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ARTICLE

Improving argumentative writing: Effects of a blended learning approach and gamification

Yau Wai Lam, *The University of Hong Kong*

Khe Foon Hew, *The University of Hong Kong*

Kin Fung Chiu, *The University of Hong Kong*

Abstract

This study investigated the effectiveness of a blended learning approach—involving the thesis, analysis, and synthesis key (TASK) procedural strategy; online Edmodo discussions; online message labels; and writing models—on student argumentative writing in a Hong Kong secondary school. It also examined whether the application of digital game mechanics increased student online contribution and writing performance. Three classes of Secondary 4 students (16- to 17-year-olds) participated in the 7-week study. The first experimental group (n = 22) utilized the blended learning + gamification approach. The second experimental group (n = 30) utilized only the blended learning approach. In the control group (n = 20), a teacher-led direct-instruction approach on the components of argumentation was employed. Data sources included students' pre- and post-test written essays, students' online Edmodo postings, and student and teacher interviews. We found a significant improvement in students' writing using the blended learning approach. On-topic online contributions were significantly higher when gamification was adopted. Student and teacher opinions on the blended learning approach were also examined.

Keywords: *Writing, Blended Learning and Teaching, Instructional Design*

Language(s) Learned in this Study: *English*

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Introduction

The ability to make a good argument is imperative in today's society. Kuhn (1991) considered argumentation to be a thinking skill essential to idea formulation, problem-solving, and good judgment. However, compared to other topics in education (e.g., science education), few empirical studies have focused specifically on training students to write argumentative text (Lukomskaya, 2015; Nussbaum & Schraw, 2007). We begin this article by briefly describing the research on English argumentative writing. We then discuss our investigation to improve secondary school Hong Kong ESL students' argumentative writing under three different conditions, in which learning strategies were manipulated.

Fundamentally, good arguments have two sides: claims and counterclaims (Nussbaum & Schraw, 2007). Claims–counterclaims integration is found to be more credible in written texts, because the writer appears to be more knowledgeable and less biased (O'Keefe, 1999). More specifically, argumentative writing is the process of making a claim, challenging it, supporting it with reasons, questioning the reasons, rebutting them, and finally reaching a conclusion (Kuhn, 1991). Toulmin, Rieke, and Janik (1990) propose a similar model of argumentative writing that includes *evidence*, *claim*, *warrant*, *backing*, and *rebuttal*.

The most common method for measuring the quality of argumentation is textual analysis of student

essays (Jonassen & Kim, 2010). The two main types of conceptual models for analyzing argumentation include (Inch & Warnick, 2002): (a) the standard models, which analyze essays according to typical argumentation elements such as claim, counterclaim, rebuttal, and supporting data (e.g., Liu & Stapleton, 2014; Nussbaum & Kardash, 2005), and (b) the more specific Toulmin-based models, which seek to further categorize supporting claims into grounds and warrants.

Previous studies in the context of English as first language (L1) have found poor student performance in argumentative writing. For example, Crowhurst (1990) reported that young writers started their essays as an argument but then drifted into narratives that were mainly descriptive. Native English-speaking college students tended to ignore opposing viewpoints when writing arguments to reason with their peers (Felton, Crowell, & Liu, 2015). Toplak and Stanovich (2003) similarly found undergraduate native English-speaking students generated more *my-side bias* (i.e., the tendency to ignore evidence against a position the person favors). This was also affirmed in studies by other researchers (e.g., Nussbaum & Kardash, 2005; Wolfe & Britt, 2008), who found native English-speaking participants tended to present claims that supported their position and ignored counterclaims. Basically, research in L1 context suggests that typical student weaknesses of argumentative writing include lack of support for reasons, counterclaims, and supporting reasons for counterclaims.

Second-language writing researchers have also examined the performance of second language (L2) English learners in argumentative writing, particularly in higher education contexts. Compared to L1 learners, L2 learners generally face greater challenges with argumentative writing (El-Henawy, Dadour, Salem, & El-Bassuony, 2012). The first possible reason for this may be attributed to cultural background. For example, Indonesian EFL university students usually avoid giving counterarguments because criticizing other people, especially those of a higher social status, is considered impolite (Arsyad, 1999). Second, EFL learners may encounter greater grammatical deficiencies and limitations in vocabulary. Third, L2 learners lack knowledge of the argumentative structure (El-Henawy et al., 2012; Hirose, 2003; Liu & Stapleton, 2014). Similar to L1 writings, deficiencies in acknowledging counterarguments and refuting them are often present in L2 learners' arguments (Liu & Stapleton, 2014). Most EFL university learners in China, for example, did not supply a counter-argument section in their essays (Liu & Stapleton, 2014; Qin & Karabacak, 2010). Hirose (2003) reported that Japanese EFL learners' experience in argumentative writing was practically non-existent as most L2 writing instruction was oriented toward translation at the sentence level. El-Henawy et al. (2012) found that Egyptian EFL learners failed to consider opposing viewpoints. This finding was supported by Rusfandi (2015), who found that a majority of third-year Indonesian EFL learners developed a one-sided model of argumentation in their essays by focusing only on how to state their main claims and providing relevant reasons for it.

Instructional Strategies

Despite cultural and language barriers, researchers in L2 writing have argued that, with relevant instruction, EFL students can overcome the difficulties of argumentative writing (Bacha, 2010). Since most of the research on L2 has been closely dependent on L1 research, L1 methods have had a significant influence on the development of L2 writing approaches (Myles, 2002). As such, the standard approach used by many teachers in both L1 and L2 contexts is explicit or direct instruction on argumentation (Cho & Jonassen, 2002): the setting of the lexical standards and tone, the organization of the argumentative writing, and the assessment of arguments. Advocates of this method believe *knowing that* is a necessary prerequisite for *knowing how to* (Crowhurst, 1990). However, research findings has shown mixed results. Several studies showed that direct instruction improved argumentative writing (e.g., Nussbaum & Schraw, 2007; Sanders, Wiseman, & Gass, 1994). Others suggested no effect (e.g., Knudson, 1994; Reznitskaya, Anderson, & Kuo, 2007).

In Hong Kong, argumentative essay writing instruction similarly relies heavily on direct instruction from teachers, with a particular focus on appropriate lexical items and essay structure. Even though students are encouraged to research their topics beforehand, they tend to wait for the teacher's answers. Students rarely practice independent thinking (Murphy, 1987), and seldom proactively consider opposing views

from different parties. This corroborates other researchers' observations that awareness of argumentation principles does not necessarily equate proficient application of these principles (e.g., Reznitskaya et al., 2007; Rusfandi, 2015).

Some scholars have advocated the use of alternative methods to facilitate learner development of argumentative writing, such as constraint-based argumentation scaffold (Cho & Jonassen, 2002), self-regulated strategy development (El-Henawy et al., 2012), model pieces of writing (Knudson, 1992; Lancaster, 2011), electronic outlining (De Smet, Broekkamp, Brand-Gruwel, & Kirschner, 2011), question prompts (Jonassen et al., 2009), or graphic organizer (Nussbaum & Schraw, 2007). Yet again, past research findings did not always show consistent positive results. For example, although graphic organizers may help increase rebuttals (Nussbaum & Schraw, 2007), they may not necessarily enhance students' critical understanding of issues (Scheuer et al., 2010). Jonassen et al. (2009) use a series of question prompts (e.g., *Whose perspective supports your selection? How might someone supporting the other solution disagree with your preferred solution?*) to engage students in argumentation about engineering ethical dilemmas. The researchers found that these prompts did not help students to adequately consider and support counterclaims. Knudson (1992) found no significant differences between instructions guided by model answers and unaided free-writing. De Smet et al. (2011) found that outline writing with Microsoft Word helped organize texts, but did not help with generating arguments.

Purpose of the Study and Research Questions

Overall, we believe that learning to write sound argumentative texts is complex. Rather than favoring one specific method over another, we felt that a successful intervention required a careful mix of the various methods. The main purpose of this study was therefore to develop a relatively simple blended learning intervention that could improve the argumentative writing of secondary school students following the English as a Second Language (ESL) stream. We then tested the effectiveness of this model using a quasi-experimental design on Secondary 4 (10th grade) students (16- to 17-year-olds). We also added an expanded intervention, gamification, in one of the experimental groups in order to determine if the use of digital game mechanics could increase students' online contribution and further improve their argumentative writing. The present study was guided by the following specific questions:

1. Does a blended learning approach improve student argumentative writing compared to a teacher-led direct-instruction approach?
2. Does a blended learning approach improve student argumentative writing compared to a blended learning + gamification approach?
3. Does a blended learning + gamification approach improve student argumentative writing compared to a control condition?
4. Does the application of gamification increase student online contribution?
5. How do students and teachers perceive the blended learning approach?

The Blended Learning Approach

Figure 1 illustrates the blended learning approach used in this study. The various blended learning components were selected based on three main theoretical perspectives of L2 writing: text modeling, process modeling, and social aspect (Barkaoui, 2007; Cumming, 2001). Text modeling aims to improve L2 argumentative writing in terms of syntax, vocabulary, and organization (Barkaoui, 2007), while process modeling focuses mainly on the strategies that underlie effective writing such as the process model of the Toulmin argument model.

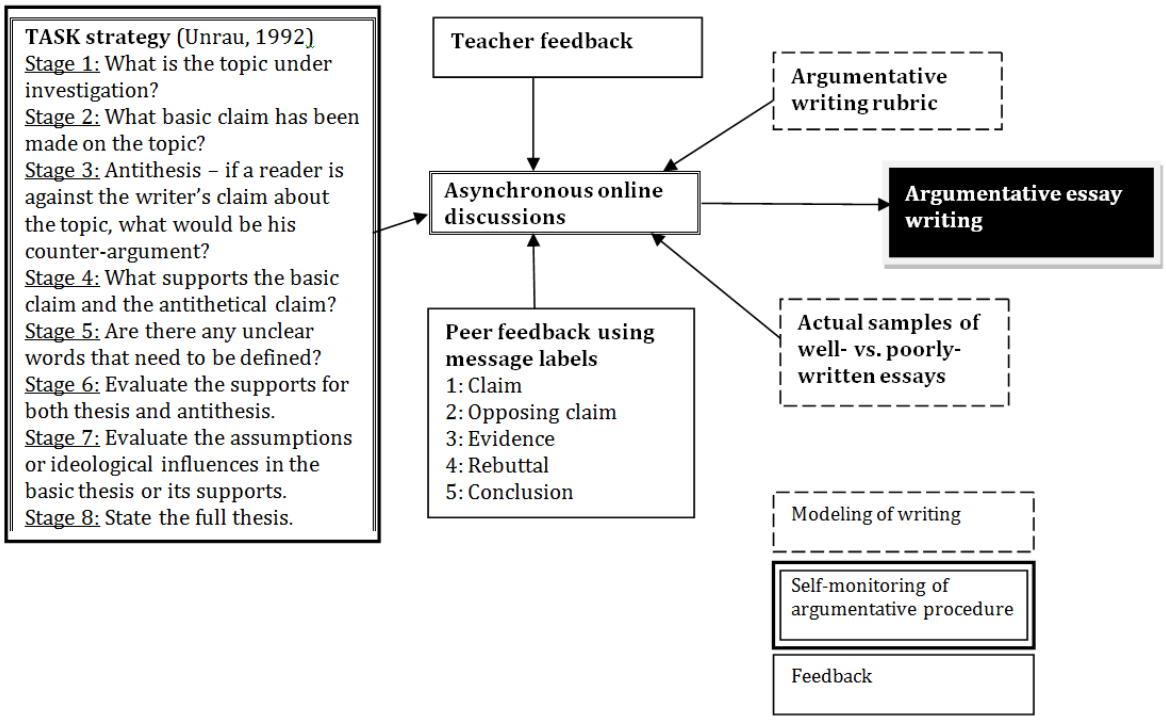

Figure 1. The blended learning model used in this study.

In this study, we facilitated text and process modeling through the use of writing samples and a writing rubric. To further promote process modeling, as well as help students self-monitor and reflect on their argumentative writing, we employed the thesis, analysis, and synthesis key (TASK) method. Central to the social aspect is the assumption that students acquire argumentative literacy through student–teacher and student–peer interaction (Newell, Beach, Smith, & VanDerHeide, 2011). Teacher and peer interactions can help identify weaknesses in students' contributions and foster students' willingness to engage in an argument (Smidt, 2002). In this study, we employed the use of online discussion through Edmodo for students to interact with one another. We also utilized gamification in order to examine whether it would motivate students to make more meaningful contributions in online discussions. Table 1 summarizes the main components incorporated in the blended learning approach. In the following paragraphs, we describe each blended learning component in more detail.

Table 1. *Summary of Blended Learning Components*

Theoretical Perspective	Description of Component
Process Modeling	Use of questions in the TASK procedural strategy to guide students to plan, write, and self-assess their arguments
Self-Monitoring	Use of message labels to classify and tag their comments during online discussion; these labels included *claim*, *opposing claim*, *support*, *evidence*, *rebuttal*, and *conclusion*
Text Modeling	Use of argumentative writing rubrics Use of well- and poorly-written samples
Social	Use of Edmodo as an online tool for peer and teacher feedback

Writing Samples and Rubric

We used two types of resources to facilitate text and process modeling of argumentation skills: samples of well- and poorly-written essays and an argumentative writing rubric. The well- and poorly-written

argumentative texts were assessed according to the rubric of the Hong Kong Diploma of Secondary Education (HKDSE) examination. The three main criteria were content, language use, and essay organization. The quality of each sample, whether well-written or poorly-written, was determined by mutual consent from at least two experienced markers of the HKDSE examination. Samples of well- and poorly-written essays were presented so that students could acquire the syntax and lexicons, as well as analyze the development of good versus poor writing—which we hoped would help them internalize what to do and what not to do. Such activities help increase students' awareness of stance-taking options and make them more mindful of their own choices (Lancaster, 2011). A writing rubric (see Appendix A) was shown because it reduced students' anxiety toward writing (Wyngaard & Gehrlce, 1996) and showed them how they could improve (Bergdahl, 1999).

TASK Method

In this study, we utilized the TASK method (Unrau, 1992) to scaffold the process modeling of writing arguments, as well as foster students' self-monitoring and self-correcting of writing. Self-monitoring and self-correcting are important components of self-regulation (Zimmerman, 2013) because they involve the learners' internal processes of reflection. When self-regulatory mechanisms such as monitoring and correcting are incorporated into writing, they generally produce better writings (Graham & Harris, 2000; Graham & Perin, 2007). The eight stages outlined in the TASK method (see Appendix B) help students explicitly consider and reflect on the different elements in argumentative writing.

According to Unrau (1992), TASK helps students to "recognize and challenge the claims and evidence that constitute arguments, to search for good reasons to support both claims and counterclaims, to view arguments from different perspectives, and to engage in a dialectical process while constructing texts" (p. 436). U.S. high-school students who used TASK attained significant improvements in their ability to evaluate and write arguments (Unrau, 1989). More recently, Koh (2004) found a significant improvement of Secondary 3 Singapore students' performance in their overall argumentative writing scores as a result of TASK.

Teacher and Peer Feedback Through Online Discussion

Although self-monitoring can help a learner reflect and make improvements upon the argumentative writing process, external feedback still plays an important role (Lee, Cheung, Wong, & Lee, 2013). Feedback helps point out errors and suggests areas for improvement. To facilitate peer and teacher feedback both in and out of class, we used an online text-based asynchronous social medium, Edmodo. The text-based nature of the online medium helped increase students' awareness of grammar use. When students discover grammatical mistakes in their posts, they tend either to revise them before posting the messages or to make an extra post correcting their errors (Yamada, 2009). Edmodo was selected because it looked similar to Facebook, a leading social network tool used by many students. However, unlike Facebook, Edmodo promoted a more secure online environment for student interaction (see Kongchan, 2013).

In this study, we utilized both teacher and peer feedback via online interaction on Edmodo. A teacher's feedback was useful because it helped focus students' discussion on the topic, prevent possible conflicts, and provide pertinent information, while peer feedback allowed students to share their views more openly (Hew, 2015). In order to further help students reflect on their own thoughts and consider the function and purpose of their messages, each student was required to classify each message using certain labels: *claim*, *opposing claim*, *evidence*, *rebuttal*, or *conclusion* (see Figure 1). The use of these labels also facilitated dialogues, as teachers and peers could easily identify the purpose of their contributions by looking at the labels (Hew & Cheung, 2014).

Gamification for Enhancing Student Engagement

Gamification refers to the application of digital game mechanics to non-game situations to motivate users' behaviors (Deterding, Dixon, Khaled, & Nacke, 2011). The rationale for using gamification was to motivate students to conduct online discussions on the argumentative topic on Edmodo, which was

hypothesized to help students learn to think more argumentatively. More specifically, we hoped that the use of gamification would encourage students to make meaningful contributions to the argumentative writing topics. Meaningful contributions referred to stating one's own perspective about a topic or making posts supported by reason or evidence. We wanted to examine whether the use of gamification would enhance students' online contribution on Edmodo and their subsequent argumentative essay writing performance.

In this study, we explored the use of points and leaderboards, since they were the most commonly employed digital game mechanics (Dicheva, Dichev, Agre, & Angelova, 2015). Points can help stimulate a person's desire for reward, while a leaderboard can fulfills a person's desire for competition while catering to his or her need for achievement (Bunchball, 2010). Nevertheless, the sole use of points or leaderboards could be frustrating to some students. Nicholson (2012) proposed that instructors focus on *play* as a strategy to circumvent this problem. *Role-play* is a form of exploration-type play activity that enables users to explore from different angles or perspectives (Bartle, 1996). Students can take up a role in a context created by their teachers and they can explore and connect deeper with the issue at hand. In this manner, students make their own choices as to what information to look at and what stance and counter stance they take. With a role, students' reflections are also maximized. In view of this, a simple narrative was used in this study where the students took up a role in their discussion on Edmodo.

Method

A combination of quasi-experimental and qualitative research methods (i.e., interviews) was used. The study was carried out in an all-girls' school and involved three classes of Secondary 4 (Grade 10) students (16–17 years old). The selection of the research site being an all girls' school was a convenient sample. We were able to gain access to the teacher who conducted this writing project. The teacher specialized in teaching ESL to senior secondary level students (Grades 10 and 11). At the time of writing, the teacher had two years of teaching experience, with the curriculum covering the teaching of writing, especially the skill of argumentation.

According to the teacher, the biggest challenge the participants faced in their argumentative writing was their ability to organize and formulate their argument, rather than their language proficiency. The participants had the language proficiency necessary to express their thoughts. The secondary school they were studying in used English as the medium of instruction (EMI), which meant they learned all subjects, aside from the Chinese Language and Chinese history, in English. In Hong Kong, only 32% to 40% of students are deemed suitable to learn in an EMI environment by the Education and Manpower Bureau (2004). This is a recognition of the participants' L2 English proficiency.

More specifically, in Secondary 1 and 2 (Grades 7 and 8), the participants were taught to write text types such as stories and letters. In Secondary 3 (Grade 9), through direct instruction, the participants were taught the basic organization of an argumentative writing, including paragraphing and the use of topic sentences. As for selecting students of this particular educational level, we believed that students in Secondary 4 (Grade 10) had sufficient grammar proficiency and some prerequisite ideas of the basic organization of an argumentative essay.

The research design (see Appendix C) consisted of a pre- and post-test for all three groups. To find out the effectiveness of the blended learning approach, the differences between the pre-test and post-test scores of the three groups were compared. To find out whether students became more motivated when gamification was applied, students' contributions on Edmodo for the first and second experimental groups were compared. To minimize confounding variables, the lessons were conducted by the same teacher, the students were asked to work on the same writing topics, and the students took the same pre- and post-tests across the groups.

Procedure

This study was conducted over a 7-week period because this was the only time available in the school

timetable. Although we would have preferred a longer time frame, the five weeks (not counting the first and last weeks that were used for pre-test and post-test, respectively) seemed sufficient for the students to complete all the necessary activities. Appendix D shows the argumentative topics addressed by the three groups each week. The first phase of the study was a pre-test that was administrated to all three groups of students. Students were given one hour to write an individual argumentative essay on the topic. The second phase of the study consisted of argumentative writing lessons. In the post-test, the same procedure as in the pre-test was carried out. Students were given one hour to write their essays. To avoid carry-over test effect, the topic in the post-test was different from the pre-test but was of similar difficulty level. Students wrote their pre- and post-test essays by hand on single-lined papers.

Control Group

The teacher in the control group provided direct instruction on argumentative writing. In the first lesson after the pre-test, she went through the key components of argumentation (Appendix B, first column) and then introduced the assessment rubric (Appendix A), which was provided to students to self-reflect and improve their own work. The teacher in the control group also taught students to use the eight stages of TASK strategy (Appendix B, second column). However, the students in the control group were not provided any samples of well- and poorly-written arguments. Control group students also did not use Edmodo or the message label. Students had 10 minutes to discuss the topic with their peers, followed by an informal oral report. Afterward, students were asked to write on the topic individually.

Experimental Groups

Students in the first and second experimental groups were introduced to the blended learning approach (see Figure 1). The relevant supports (i.e., the TASK strategy, assessment rubric, and message label guidelines) were uploaded to Edmodo, where students could access them any time. During the first lesson, students from the first and second experimental groups were reminded of the key components of argumentative writing and introduced to the same assessment rubric for argumentative writing as the control group.

In the subsequent lessons, the teacher commenced the face-to-face part of the lesson by showing students some general good and bad examples of argumentative writing. Students analyzed and reported the strengths and shortcomings of the examples. Next, the teacher posted the particular week's argumentative topic on Edmodo. Students then individually posted their thoughts. They also used the appropriate labels (e.g., *claim*, *opposing claim*, or *rebuttal*) to tag their online posts. Subsequently, they were asked to interact with others by leaving comments on their posts and tagging them with the correct labels. The teacher also helped focus the students' thinking by posing questions and comments based on the TASK strategy. However, the teacher did not use the message labels. The whole purpose of the online interaction exercise was to facilitate peer and teacher feedback on students' thoughts about an argumentative topic. After completion of the online discussion, students wrote their argumentative essays on the week's topic individually.

Experimental Group 1 additionally used digital game mechanics, whereas Experimental Group 2 did not. First, a points-based system was used to motivate students to contribute their viewpoints and to support them with evidence. For example, students were awarded one point when they contributed ideas relevant to the topic using the correct message labels. Secondly, a leaderboard, which was essentially a high-score table that ranked students according to the total points they earned, was shown and refreshed every two weeks. To maximize play in the class, the topic of each lesson was given a specific context, with students taking roles to develop their arguments. For example, in Week 5, for the topic of *Putonghua should be used as the medium of instruction for Chinese lessons in primary schools*, students were given the roles of parents, principals, teachers, students with good Putonghua, and students with poor Putonghua. They were also told to imagine themselves at a meeting where they would cast their vote, voice their views and try to convince each other to switch to their side.

In the last lesson, students completed their post-test. The same assessment rubric used to evaluate the pre-test was used on the students' post-test writings. To select the interview participants, students from the

two experimental groups were divided into three levels (i.e., high, medium, and low) according to their results of their post-test. Then one student from each level was randomly chosen. This was to ensure that students of stronger and weaker ability were interviewed. The interview took place within one week after the post-test and each interview lasted around 15 minutes. The students were asked about their perceptions of using Edmodo, TASK strategy and message labels, and digital game mechanics.

Data Analysis

The students' pre- and post-test writings were first graded by the teacher using the rubric shown in Appendix A. To determine the reliability of the grading, an independent marker was asked to grade 70% of the students' essays. The overall percentage agreement between the two markers was 86%. The results of the pre-test were as follows: Experimental Group 1, blended learning + gamification (n = 22, M = 10.09, SD = 0.81); Experimental Group 2, blended learning (n = 30, M = 11.40, SD = 0.89); and Control Group, teacher-led direct-instruction (n = 20, M = 10.55, SD = 1.10).

The length of the students' pre-test essays were as follows: Experimental Group 1, blended learning + gamification (M = 344.09, SD = 55.48); Experimental Group 2, blended learning (M = 417.40, SD = 87.91); and Control Group, teacher-led direct-instruction (M = 402.90, SD = 87.71). The length of the students' post-test essays were as follows: Experimental Group 1, blended learning + gamification (M = 373.45, SD = 72.10); Experimental Group 2, blended learning (M = 517.73, SD = 110.98); and Control Group, teacher-led direct-instruction (M = 496.90, SD = 120.94).

To analyze the differences between the pre-test and post-test of the three groups, a series of ANCOVAs were performed by excluding the effect of the students' pre-test scores. The pre-test of the participants was treated as a covariate because students' prior ability could impact their subsequent writing performance. We transcribed and translated the recording of the semi-structured interviews. The student interview data were analyzed using the grounded approach (Strauss & Corbin, 1998) in relation to the following elements: (a) students' opinions of Edmodo, (b) students' opinions of TASK strategy and message labels, (c) students' opinions of learning effectiveness using the blended learning approach, and (d) students' opinions of gamification. Specifically, for each element, students' positive and negative comments, as well as suggestions for improvements were noted down.

During the course of the research, we solicited the teacher's comments about the study. We also obtained her consent to participate in a face-to-face interview at the end of the study to clarify some of her comments, and provide more in-depth explanations. The teacher's comments were analyzed using the grounded approach with regard to her views about the blended learning approach, gamification, and the teacher-led direct-instruction method.

Results

RQ 1: Does a blended learning approach improve student argumentative writing compared to a teacher-led direct-instruction approach?

The analysis of homogeneity of the regression coefficient showed that two groups had no difference in envisioning antithesis ($F_{(1, 48)}$ = 0.54, p = .464), evaluating point of view ($F_{(1, 48)}$ = 2.05, p = .159), providing rebuttals ($F_{(1, 48)}$ = 4.01, p = .051), or supporting conclusion ($F_{(1, 48)}$ = 0.00, p = .985). These confirm the assumption of homogeneity. Only stating stance did not pass the homogeneity test. Following that, analyses of covariance (ANCOVAs) were conducted to analyze the scores in the five post-tests.

For the dependent variable envisioning antithesis, the adjusted means of the blended learning and direct-instruction groups were 2.66 and 1.91, respectively (see Appendix E). There was a significant difference in the post-test scores between the two groups ($F_{(1, 47)}$ =14.21, p < .001, η^2 = .23), showing a large effect size. For the dependent variable providing rebuttals, the adjusted means of the blended learning and direct-instruction groups were 2.76 and 1.96, respectively. The post-test scores of the two groups achieved significance ($F_{(1, 47)}$ = 22.29, p < .001, η^2 = .99), showing a large effect size. For evaluating point

of view and supporting conclusion, there were no significant differences in the post-test scores. We may therefore conclude that students developed better skill in envisioning antithesis and providing rebuttals with the blended learning approach.

RQ 2: Does a blended learning approach improve student argumentative writing compared to a blended learning + gamification approach?

The analysis of homogeneity of the regression coefficient showed that two groups had no difference in envisioning antithesis ($F_{(1, 50)} = 0.20$, $p = .653$), evaluating point of view ($F_{(1, 50)} = 2.04$, $p = .159$), providing rebuttals ($F_{(1, 50)} = 10.92$, $p = .002$), supporting conclusion ($F_{(1, 50)} = 0.20$, $p = .658$), or total score ($F_{(1, 50)} = 0.77$, $p = .358$). These confirm the assumption of homogeneity. Only the stating stance variable did not pass the homogeneity test. Following that, ANCOVAs were conducted to analyze the scores in the five post-tests. There were no significant differences in the post-test scores for all variables between the blended learning and blended learning + gamification groups (see Appendix F).

RQ 3: Does a blended learning + gamification approach improve student argumentative writing compared to a control condition?

The analysis of homogeneity of the regression coefficient showed that two groups had no difference in envisioning antithesis ($F_{(1, 40)} = 0.55$, $p = .462$), evaluating point of view ($F_{(1, 40)} = 0.01$, $p = .933$), providing rebuttals ($F_{(1, 40)} = 0.00$, $p = .995$), or supporting conclusion ($F_{(1, 40)} = 0.03$, $p = .862$). These confirm the assumption of homogeneity. Only stating stance did not pass the homogeneity test. Following that, ANCOVAs were conducted to analyze the scores in the five post-tests.

For the dependent variable envisioning antithesis, the adjusted means of the gamification and direct-instruction groups were 2.40 and 1.81, respectively (see Appendix G). There was a significant difference in the post-test scores between the two groups ($F_{(1, 39)} = 5.23$, $p = .028$, $\eta^2 = .12$), showing a medium effect size. For the dependent variable providing rebuttals, the adjusted means of the intervention and control groups were 2.42 and 1.84, respectively. The post-test scores of the two groups reached a significant level ($F_{(1, 39)} = 5.76$, $p = .021$, $\eta^2 = .13$), showing a medium effect size. For dependent variables evaluating point of view and supporting conclusion, there were no significant differences in the post-test scores. We concluded that students developed better skills in envisioning antithesis and providing rebuttals with the blending learning + gamification approach.

RQ 4: Does the application of gamification increase student online contribution?

The students' contributions over seven weeks in Edmodo were coded and categorized into three groups: meaning contribution, meaning contribution with incorrect or missing message labels, and off-topic contribution. To recall, meaningful contribution referred to contributions with ideas relevant to the topic, such as stating one's perspective with the use of appropriate message labels. Contributions with relevant ideas but with missing or incorrect message labels were categorized separately. Off-topic contribution referred to any comments students made that were irrelevant or expressions of agreement or disagreement without support or giving new insights. To determine reliability, an independent marker was asked to code the students' contributions and an inter-scorer reliability of 86% was found.

One-way between subjects ANOVAs were conducted to compare the effect of gamification on levels of contribution on Edmodo between the blended learning and blended learning + gamification groups. Appendix H shows the means and standard deviations of student Edmodo contributions in each group. There were significant effects of gamification on meaningful contribution ($F_{(1, 50)} = 22.64$, $p < .001$) and off-topic contribution ($F_{(1, 50)} = 16.88$, $p < 0.001$). Our results therefore suggested that gamification helped motivate students to post more ideas relevant to the topic and fewer off-topic comments. There was no significant effect on relevant but mislabeled contributions ($F_{(1, 50)} = 2.02$, $p = 0.161$).

RQ5: How do students and teachers perceive the blended learning approach?

Students' Opinions of Edmodo

It was consistently found that all six interviewees preferred the use of Edmodo for online feedback over

face-to-face class feedback. The main reasons for this preference were that everyone could contribute at the same time, that there was more flexibility of online participation in terms of time and place, and that the environment was less stressful.

> S4: *When we discuss in class, the number of people actually involved in the discussion is limited. Usually it is always the same people who do the sharing. The other students would just sit in their seats and do not contribute … But in Edmodo, my classmates would post something they have found from different sources and my horizons were broadened. … Through the online Edmodo, we can look at it when we are at home.*

Nevertheless, there were some students who were reluctant to respond to other people's posts. Some were afraid of offending other people, while others felt that the discussion topics should have been more controversial:

> S6: *I found it somewhat intimidating to reply others' posts.*

> S3: *To attract people to respond… the discussion topics can be something of greater controversy. If we feel like arguing about it, we will be more likely to comment on what each other have said.*

Students' Opinions of the TASK Strategy and Message Labels

All six interviewees' opinions on both the TASK strategy and the message labels were very positive. They found the TASK strategy helpful in guiding them to think about the issue in a stepwise manner. The message labels enhanced clarity for the readers of the posts, and also led them to consider the purpose of the writing.

> S1: *[The TASK strategy] is useful. It helps me to analyze the issue and I can come up with more ideas this way … [The message labels] help us to identity what we are looking at. It also guides us to think about what to put in which part, to think about how to achieve what is required.*

Students' Overall Opinions of the Blended Learning Approach

All six interviews reported that they gained greater confidence in writing arguments through the blended learning approach:

> S1: *I know better about how to write argumentative essays.*

> S2: *I feel more confident overall … I have a better idea how to organize my writing.*

> S3: *I think I don't feel scared about writing argumentative essays like I did at the beginning … I know how to go about writing arguments.*

Students' Opinions of Gamification

All three students found the points-based system motivating. All students also felt that the leaderboard helped motivate online contribution. However, the leaderboard should have been made more conspicuous according to Student 1. Student 1 also suggested the addition of a level system.

> S1: *The leaderboard needs to be more easily seen, be put somewhere obvious … I think there could be a level system. Everyone likes going up higher levels.*

> S2: *I checked the leaderboard. I could see that I am one of the students with the highest score. I wanted to be at the top so I contributed even more on the forum.*

> S3: *Having a leaderboard ignites your motivation. … As you see your name moving up the rank, you feel happy and a sense of achievement.*

Teacher's Overall Opinions

Overall, the teacher felt that the blended learning model was effective in helping students write better arguments. More specifically, the teacher found the use of message labels and writing samples to be particularly useful:

> Teacher: *The message labels helped students to better clarify the components of their arguments. For example, the use of "evidence" label forced students to consider and provide relevant support for their claims, rather than base a claim on mere speculations. Message labels thus helped students reflect more carefully on their own thoughts. … By analyzing the weaknesses and strengths of the writing samples, students know what mistakes to avoid and how to structure their arguments better.*

The blended learning model also encouraged participation and peer learning. Every student participated online and read comments from classmates. The use of gamification such as points and leaderboards helped students focus on the argumentative topic. Students in the non-gamified group posted more irrelevant messages (e.g., *Hello, I'm so beautiful today*) as compared to their counterparts in the gamified group. Although the use of gamification fostered more on-task discussion, it failed to improve students' argumentative writing. According to the teacher, one possible reason is that students in the gamified group posted mostly their own opinions about the argument instead of challenging or pointing out logical fallacies in other people's views. The latter activity is an important process of constructing a strong argument in writing.

The teacher-led direct instruction allowed teachers to convey key ideas in a relatively short period of time as compared to the other two groups (i.e., blended leaning and blended learning + gamification). However, it failed to engage students to come up with their own ideas about the argumentative topics:

> Teacher: *Students tend to wait for my ideas in the teacher-led direct-instruction approach. They just want to copy my answers in their writings.*

Discussion

Three main research objectives guided this study. The first objective was to explore whether the use of a blended learning approach (grounded in the social cognitive theory of self-regulation) could improve Hong Kong ESL secondary school students' argumentative writing. The second objective was to examine whether the use of digital game mechanics could further improve students' writing and increase their online contribution. The third objective was to explore the students' and teacher's perceptions toward the blended learning approach and the use of digital game mechanics.

A significant improvement in terms of student writing was found between the blended learning group and the control group. A significant improvement was also found between the blended learning + gamification group and the control group. These results suggested that the blended learning approach was more effective in teaching argumentative essay writing as compared to a teacher-led direct-instruction method. Specifically, we found that the blended learning approach improved students' ability to envision antithesis and provide rebuttals more than other argumentative components.

In addition, we wish to highlight the following observation. The students in both the blended learning and control groups did a fair amount of additional writing in the post-tests compared to the pre-tests, while students in the blended learning + gamification group only increased a small amount in this regard. Although the results showed an increase in the blended learning and control groups' post-test essays in terms of mean word count, there was overall no significant difference among the three groups in terms of the length word gain of essays per se ($F_{(2,69)} = 2.95$, $p = .059$).

We also observed that while students in the control group had written longer post-test essays compared to students in the blended learning + gamification group, the quality of the argumentative essays in the latter was significantly higher than the control group. Although inconclusive at this moment, the above result seems to suggest that higher scores of student argumentative essays (i.e., quality of writing) may not be influenced by the word count.

Students' perceptions of the effectiveness of the blended learning approach supported the results of the quantitative study. All six interviewees expressed their preferences for online feedback through Edmodo over face-to-face discussion. They found peer interaction and feedback more effective when the discussion was done online because they could read the posts and respond to their peers without

constraints of time and space. The TASK strategy and the use of message labels were also reported to be helpful. Specifically, the TASK strategy guided students to think logically, while the message labels helped enhance students' awareness of the nature of their contributions. The use of message labels forced students to reflect prior to making their contributions (Koh, 2004). This probably led to the improvement in students' skills on more difficult tasks such as the provision of rebuttals (Koh, 2004).

The use of game mechanics motivated students to post significantly more messages on Edmodo. All three students in the blended learning + gamification group reported that the points system was motivating, while some students were particularly encouraged by their rank on the leaderboard. There are two plausible explanations for this. First, the use of game mechanics gives explicit goals for participants to aspire to (Kumar & Herger, 2013). According to goal setting theory, students' motivation can be promoted when the goals are specific and moderately challenging (Locke & Latham, 1990). In the blended learning + gamification group, students were given one point for every meaningful contribution posted. Meaningful contributions, as previously mentioned, referred to stating one's own perspective about the topic, or making posts supported by reasons or evidence. According to Jung, Schneider, and Valacich (2010), when users were given a clear goal, their engagement increased in contrast to individuals who were told to simply do their best or who were not given an explicit goal.

Second, using a leaderboard showed users where their performance stood in regard to other users. According to social comparison theory, human beings like to evaluate their abilities by comparing with those of others (Festinger, 1954). Therefore, using a leaderboard catered to the competitive nature of human beings, which prompted participants to generate more posts.

Unfortunately, our use of gamification failed to significantly improve students' argumentative writing. We found no significant differences in students' argumentative post-test scores between Experimental Group 1 (blended learning + gamification) and Experimental Group 2 (blended learning). As earlier mentioned, the teacher found that students in the blended learning + gamification group mostly explained their own opinions about the topic rather than challenging other people's views. There are two reasons for this. First, not all students were confident enough to put forward opposing views because they were either afraid of offending other people or worried that their views might not be convincing enough. Second, in retrospect, we realized that the use of gamification in the present study mainly focused on the skill of explanation using evidences. Fostering students' logical thinking could be fundamental in improving students' argumentative writing skills. By logical thinking, we mean the ability to make valid inferences (Jaakko & Sandu, 2006). In writing argumentative essays, any evidence offered to support or rebut a stance or view should be logical. For example, if the temperature in cup A was higher than in cup B and if the temperature in cup B was higher than cup C, then by logical reasoning, the temperature in cup A must be higher than in cup C. Instead of rewarding students for merely explaining their views, extra points could have been given to students who pointed out a logical fallacy in someone's views. Future research can be conducted to determine if using such a scheme would help improve students' arguments.

Conclusion

Overall, the result of this study recommends the use of a blended learning approach over a teacher-led direct-instruction approach for teaching argumentative writing. The success of the blended learning approach depends largely on several factors that worked together, including text and process modeling of how to write arguments (e.g., well- and poorly-written essays, rubrics), students' self-monitoring and judgment of the argumentation procedure (e.g., TASK method, message labels), and feedback from the teacher and peers. In the teacher's opinion, the use of message labels and writing samples were particularly useful because they specifically enhanced students' self-monitoring and self-correction of writing. When self-monitoring and self-correction are incorporated into writing, they tend to produce better essays (Graham & Perin, 2007).

The blended learning approach can be improved in the following ways. First, to help students feel more relaxed about expressing their views, it would be a good idea to assign online anonymity to them.

Students tend to contribute more critical posts, such as posts supported by evidence, when there is author anonymity than when compared to an author-identity-revealed condition (Cheung, Hew, & Foo, 2009). One legitimate concern about using online anonymity is the possible occurrence of aggressive student behavior, such as flaming (Bertera & Littlefield, 2003). However, incidences of malicious behavior occur much less frequently in an institutional course-related discussion than in public online forums because students know that they are anonymous only to their peers and not to the teacher. This motivates students to be responsible in their posting of comments. Second, in order to promote peer feedback about the argumentative topic, teachers could divide the whole class into smaller online groups of about 10 students each. Previous research has suggested that groups of 10 students help maximize online interactions among participants (Hew & Cheung, 2012). Too large a group (e.g., 20 or more) encourages the problem of lurking, while smaller groups tend to run out of ideas quickly.

Although the present study has provided a useful snapshot of the impact of gamification and a blended learning approach on student writing performance and online posting, the findings should be viewed with caution. One limitation was the small sample sizes of our three classes. Another limitation was that we sampled only female Hong Kong students as the study was conducted in a girl's school. Hence, the results of this study should not be generalized to other contexts. In the future, we intend to extend both the duration and sample size of the participants. As an example, we would investigate the effects of game mechanics over a longer period of time, preferably over six months, to see if the motivational effect of points or leaderboards holds or wears off. We could also examine how blended learning + gamification affects male students, as well as students in other subject disciplines, such as mathematics or the sciences.

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Appendix A. Assessment Rubric for Argumentative Writing

Key Components of Argumentative Writing	Assessment Indicator
Stating stance and provide evidence for one's own thesis	4 – Makes assertions with explicit evidence 3 – Makes assertions based on superficial evidence 2 – Takes a side but make assertion without supporting evidence 1 – No clear stance
Envisioning anti-thesis and their support	4 – States major alternative points of view with explicit evidence 3 – States alternative points of view with superficial evidence 2 – States obvious alternative points of view without evidence 1 – Ignores alternative points of view
Evaluating points of view, supports and questionable inferences	4 – Evaluates major points of view, supports and questionable inferences 3 – Evaluates alternative points of view, supports and/or questionable inferences 2 – Evaluates obvious points of view, supports or questionable inferences superficially 1 – No evaluation of points of view, supports or questionable inferences
Providing rebuttals	4 – Provides salient rebuttals 3 – Provides relevant rebuttals 2 – Fails to identify strong, relevant rebuttals 1 – Fails to provide relevant rebuttals
Supporting conclusion using both thesis and anti-thesis	4 – Defends conclusion using salient supports from both thesis and anti-thesis 3 – Defends conclusion using relevant supports from thesis or anti-thesis 2 – Defends conclusion using superficial supports 1 – Fails to provide supports to defend conclusion

Note. This rubric is adapted from several sources, including the taxonomy for critical thinking by Greenlaw and DeLoach (2003), the holistic critical thinking scoring rubric by Facione and Facione (1994), Kuhn's (1991) components of an argument, and the skills for a sound argument by Toulmin et al. (1990).

Appendix B. TASK Strategies With Corresponding Message Labels

Key Components of Argumentative Writing	TASK Strategy	Message Labels
Stating stance and provide evidence for one's own thesis	Stage 1: What is the topic being judged? Stage 2: What basic claim is made about the topic? Stage 4: What supports the basic claim?	*claim, opposing claim, evidence*
Envisioning anti-thesis and their support	Stage 3: Antithesis – if a reader is against the writer's claim about the topic, what would be his basic stance? Stage 4: What supports the antithetical claim?	*claim, opposing claim, evidence*
Evaluating points of view, supports and questionable inferences; providing rebuttals	Stage 5: Are there any unclear words in the piece? Stage 6: What are some of the questionable inferences, irrelevant supports, fallacies, or other weaknesses in the arguments? Stage 7: What are the assumptions or ideological influences in the basic thesis or its supports? Do any of them shake the validity of the claim?	*evidence, rebuttal, conclusion*
Supporting conclusion using both thesis and anti-thesis	Stage 8: State the full thesis in the following form: "Although (the antithesis or one of its strongest supports)…, (the basic claim)… because C (a major cause for belief in the basic claim)…"	*conclusion*

Note. These strategies are adapted from Koh, 2004 and Unrau, 1992.

Appendix C. Research Design

Week	Control Group	Experimental Group 1	Experimental Group 2
1	Pre-test	Pre-test	Pre-test
2–6	Students were introduced to (a) the five key components of argumentation, (b) the assessment rubric, and (c) the TASK strategy. In each session, students were (1) given an argumentative topic, (2) given 10 minutes to orally discuss the topic with their peers, (3) asked to do an informal oral report, and (4) asked to write an argumentative writing on the topic individually.	Students were introduced to (a) the five key components of argumentation, (b) the assessment rubric, and (c) the TASK strategy. In each session, students were (1) provided with well- and poorly-written samples of arguments, (2) asked to orally discuss the strengths and weaknesses of the well- and poorly-written samples, (3) given an argumentative topic, (4) asked to discuss the topic on Edmodo with the use of message labels, (5) provided with feedback from teachers on Edmodo, and (6) asked to write an argumentative writing on the topic individually. There was also an application of digital game mechanics. The teacher gave students a context and a role when introducing the argumentative topic. When students interacted with each other on the discussion forum, their participation was counted in a point-based system where active and meaningful participation was rewarded.	Students were introduced to (a) the five key components of argumentation, (b) the assessment rubric, and (c) the TASK strategy. In each session, students were (1) provided with well- and poorly-written samples of arguments, (2) asked to orally discuss the strengths and weaknesses of the well- and poorly-written samples, (3) given an argumentative topic, (4) asked to discuss the topic on Edmodo with the use of message labels, (5) provided with feedback from teachers on Edmodo, and (6) asked to write an argumentative writing on the topic individually.
7	Post-test	Post-test	Post-test
8		Semi-structured interviews were conducted	Semi-structured interviews were conducted

Appendix D. Argumentative Writing Topics

Week	Writing Topic
Week 1 pre-test	Many teachers incorporate songs into their lessons as they think it has various educational benefits. However, some parents oppose this as they think it is a waste of time. Write an article giving your opinions on the matter.
Week 2 session	All lives are equal.
Week 3 session	The third runway should be built in Hong Kong
Week 4 session	Kids are essential to a family.
Week 5 session	Putonghua should be used as the medium of instruction for Chinese lessons in primary schools.
Week 6 session	The sale of human organs should be legalized.
Week 7 post-test	In Hong Kong, many families have full-time working parents. Some people think it is undesirable if both parents work since it means kids are close to their maids, private tutors, and piano teachers, rather than their own parents. Others argue that it is not a big problem since parents need to find cash to make ends meet. Write an article for your school magazine giving your opinions.

Appendix E. Descriptive Data and ANCOVA Results of the Post-Tests Between the Blended Learning and Control Groups

Variable	Group	*N*	*M*	*SD*	Adjusted Mean	*SE*	*F*	η^2
Envisioning antithesis	Blended	30	2.63	0.67	2.66	0.12	14.21**	.23
	Control	20	1.95	0.69	1.91	0.15		
Evaluating point of view	Blended	30	3.20	0.71	3.13	0.13	2.47	.05
	Control	20	2.70	0.86	2.80	0.16		
Providing rebuttals	Blended	30	2.77	0.43	2.76	0.11	22.29***	.99
	Control	20	1.95	0.76	1.96	0.14		
Supporting conclusion	Blended	30	2.13	0.43	2.13	0.09	1.71	.035
	Control	20	1.95	0.51	1.95	0.11		

***p < 0.01, ***p < 0.001*

Appendix F. Descriptive Data and ANCOVA Results of the Post-Tests Between the Blended Learning and Blended Learning + Gamification Groups

Variable	Group	*N*	*M*	*SD*	Adjusted Mean	*SE*	*F*	η^2
Envisioning antithesis	Blended + gamification	22	2.27	0.77	2.40	0.15	0.52	.01
	Blended	30	2.63	0.67	2.55	0.13		
Evaluating point of view	Blended + gamification	22	3.18	0.80	3.22	0.15	0.07	.00
	Blended	30	3.20	0.71	3.17	0.13		
Providing rebuttals	Blended + gamification	22	2.32	0.78	2.42	0.14	1.98	.04
	Blended	30	2.77	0.43	2.70	0.11		
Supporting conclusion	Blended + gamification	22	1.91	0.53	2.01	0.09	0.14	.00
	Blended	30	2.13	0.43	2.06	0.08		

Appendix G. Descriptive Data and ANCOVA Results of the Post-Tests Between the Blended Learning + Gamification and Control Groups

Variable	Group	*N*	*M*	*SD*	Adjusted Mean	*SE*	*F*	η^2
Envisioning antithesis	Blended + gamification	22	2.27	0.77	2.40	0.17	5.23*	0.12
	Control	20	1.95	0.69	1.81	0.17		
Evaluating point of view	Blended + gamification	22	3.18	0.80	3.15	0.17	2.80	0.07
	Control	20	2.70	0.86	2.74	0.18		
Providing rebuttals	Blended + gamification	22	2.32	0.78	2.42	0.16	5.76*	0.13
	Control	20	1.95	0.76	1.84	0.17		
Supporting conclusion	Blended + gamification	22	1.91	0.53	1.92	0.11	0.01	0.000
	Control	20	1.95	0.51	1.94	0.12		

**p < 0.05*

Appendix H. Means and Standard Deviations on the Measure of Student Online Contribution

Types of Contribution	Condition	Score	
		M	*SD*
Edmodo_M	Blended learning + gamification***	3.82	1.59
	Blended learning only	1.87	1.36
Edmodo_C	Blended learning + gamification	0.23	0.53
	Blended learning only	0.50	0.78
Edmodo_O	Blended learning + gamification***	0.14	0.47
	Blended learning only	2.00	2.08

Note. Edmodo_M refers to meaningful contribution with correct message labels, Edmodo_C refers to meaningful contribution with incorrect or missing message labels, and Edmodo_O refers to off-topic contributions.

****p < 0.01*

About the Authors

Miss Lam Yau Wai is a full-time secondary school teacher in Hong Kong and a part-time student pursuing a Doctorate of Education degree at the University of Hong Kong. Her research interests include instructional design and e-learning.

E-mail: vywlam@connect.hku.hk

Dr. Hew, Khe Foon is an Associate Professor in the Faculty of Education (Division of Information and Technology Studies) at the University of Hong Kong. His research interests consist of online pedagogy, instructional design, and e-learning.

E-mail: kfhew@hku.hk

Dr. Chiu, Kin Fung is a lecturer in the Faculty of Education (Division of Information and Technology Studies) at the University of Hong Kong. He is interested in multimedia learning, cognitive learning, and social cognitive learning.

E-mail: tchiu@hku.hk