# Differences between the relationship of L1 learners' performance in integrated writing with both independent listening and independent reading cognitive skills

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**Abstract**

In recent decades, integrated language competence has been highlighted in the language curricula taught in schools and institutions, and the relationship between test-takers' performance on integrated tasks and comprehension sources has been much studied. The current study employed the frameworks of reading and listening comprehension processes to examine the difference between the effects of reading competence and listening competence on integrated writing performance. A total of 152 Secondary 5 students from five local schools in Hong Kong responded to three tasks, including an independent listening task, an independent reading task and an integrated writing task. The reading cognitive skills contributed more towards the performance of the integrated writing task than the listening cognitive skills did. Furthermore, the interaction between the relationships of reading and listening to the integrated writing performance was significant. Three subskills each for both listening and reading that belong to higher-order thinking skills—Elaborating, Evaluating and Creating— had significant correlation with integrated writing performance. Implications for the teaching of integrated writing were also discussed.

Keywords Integrated writing, Reading process, Listening process, Cognitive skill, Chinese language as L1

This study forms a part of a larger ongoing project aimed at exploring the cognitive process of Hong Kong secondary students in processing integrated writing tasks.

**Introduction**

In line with the unprecedented demands of writing based on real-life input sources, integrated writing—also known as writing from sources—has become increasingly popular in language testing. Students are exposed to tasks that require them to gather and synthesise information from audio and/or visual input sources, develop ideas, and then produce a piece of writing in response to a prompt. By doing so, they benefit from integrated writing, in accordance with the multi-literacies ideas of educational practice (Cope & Kalantzis, 2009; Cumming, 2013). The advantages of integrated writing are that it provides realistic and challenging literacy activities for the learners (Cumming, 2013), enables stakeholders to infer the capacity of the test-takers (Weigle, 2004), and engages test-takers in response to specific ideas and content (Cumming, 2013, 2014) with goal-directed use of language (Plakans, 2015). However, the complexity of having to engage in comprehending multiple source materials and composing a piece of writing imposes high cognitive challenges on students (Chan, Wu, & Weir, 2014; Plakans & Gebril, 2012). In Hong Kong, students take both independent and integrated tasks during public examinations. Therefore, this study aims to examine how the cognitive skills used in independent tasks (e.g., reading or listening alone) contribute to the performance of integrated writing.

Previous research has used a wide variety of approaches to explore the construct of integrated tasks and the challenges faced by test-takers, including examining the discourse features of the written or spoken texts produced by students (e.g., Chapelle, Enright, & Jamieson, 2008; Cumming et al., 2005; Frost, Elder, & Wigglesworth, 2011; Kyle & Crossley, 2016), comparing scores between integrated tasks and independent tasks (e.g., Esmaeili, 2002; Sawaki, Quinlan, & Lee, 2013), and investigating the complexity of the processes involved (e.g., Bra°ten, Ferguson, Strømsøn, & Anmarkrud, 2014; Hirvela & Du, 2013). However, the relationship between integrated writing and independent tasks has not been thoroughly researched and there is a need to provide clarity on this issue. In the following sections, we will review the research of integrated writing and its relevant comprehension components that support our attempt to construct and test the hypothesised cognitive competence borne by the test-takers.

**Literature review**

**Construct of integrated tasks**

Although a number of studies have explored the relationship between holistic scores in response to an integrated task and an independent task, their findings were inconclusive. For example, some studies have suggested that there are weak or few connections between the scores of the two types of tasks (e.g., Delaney, 2008; Guo, Crossely, & McNamara, 2013) and have consequently inferred that the cognitive skills required for the two types of tasks are different. Meanwhile, other studies have found sizable correlations (e.g., Cumming et al., 2005; Gebril, 2009; Lee, 2006) and have consequently proposed that there may be a unifying ability required in both independent and integrated tasks. For instance, a high correlation was detected between the scores in both reading and writing with a thematic connection (Esmaeili, 2002). Sawaki, Quinlan, and Lee (2013) used a multi-dimensional variable to further investigate the relationship between reading, listening and integrated writing tasks, and found that the scores on the content of integrated writing converged to a comprehension factor with reading and listening modalities, while two other aspects of integrated writing (i.e., sentence conventions and productive vocabulary) were separated from the input modalities. Although this study was among the few to have included listening modality as a source of integrated writing, the authors did not seem to have given much thought to why reading and listening can be merged into one factor. This has inspired us to further explore the relationships between reading and listening in the context of integrated writing.

By studying the process involved, the integrated writing task has been proven to surpass the independent tasks in terms of both the range and depth of the strategies used (Cumming, 2014). The comprehensive reviews conducted by Cumming (2014) and Cumming, Lai, and Cho (2016) showed that the test-takers' processes in planning, writing, revising, and editing are more or less similar to the independent writing process. However, more complex cognitive skills and strategies may be involved when evaluating the information from the source materials and integrating the information to write coherently (Bra°ten, Ferguson, Strømsøn, & Anmarkrud, 2014;

Cumming, 2014; Hirvela & Du, 2013). For instance, discourse synthesis is a model of three sub-processes; it considers that test-takers undergo 'text connection, selection, and organisation' during reading and writing. This model was first applied to first-language studies (e.g., Spivey, 1997), and later applied to second language studies (e.g., Ascencio´n, 2005; Plakans, 2009). Test-takers' strategies involved the following stages: interpretive, analytic, self-monitoring, and composing (e.g., Esmaeili, 2002; Plakans & Gebril, 2012; Yang & Plakans, 2012). Rub-Funes (2001), and Yang and Shi (2003) further documented students' synthesising, commenting on, monitoring, structuring, and elaborating ideas during writing. Plakans (2010) added handling language difficulties as another of the interacting cognitive processes, in addition to the previously described strategies. Moreover, Yang and Plakans (2012) suggested that language comprehension and production are interactive and interdependent. Such a claim obviously suggests that the process of integrated writing may be more complicated than expected, which would account for the inconsistent findings among many different types of tasks.

In addition to the cognitive processes and strategies involved in processing integrated writing, some recent research has broadened the study to include competence that emphasises the communication of ideas with interpersonal functions, textual awareness, and so on. By studying undergraduates' attempts at multiple controversy reading, Stadtler, Scharrer, Skodzik, and Bromme (2014) found that the purpose of writing may cause students to write in a one-sided fashion or to provide a more balanced view. Both Beaufort's (2004), and Chan, Inoue, and Taylor's (2015) studies have shared this focus. Beaufort (2004) constructed a conceptual model for integrated writing by emphasising the importance of discourse community knowledge and genre knowledge, while Chan, Inoue, and Taylor's (2015) suite of rubrics also contained task fulfilment (i.e., achievement of communication aim and awareness of writer-reader relationship) as one of the criteria. Given that integrated writing was sometimes considered as a fundamental skill in interpersonal communication (Cumming, 2014, p. 9), we believe that these contextual factors (e.g., aim and genres) are also important aspects in the construct of integrated writing.

In researching the integrated writing tasks adopted in public examinations in Hong Kong, Zhu (2005a) developed the Four Traits of Integrated Writing Competence (hereafter, Four Traits), which was later validated by piloting with 226 Secondary 5 students (Zhu et al., 2016a). The first trait is Contextual Awareness (IW1). IW1 requires the test-taker to apply the appropriate register in relation to the context, the audience and the purpose of writing, and to demonstrate standard usage and mechanics of practical writing. The second trait is Citation and Synthesis (IW2), which measures the test-taker's ability to select and cite relevant ideas from input source materials, synthesise those ideas that are relevant to the task prompts, and link the ideas to prior knowledge and experience whenever necessary. The third trait is Original Opinion and Argument (IW3), which focuses on the test-taker's ability to infer and predict with reference to the sources, to make practical and creative suggestions, and to provide concrete evidence and convincing explanation in arguments. The last trait is Written Expression and Organisation (IW4), which involves the test-taker applying an appropriate tone and mood to express his attitude towards the topic, as well as expressing his ideas clearly, cohesively and coherently. During the pilot study, joint factor analysis and regression analysis were employed, and closely related variables were grouped as factors. While attempting to group the variables to form the least possible number of factors, certain deliberations may differ from our accustomed understanding. For instance, IW2 includes citation and synthesis, which are two complex operations that are both part of the basic operation of extracting information from external sources and integrating it into the writing. The exploratory factor analysis (EFA) conducted in this previous study showed that the two can be merged to keep to the least possible number of factors. The other variables were merged into Contextual Awareness (IW1), Original Opinion and Argument (IW3), and Written Expression and Organisation (IW4), which tap into different aspects of integrated writing. The Four Traits accounted for 81.8% of the variance of Listening–Reading–Writing Task (Zhu et al., 2016a). Although the factors are formulated as so, it does not hold back teachers to teach the skills separately and explicitly.

Overall, previous research has revealed some understanding of the partial cognitive processes that test-takers undergo, while the construct of integrated writing remains rudimentary. With reference to this literature, we illustrate the process of integrated writing using a visualisation of the core concepts in Fig. 1,
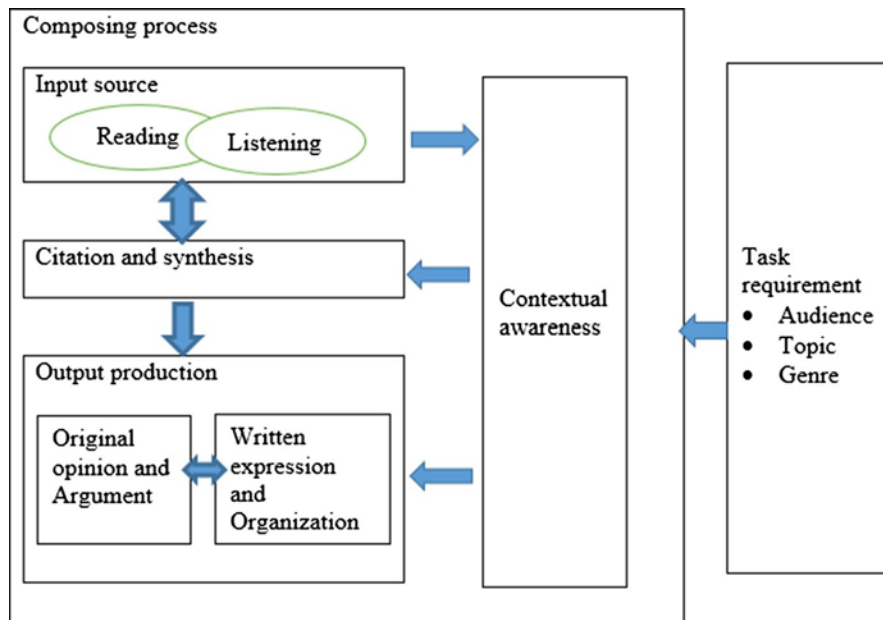
Fig. 1 Composing Process of Integrated Writing Tasks

which has the following features. First, inspired by the interactionist view of assessment (Cumming, 2014), the task prompts direct the test-taker to complete a task while keeping the situational context, awareness of self, and audience in mind (e.g., Chan, Inoue, & Taylor, 2015). Second, the integrated writing process involves the comprehending and composing sub-processes, which are interactive and interdependent in selecting and synthesising ideas from the input sources (e.g., Spivey, 1997). These ideas also integrate with the prior knowledge and original opinion of the test-taker in an attempt to respond to the task (e.g., Zhu et al., 2016a). Third, language use and organisation of text in the writing product may be distinctively separated from the comprehension process (e.g., Cumming, Lai, & Cho, 2016).

While much research has been done to explore the linguistic features of the production (e.g., Plakans & Gebril, 2013) and the skills needed in the process from input to output (e.g., Plakans, 2009; Spivey, 1997), fewer studies have examined the unique contribution of independent skills to integrated writing and the relationships between them. The current study explores the relationship between integrated writing and the comprehension sub-processes, with particular respect to the interaction between the cognitive subskills.

*Processes and cognitive subskills in reading and listening*

In this study, we are interested in identifying the cognitive processes involved in both listening and reading—especially how they affect the written product of integrated tasks, and to what extent the competence of these input modalities can predict test-takers' performance in integrated writing. We explore the relevant work done concerning the input modalities in the following subsection.

*Reading skills found in the integrated task and reading competence framework*

Extensive research on reading skills has investigated the intertextuality between source texts and students' writing. Some studies have focused on textual borrowing (e.g., Plakans & Gebril, 2013; Weigle & Parker, 2012; Wette, 2010) while others have paid attention to how the students' writing is affected by specific aspects of the source texts, for instance: signalling of conflicting views, the reading goal (e.g., Stadtler, Scharrer, Skodzik, & Bromme, 2014), genres (e.g., Keck, 2014), comprehending concepts across multiple source materials (e.g., Linderholm, Therriault, & Kwon, 2014; Thomm & Bromme, 2016), and prompts for writing (e.g., Hamp-Lyons & Mathias, 1994; Hinkel, 2002; Kobrin, Deng, & Shaw, 2011; Miller, Mitchell, & Pessoa, 2016). In the attempt to compare between integrated and independent reading tasks, Trites and McGroarty (2005) found that moderate to high correlations between ''read to integrate'' and various independent reading tasks (e.g., Nelson–Denny, TOEFL reading comprehension) existed.

Most of these studies have investigated specific aspects of integrated tasks, while only a few have taken a more macro-level approach. The Documents Model (Anmarkrud, Bra˚ten, & Strømsø, 2014; Britt, Perfetti, Sandak, &

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Rouet, 1999) sets out the sub-components representing information across the source materials, and suggests that students form connections and engage high-level language skills. However, this model focuses on the content of the text and it pays less attention to the cognitive aspect. In this paper, we explore the independent reading task further in search of a means to interpret the framework behind a reading test.

Reading is a dynamic and complex process that includes thinking, reasoning, imagining, and interpreting (e.g., Kamhi, 2007; Rumelhart, 1977; van den Broek, Young, Yuhtsuen, & Linderholm, 1999). Kintsch (1988, 1998) represented reading as two key processes, construction and integration among the surface structure, the text base, and the situation model. This three-layer model brought a balance to the roles played by the reader and the text in the comprehension process, and included various contexts as the background where reading takes place.

In a previous work, we also made reference to a six-level reading comprehension competency framework entitled 'the Six Types of Reading Comprehension Processes' (Zhu, 2005b) (hereafter referred to as the Six Reading Types framework). The indicators of this framework include: retrieving (R1), recalling explicitly stated information; explaining (R2), paraphrasing specific words and sentences; summarising (R3), summarising the main idea of the text and sorting out the interrelationship of the content; elaborating (R4), inferring implicit meanings; evaluating (R5), appraising and critiquing content, language form and textual elements; and creating (R6), generating new solutions to problems in the text. These six indicators suggest new ways of eliciting and using information provided in the text to solve real-life problems. The Six Reading Types framework was used to develop reading level descriptors in one of the standards of Chinese-language assessment in reading, writing, and integrated skills (Zhu, 2005b). These descriptors have been implemented in the Hong Kong Certificate of Education Examination (HKCEE) Chinese-language standards-referenced assessment (Hong Kong Exam- inations and Assessment Authority [HKEAA], 2005) and they are also widely referred to in the context of Chinese language assessment (Zhu et al., 2016b).

*Listening skills found in the integrated task and listening competence framework*

For listening skills, we note the scarcity of research into the comprehension of listening materials in integrated tasks (e.g., Frost, Elder, & Wigglesworth, 2011). Defined as a process in which listeners actively manipulate linguistic and non- linguistic knowledge to construct shared mutual beliefs (Brown, 1995; Vandergrift, 1999), the test-taker takes in the incoming data—the acoustic signal—and interprets it using a wide variety of knowledge, and for a particular communicative purpose. This is an ongoing and inferential process of interpreting what the text is about, based on whatever information seems relevant while listening (Alderson, 2000; Buck, 2001).

Because both listening and reading belong to the comprehension modalities, we have also adopted a six-level framework entitled 'Six Types of Listening Comprehension Processes' (hereafter referred to as the Six Listening Types framework). In parallel with the Six Reading Types framework, the listening comprehension framework includes: memorising (L1), retaining and retelling explicit information from the sources; explaining (L2), paraphrasing important information; summarising (L3), summarising the theme of the text and sorting out the ideas and the interrelationship of the content; elaborating (L4), inferring the implied meanings by applying imagination and inference to the surface meaning in listening material; evaluating (L5), appraising and critiquing the views of the speaker and his language use; and creating (L6), generating personal opinions, or solving problems by applying the information provided. The framework was first referred in the assessment standard of Hong Kong public examinations (HKEAA, 2005) because they aimed to assess students' higher-order thinking in the listening modality. The same framework was later used to study Hong Kong secondary students' Putonghua listening competence (Zhu, 2012).

In a recent study, Zhu et al. (2016a) examined the multi-variables between integrated writing tasks and independent listening tasks, and found that the indicators of elaborating, evaluating and creating in the independent listening task had significant correlations with multiple indicators in the listening–reading–writing task. In the current study, we use the Six Listening Types framework to analyse the test-takers' cognitive performance in the independent listening task.

*The relationship between listening and reading comprehension*

The Six Listening Types framework and the Six Reading Types framework collectively represent the input modality processes. According to the complexity of the thinking process involved, the first two subskills in both

frameworks are related to lower-order thinking skills, while the other four are related to higher-order thinking skills. We used these frameworks to study the interaction between these two input modalities in integrated writing.

Studies on the differences between these two modalities have produced two prevailing views. The first argues that listening and reading essentially represent different processes. Taking into account the specific linguistic characteristics, spoken language differs from written language in both syntactic and lexical features (e.g., Guthrie & Tyler, 1976; Sinatra, 1990; Smiley, Oakley, Worthen, Campione, & Brown, 1977). For example, spoken language is less likely to contain complex sentences. Considering the contextual situation, the speaker and listener are engaged in greater interaction in the same context. Furthermore, listeners make use of non- linguistic clues, such as gestures and prosodic information, or stress and intonation, in oral communication (Sinatra, 1990).

The second prevailing view takes the stance that listening comprehension and reading comprehension are highly interrelated (Sticht, Beck, Hauke, Kleinman, & James, 1974). This view mainly adheres to the idea that general language proficiency exists, and it is the foundation for both oral and written performance. Therefore, it is easy to transfer knowledge across oral and written mediums (Yoro, 2007). For language acquisition in the early stage, word-decoding and listening comprehension accounted for a large portion of the variance of reading compre-hension (Hoover & Gough, 1990). Furthermore, Diakidoy, Stylianou, Karefillidou, and Papageorgiou (2005) found that the relationship between listening and reading becomes stronger when learners have mastered the word-decoding skills to a satisfactory degree. However, they also noted that the processes of listening and reading comprehension may diverge when the students process lengthy and difficult texts (e.g., expository text). Nevertheless, the task demands of listening and reading are inherently different in the linguistic characteristics, but their cognitive processes share a lot in common. In integrated writing tasks, the students have to read multiple texts and listen to a lecture or talk. One of the aims of this study is uncover whether these two processes converge or diverge in the task.

*The Relationship between listening and reading in integrated writing*

Studies on the relationship between listening and reading in integrated writing have yet to yield substantial results, with more work indicating that listening, reading and integrated writing were significantly correlated. For instance, Sawaki, Quinlan, and Lee (2013) found the content factor extracted from students' performance in integrated writing was highly correlated with independent reading and listening skills, ranging from .83 to .87, implying that the skills measured in independent tasks were almost same as skills for retrieving information from verbal and written medians in integrated tasks. Plakans and Gebril (2013) further found that listening and reading accounted for 31 and 22% variance of integrated writing respectively in TOEFL Internet-based Test (iBT), suggesting that listening plays a more important role in integrated writing as compared to reading. However, these studies do not seem to have considered the interrelationship between listening and reading, which raised a further question on whether these two modalities would contribute to integrated writing separately or if they would influence each other.

Although not designed to study integrated writing, Mayer and Sims's (1994) study may shed some light to our investigation on the relationship between the two input modalities. They found that when both written and verbal information were presented, participants could produce more effective solutions to a real-world problem than the groups who processed the two sources successively. The researchers also found that participants who possessed high visual-spatial ability were more capable of using ability-as-compensator when verbal information was provided separately. The 'Ability-as-compensator' effect allows the high ability students to retain more visual information in the working memory so as to connect it with the incoming verbal information later, whereas low ability students relied more on simultaneous presentation of both modalities. Indeed, similar effect has also been found in other studies when both visual and verbal learning were involved (e.g., Waddill, & McDaniel, 1992; Scheiter, Schu¨ler, Gerjets, Huk, & Hesse, 2014).

Existing research have made some attempts to investigate the influence of individual difference in language proficiency. Cumming (2013) pointed out that a major constraint on integrated tasks arises from the fact that for both comprehension and production, the test-taker needs to reach a threshold level of language proficiency in order to perform the task competently. In relation to the threshold level, Plakans (2009) had compared high- and low-scoring writers, and determined that the discourse synthesis processes were more common with the more proficient test-takers. The lower-proficiency writers, on the other hand, had paid more attention to fundamental language

demands, such as constructing sentences and selecting vocabulary. As mentioned in Wells (1987)'s four-level taxonomy, when learners become more capable of using language at the informational and epistemic level, both the spoken and written languages will converge more (pp. 110–111). While these arguments and findings are valuable to understand the relationship between input modalities and integrated writing, it is unclear about the impact of individual difference in reading or listening on integrated writing.

While we anchored to the theoretical basis in integrated writing and asserted that listening and reading comprehension are highly related, we also borrowed concept of ability-as-compensator as a possible effect interplaying between them.

**The present study**

The current study uses a multifaceted approach to study the relationship between three tests for Chinese-language assessment that are publicly administered by the Hong Kong Examination and Assessment Authority (HKEAA). The integrated writing task is currently in use in the Chinese-language assessment of the Hong Kong Diploma of Secondary Education (HKDSE). The integrated writing task requires students to listen to and read source materials, and then produce a piece of writing based on the ideas or information from the sources. The Four Traits framework was introduced to the Hong Kong public examination of Chinese language and it has since been widely used in school-based assessment (Zhu, 2005a, b; HKEAA, 2005).

Due to the complex nature of language competence, there is a common consensus that a single assessment cannot fully reflect the students' performance (Diakidoy, Stylianou, Karefillidou, & Papageorgiou, 2005). In addition to the integrated writing task, the Chinese language assessment includes independent listening, independent speaking, independent reading, and independent writing tasks. The requirement of HKDSE provides a unique opportunity to investigate the relationships between different types of language skills in the L1 context. A practical issue emerged because Chinese language teachers seem to face challenges in differentiating and preparing students for both integrated writing and reading assessments, because the integrated writing task already includes comprehension of the source texts (Zhu & Wu, 2013; Zhu, 2015). Consequently, the present study not only enriches the theoretical understanding of the relationship between the variables that constitute the cognitive skills involved in independent reading, independent listening, and integrated writing in Chinese language assessment, but may also provide further guidance for teacher instruction. Our research questions are as follows:

1.      To what extent can reading comprehension and listening comprehension demonstrated during the independent reading and listening tasks, respectively, predict the performance of the integrated writing task? Are there any differences in the predicting ability between the two input modalities?

2.      Is there an interaction between the relationship of the two input modalities (i.e., reading and listening) to the test-taker's integrated writing performance? If yes, how does the relationship of one independent task to integrated writing change across the different levels of another independent task?

With regard to the first question, previous research had indicated that the linguistic features will diverge (e.g., Guthrie & Tyler, 1976; Sinatra, 1990) and the cognitive processes will converge (e.g., Yoro, 2007). In terms of the two input modalities, Plakans and Gebril (2013) have indicated that listening comprehension makes a bigger contribution to integrated writing, we expect that the performance of listening may play a more important role than that of reading. Looking at the Four Traits of integrated writing, we expect that the input modalities may contribute more towards the first two traits—that is, Contextual Awareness (IW1) and Citation and Synthesis (IW2)— because students have to retrieve and integrate information from both modalities. Meanwhile, the third trait, Original Opinion and Argument (IW3), which focuses on the test-taker's ability to provide original ideas with necessary evidence and explanation, may be least predictable. Finally, some aspects, such as sentence conventions and productive vocabulary—that is, Written Expression and Organisation (IW4)—are more closely related to writing and therefore may be less predictable by the input modalities.

With regard to the second question, previous studies have discussed the comprehending and composing processes as interactive and interdependent (e.g., Spivey, 1997; Yang & Plakans, 2012), and that the processes of listening and reading comprehension may diverge when the texts used in the task are lengthy and difficult (Diakidoy, Stylianou, Karefillidou, & Papageorgiou, 2005). However, less is known about the way of interaction. As such, we were inspired by the concept of

the ability-as-compensator found in multimedia learning studies (e.g., Mayer & Sims, 1994). The effect of the ability-as-compensator argues that one high cognitive ability sometimes compensates for the negative situation in receiving input information. Therefore, we hypothesis that there is also such a similar effect within the process of integrated writing. That is to say, when students possess high ability in one modality, they may still comprehend the input materials even if the ability of another modality is low. If the hypothesis is proven, there should be a statistical interaction between the relationships of listening and reading to integrated writing.

**Method**

Participants

In total, 173 Secondary 5 students (with an average age of 17) from five secondary schools in Hong Kong completed the three tasks. The five schools covered all three bands1 in Hong Kong, providing participants with varying academic achievement for this study. Because integrated writing skills are part of the curriculum (Curriculum Development Council, 2001; Zhu, 2005a; Zhu et al., 2016a), all of the recruited participants were familiar with it. The schools accepted our invitation to participate in this project and all of the participants expressed their explicit consent to voluntarily participate in this project. Due to the students' tight school schedules, the three tests were conducted over two consecutive days. The reading task and listening task were conducted on the first day and the integrated task was conducted on the second day. All of the tasks were conducted in the classrooms where the participants usually had their Chinese lessons. Some of the participants (N = 21) asked for leave on either the first or second day and therefore did not complete all three tasks. These students were ruled out in the data analysis, leaving 152 students for analysis—68 males and 84 females.

*Instruments*

We used a set of tests that included a reading task, a listening task, and an integrated writing task (i.e., the listening–reading–writing task) that were developed based on the Six Reading Types framework, the Six Listening Types framework and the Four Traits framework.

*Reading task*

The reading task contained two argumentative passages. The first passage was 1171 Chinese characters in length and was based on the topic 'Criticism of Different Perspectives in Academia'. The second passage contained 1790 Chinese characters on the topic of 'The Origin of the Human Race'. The topics and length were verified as appropriate by experienced teachers during focus group meetings. Each passage was followed by seven to eight question items, including multiple-choice questions and short-answer questions (see ''Appendix Table 4''). The maximum duration of the whole reading task was 40 min. The number of items for each indicator of the Six Reading Types framework was as follows: Retrieving (three items), Explaining (three items), Summarising (three items), Elaborating (two items), Evaluating (two items), and Creating (two items). Cronbach's Alpha was .69 for the reading task, indicating an acceptable reliability (Hair, Anderson, Tatham, & Black, 1998).

*Listening task*

The listening task was based on an audio recording of a forum, which was played in two sections. The audio recording was approximately 8 min long. The forum topic was on Chinese traditional art. The participants of the forum included a professor who specialised in this field and three members of a student council. The participants discussed various art forms, key features, and essential techniques in relation to Chinese traditional art. The conversation was followed by 14 questions including multiple-choice items and cloze passages. The test-takers were also required to fill in a table and answer short-answer questions (see ''Appendix Table 5''). Adopting the Six Listening Types framework, the number of items for each listening skill were as follows: Memorising (two items), Explaining (two items), Summarising (four items), Elaborating (two items), Evaluating (two items) and Creating (two items). In addition to the time required for listening to the audio recording, the test-takers were allowed another 20 min to complete the task. Cronbach's Alpha for this test was .60, which was within an acceptable range (Hair et al., 1998).

*Integrated writing task*

The integrated writing task included a 5-min audio recording, five written passages of approximately 2000 words total, and a prompt to respond to an email based on the reading and listening materials. These materials were carefully selected and designed because the base text provided in the task influenced the intertextual understanding (Bigot & Rouet, 2007). The audio recording contained a discussion among three members of the student council on organising their second year of Chinese Traditional Art Week. The details included the theme, the activities, and the publicity strategies. The five written passages included: (1) An email from the corresponding teacher who reviewed the first Art Week and provided suggestions for improvement. (2) The programme outline of the school's first Chinese Traditional Art Week for the students' reference to design this year's programme outline. (3) A newspaper article that introduced the various Chinese traditional art forms, some of which were suitable for school exhibition. (4) The school's online forum where the students post ideas and suggestions on organising the Art Week, which featured a range of opinions from describing how meaningful it is to conserve Chinese culture and urging others to support the event to expressing no interest in participating at all. Some posts also provided constructive suggestions (e.g., incorporating technology) to attract public interest. The test-takers could select different ideas based on their own personal opinion and argue against some ideas as appropriate. (5) Survey results from the first Art Week with diagrams and tables to illustrate the participation rate and feedback on the satisfaction level of the participants. This allowed the test-takers to make decisions on which activities to keep or improvise upon. Many curricula require students to read and understand 'non-continuous texts' such as diagrams and tables (e.g., HKCDC, 2001) because they feature a considerable amount of information and the ability to do so is a crucial part of everyday knowledge (Åberg-Bengtsson & Ottosson, 2006; OECD, 2009). While additional perceptual skills are required, research has shown that the cognitive process of comprehending tables and diagrams is interactive and involves bottom-up and top-down processing (Freedman & Shah, 2002), which in many ways is similar to text compression. Further research also proved that the cognitive nature and perceptual properties of diagrams and tables influenced the participants' engagement with the task (Yu, He, & Isaacs, 2017; Yu, Rea-Dickins, & Kiely, 2012). Therefore, this source material was included in the integrated writing task. Contradictory perspectives were also included across the materials because effective comprehension of controversial issues has become imperative with the advance of communication technologies, while leaving the readers a plethora of information to decipher at one's discretion (Bråten, Ferguson, Strømsøn, & Anmarkrud, 2014). The test-takers could select ideas based on personal opinion and argue against ideas as they feel appropriate.

The task prompt required the test-takers to write an email in response to the corresponding teacher in the capacity of the student council president. The time allocated was 1 h, which included the listening and reading portions, and the composition of a piece of writing with no less than 400 Chinese characters. Cronbach's Alpha for this test was .86, indicating a good reliability.

Rating procedure

A pilot study was conducted with 36 Secondary 5 students for all three tasks. The tasks and the mark schemes were then adjusted and finalised based on the students' performance. For the listening and reading tasks (except for a few objective items), reference answers were provided for each rating level. These reference answers were developed from the students' actual answers. For the integrated writing task, the rubrics of the Four Traits (see ''Appendix Table 6'') were used (Zhu, 2005a; Zhu et al., 2016a). Typical student answer scripts were included as examples of the marking scheme of the rubrics of the integrated writing task.

For all three tasks, each script was marked by two raters, who both have more than 6 years of teaching experience in secondary schools. To ensure that the raters used the marking schemes accurately and consistently, focus group discussions were held where the task design, marking scheme, and general guidelines were discussed in detail. The raters then marked 30 scripts in trial for each task, and the results were reviewed. Discrepancies were discussed to arrive at agreed scores. The inter-rater reliability for the six skills (indicators) of the reading task ranged from .73 to .88. The inter-rater reliability for the six skills (indicators) of the listening task ranged from .70 to .94. The inter-rater reliability for the Four Traits (indicators) of the integrated writing task ranged from .74 to .87.

Statistical analysis

The task scores were entered into SPSS (Version 24.0) for statistical analysis. Descriptive statistics (i.e., mean, standard deviation (SD), and skewness and kurtosis) were first calculated to examine the central tendencies,

variation, and distributional properties of the data. A Pearson product-moment correlation analysis was then conducted to determine whether there was a connection between the scores of both the reading task and the listening task with the integrated writing task. Hierarchical regressions were next carried out to explore the contribution of reading and listening to the integrated writing performance. Regression assumptions were first checked by examining the normality, linearity, and homoscedasticity. Given the fact that listening comprehension and reading comprehension are closely correlated, we also checked the collinearity for each regression model and found that the value of variance inflation factor was 1.51, which was within the acceptable range (Hair et al., 1998).

Finally, we were also interested in whether there was any interaction between the relationships of the different predictors with writing performance. Typically, interaction takes place when one variable's (X) effect on another variable (Y) is influenced by the magnitude of a third variable (M), or vice versa (Hayes, 2013). To examine this, we ran the regression using the total scores of reading and listening together with an interaction term from them as predictors to examine whether the interaction was significant in the regression model. Additionally, conditional effects at different levels of the predicting variables were examined. Following Aiken, West, and Reno's (1991) procedure to analyse the interaction effect between continuous variables, we computed the values representing the different levels for all of the variables of interest by adding and subtracting one SD from the mean of the respective variable. All of these analyses of interaction effects were performed using PROCESS macro (Version 2.16.3), which is an SPSS macro that was developed by Hayes (2013). This macro enabled us to complete all of the necessary computations automatically.

**Results**

*Descriptive statistics*

Table 1 presents the descriptive statistics of all of the variables of the students' performance from the three tasks. Generally, the students performed well in some lower-level skills, such as retrieving in reading and memorising in listening, as indicated by the scoring percentages. The data can be considered normally distributed because the absolute values of skewness were less than 3 and the absolute values of kurtosis were less than 10 (Kline, 2005). Therefore, follow-up statistical analysis was conducted accordingly.

Table 1 Descriptive statistics for all indicators of the three tasks (N = 152)

| | Min | Max | Full score | Mean (converted to percentage) | SD | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| *Reading task* | | | | | | | |
| Retrieving (R1) | 1.00 | 6.00 | 6.00 | 4.70 (78.33%) | 1.20 | − 0.69 | 0.22 |
| Explaining (R2) | 0.00 | 8.00 | 8.00 | 3.37 (42.13%) | 1.97 | 0.21 | − 0.61 |
| Summarizing (R3) | 0.00 | 11.00 | 11.00 | 7.14 (64.91%) | 2.66 | − 0.52 | − 0.51 |
| Elaborating (R4) | 0.00 | 9.00 | 9.00 | 3.31 (36.78%) | 1.95 | 0.29 | − 0.47 |
| Evaluating (R5) | 0.00 | 8.00 | 9.00 | 3.51 (39%) | 1.79 | 0.17 | − 0.35 |
| Creating (R6) | 0.00 | 7.00 | 8.00 | 3.55 (44.38%) | 1.45 | 0.10 | − 0.10 |
| Total | 5.33 | 40.00 | 51.00 | 25.59 (52.73%) | 7.29 | − 0.51 | − 0.01 |
| *Listening task* | | | | | | | |
| Memorizing (L1) | 1.00 | 2.00 | 2 | 1.81 (90.50%) | 0.39 | − 1.59 | 0.53 |
| Explaining (L2) | 0.00 | 2.00 | 2 | 1.03 (51.50%) | 0.70 | − 0.03 | − 0.96 |
| Summarizing (L3) | 2.00 | 6.00 | 6 | 4.90 (81.67%) | 1.02 | − 0.47 | − 0.80 |
| Elaborating (L4) | 1.00 | 9.00 | 9 | 4.80 (53.33%) | 1.71 | 0.17 | − 0.22 |
| Evaluating (L5) | 0.00 | 7.00 | 8 | 2.83 (35.38%) | 1.78 | 0.26 | − 0.58 |
| Creating (L6) | 0.00 | 4.00 | 4 | 1.28 (32.00%) | 0.93 | 0.76 | 0.58 |
| Total | 7.00 | 27.00 | 31 | 16.65 (53.71%) | 4.00 | 0.20 | − 0.33 |
| *Integrated writing task* | | | | | | | |
| Contextual awareness (IW1) | 1.00 | 20.00 | 20 | 16.48 (82.40%) | 4.10 | − 2.46 | 6.00 |
| Citation and synthesis (IW2) | 1.00 | 19.00 | 20 | 10.52 (52.60%) | 3.09 | − 0.13 | 0.68 |
| Original opinion and argument (IW3) | 0.00 | 19.00 | 20 | 8.61 (43.06%) | 3.88 | 0.13 | − 0.01 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Written expression and organization (IW4) | 4.50 | 16.00 | 20 | 10.65 (53.27%) | 2.22 | 0.07 | 0.07 |
| Total | 11.00 | 68.00 | 80 | 46.27 (57.83%) | 9.56 | – 0.80 | 1.27 |

*The relationships between the integrated writing task and the independent tasks*

A Pearson product-moment correlation analysis was performed to examine the relationships between the scores of the two independent tasks (i.e., the reading task and the listening task) and the integrated writing task. As shown in Table 2, the correlation of the total scores between the reading task and the integrated writing task was 0.40 (p \ 0.001), and all of the subskills of the reading task significantly correlated with the total score of the integrated writing task, with r ranging from .16 to .34. In contrast, for the listening task, a significant correlation existed between the total scores of the listening task and the integrated writing task (r = .32, p \ 0.001), but among the six subskills, only three higher-order skills—Elaborating (L4), Evaluating (L5), and Creating (L6)—correlated with the total score of the integrated writing task significantly, with r ranging from 0.22 to 0.34. From these results, it can be inferred that both reading and listening have a positive association with the performance in integrated writing. Especially, due to the different number of skills correlated with integrated writing between reading and listening, it was inferred that the three higher-order skills of both reading and listening—Elaborating (R4, L4), Evaluating (R5, L5), and Creating (R6, L6)—were more necessary to complete the integrated writing task.

Table 2 Correlation matrix between the scores of the two independent tasks and the integrated writing task

| | Contextual awareness (IW1) | Citation and synthesis (IW2) | Original opinion and argument (IW3) | Written expression and organization (IW4) | Total |
|---|---|---|---|---|---|
| *Reading task* | | | | | |
| Retrieving (R1) | .29*** | .22** | .23** | .23** | .34*** |
| Explaining (R2) | .21** | .13 | .04 | .07 | .16* |
| Summarizing (R3) | .27** | .30*** | .17* | .21** | .33*** |
| Elaborating (R4) | .26** | .19* | .12 | .14 | .25** |
| Evaluating (R5) | .20* | .31*** | .17* | .23** | .31*** |
| Creating (R6) | .14 | .20* | .10 | .08 | .18* |
| Total | .35*** | .35*** | .20* | .24** | .40*** |
| *Listening task* | | | | | |
| Memorizing (L1) | .12 | – .04 | .06 | .04 | .07 |
| Explaining (L2) | 0 | .14 | .06 | .07 | .09 |
| Summarizing (L3) | .03 | – .08 | – .01 | – .08 | – .04 |
| Elaborating (L4) | .18* | .21** | .12 | .12 | .22** |
| Evaluating (L5) | .26** | .34*** | .17* | .21** | .34** |
| Creating (L6) | .27** | .23** | .13 | .14 | .27** |
| Total | .27** | .29*** | .17* | .18* | .32*** |

*p \ .05, **p \ .01, ***p \ .001 (2-tailed)

For the correlations between the subskills of both listening and reading, and the Four Traits of integrated writing, 16 out of 24 correlations between the subskills of the reading task and the integrated writing task were significant. Among them, three reading subskills—Retrieving (R1), Summarising (R3) and Evaluating (R5)—had significant correlations with all of the Four Traits, p \ 0.05. This was probably because the students needed to retrieve or integrate specific information from the texts back and forth, and then evaluate the usefulness of the materials to their writing. Meanwhile, of the 24 correlations between the listening and integrated writing skills, only 8 were significant. The Evaluating (L5) skill had significant correlations with all of the Four Traits, p \ 0.05. The correlations of these subskills may imply that more reading subskills than listening subskills were required when completing the integrated writing tasks.

*Prediction of the total scores of both independent tasks to the integrated writing task*

Because both listening and reading skills were significantly correlated with the integrated writing, hierarchical regressions were performed to determine their unique contribution to integrated writing. The dependent variables were the scores of the integrated writing task; that is, the scores of each of the four traits and the total score. The independent variables were the total scores of the two independent tasks. To examine the relationships among these variables thoroughly, the independent variables were entered in the model in a different order each time. Therefore, two hierarchical regressions were performed for every dependent variable.

Some meaningful results were found (see Table 3). First, reading and listening together accounted for different portions of the variance of the various dependent variables, ranging from 4.5 to 17.2%. Among the regressions predicting the Four Traits of integrated writing, reading and listening may have more prediction to Contextual Awareness (IW1) and Citation and Synthesis (IW2) than Original Opinion and Argument (IW3) and Written Expression and Organisation (IW4). This result was reasonable because the latter two traits may relate more strongly to the independent writing skills.

Second, when the total score of listening was placed ahead of reading in the regression model, it was able to significantly predict all of the Four Traits and also the total score of the integrated writing by explaining from 2.8 to 10.2% variance of the dependent variables. However, as soon as the reading score was entered at the second step in the model, listening became non-significant in each regression model. Similarly, when reading was placed in the first step, reading alone accounted for 4.1–16% variance of various dependents and the contribution listening was insignificant when it was entered the regression model in the second step.

Considering these results, we speculated that reading played a more important role than listening in completing the integrated writing. The non-significant contribution of listening comprehension may have arisen because listening and reading shared much in terms of the cognitive process. Therefore, this can also account for the variance in integrated writing that can be explained by listening.

Table 3 Hierarchical regression analysis of the integrated writing task on the total scores of both independent tasks

|  | Step 1 | Step 2 |
|---|---|---|
| **Dependent: contextual awareness (IW1)** | | |
| blistening | 0.27** | 0.10 |
| breading | | 0.29** |
| $R^2$ | 0.073** | 0.129*** |
| $DR^2$ | | 0.055** |
| breading | 0.35*** | 0.29** |
| blistening | | 0.10 |
| $R^2$ | 0.122*** | 0.129*** |
| $DR^2$ | | 0.007 |
| **Dependent: citation and synthesis (IW2)** | | |
| blistening | 0.29*** | 0.14 |
| breading | | 0.27** |
| $R^2$ | 0.085*** | 0.133*** |
| $DR^2$ | | 0.048** |
| breading | 0.35*** | 0.27** |
| blistening | | 0.14 |
| $R^2$ | 0.120*** | 0.133*** |
| $DR^2$ | | 0.012 |
| **Dependent: original opinion and argument (IW3)** | | |
| blistening | 0.17* | 0.08 |
| breading | | 0.16 |
| $R^2$ | 0.028* | 0.045* |
| $DR^2$ | | .016 |
| breading | 0.20* | 0.16 |

| | | |
|---|---|---|
| blistening | | 0.08 |
| R2 | 0.041* | 0.045* |
| DR2 | | 0.005 |
| Dependent: written expression and organization (IW4) | | |
| blistening | 0.18* | 0.05 |
| breading | | 0.21* |
| R2 | 0.031* | 0.061** |
| DR2 | | 0.030* |
| breading | 0.24** | 0.21* |
| blistening | | 0.05 |
| R2 | 0.059** | 0.061** |
| DR2 | | 0.002 |
| Dependent: overall score of integrated writing | | |
| blistenig | 0.32*** | 0.13 |
| breadig | | 0.32** |
| R2 | 0.102*** | 0.172*** |
| DR2 | | 0.07** |
| breading | 0.39*** | 0.32** |
| blistening | 0.160*** | 0.13 / 0.172*** |
| R2 | | |
| DR2 | | 0.011 |

*p \ .05, **p \ .01, ***p \ .001* (2-tailed)

*Interaction between the relationships of the two independent tasks to the integrated task*

On the basis of these results, the interaction effect was further analysed to determine the contribution of listening and reading to integrated writing. A regression model was constructed using the PROCESS macro. It was found that the interaction term multiplied by the listening and reading scores made a statistically significant 5.36% contribution to integrated writing (B = - 0.08, SE = 0.03, t (3, 148) = - 2.86, p \ 0.01). This indicates that the relationship between reading and integrated writing was affected by the relationship of the listening to the writing, and vice versa.

Figure 2 illustrates the significant interactions between reading and listening on reading and writing. In this figure, the horizon axis represents the centred total score of reading. The three points representing high, medium and low levels were ? 1 SD (i.e., mean ? 7.29), 0 (Mean), and low (mean - 7.28), respectively. The separated lines represent the effect of reading on integrated writing at three different levels of listening. The high, medium and low values for listening were 1 SD (i.e., 4) below the mean (i.e., 12.6; low), the mean (i.e., 16.6; medium), and 1 SD above the mean (i.e., 20.6; high), respectively.

As shown in Fig. 2, the prediction of reading to the integrated writing performance varied significantly at different levels of listening. Reading had a significant prediction to writing at low and medium levels of listening (B = 0.60, p \ 0.001; B = 0.30, p \ 0.05, respectively). In other words, as the score of reading increased by one point, the low and medium levels of the listeners increased by 0.6 and 0.3 points in writing, respectively. However, reading had no significant prediction correlation to writing at a high level of listening (B = 0, p [ 0.05). Figure 2 also showed that when the students' level of reading comprehension was low but listening comprehension level was high, they still achieved relatively good performance in integrated writing. However, when their reading comprehension was at a high level, listening only had a minor influence on writing because the test- takers' writing scores maintain a relatively high level (i.e., no less than 49.16) no matter how high the listening level is.
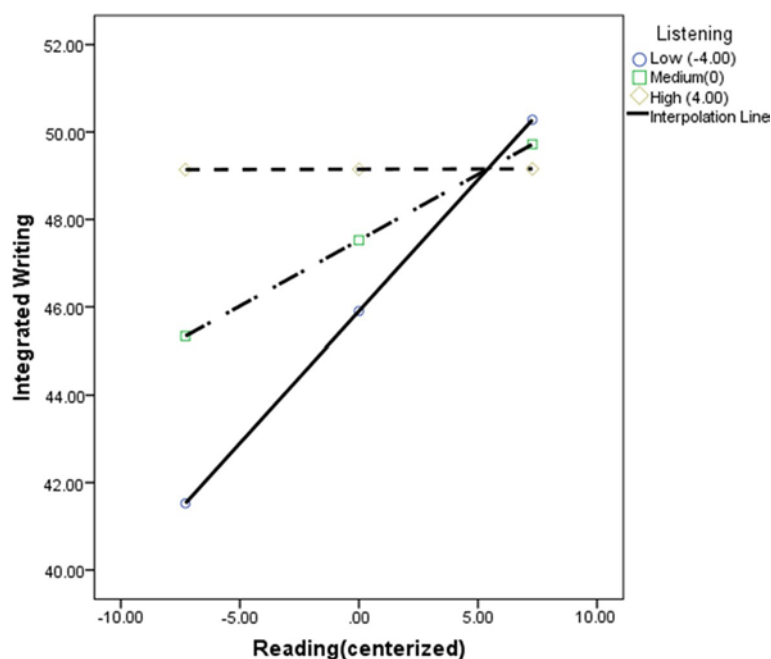
Fig. 2 Simple slopes of reading on writing at low (1 SD below the mean), medium (mean), and high (1 SD above the mean) levels of listening

**Discussion**

The current study aimed to examine the relationship of the cognitive skills demonstrated during independent tasks and during integrated writing performance. It also aimed to find the difference between the effects of reading skills and listening skills on integrated writing performance.

*The effect of reading and listening competencies on the overall performance of the integrated writing*

The total score of the integrated writing task performance showed that there was a significant correlation with each of the scores of the reading task and the listening task. This result was expected considering the nature of the integrated writing task, for which the test-taker needs to retrieve and integrate information from the two mediums. However, together they can only explain 17.2% variance of the total score of the integrated writing task, which was relatively small. This implies that reading and listening have a significantly positive but limited effect on integrated writing. These results seem to contradict the moderate to high correlations found in previous studies findings (Trites and McGroarty, 2005; Sawaki, Quinlan, & Lee, 2013). To explain the discrepancy, we speculated that the reason lies in the different task requirements. It should be noted that the integrated writing tasks used in aforementioned studies only required participants to connect ideas from different source texts and, therefore, comprehension of the texts became extremely important. If some important ideas were missing, then the students would be unable to write a well-summarised essay. However, in our study, the students not only had to retrieve and summarise the important information from the listening and reading source materials—they also had to generate their own original opinion and provide reasonable arguments. Therefore, reading and listening could only explain a small portion of the variance of the integrated writing. The low contribution from the input modalities also implies that the integrated writing task in the HKDSE constitutes a language competence that is not assessed by the independent listening and reading tasks.

The present study also found that reading played a more important role in predicting integrated writing performance than listening. Listening alone can explained 2.8–10.2% variance of the Four Traits and the total score of integrated writing, which were less than that of reading. Moreover, listening became a non- significant predictor when reading was entered in the regression models.

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Again, this result is outside our expectations, and it is not consistent with Plakans and Gebril's (2013) study, in which they found that listening contributed 31% predictive value while reading contributed 22% predictive value. This may be due to the fact that Plakans and Gebril's (2013) findings were based on the analysis of source texts and written essays as the content, thus the inclusion of certain ideas may have had an important influence on the writing. However, in this study we explored the relationship between listening, reading and integrated writing from a cognitive perspective. Given the similar processes of listening and reading, the subskills used in the reading process can also function well in listening comprehension, which therefore makes the contribution of listening insignificant. As mentioned earlier, the cognitive skills of reading and listening converged significantly for the test-takers because they had passed the decoding development stage (Diakidoy, Stylianou, Karefillidou, & Papageorgiou, 2005; Sticht et al., 1974). Following this argument, we also infer that the input from written information was more important to test- takers when simultaneously processing written and verbal information.

*Relationship of individual reading and listening skills and the integrated writing task performance*

A common phenomenon was identified between the effects of the reading and listening skills. Three skills—Elaborating (R4, L4), Evaluating (R5, L5) and Creating (R6, L6)—were identified as having statistically meaningful correlations with the integrated writing task. This result corroborates our assumptions and previous findings. Zhu et al. (2016a) reached the conclusion that the indicators of Elaborating, Evaluating and Creating in an independent listening task were significantly correlated with the total score of an integrated writing task.

The three skills—Elaborating (R4, L4), Evaluating (R5, L5) and Creating (R6, L6)—are all higher-order thinking skills. We argue that this adheres to the idea that general language proficiency exists, and that information and knowledge is transferable across the oral and written mediums (Sticht et al., 1974; Yoro, 2007). Borrowing Wells's (1987) four levels of literacy, our study also agrees that the convergence of the oral language and written language happened at the two higher levels; that is, the informational and epistemic levels. Consequently, classroom teaching and assessment should place more emphasis on the integrative approach and higher-order thinking. Therefore, as in an L1 context, the objectives of integrated writing tasks should not only assess students' abilities in using information from various sources to produce a writing product but should also assess their higher-order thinking skills (HKEAA, 2005, 2012).

The fact that these three skills emerged from the current study has brought our attention to the differences between L1 and L2. Most L2 integrated writing tasks require test-takers to select the source materials and synthesise what they learn into their writing. However, previous research has revealed that test-takers tend to include more ideas, which are often less developed, compared with their independent writing responses (Lewkowicz, 1994). By providing test-takers with sources, L2 writing tends to reduce the demand for creativity (Plakans, 2008; Read, 1990). In contrast, because L1 learners usually have higher proficiency to understand aural and written sources, and because they apply language conventions with more ease (Zhu et al., 2016a), they are better able to demonstrate higher-order cognitive ability than their L2 counterparts.

With regard to the differences between the effect of the reading and listening competence on the integrated writing task, both Retrieving (R1) and Summarising (R3) in the reading task had significant correlations with the integrated writing task, while this effect was not seen in the listening task. This finding may be attributed to the difference in the access time between reading and listening. The test-takers had the opportunity to refer to the reading source throughout the whole process of writing, while they could only access the listening source once. We argue that given this condition in reading, it would be easier for them to grasp key concepts and evaluate them than to reiterate the details. This finding in L1 echoes the results of the studies of L2 by Cummings et al. (2005, 2006), who found that

the tendency of copying information was more frequently captured in a reading–writing test than in a listening–writing test.

*Prediction of reading and listening on different traits of integrated writing*

As shown in the hierarchical regression results, both the scores of the reading task and the listening task had significant prediction effects on each of the Four Traits of the integrated writing task. Looking into each of the Four Traits, both reading and listening skills had a relatively greater effect on Contextual Awareness (IW1) and Citation and Synthesis (IW2). Because previous studies have claimed that the ability to synthesise appropriate content from source materials contributes to success in integrated writing tests (Ascencio´n, 2005; Plakans, 2008), it is understandable that both reading and listening competencies had significant prediction effects on the Citation and Synthesis (IW2). The prediction effect of both the reading and listening abilities on Contextual Awareness (IW1) was, however, less discussed in previous studies. Contextual Awareness (IW1) is a new area that closely relates to the communicative functions of language. Several related factors can be observed in a few other research frameworks, such as discourse community knowledge (Beaufort, 2004) and task fulfilment (Chan, Inoue, & Taylor, 2015).

Considering that the current study is based in Hong Kong, and that the design of the integrated writing task is similar to that which is implemented in Hong Kong public examinations and practiced in schools, there could be three reasons for the significant prediction effect of reading and listening on Contextual Awareness (IW1). First, the task as designed was aligned to the authenticity nature of integrated writing, where the voice of the writer, the awareness of the readers, the communicating purpose of the writing, and dealing with conflicting views are important features that are highlighted for the learners. The test-takers were also asked to answer the question from the perspective of one of the participants in the designed context. Thus, the design will have an effect on Contextual Awareness (IW1). As pointed out by Britton, Burgess, Martin, McLeod, and Rosen (1975), young children's contextual awareness develops gradually with age. Younger writers (i.e., 11 years old) tend to pay closer attention to language expression, while older writers (i.e., 18 years old) tend to be more aware of the audience and self- identify in the composition. The participants in this study were Secondary 5 students, who may have developed high contextual awareness. Second, the students' Chinese cultural characteristics may be a contributing factor in the high prediction effect. Because Chinese culture emphasises social morality, test-takers naturally show their respect in their writing towards people with seniority (Zhu et al., 2016a). Finally, as L1 writers, the test-takers had more resources. This enabled them to pay closer attention to cultural and contextual factors as they wrote.

*The interaction between  the relationships  of reading  and  listening to integrated writing performance at different reading and listening proficiency levels*

We found that there was a significant interaction of the relationships between listening and reading to the integrated writing performance in the current study. This implies that the contribution of one input modality to integrated writing performance varies across the range of ability of another input modality.  This result has confirmed our hypothesis and supported the existence of the effect of the ability-as-compensator.

As demonstrated in Fig. 2, improving the ability of at least one modality is very important for students who are less proficient readers or listeners, because these students can still to process the given materials using higher-order cognitive skills, such as elaborating, evaluating and creating. That is to say, the high ability in one modality could compensate the low performance in another modality. On the contrary, if these test-takers are not able to perform these skills in neither of modalities, then they can only rely on superficial processing—such as copying words and phrasing directly from source materials (Plakans & Gebril, 2013)—resulting in low performance for integrated writing. To some extent, this study echoed Cumming's (2013) argument that before a threshold language proficiency

level is attained, the test-takers may not have sufficient abilities to comprehend the sources, then their performance in the integrated tasks may be hindered.

**Conclusion**

Overall, some of our assumptions have been verified but others have been rejected. Our findings are able to provide some pedagogical suggestions to frontline teachers. For instance, teachers should pay attention to developing their students' higher- order skills in both listening and reading; they should capitalise on providing multiple source materials to increase the opportunity of success. It should also be noted that this study was conducted in the context of learning Chinese as a first language in Hong Kong. Theoretically, research on both L1 and L2 learners has suggested that the cognitive skills involved in reading, listening or writing should be similar (Grabe, 2003). Therefore, we believe that the relationships reported here  should exist in other language-learning areas.

This study has observed several limitations, which should be interpreted with caution. First, the small number of participants has limited the generalisability of the findings. Second, due to the tight teaching schedule in the secondary schools, we were unable to conduct tests that last for long hours, and we could not include too many test items, which may have hampered the reliability of our instruments. Finally, this research aimed to study the impact of the two types of input tasks on an integrated writing task that involves a complex cognitive activity, namely writing. Consequently, we assumed that the test-takers' writing processes are similar to that of independent writing. This limitation may affect the interpretation of the statistical results and should be taken into account. It also warrants further research of the relationship of integrated writing tasks and all of the components that constitute its performance.

Appendix

See Tables 4, 5 and 6.

Table 4 Sample questions from the reading task

| Questions and suggested answers | Purpose of question |
| --- | --- |
| 1. In the second paragraph, a short essay named 'Responding to a very principled friend' was mentioned. Who does 'a very demanding friend' refer to?<br>Suggested Answer: Peter Hallward | R1 'retrieving'<br>To answer the question, the students need to locate the corresponding paragraph and identify the person's name |
| 2. Explain the meaning of 'layman' in paragraph 5 in the context of the passage<br>Suggested Answer: People without anatomical professional knowledge | R2 'explaining'<br>The students need to make reference to the context of the corresponding paragraph to explain the word |
| 3. Why does the author think that Hermann Schaaffhausen's opinion is bold?<br>Suggested Answer: Hermann Schaaffhausen's opinion is very different from the mainstream | R3 'summarising'<br>The students need to understand and integrate a few ideas from a few paragraphs, and then reorganise these ideas into a coherent answer |
| 4. According to paragraph 6, explain and illustrate the meaning of 'the rules of modern academia'<br>Suggested Answer: Criticism and challenges should be put forward in a frank and respectful manner to show the writer's genuine recognition. At the same time, when challenged, one needs to be open-minded and respond sincerely, so that academic thought can be healthier and developed. (This is an example: the students could provide other answers as long as they are well-justified and illustrated in the context of the passage) | R4 'elaborating'<br>The students need to understand the implied meaning of the passage. Even though 'the rules of modern academia' were mentioned in the passage, there are no detailed explanations. The students have to further infer the author's intention from the varied examples given |
| 5. The author believes that the academic exchange between teachers and students can be seen as 'genuine respect' only in foreign countries, (paragraph 6). Evaluate on the author's point of view<br>Suggested Answer: Students can have different opinions, as long as a good argument is provided. At the same time, the evaluation should focus on 'ways of academic exchange between teachers and students'. Students could also base their opinions on any particular context, for instance, when the teacher is being challenged publicly by the students | R5 'evaluating'<br>The students need to evaluate the author's opinion based on the content of the article and also on their prior knowledge or experience |
| 6. When you have different views to those of academics or of your teacher, how can you be 'genuinely respectful', apart from the ways mentioned in the passage?<br>Suggested Answer: The students need to provide new advice. There is no model answer as long as it is reasonable and well-justified. For example, the issue could be discussed privately to avoid embarrassing the academic or teacher in public | R6 'creating'<br>This requires students to deal with problems in their own ways instead of using the methods suggested in the passage |

Table 5 Sample questions from the listening task

| Questions and suggested answers | Purpose of question |
|---|---|
| 1. Why do the New Territories residents build brick houses forming a high wall around the village?<br>A. To practice shooting<br>B. To defend against bandits (correct answer)<br>C. To fight the enemies during war<br>D. To unite the family | L1 'memorising'<br>In the audio material, a conservator explicitly mentioned that the houses were built this way to defend against the bandits |
| 2. Dr Zhang mentioned 'the huge creatures are expressionless', what does 'huge creatures' refer to? And what does 'expressionless' mean?<br>Suggested Answer<br>(1) Huge creatures: skyscrapers in the city<br>(2) Expressionless: all of the skyscrapers are almost the same, they lack unique features | L2 'explaining'<br>A character in the audio material, Dr Zhang, expressed his views about the characteristics of the modern cities, by comparing the skyscrapers in Hong Kong and traditional houses |
| 3. Quoting Wing Lee Street as an example, what does Dr Zhang suggest about the value of heritage buildings?<br>A. Collective memories and sense of belonging (correct answer)<br>B. The origin and development of history<br>C. The technique and art of architecture<br>D. The development of economy and tourism | L3 'summarising'<br>The students need to compare, summarise and match the information, to understand the relationship between the specific example (i.e., Wing Lee Street) and the related topic (i.e., collective memories and sense of belonging). A mixed ability is required |
| 4. When answering questions from the students, Dr Zhang mentioned his study trip to the ancient Japanese city of Kyoto. What do you think his purpose was?<br>A. To show that the preservation of heritage buildings is not contradictory to the development of cities (correct answer)<br>B. To illustrate that the preservation of heritage buildings can have a negative influence on the development of cities<br>C. To praise Kyoto for the remarkable work of preserving heritage buildings<br>D. To suggest that Hong Kong should take reference from ways of preserving heritage buildings in Kyoto | L4 'elaborating'<br>This question requires the students to infer the author's intention from the information that has been given in the text |
| 5. In terms of rhetorical skills, what are the merits of Dr Zhang's speech? Briefly state two features<br>Suggested Answer<br>(1) Use rhetorical questions to engage the students<br>(2) Use examples to persuade his audience<br>(3) Use analogy to make his views vivid | L5 'evaluating'<br>This question requires the students to critically evaluate Dr Zhang's speech in terms of functions of expression |
| 6. Apart from the values that Dr Zhang mentioned, what other values do you think heritage buildings possess? State one and elaborate | L6 'creating'<br>The students need to provide new ideas while making reference to the context or topic |

Table 6 Marking rubrics for integrated writing

| **(IW1)Contextual awareness** |
| --- |

| Marks | Level descriptor |
| --- | --- |
| 9-10 | A good sense of self and audience is established with a correct form to address the audience and a clear self-introduction. An appropriate text type is used with a fitting ending to conclude the speech and show acknowledgement for the audience. The communicative purposes are achieved with excellence. |
| 7-8 | A sense of self and audience is established with a correct form to address the audience. Self-introduction is missing. An appropriate text type is used, but the ending is incomplete (i.e., only the conclusion of the text or an acknowledgement for the audience is included). The communicative purposes are achieved well. |
| 5-6 | Some of the important information is quoted or rephrased from the source texts or the recording, while some key points are missing. Differing perspectives (from the source texts or the recording) are synthesized, but the content is insufficient. |
| 3-4 | The sense of self and audience is weak. The form of addressing audience is imprecise and partly incorrect. Self-introduction is missing. The text type contains obvious mistakes (e.g., a mix of letter and speech format). The communicative purposes are not clear or contain many obvious mistakes. |
| 1-2 | There is a lack of sense of self and audience. The writer did not address the audience nor introduce him/herself. The required text type is not recognizable. The communicative purposes are mistaken or missing. |
| 0 | Blank answer sheets or the writing is completely off topic. |

| **(IW2)Citation and synthesis** |
| --- |

| Marks | Level descriptor |
| --- | --- |
| 9-10 | Important information is comprehensively and concisely quoted or rephrased from the source texts or the recording. Differing perspectives (from the source texts and the recording) are concisely synthesized. An effective connection between the source information and the writer's prior knowledge or experience is shown consistently. |
| 7-8 | Important information is purposefully quoted or rephrased from the source texts or the recording, but the expression is somewhat redundant. Differing perspectives (from the source texts or the recording) are synthesized. A reasonable connection between the source information and the writer's prior knowledge or experience is shown. |
| 5-6 | Some of the important information presented in the readings and/or from the recording is summarized while some key points are missing. Differing A connection between the source information and the writer's prior knowledge or experience is shown, but the content is somewhat insufficient. |
| 3-4 | Information is quoted or rephrased from the source texts or the recording, but the selection of information is unbalanced (e.g., overemphasis on the traditional or the modern view) with many key points missing. An attempt to synthesize differing perspectives (from the source texts or the recording) is made, but most of the content is not reasonable. A connection between the source information and the writer's prior knowledge or experience is rarely made; or most of the connections are inappropriate. |
| 1-2 | The writer made no attempt to select information. Most of the content is directly copied from the source texts or quoted from the recording. An attempt to synthesize differing perspectives (from the source texts or the recording) is not evident. A connection between the source information and the writer's prior knowledge or experience is not evident. |
| 0 | Blank answer sheets or the writing is completely off topic. |

| **(IW3)Opinion and argument** |
| --- |

| Marks | Level descriptor |
| --- | --- |
| 9-10 | Constructive and creative opinions are provided to explain a position. Sound and convincing evidence for the opinions is provided. |

| **7-8** | Constructive opinions are provided to explain a position. Appropriate evidence for the opinions is provided. |
| **5-6** | Differing perspectives (from the readings or the recording) are synthesized, but the content is not sufficient |
| **3-4** | Personal opinions are provided to explain a position, but the explanation of the opinions is somewhat inadequate. Evidence for the opinions is provided, but it is somewhat weak. |
| **1-2** | The writer's stance on the topic is obscure or irrelevant to the task prompt. Evidence for the opinions is unreasonable or missing. |
| **0** | Blank answer sheets or the writing is completely off topic. |

**(IW4)Written expression and organization**

| Marks | Level descriptor |
| --- | --- |
| **9-10** | Decent expressions are used to demonstrate the right attitude towards the audience (e.g., showing respect to the principal, guests, and teachers). Interaction with the audience is effective and consistent (e.g., by engaging the audience with questions in different ways). The text is well organized with the opening and the ending complementing each other. Ideas are clearly and cohesively presented. Sentences are meticulously crafted to form cohesion. A wide range of vocabulary is used accurately. |
| **7-8** | The correct expressions are used to demonstrate the right attitude towards the audience (e.g., showing respect to the principal, guests, and teachers). Interaction with the audience is present (e.g., by engaging the audience with question). The structure of the text is clear. Ideas are presented logically. Sentences are crafted correctly. The usage of vocabulary is correct. |
| **5-6** | The correct expressions are used in general to demonstrate the right attitude towards the audience (e.g., showing respect to the principal, guests, and teachers), but there may be occasional inappropriate expressions or omission (e.g., greeting the audience). Interaction with the audience is occasionally present (e.g., by asking the audience limited questions). The structure of the text is basically clear, but the development of ideas is somewhat confusing. Sentences are crafted correctly in general. Errors of usage of vocabulary are shown, but do not obstruct the comprehension of the speech. |
| **3-4** | Many inappropriate expressions are used, showing a lack of respect to the audience (e.g., the principal, guests, and teachers). Interaction with the audience is rare. The structuring of the text is poor. The development of ideas is confusing. Errors of sentences and usage of vocabulary obstruct the comprehension of the speech. |
| **1-2** | Inappropriate expressions are used throughout, showing no respect to the audience (e.g., the principal, guests, and teachers). No evident interaction with the audience is shown. The structure of the text is not recognizable. The development of ideas is very confusing. Errors of sentences and usage of vocabulary seriously obstruct the comprehension of the speech. |
| **0** | Blank answer sheets or the writing is completely off topic. |

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