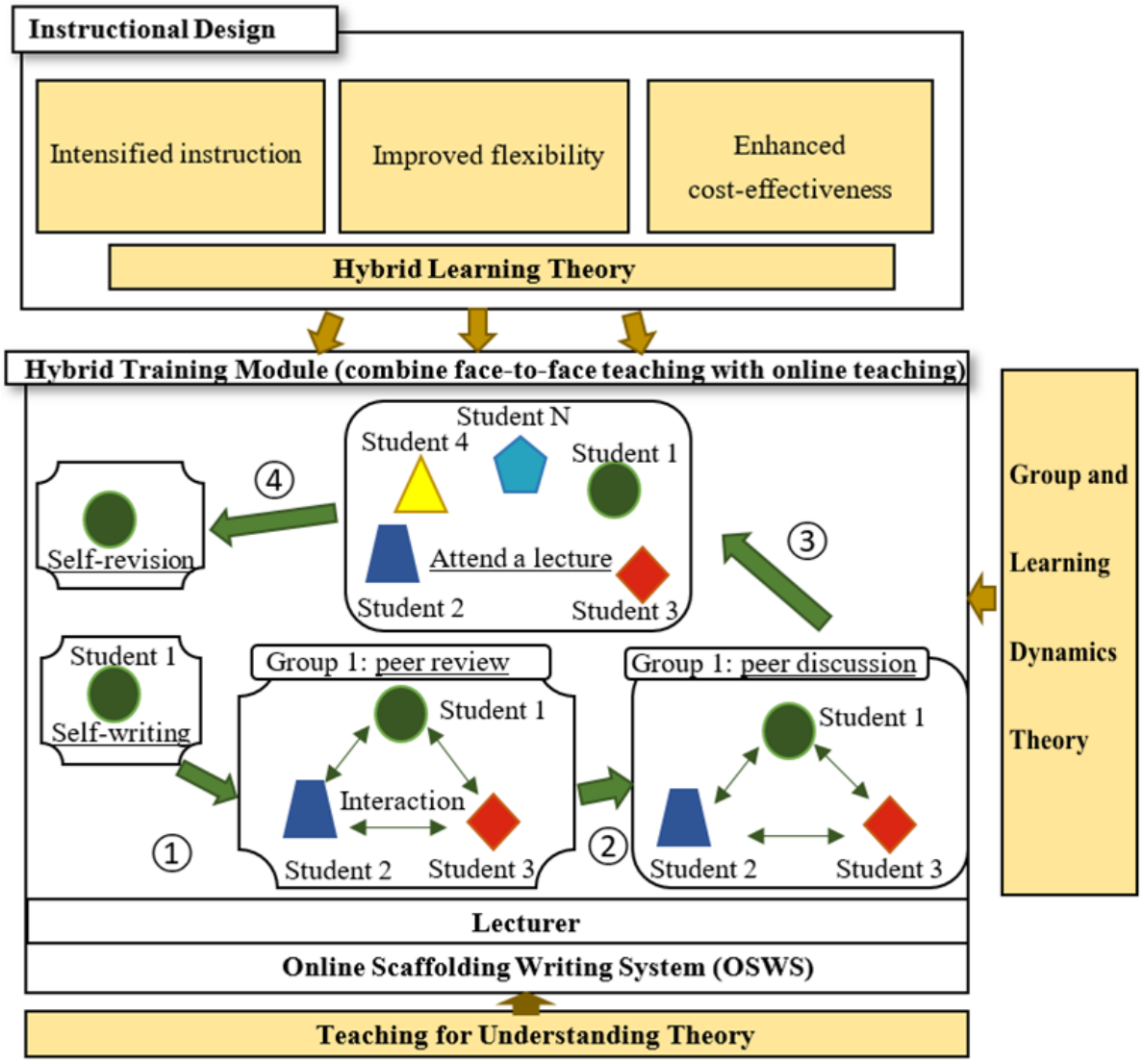
2.3. Theoretical framework of the HTPP module

The features of Teaching for Understanding, Hybrid Learning, and Group and Learning Dynamics theories were incorporated into an integrated conceptual framework for the HTPP module (Figure 1). These three theories are highly related to constructivist learning, which underpins the core mission of the HTPP module, i.e., to facilitate students' construction of knowledge on plagiarism-free academic writing by engaging them in instructional activities (Figure 1, middle panel). The instructional activities specified in the concave-cornered rectangles were conducted online, whereas those specified in the round-cornered rectangles were conducted in class.

Teaching for Knowing theory focuses on rote learning, whereas Teaching for Understanding theory focuses on improving students' understanding from the level of remembering to the level of performance (Wiske & Breit, 2013). Our literature review on plagiarism instruction in academic writing shows that for plagiarism to be

eliminated, students' understanding of plagiarism at the practical performance level needs to be prioritised. Thus, our use of Teaching for Understanding theory in the current study was justified.

Figure 1. Theoretical framework of the Hybrid Training for Plagiarism Prevention (HTPP) module



Once a learning objective is clearly identified, instructional activities need to be carefully designed to intensify instruction (Hutchison & Woodward, 2014). Hybrid learning has three key features: intensified instruction, improved flexibility, and enhanced cost-effectiveness (Law et al., 2019). These features match the instructional needs of the HTPP module. Therefore, a customised ICT tool—OSWS—was developed by the first author to support the construction of a hybrid learning environment with three instructional purposes: to intensify plagiarism instruction by supporting faculty in their supervision of students' writing processes and provision of timely feedback; to improve flexibility by providing students with enhanced temporal and geographic flexibility to complete their academic writing tasks and communicate with peers; and to enhance cost-effectiveness by delivering plagiarism instruction within disciplinary courses and scaffolding students' learning about plagiarism during their course writing assignments.

Task cooperation may reduce academic dishonesty by strengthening conscientiousness among students (Peled et al., 2019), which supports the adoption of peer interactions in the design of the HTPP module. Moreover, we used Group and Learning Dynamics theory to explore how interactions between students can be facilitated in a hybrid learning space. It has been reported that when students successfully collaborate with one another in hybrid learning contexts, the success of their interactions is attributable to both positive group dynamics (e.g., reflection and feedback) and positive learning dynamics (e.g., the building of ideas and meta-communication) (AlSheikh & Iqbal, 2019).

3. Methodology

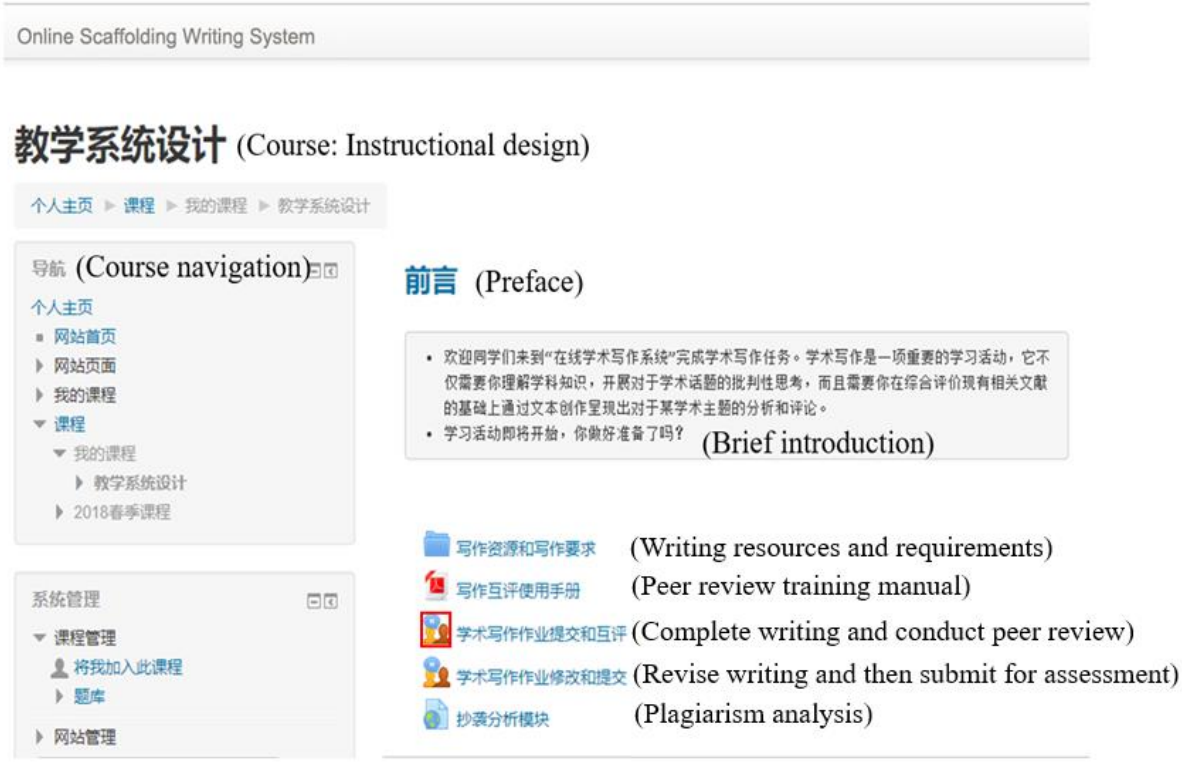
3.1. Instructional and experimental procedures

3.1.1. OSWS supports the hybrid instructional procedure

The theoretical framework of the HTPP module was used to design instructional strategies and activities to meet the intended learning objective: to give students' an adequate understanding of plagiarism. Peer review and peer discussions are complementary peer interaction strategies for academic writing instruction (To & Carless, 2016), and a combination of written peer review and oral peer discussions can facilitate deep interaction between peers by enabling reviewers and reviewees to clarify their writing and receive feedback (Hadwin et al., 2017). In the current study, we employed written peer review and oral peer discussions as the key scaffolding strategies: the students were expected to identify plagiarism and poor writing in their peers' writing during peer review and exchange ideas to solve the identified problems during peer discussion. Compared with face-to-face peer review, online peer review provides greater feedback and improves writing performance to a greater extent (Awada & Diab, 2021). Therefore, we conducted online written peer review supported by OSWS.

The HTPP module was designed and introduced to both the students and their instructor during the academic writing process in their subject courses. When the students were assigned a writing task, they prepared their writing based on the academic material provided by their course instructor. After submitting their first drafts, they followed the instructional procedure of the HTPP module to revise their writing. First, the students learned about the process and criteria of peer review by reviewing three examples of writing with varying levels of plagiarism, after which they compared their review results with those of the instructor. Then, the students were divided into groups and reviewed their group members' writings. According to a previous study, each peer-review group should include three to four students (Reinholz, 2016); thus, students were asked to review the writing of two of their group members and evaluate the writing using the criteria introduced in the peer-review training. Second, after receiving peer and instructor reviews on their writing, the students were given a chance to discuss face-to-face with their peers in class regarding the plagiarism problems identified in the peer reviews. Third, the instructor provided 1 h of instruction based on the plagiarism detected by the OSWS and the students' concerns about plagiarism and writing problems. Finally, the students reflected on own writing, revised it if necessary, and submitted it for assessment.

Figure 2. Arrangement of learning activities in the OSWS (middle panel)



Aside from the face-to-face peer discussions and in-class lectures, most of the learning activities took place in an online learning environment supported by the OSWS, which is a key component of the HTPP module. We had

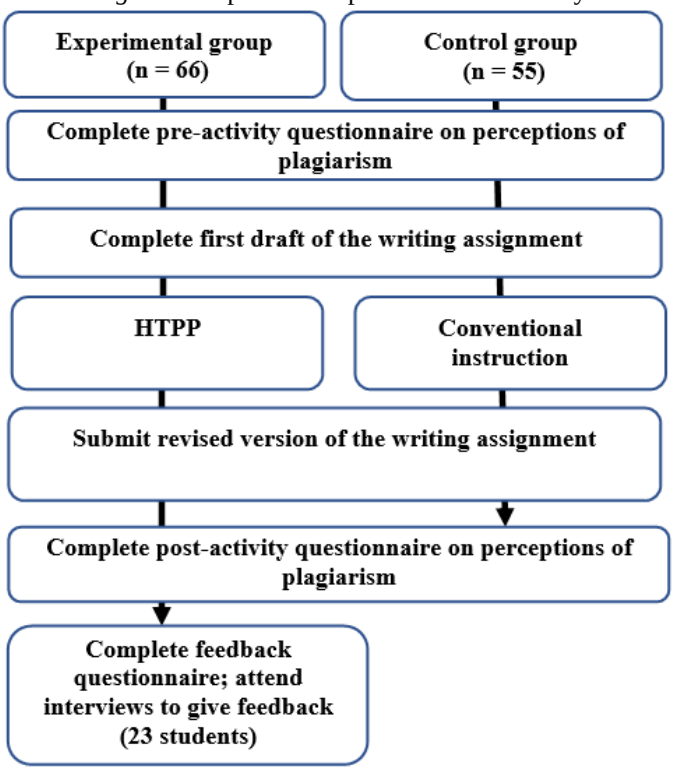
considered whether current ICT tools could meet the above-mentioned training needs. Previously created ICT tools can be used for plagiarism detection (e.g., CrossCheck and WCopyFind), writing practise (e.g., Criterion and WriteToLearn), or both (e.g., Turnitin and Glatt) (Liu et al., 2013). However, users of plagiarism-detection tools may receive similarity scores for their writing but receive no feedback on how to improve their writing (Zhang et al., 2019). Similarly, users of writing tools may practise their writing without learning how to correctly incorporate aspects from sources into writing. In addition, because these tools are tailored for self-learning, users may be limited by the lack of an opportunity to learn from others. The OSWS was developed by the first author as a solution to the above-mentioned limitations, the term "scaffolding" in the full-form of the OSWS indicates that the system was designed to support students to practise plagiarism-free academic writing.

The OSWS is based on Moodle, a widely used open-source learning content management system. The online learning activities were arranged based on the timeline of the instructional procedure. Some of the features of the OSWS were designed based on Moodle's pre-designed functions; for example, the "written peer review" function was built using the "workshop" activity in Moodle (see the icon in the red rectangle in Figure 2). The OSWS also includes customised functions, such as the "plagiarism analysis" tool. This function was established to help instructors identify plagiarism in students' writing.

3.1.2. Experimental procedure

This 8-week-long quasi-experiment was performed in the spring of 2018. Figure 3 presents the experimental procedure of this study. Before the writing assignments, two groups of students completed a pre-activity questionnaire on their perceptions of plagiarism. The students were then assigned a writing task and instructed to write pieces based on the provided academic material. Once the students had finished the first draft of their writing, each group revised their first drafts in different ways: the experimental group followed the HTPP module procedure (which consists of an online written peer review, face-to-face peer discussions, and in-class lectures), whereas the control group followed the conventional approach, i.e., they received instructional feedback from their instructor regarding plagiarism and other problems in their first draft. After both groups had revised their first drafts and submitted them for assessment, they took a post-activity questionnaire to examine possible perceptional changes during the experiment as well as perceptional differences on plagiarism between the two groups. Each groups' writing was assessed and compared in terms of two aspects—its level of plagiarism and its quality—to reveal improvements in students' writing performance. At the end of the experiment, the experimental group students completed a feedback questionnaire, and 50% of the students (randomly selected) attended an interview to share their views on the usefulness of the HTPP module.

Figure 3. Experimental procedure of the study



3.2. Study participants

The participants were recruited using convenience sampling (Creswell, 2012). The target population comprised first-year undergraduates from two different classes (mean age, 19 years) and their instructor Ms Z (This is a pseudonym to ensure the instructor's anonymity). from the education department of a public university in Chinese Mainland. The students' demographic data are shown in Table 1. The sample comprised 121 participants, with 66 in the experimental group and 55 in the control group. The participants were segregated based on sex [97 (80.2%) girls, 24 (19.8%) boys], and the sex distribution in each group was similar. Moreover, both groups had few prior experiences of learning about plagiarism. The HTPP module was introduced to the experimental group as an academic writing project tied to writing assignments in a subject course called "instructional design." By contrast, the control group undertook the same writing assignments but without using the module.

Table 1. Participants' demographic data

Sex	Experimental Group (%)	Control Group (%)	Total (%)
Male	13 (10.7)	11 (9.1)	24 (19.8)
Female	53 (43.8)	44 (36.4)	97 (80.2)
Anti-plagiarism learning experience			
During university education	0 (0)	1 (0.8)	1 (0.8)
Before entering university	0 (0)	3 (2.5)	3 (2.5)
None	66 (54.6)	51 (42.1)	117 (96.7)
Total	66 (54.6)	55 (45.4)	121 (100)

3.3. Instruments

The ability of the HTPP module to prevent students from committing plagiarism in their academic writing was examined by comparing the experimental group students' perceptional and behavioural changes regarding plagiarism-free academic writing with those of the students in the control group. Moreover, the students' and their instructor's views on the HTPP module were assessed by analysing data from the feedback questionnaires and interviews.

3.3.1. Perceptions of plagiarism questionnaire

The questionnaire was based on the "knowledge and attitudes to plagiarism" questionnaire developed by Lee et al. (2016) and assessed 13 items. The first three items were students' self-evaluations of their abilities to write without committing plagiarism, while the remaining 10 items were students' self-evaluations of their abilities to distinguish plagiarism in various scenarios. All of the questions were checked by the second author and an academic writing expert to ensure the validity. Cronbach's alpha was 0.74, indicating that there was reasonable internal consistency between the items (Robinson et al., 1991).

3.3.2. Feedback questionnaire

The feedback questionnaire comprised two parts. One part sought the students' views on the effectiveness of the HTPP module, whereas the other sought their views on the usefulness and usability of OSWS. The first part was based on a questionnaire developed by Lee et al. (2016), whereas the second part was adapted from a questionnaire developed by Liu et al. (2013). The feedback questionnaire contained 19 questions, which were checked by the second author and an academic writing expert to ensure validity. The Cronbach's alpha was 0.93 for the HTPP module and 0.91 for the OSWS, demonstrating good internal consistency (Robinson et al., 1991).

3.3.3. Writing assignment

The effects of the HTPP module on the students' behaviour were examined by analysing two dimensions of their submitted writing: its quality and its level of plagiarism. The requirements for the writing assignment were based on Lu's (2013) writing assignment design. The writing quality was evaluated using a four-dimensional rubric based on the studies of Liu et al. (2013) and Choi (2012) (detailed information is provided in Appendix A). The students' writing was independently rated by the first author (rater 1) and the students' instructor (rater 2); the

Pearson correlation co-efficient (r = 0.83) was calculated to confirm the presence of inter-rater reliability (Benesty et al., 2009).

The extent of plagiarism in writing is usually evaluated based on two widely used plagiarism assessment measures—the degree of similarity and the number of consecutively copied words. However, both measures have some limitations. The validity of the degree of similarity measure is often questioned, and many universities (e.g., University College London, 2019) consider any degree of similarity to be unacceptable. The number of consecutively copied words is frequently used by research associations to evaluate plagiarism; however, the threshold for determining plagiarism varies widely under different academic conditions (Masic, 2012). Therefore, in this study, the extent of plagiarism in writing was evaluated using a newly designed plagiarism assessment scale (see Table 2). The scale was customised based on the plagiarism assessment criteria of Chu et al. (2021) and Yeung et al. (2018); this scale had been used by a group of university students over an academic year, and its validity was carefully examined by the authors of the present study and an academic writing expert. The first author (rater 1) and a research assistant (rater 2) independently rated the levels of plagiarism, and Spearman's co-efficient (r = 0.93) was calculated to confirm the presence of inter-rater reliability. The level of plagiarism in each piece of writing was determined by averaging its two ratings.

Table 2. Plagiarism assessment scale

Level	Label	Description
Level 1	None	• No plagiarism.
Level 2	Minor	• Copying a block of text, which is greater than *x* and less than *y* Chinese characters, from a source, rearranging its phrases, adding words and replacing words with synonyms, and not providing a citation.
Level 3	Moderate	• Copying a block of consecutive Chinese characters, which is greater than *x* and less than *y*, from a source without providing a correct quotation, or • Copying a block of text of over *y* Chinese characters from a source without providing a citation but providing a reference at the end of the work.
Level 4	Serious	• Copying more than *y* consecutive Chinese characters from a source without providing a correct quotation, or • Copying a block of text of over *y* Chinese characters from a source without providing a citation.

Note. The minimal phrase match is denoted by *x*, which was six Chinese characters for student writing, based on previous research (Kostoff et al., 2006); the mean score of the most consecutively copied words in each piece of writing is denoted by *y*, which was calculated to be 85 Chinese characters in the experiment (using the plagiarism analysis module in the OSWS).

3.3.4. Interviews

The student interviews were conducted according to student interview procedure of Lu (2013); thus, 50% of the students (n = 33) were randomly selected and invited to interviews at the end of the experiment. However, because several students were reluctant to attend the interview, convenience sampling was used to invite students, which resulted in 23 volunteering to be interviewed. In addition, the instructor was interviewed to collect her instructional experiences in using the HTPP module, with the interview based on the faculty interview procedure of Grigg (2016). For the convenience of the interviewees, all interviews were conducted at the interviewees' university after the experiment was completed.

3.4. Data analysis

We used different statistical tests to analyse the quantitative data. If the data met the requirements for normal distribution and the variance homogeneity conditions, an independent samples *t*-test was used to compare the data of the experimental group with that of the control group; if not, the Mann–Whitney *U* test was used to make this comparison (Hoy & Adams, 2015).

The content analysis method was used to analyse the interview data. To ensure the reliability of the interviews, 50% of the interview data were separately coded by the first author and a research assistant into themes and sub-themes, and active discussions were conducted until the inter-rater agreement reached a level of 83%, indicating a satisfactory reliability (Stemler, 2004). Then, the remaining part of the interview data were coded by the fist author alone.

4. Results

4.1. Changes in students' perceptions of plagiarism

Data on students' perceptions of plagiarism were collected before and after the writing assignment. The data collected from the pre-activity questionnaires revealed that the two groups had similar views on plagiarism. Moreover, although most students had no prior experience learning about plagiarism prevention, they provided high ratings to some items. For instance, most students believed that they had "a good understanding of the importance of avoiding plagiarism," and the mean rating for the item was above 5. In addition, many of the students could easily identify typical explicit examples of plagiarism, such as "adding others' writing into my writing assignments without acknowledging the source," which had a mean rating of above 4.5.

Table 3. Perceptions of plagiarism in the post-activity questionnaire

Questionnaire items	Mean (*SD*)		Mann–Whitney *U* test
	Experimental group (*N* = 61)	Control group (*N* = 43)	*p*
(1) I am capable of identifying plagiarism-involving cases.	5.11 (0.99)	5.28 (0.63)	.588
(2) I am capable of avoiding plagiarism.	4.28 (0.93)	4.30 (0.99)	.454
(3) I have a good understanding of the importance of avoiding plagiarism.	4.13 (0.94)	4.44 (0.85)	.045*
(4) Adding others' writing into my writing assignment without acknowledging the source is plagiarism.	4.57 (1.27)	4.49 (1.18)	.548
(5) Paraphrasing others' writing, and adding it to my writing assignment without acknowledging the source is plagiarism.	4.92 (1.22)	4.53 (1.20)	.060
(6) Incorporating others' ideas (not writing) into my writing assignment without acknowledging the source is plagiarism.	4.33 (1.59)	2.91 (1.41)	.000*
(7) Incorporating teachers' course materials into my writing assignment without acknowledging the source is plagiarism.	4.56 (1.46)	4.09 (1.41)	.053
(8) Using my previous writing assignment for the current one without acknowledging the source is plagiarism.	4.93 (1.15)	4.51 (1.26)	.053
(9) Introducing Internet materials without source information in my writing assignment and submitting it in my name is plagiarism.	5.10 (1.01)	5.09 (0.72)	.482
(10) Inserting an Internet picture into my writing assignment without acknowledging the source is plagiarism.	4.18 (1.59)	3.51 (1.45)	.024*
(11) Incorporating data that has no author's information into my writing assignment without acknowledging the source is plagiarism.	4.07 (1.52)	3.33 (1.39)	.014*
(12) Inserting an author's conclusion into my writing assignment without acknowledging the source is plagiarism.	4.67 (1.11)	4.19 (1.20)	.042*
(13) Even though I have helped my friend finish his/her writing assignment, it is plagiarism if I copy his/her manuscript and hand it in under my name.	4.92 (1.23)	4.91 (0.97)	.504

Note. Seventeen students failed to complete the questionnaire, so 104 completed questionnaires were obtained. The ratings are based on a 6-point Likert scale ranging from 1(*strongly disagree*) to 6 (*strongly agree*). $^{*}p < .05$.

Some significant differences were found when the two groups' perceptions of plagiarism were compared again at the end of the experiment (see Table 3). Compared with the control group students, the experimental group students provided higher self-ratings for 10 of the 13 items, four of which had statistical differences (see Q6,

Q10, Q11, and Q12 in Table 3). The comparison revealed that many of the experimental group students could identify typical implicit plagiarism problems, such as "incorporating others' ideas into my writing assignments without acknowledging the source." However, it was surprising that both groups had lower self-ratings on their understanding of the importance of avoiding plagiarism after the activity than before (see Q3 in Table 3) and that the self-ratings of the experimental group were even lower than those of the control group in the post-activity questionnaire.

4.2. Students' behavioural changes in response to plagiarism

Before the HTPP module instructional intervention was delivered, two dimensions of the students' written pieces were analysed: their extent of plagiarism and their quality of writing. Most had serious plagiarism problems: the mean level of plagiarism was about Level 3, indicating a moderate level of plagiarism based on the Plagiarism Assessment Scale (Table 2), and the mean value of the most consecutively copied words was 85 Chinese characters. In addition, the students' writing quality was poor, with a mean writing quality score of 58 points based on the four-dimensional rubric (Appendix A). After the intervention, the experimental group significantly improved in terms of both their plagiarism level and writing quality: the mean plagiarism was Level 2, and the mean writing quality score of 76 points. The Mann–Whitney *U* test and independent samples *t*-test results showed there were significant differences between the groups in terms of their pieces' level of plagiarism and writing quality (see Table 4).

Table 4. Students' writing performance after the intervention (the HTPP module)

Measure	Mean (*SD*)		Mann-Whitney *U* test	
	Experimental group (N = 64)	Control group (N = 46)	*U*	*p*
I. Extent of plagiarism				
(1) Level of plagiarism	2.34 (1.04)	3.00 (1.05)	974	.002*
			Independent *t*-test	
			t	*p*
(2) Most consecutively copied Chinese characters	52.25 (46.42)	74.33 (5.057)	-2.337	.022*
II. Writing quality			Mann-Whitney *U* test	
			U	*p*
(1) Assignment response	17.81 (4.89)	16.25 (3.06)	1,217.5	.114
(2) Coherence and cohesion	22.58 (3.67)	19.08 (2.90)	607.5	.000*
(3) Vocabulary and language use	19.22 (4.18)	17.50 (3.33)	1,166.5	.059
(4) Citation	16.41 (8.44)	14.40 (6.92)	1,109	.025*
Total	76.02 (16.58)	67.23 (13.85)		

Note. Eleven students failed to submit their writing, and 110 pieces of writing were collected. *$p < .05$.

4.3. Students' and instructor's feedback about the HTPP module

The HTPP module was presented to the experimental group students as an academic writing project. At the end of the experiment, the students' opinions regarding their learnings from the project were solicited. Based on the data collected from the feedback questionnaire, most of the students (> 95%) indicated a high level of satisfaction with the HTPP module, with all ratings above the mid-point (3.5) on the 6-point Likert scale (Table 5). Many of the students considered the module useful for improving their ability to identify plagiarism, avoid plagiarism, and become aware of the importance of avoiding plagiarism (see the high mean scores for Q1, Q2, and Q3). Moreover, most of the students believed that their enhanced knowledge regarding paraphrasing, summarising, synthesising, and in making citations, facilitated their ability to avoid plagiarism (see the high rates of agreement for Q9, Q10, and Q11). Although the students' scores for the usefulness and usability of the OSWS were lower (see Q12–Q19) than their ratings on the effectiveness of the module, more than four out of five students valued the learning gained from using the OSWS. Most of the students considered that the OSWS was easy to use (see Q15) and were satisfied with the usefulness of the peer review process for facilitating communication between peers and decreasing plagiarism (see Q18 and Q19).

Table 5. Student feedback on the HTPP Module

Questionnaire items	Mean (*SD*) (*N* = 64)	Proportion of agreement
I. The effectiveness of the Academic Writing (AW) project[#]		
Understanding Plagiarism		
(1) I am more capable of identifying plagiarism cases after completing the AW project.	4.81 (.84)	94.9%
(2) I am more capable of avoiding plagiarism after completing the AW project.	4.97 (.74)	98.3%
(3) I have a better understanding of the importance of avoiding plagiarism after completing the AW project.	5.03 (.74)	96.6%
Understanding academic writing		
(4) I am more capable of expressing others' ideas in my own words (i.e., paraphrasing) after working on the AW project.	4.61 (.70)	96.6%
(5) I am more capable of presenting the key information as a concise statement (i.e., summarizing) after working on the AW project.	4.53 (.73)	96.6%
(6) I am more capable of distinguishing paraphrasing, summarizing and patch-writing after working on the AW project.	4.59 (.65)	98.3%
(7) I am more capable of integrating several source materials with my own ideas (i.e., synthesizing) after working on the AW project.	4.68 (.68)	96.6%
(8) I am more capable of producing proper citations after working on the AW project.	4.81 (.68)	98.3%
Others		
(9) Due to gaining a better understanding of plagiarism by completing the AW project, I am more capable of avoiding plagiarism in my work.	4.80 (.81)	94.9%
(10) Due to gaining an enhanced ability to use the skills of paraphrasing, summarizing and synthesizing by completing the AW project, I am more capable of avoiding plagiarism in my work.	4.76 (.68)	98.3%
(11) Due to gaining an enhanced ability to create proper citations by completing the AW project, I am more capable of avoiding plagiarism in my work.	4.78 (.62)	98.3%
II. Perceived usefulness and usability of the Online Scaffolding Writing System		
(12) Use of the online writing system has stimulated my interest in writing assignments.	4.39 (1.03)	88.1%
(13) Use of the online writing system has enhanced my engagement in writing assignments.	4.49 (.92)	88.1%
(14) I would like to use the online writing system in other courses.	4.54 (.82)	94.9%
(15) The online writing system is easy to use in general.	4.76 (.70)	96.6%
(16) The benefits of using the online writing system outweigh its technical challenges for users.	4.39 (.97)	84.7%
(17) The online writing system helps me to achieve my learning goals.	4.37 (.96)	88.1%
(18) In the online writing system, peer review is helpful for exchanging views on plagiarism and source use with peers.	4.80 (.81)	94.9%
(19) In the online writing system, peer review is effective at decreasing plagiarism in academic writing.	4.71 (.89)	91.5%

Note. [#]The HTPP module was introduced to students as an "academic writing project." The ratings are based on a 6-point Likert scale ranging from 1(*strongly disagree*) to 6 (*strongly agree*). "Proportion of agreement" refers to the number of responses expressing agreement (i.e., *slightly agree*, *agree*, or *strongly agree*), compared with the total number of responses (i.e., 64). Two students failed to submit their feedback questionnaires; the number of questionnaires collected was 64.

Twenty-three students and their instructor were interviewed to further explore their opinions on learning with the HTPP module. According to Creswell (2012), interview data analysis comprises several steps that include having a general idea about an interview transcription, coding the transcription, listing codes, and reducing the codes into several themes. The student and instructor interview data were analysed following these steps, and some key

themes emerged (Table 6). The numbers in the column of "students' feedback" are the numbers of interviewees who held positive or negative perceptions of the stated theme.

All the students expressed satisfaction with their learning experiences from using the HTPP module (see Item 1 in Table 6), and most were satisfied with the peer interaction section that facilitated anti-plagiarism behaviour and academic writing (see Item 2 and Item 3). One student (S10) mentioned that she might not have received a chance to learn about plagiarism avoidance and academic writing if she had not been involved in this academic writing project (i.e., the HTPP module). As to what extent they believed that the HTPP module had effects on their plagiarism-free academic writing, 19 interviewees responded that the proportion was more than 70% and its positive effects were mainly on helping them know how to conduct academic writing without plagiarism (see Item 4). However, some students remained concerned about the long-term effects of the HTPP module. One student (S13) remarked, "I feel that my capability of avoiding plagiarism hasn't been greatly improved [by completing the HTPP module]. It is just the beginning and I need more similar writing practise to make greater improvement."

Table 6. Student interview data

Themes	Students' feedback		
	Positive	Negative	Codes
(1) Learning experience with the HTPP module	23 (100%)	0 (0%)	(a) More aware of the importance of anti-plagiarism than before (b) Learned how to identify and avoid committing plagiarism (c) Improved writing skills
(2) Anti-plagiarism enabling factors of the HTPP module	23 (100%)	0 (0%)	(a) Peer interaction (b) Learning resources in the OSWS, especially the three pieces of writing with varying levels of plagiarism and source acknowledgment (c) The course instructor's instruction
(3) Academic writing enable factors of the HTPP module	23 (100%)	0 (0%)	(a) Peer interaction (b) Learning resources in the OSWS, especially the three writings with varying quality in plagiarism and source use (c) The course instructor's instruction
(4) Effects of the HTPP module on plagiarism-free academic writing	19 (87%)	4 (13%)	(a) Improved knowledge of how to generate plagiarism-free academic writing (b) Improved knowledge of how to avoid committing plagiarism (c) Understand what constitutes academic writing
(5) Perceptions of undergraduates' learning about anti-plagiarism	23 (100%)	0 (0%)	(a) Objective • Plagiarism is getting serious and it needs be treated seriously • Lack of skills in generating plagiarism-free academic writing (b) Subjective • Serious plagiarism detected in one's dissertation will affect one's graduation (according to the university's policy on dissertations)

The interview with the instructor provided deeper insights into the effects of the HTPP module on facilitating plagiarism-free academic writing. Ms Z remarked, "With the help of the hybrid training module, I not only know exactly how serious the plagiarism problems are in students' writing but can also supervise and provide instructional support during their writing process." Clearly, the introduction of the hybrid training module strengthened the instructor's confidence in delivering plagiarism-free academic writing instruction and her understanding of students' learning needs in relation to plagiarism prevention.

5. Discussion

This study provided robust evidence of the benefits of the HTPP module in facilitating students to generate plagiarism-free academic writing. This success supports a previous study's claims on the pedagogical rationale of developing anti-plagiarism training modules for students and faculty members (Michalak et al., 2018).

5.1. Effects on the students' perceptions of plagiarism

Before the instructional intervention, the students' perceptional baseline was established by comparing the groups' perceptions towards plagiarism. Both groups found it easy to identify the typical features of explicit plagiarism but many students from both groups struggled to distinguish implicit plagiarism in various contexts. The students' learning from the HTPP module were found to contribute more to enhancing their awareness of implicit plagiarism rather than their awareness of explicit plagiarism. This indicates that students' personal experiences related to anti-plagiarism are foundational for acquiring plagiarism awareness, as reported by Peled et al. (2019), and that the effects of the HTPP module on the students' acquisition of knowledge about explicit and implicit plagiarism were uneven.

5.2. Effects on the students' writing, particularly its level of plagiarism and quality

The students' learnings of plagiarism prevention were implemented into their academic writing practise, and the experimental group students were more successful in reducing their writing's level of plagiarism and improving its quality than the control group students. This supports earlier claims regarding the need for systematic instruction on academic writing to improve students' comprehension of plagiarism prevention (Pecorari & Shaw, 2018).

Moreover, although the level of plagiarism in the experimental group students' writings decreased from Level 3 to Level 2 and the average number of the most consecutively copied Chinese characters decreased from 85 to 52, plagiarism remained. This shows that instructors should use the HTPP module for a sufficient length of time to improve their students' ability to generate plagiarism-free writing. That is, the knowledge and skills related to anti-plagiarism are not obtained in one session; they are obtained gradually via a continual process of instructional guidance (Patak et al., 2021).

5.3. Differences and similarities between students' writing performance and perceptions of plagiarism

Analysis of the students' perceptional and behavioural data revealed consistency between the students' perceptions and behavioural performances in one dimension of the intervention but an inconsistency between these in another dimension. According to Hecht et al. (2001), the relationship between perception and behaviour is complicated and thus requires close investigation, and a clear cause-and-effect relationship may not be apparently guaranteed. Similarly, analysing the link between the students' perceptions and behaviours could reveal their learning needs and preferences regarding the HTPP module.

Most of the experimental group stated that they were more capable of writing from sources and avoiding plagiarism after the intervention than before (see Table 5 and Table 6), which was in line with their statistical data showing greater improvements in writing performance than the control group students (see Table 4).

Compared with the writing of the control group, after the intervention the writing of the experimental group had a lower level of plagiarism and was of higher quality (see Table 4). However, this behavioural trend did not correspond to the students' perceptional changes; i.e., the self-evaluation score of the experimental group regarding having 'a good understanding of the importance of avoiding plagiarism' (see Q3 in Table 3) was lower than those of the control group after the intervention, and the experimental group's post-intervention self-evaluation score was also lower than its pre-intervention self-evaluation score for this item. Some researchers have suggested that people's awareness of their changing behaviours may lead them to change their perceptions (Cheng et al., 2019; Festinger, 1962). Thus, the experimental group students may have originally overestimated their understanding of plagiarism before the intervention. Therefore, during the writing process, their high self-evaluation scores may have been challenged by their realisation that they had committed plagiarism in their drafts. This might have led them to change their perceptions of their own knowledge regarding anti-plagiarism behaviour. Because students' self-evaluations regarding plagiarism-free academic writing can be altered, we believe that students' self-evaluation scores on their understanding of plagiarism will increase if they are given more opportunities to practise academic writing using the HTPP module.

6. Conclusion

We used a quasi-experimental design to investigate the effects of the HTPP module on students' plagiarism-free academic writing. Some important findings were obtained. First, the HTPP module was found to effectively improve the students' perceptions of plagiarism and their ability to generate plagiarism-free academic writing. Second, both the students and the instructor expressed their satisfaction about the use of the HTPP module in the course. Third, the students' perceptions of plagiarism were consistent with their anti-plagiarism behavioural performance in some dimensions but not in others. These findings shed light on the utility of the HTPP module for scaffolding in teaching students how to avoid plagiarism and confirm the value of the module in helping undergraduates to generate plagiarism-free academic writing. This should enhance instructors' understanding of and confidence in adopting the HTPP module in their course designs. Moreover, our findings – particularly those related to the learning experiences of the students and the instructional experiences of the instructor – support the implementation of this innovative module in various disciplinary and cultural contexts.

Our study had several limitations that should be noted, including a limited number of participants and the short duration of the experiment. Thus, in future work, more students should be evaluated over a longer duration to determine their long-term developmental progress in learning about plagiarism prevention from the HTPP module. It would also be valuable to investigate the effects of the HTPP module on the writing skills of participants of various ages. Moreover, the way of inquiry of plagiarism-free academic writing in different disciplines can greatly affect the results of a study. Therefore, there is a need to examine HTPP module-based instructional strategies that are suitable for scenarios in various disciplines and for students' various learning modes.

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Appendix A. The four-dimensional writing rubric

	Assignment response	Coherence and cohesion	Vocabulary and language use	Citation
Excellent (20～25 points)	• The writing meets all of the assignment requirements. • The writer projects a clear stance with supporting ideas. • The summary includes all of the important aspects of the sources and displays the writer's full understanding of the sources.	• The writer presents ideas in clear and logical sequence. • The writer uses cohesive devices effectively. • The writer uses paragraphing appropriately.	• The writer paraphrases and summarizes texts in his/her own way which is totally different from the sources. • The writer uses a wide range of vocabulary naturally.	The citations and references are presented correctly.
Good (13～19 points)	• The writing meets all of the assignment requirements, although some requirements are less fulfilled than others. • The writer projects a stance, although the conclusion is not clearly stated. • The summary includes some important aspects of the sources and displays the writer's good understanding of the sources, although some aspects are not accurately addressed.	• The writer generally presents ideas in a logical sequence. • The writer uses cohesive devices to connect sentences, but some cohesive devices are used erroneously. • The writer uses paragraphing but not always correctly.	• The writer paraphrases and summarizes texts in his/her own way, although sometimes uses similar phrases. • The writer uses a wide range of vocabulary but there are some inaccuracies.	There are citations and references, but some are presented incorrectly.
Average (6～12 points)	• The writing meets the assignment requirements only partially. • The writer projects a stance but it is not clearly stated. • The summary includes few important aspects of the sources and displays the writer's limited understanding of the sources.	• The writer presents ideas in sequence but this lacks logic. • The writer uses a few cohesive devices but does so repeatedly or incorrectly. • The writing is not paragraphed.	• The paraphrases and summaries contain few of the writer's own sentence structures or expressions, and contain several phrases that are similar to those in the sources. • The writer repeatedly uses a limited range of vocabulary.	Either the citations or the references are missing.
Poor (1～5 points)	• The writing barely meets the assignment requirements. • The writer doesn't project a stance. • The summary doesn't include any important aspects of the sources and displays no sign of the writer's understanding of the sources.	• The writer has very little control of organizational features.	• The paraphrase and summary display the writer's use of source language with little modifications. • The writer uses an extremely limited range of vocabulary.	Both the citations and the references are missing.
Very poor (0 point)	The author has not handed in the assignment or merely copied words from original passage.			

Note. The rubric is based on the writing assignment rubric of Lu (2013) and the rubric on paraphrasing of Choi (2012).