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Impact of a Socio-cognitive Approach to Teaching English Language Writing on Primary School Students' Compositions

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ABSTRACT

While the last two decades have witnessed a growing body of research on the quality of student writing, research on the impact of the socio-cognitive approach on young learners' writing has remained scarce. To fill this gap, this study investigates the effects of the socio-cognitive approach on the writing quality of 98 fourth graders in Singapore. The study addresses the question on whether there are any differences (in terms of macro-organization, complexity, productivity, and accuracy) in the compositions produced under the traditional methods and the socio-cognitive approach to writing program. Data sources include fourth graders' pre- and post-test written documents over two years. Using the L2 Syntactic Complexity Analyzer, the written documents were analyzed in terms of macro-organization, fluency, lexical diversity, and complexity. Results showed that post-test writings of low-achieving students in the experimental group exhibited more development in story elements, use of different words, lengthier texts, and improvement in accuracy in terms of reduction of errors in capitalization, spelling, and punctuation. This study contributes to the field by suggesting the effectiveness of teaching writing to low proficiency learners through the use of a socio-cognitive approach.

Keywords: socio-cognitive approach; writing quality; fourth graders; compositions; teaching writing

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Introduction

Over the years, most existing studies on academic writing instruction have been conducted at secondary school or university levels, particularly as contrasting rhetoric studies of L1 and L2 writing. Far less attention has been paid to other educational settings such as primary schools. It is therefore important to explore how academic writing is taught in primary schools in order to broaden our understanding of student writing. Another rationale for understanding the teaching of academic writing at the primary school level is that previous studies mainly examined the effects of explicit writing instruction on primary school students in the genre of argumentative essays. On the contrary, it is narrative writing that was found to be the focus of writing instruction in primary schools in Asia. With such an emphasis on narrative writing instruction in primary schools, there is a need to explore the effects of explicit narrative writing instruction on low proficiency students in primary school settings.

The current study aimed to examine the effects of explicit writing instruction through the socio-cognitive approach by identifying and understanding how it may impact the quality of writing produced by underachievers in a primary school. The socio-cognitive approach to teaching writing was based on the integration of genre and cognitive theories, emphasizing the readers, contexts, and goals of writing. Despite positive findings of writing intervention programs based on the socio-cognitive approach and the evident necessity of remedial support for underachieving writers, to our knowledge, there is no published study of such writing programs being implemented in primary schools (Lane et al., 2010; Ng & Cheung, 2018). So far, only narrative (Chandrasegaran & Yeo, 2006) and expository essays (Chandrasegaran, 2013) have been examined at the secondary school level, and there exists a research gap in the application of the socio-cognitive approach in narrative writing instruction at the primary school level.

The present study aims to address research gaps on the effects of the socio-cognitive approach in writing instruction in primary school settings. The goal is to examine if there are any differences (in terms of macro-organization, fluency, productivity, and complexity) in the compositions produced under the traditional methods and the socio-cognitive approach to writing program.

Theoretical framework: Socio-cognitive approach to writing

Chandrasegaran (2013) uses the term socio-cognitive as a concept which “brings together elements of cognitive process models of writing and social-cultural views including genre-based approaches to writing instruction” (p. 103). Martin’s (1993) socio-cultural view of writing, which represents writing as a “goal-directed, social activity” (p. 142), is about using writing “to get things done” (Martin & White, 2005, p. 33). It views writing as a social activity, treating “writing as participating genres with other people” (Chandrasegaran, 2013, p. 103). Writing as social interaction in the classroom may include explicit teaching of the genres that are tested in schools (Green, 2018; Lam, 2018; Veal, 2006), teaching of organization structure of genres (Rothery, 1996), and teaching vocabulary and grammar of particular kinds of genres (Williams, 2004) through deconstruction of model essays. In the cognitive process theory of writing, writing influences students’ thinking in the planning, organizing, writing, and revising stages. In short, we take Chandrasegaran’s (2013) theoretical framework as the basis for operationalizing the term socio-cognitive approach to writing in our research. With an appropriate use of socio-cognitive approach to writing (with a focus on thinking processes), students’ writing quality will be improved. In our study, students’ writing quality is defined in terms of macro-organization, fluency, productivity, and complexity (Yang, Lu, & Weigle, 2015).

Literature review

Proponents of the socio-cognitive approach suggest that explicit teaching of the thinking process, which reflects genre-specific features, will have an impact on improving writing competence. In teaching character depiction in narrative writing, Chandrasegaran and Yeo (2006) found that ninth grade students in a school in Singapore showed improvements in setting the rhetorical goal. Further, consistent explicit teaching of the thinking process of matching the rhetorical goal and justification of choice of language helped students write a goal-directed story, as students were able to use more epithets and ideational tokens while writing a narrative. Chandrasegaran (2013) conducted another study to determine the effectiveness of the socio-cognitive approach of teaching expository writing for ninth grade students in Singapore. The study found that students displayed more stance assertion moves and stance support moves in post-instruction essays, which were used as indicators of sound expository essays. Through guided class discussion and explicit teaching of cognitive processes in genre writing practices, instructions effectively raised students' awareness of the social context of the texts, as well as reader and writer roles. Students were also found to have improved in discourse moves such as elaborating claims and countering opposing views.

Despite the positive findings in previous studies (Koh, 2002; Neo, 2004), the results should be interpreted carefully. Chandrasegaran's (2013) study did not have a control group, and as a result, all participants received the same instruction. Therefore, it was unclear if improvement demonstrated was due to the intervention program. Second, Chandrasegaran (2013) assumed that participants already possessed the meta-cognitive ability to control the writing process prior to the intervention program. Participants were assumed to possess meta-cognitive abilities in choosing an appropriate support strategy to achieve their rhetorical goal. It may be argued that participants whose written English was regarded as generally understandable by the researcher might not possess the meta-cognitive abilities required to write their expository essays prior to explicit modeling of instruction in writing (Glaser & Brunstein, 2007).

Given the importance of helping students develop cognitive and meta-cognitive strategies to improve their academic writing, Harris and Graham (1992) advocated that less capable students must be explicitly instructed on cognitive and meta-cognitive strategies due to their ineffectual ability to acquire those strategies with implicit instruction. Over the last two decades, Harris, Graham, and Mason (2006) developed the Self-Regulated Strategy Development (SRSD) model to help students with learning difficulties improve writing skills (Harris, et al., 2006; Saddler, Moran, Graham, & Harris, 2004). The SRSD model integrates all major learning theories: social cognitive, constructivist, and behavioral. It emphasizes four main characteristics of self-regulated learning (i.e., goal setting, self-instruction, self-management, and self-reinforcement) to support writers.

Harris and Graham (1992, 1996) found that the integrated approach of SRSD showed impacts with struggling young writers on writing improvements by explicit teaching of genre-specific writing strategies and self-regulated strategies (Glaser & Brunstein, 2007; Graham, Harris, & Mason, 2005). The findings showed that SRSD intervention has positive impacts when helping struggling writers (Glaser & Brunstein, 2007). For instance, in the study conducted by Graham et al. (2005), participants were divided into three groups: recipients of SRSD instruction only, recipients of SRSD instruction and peer support, and the control group. Third-graders who struggled with their writing ($n = 73$) in Washington, DC were asked to write stories and persuasive essays. The findings showed that both SRSD groups improved significantly in the posttest and delayed-posttest. In another study, Sawyer, Graham, and Harris (1992) divided 33 fifth- and sixth-grade students with learning disabilities into three groups: SRSD, SRSD without explicit self-regulation instruction, and the control group. The findings indicated that the SRSD experimental group obtained significantly greater schematic structure scores at generalization

compared to the other groups. Comparison with the control group showed that SRSD conditions had substantial positive effects.

To date, some studies have demonstrated the positive impacts SRSD has on helping students with learning disabilities to improve in writing. However, there are still ways to contribute to the growing body of literature. First, measurements of writing quality have only been recorded holistically as opposed to detailed language competence analysis using software programs (e.g., Glaser & Brunstein, 2007). While holistic scoring by trained teachers may be accurate, scoring can be biased based on students' overall language proficiency (Crossley & McNamara, 2014) and rating procedures (Chiang, 1999). Second, language proficiency has not been examined in previous studies (Chandrasegaran, 2013; Harris et al., 2006). As language proficiency is a strong variable that impacts writing quality, effects of the socio-cognitive writing program would likely see varied results by different proficiency levels of students. Third, emphasis on mnemonic charts may lead students to focus excessively on cognitive strategies and, in turn, subconsciously neglect social purposes of writing such as context and audience. Therefore, it is important to help students develop cognitive and meta-cognitive strategies while, at the same time, remembering to set an appropriate goal of writing that would reflect socially-situated contexts and audiences.

Based on the above review of empirical studies of the socio-cognitive writing approach, the current study adopted a few key points to be more appropriate for the study of teaching narrative writing in primary schools. First, explicit teaching of the genre-specific thinking process was emphasized while considering young struggling learners' cognitive abilities, with self-regulation also explicitly taught. To provide students with a form of 'visible thinking process' as emphasized by Collins et al. (1987), a graphic organizer was used as a model for cognitive and meta-cognitive thinking processes. Second, students were prompted to consider their writing goal and intended audience on the graphic organizer to help make writing decisions. Third, to simplify the SRSD model for the present study, the 'WWW, WHAT2, and HOW2' chart (Harris & Graham, 1996) was used to reduce time required to educate teachers before the intervention and students during the intervention.

This study addressed the following question: Are there any differences (in terms of macro-organization, complexity, productivity, and accuracy) in the compositions produced under the traditional methods and the "socio-cognitive approach to writing" program by students of different proficiency levels? If so, what are they?

Methodology

Participants and context

A total of 98 fourth-grade students (aged 9 – 10) from a primary school in Singapore participated in the socio-cognitive writing program between January 2016 and December 2017. The fourth-grade consisted of five classes from the 2016 academic year and six classes from the 2017 academic year. Each year, fourth-grade students were grouped based on their academic abilities in terms of low, mid, and high competence. Though the medium of instruction in the school was Singapore Standard English, participants mainly used their mother tongues (Chinese, Malay, or Tamil) or Singapore Colloquial English at home.

A quasi-experimental study design was adopted. At the beginning of each academic year in January, underachieving students were selected based on their competency of English to participate in the socio-cognitive writing program as part of the experimental group. As students were selected from classes of different academic abilities, the experimental group was further

divided into three proficiency groups—experimental groups 1, 2, and 3. Underachieving students of lower academic abilities were assigned to experimental group 1 (n=20); underachieving students of relatively mid academic abilities were assigned to experimental group 2 (n=19); and underachieving students of relatively higher academic abilities were assigned to experimental group 3 (n=16).

Teachers involved in the intervention program were trained by the project principal investigator (i.e., the researcher) before the start of the program to ensure complete understanding of the objective and method of delivering the socio-cognitive writing program. Teaching materials such as lesson plans and graphic organizers were provided to all teachers.

The control group for this research consisted of 43 fourth grade students. Writing samples (i.e., pretest and posttest) were collected. Within the control group, students were subdivided into three proficiency groups. Students of lower academic abilities were assigned to the control group 1; students of mid academic abilities classes were assigned to control group 2; and students of relatively higher academic abilities were assigned to control group 3.

Pedagogical intervention

The intervention program was designed to teach writing through the socio-cognitive approach. The integration of social and cognitive theory was achieved through (i) the explicit teaching of the cognitive writing process (Bereiter & Scardamalia, 1987), (ii) modeling of the thinking process (Flower, 1994), and (iii) the genre-based approach (Martin, 1997) to consider audience and purpose of writing. Participants were instructed to follow the process writing stages of planning, organizing, writing, and revising (Bereiter & Scardamalia, 1987). The mnemonic chart of 'WWW, WHAT2, and HOW2' questions was adapted from Harris and Graham (1992) to help participants develop thinking processes for narrative writing (see Table 1). The 'why' questions were the most important feature in the mnemonic chart as it was believed that by teaching students to ask themselves the reason for including a particular detail in their composition would also help toward aligning their written document with their goal of writing.

In the adaptation of the SRS model, self-assessment was chosen as the self-regulation strategy that participants needed to master. Self-assessment was provided in the form of a checklist for participants to self-assess their writing process at the end of the planning, writing, and revising phase. Also, a genre-based approach was integrated into the study by instructing participants to set a purpose and determine the audience for each narrative writing assignment. The five stages of narrative writing were orientation, events, complication, resolution, and ending. The thinking processes at each stage in relation to the genre procedure were modeled by teachers before students began their writing. Table 1 shows the content of the intervention program.

Table 1
Structure of the Socio-Cognitive Writing Intervention Program (Harris & Graham, 1992)

Units	Cognitive processes	Genre practices
1	Planning: Setting the purpose and audience of the target text	Purpose and audience of the target text
	Organizing: Generating ideas based on the procedures of narrative. WWW, WHAT2, and HOW2 questions were introduced in connection to stages of the genre.	
2	WHO is the main character? WHEN does the story happen? WHY WHERE does the story happen?	Orientation
	WHAT does the main character do? WHY	Events
	WHAT is the problem that the main character faces? WHY	Complication
	HOW is the problem (or complication) solved? WHY	Resolution
	HOW does the story end? WHY	Ending
3	Writing/Revising: Based on planning/organizing, students were asked to write a story. Consistent recall of rhetorical goal and audience was performed through 'why' questions and self-assessment. Students needed to refer to the planning while writing.	Orientation Events Complication Resolution Ending

Before the intervention program was administered, a two-hour teacher training session was conducted by the first author to explain the structure of the program, and to demonstrate how each cognitive process was to be taught in the intervention program. The researcher emphasized modeling the thinking process of narrative writing through demonstration with some examples of narrative writing topics suitable for fourth grade students. By asking the WWW, WHAT2, and HOW2, and the WHY question, teachers were shown how to achieve a rhetorical goal and hold audiences' interest while planning and writing narrative compositions. Teaching materials and lesson plans were provided by the researcher.

The pedagogical intervention program consisted of three one-hour-long lessons, and were conducted by English teachers with their respective classes. In the first lesson, the overall structure of the thinking process of narrative writing was introduced; the importance of setting a rhetorical goal, audience, and justifying a piece of written text with the 'why' question was emphasized. Next, a writing topic and three pictures were introduced. The topics (such as 'my pet' and 'a day in the park') can be found in the Strategies for English Language Learning and Reading (2010) curriculum. With a given topic and pictures, teachers first demonstrated how to set a goal and select an audience, then explained the thinking process of planning a story following the five stages of narrative writing: orientation, events, complication, resolution, and ending, using the WWW, WHAT2, and HOW2, and WHY mnemonic chart. At the end of the first lesson, participants were instructed to self-assess the planning using the graphic organizer. Participants were asked to assess their writing to see if their plan would help them achieve the rhetorical goal and interest the audience. They were made to modify the planning if dissatisfied with the self-assessment.

At the beginning of the second and third lessons, teachers first reviewed the setting of a rhetorical goal, target audience, and the thinking process. Teachers also demonstrated the thinking process of writing (orientation, event, complication, resolution, and ending) in the second lesson. In the second and third lessons, students composed a story based on the planning done in the first lesson. The focus of the teacher's modeling centered on using the 'why' questions to justify their choice of storyline. After modeling, participants were instructed to write their narrative composition. Self-assessments were performed at the end of all three lessons, with participants

being allowed to modify written documents based on their self-assessment. Finally, participants completed the narrative composition during the third lesson of the intervention program based on their revised plan. On the actual days of pedagogical intervention, the research team was sitting at the back of the classroom to monitor the classroom practice.

Data sources

Before the intervention program, both the control and the experimental group did a pretest. The format of the pretest was designed to simulate that of the PSLE English Composition Paper. Within an hour, students wrote a composition of at least 120 words based on a given theme and three pictures. Examples of themes included honesty, friendship, and a surprise. The time limit and text length were the same across all proficiency levels.

The posttest was conducted as part of the school examination at the end of the semester. During the English writing examination, a topic and three pictures were provided. Students were asked to write a narrative composition on the topic provided while including at least one of the three pictures. The duration of the examination was about an hour and students had to write at least 120 words. The posttest was performed by both groups, control and experimental.

Participants' pretest and posttest written documents, as well as the two compositions completed during the intervention, were collected. The documents were scanned and typed in a word processor for further analysis using computer software. Informed consent was sought prior to data collection.

Data analysis

To determine if participants' writing quality improved after the intervention program, the pretest and posttest written documents of both the control and the experimental groups were analyzed in areas of macro-organization, complexity, productivity, and accuracy. The written documents were analyzed and rated by two assessors who have Master's degrees in Applied Linguistics.

The first measurement of the quality of writing in this study was macro-organization, which was part of ten sub-categories of writing quality adapted from Wagner et al. (2011) and Harris and Graham (1996). Wagner et al. (2011) examined first and fourth grade students' writing in terms of macro-organization, syntactic complexity, productivity, spelling, and punctuation errors. To assess macro-organization, Wagner et al. (2011) suggested holistic measurements in topic, logical ordering of ideas, and number of key elements.

As the current study is based on narrative writing, the thinking process was adapted from Harris and Graham (1996) and a 'story scale' element was adapted to measure macro-organization of the writings. The story scale of the current study comprised the main character, location, time, starter event, problem, resolution, and ending. The presence of each of these seven elements in a piece of narrative composition would be awarded one point, with additional elaboration awarding an extra one or two points, up to a maximum of nine.

All written documents were separately graded, and the two assessors were not allowed to share their evaluations. The extent of agreement between the assessors was calculated using Cohen's Kappa Coefficient, with values of .869 for the pretest, and .814 for posttest, $p < .0005$. Based on Altman's (1991) guidelines for interpreting Kappa values, these values indicated a high degree of agreement between the assessors.

In previous studies, examining teaching writing using the socio-cognitive approach, writing quality was examined holistically and without using computer software for statistical analysis (Tracy, Reid, & Graham, 2009). To improve the robustness of the present study, only macro-organization was scored holistically, with other elements such as complexity, productivity, and accuracy analyzed using appropriate computer software.

The second measurement of quality of writing was productivity, which was analyzed through fluency and lexical diversity. The total number of words was calculated for each piece of writing as an indication of fluency. In a study involving the development of writing fluency and lexical complexity in university students, Fellner and Apple (2006) defined writing fluency as “the number of words produced in a specific time frame, irrespective of spelling and content, provided that the writer’s meaning is readily understandable” (p. 19). With respect to lexical diversity, the number of different words (expected random 50) was measured using the Lexical Complexity Analyzer (LCA) (Lu, 2012). This method of measurement differed from the Number of Different Words (NDW) used by Wagner et al. (2011), as NDW has been previously criticized for its dependability on standardization of sample size (Lu, 2012; Malvern, Richards, Chipere, & Durán, 2004). It was criticized because NDW tends to increase when the text is lengthier (Malvern et al., 2004), and hence required additional standardization procedures before data could be used for analysis. In this sense, NDWER-50 is the improved version of NDW as it standardizes transcript lengths automatically and systematically.

The third measurement of quality of writing was complexity, wherein three aspects of data were measured: Mean Length of T-unit (MLT), Dependent Clause per T-unit (DC/T), and Mean Length of Clause (MLC) using the L2 Syntactic Complexity Analyzer (Yang, Lu, & Weigle, 2015). MLT, DC/T, and MLC indicated complexity by (1) length, (2) subordination, and (3) clausal elaboration, respectively. Using three different traits allowed us to measure syntactic complexity in a more stringent manner.

The fourth measurement of quality of writing was accuracy. The number of errors in spelling, capitalization, and punctuation involving periods were coded using Systematic Analysis of Language Transcripts (SALT) software (Miller & Iglesias, 2015). These three types of errors were adopted from the Wagner et al. (2011) coding scheme for overall writing quality. Convention rules for transcriptions for written text were adopted from SALT. The number of errors from each category was divided by 100 words to remove the sample size effect. The sub-categories of writing quality are presented in Table 2.

Table 2
Summary of writing performance measures

Area	Measure	Code
Macro-organization	Story scale	-
	Mean Length of T-units	MLT
Complexity	Dependent Clause per T-unit	DC/T
	Mean Length of Clause	MLC
Productivity	Number of words	NOW
	Number of Different Words (Expected Random 50)	NDWER-50
Accuracy	Punctuation errors per 100 words	PNER-100W
	Capitalization errors per 100 words	CPER-100W
	Spelling errors per 100 words	SER-100W

After the written documents were scored, two-way mixed ANOVA was used to determine if there were any significant differences between pretests and posttests of the three control groups (low-, mid- and higher proficiency) and the three experimental groups (low-, mid- and higher proficiency). This was verified by two statistics experts. At first, all control groups and all experimental groups were combined and analyzed. Due to the small sample size, the results were not insignificant. Next, effect sizes were analyzed. Due to the small sample, the effect size was also small ($g = 0.03$). Two-way mixed ANOVA was performed to examine how low-, mid- and higher proficiency groups functioned in control and experimental settings. The analysis was justified as we found some significant results.

Results

Participants studied under the traditional methods (i.e., without the exposure to the socio-cognitive approach to writing program) were classified as the control group. Those participants who studied under the socio-cognitive approach to writing program were assigned as the experimental group.

Overall, the differences (in terms of macro-organization, complexity, and accuracy) in the compositions produced under the traditional methods and the socio-cognitive approach to writing program were insignificant, though the experimental group performed slightly better than the control group in terms of complexity and accuracy in writing.

Traditional (control) vs. socio-cognitive approach to writing programmes (experimental)

As shown in Table 3, in terms of macro-organization, the control group (49.71) performed slightly better than the experimental group (49.34). However, the finding was not significant ($U = 1173.5, p = .947$).

Table 3
Mann-Whitney U test (difference between pre-post)

	Control	Experimental
Mean rank	49.71	49.34
Sum rank	2137.50	2713.50
Test stats	(U = 1173.5, p = .947)	
Test of correlation pre-post		
Spearman's rho	.165	p = .105

As depicted in Table 4, in terms of complexity, the experimental group (52.53) performed better than the control group (45.63). However, the finding was not significant ($U = 1016.0, p = .233$).

Table 4
Mann-Whitney U test (difference between pre-post)

	Control	Experimental
Mean rank	45.63	52.53
Sum rank	1962.00	2889.00
Test stats	(U = 1016.0, p = .233)	
Test of correlation pre-post		
Spearman's rho	.165	p = .105

As indicated in Table 5, in terms of accuracy, the experimental group (53.25) performed better than the control group (44.70). However, the finding was not significant ($U = 976.0$, $p = .139$).

Table 5
Mann-Whitney U test (difference between pre-post)

	Control	Experimental
Mean rank	44.70	53.25
Sum rank	1922.00	2929.00
Test stats	(U = 976.0, p = .139)	
Test of correlation pre-post		
Spearman's rho	.165	p = .105

Score comparison between control and experimental groups with different proficiency levels

As summarized in Tables 6 - 8, the effect size was small. The scores could not clearly tell us the strengths and weaknesses of student writing.

Table 6
Control 1 and Experimental 1 = low-proficiency groups

Groups		N	Mean	Std. Deviation	Std. Error Mean
PRE-	Control 1	10	10.8000	1.13529	.35901
POST	Experimental 1	20	11.1500	1.34849	.30153

Table 7
Independent samples test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PRE-POST	E.V. assumed	.092	.763	-.704	28	.487	-.35000	.49722	-1.36852	.66852
	E.V. not assumed			-.747	21.183	.464	-.35000	.46884	-1.32449	.62449

Table 8
Effect size

Hedges' g (Unbiased):	-0.2652539	Lower limit on d:	-1.0326148
Conversion from g to r:	-0.12836	Upper limit on d:	0.4921787

The effect size ($g = 0.27$) for the difference between the pre-test and post-test between the two low-achieving groups in macro-organisation is moderate.

Table 9
Control 2 and Experimental 2 = mid-proficiency groups

	Groups	N	Mean	Std. Deviation	Std. Error Mean
PRE-	Control 2	8	11.3750	.91613	.32390
POST	Experimental 2	19	11.5263	.77233	.17718

Table 10
Independent samples test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PRE-	E.V. assumed	.956	.338	-.440	25	.663	-.15132	.34356	-.85888	.55625
POST	E.V. not assumed			-.410	11.419	.689	-.15132	.36920	-.96029	.65766

Table 11
Effect size

Hedges' g (Unbiased):	-0.1704538	Lower limit on d:	-1.1311561
Conversion from g to r:	-0.0902046	Upper limit on d:	0.777849

The effect size ($g = 0.17$) for the difference between the pre-test and post-test between the two mid-proficiency groups in macro-organisation is moderate, as demonstrated in Tables 9 -11.

Table 12
Control 3 and Experimental 3 = higher-proficiency groups

	Groups	N	Mean	Std. Deviation	Std. Error Mean
PRE-	Control 3	25	11.5200	.71414	.14283
POST	Experimental 3	16	11.1875	1.04682	.26171

Table 13
Independent samples test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PRE-POST	E.V. assumed	2.167	.149	1.211	39	.233	.33250	.27454	-.22280	.88780
	E.V. not assumed			1.115	23.939	.276	.33250	.29814	-.28292	.94792

Table 14
Effect size

Hedges' <i>g</i> (Unbiased):	0.3802472	Lower limit on <i>d</i> :	-0.248025
Conversion from <i>g</i> to <i>r</i> :	0.1868342	Upper limit on <i>d</i> :	1.018641

The effect size ($g = 0.38$) for the difference between the pre-test and post-test between the two higher-proficiency groups in macro-organisation is small to moderate, as suggested by Tables 12 – 14.

In order to understand how low-, mid- and higher proficiency groups function in control and experimental settings, two-way mixed ANOVA was performed. The analysis was justified as we found some significant findings. The findings are organised according to the four areas of macro-organisation, complexity, productivity, and accuracy, which were used to measure quality of writing to determine if there were any significant differences in participants' writing performance.

Macro-organization

Two-way mixed ANOVAs were conducted to investigate (1) whether scores of macro-organization (story scale) were significantly different in the pretest and posttest, and (2) whether there were any differences between control group 1 (lower-proficiency), control group 2 (mid-proficiency), control group 3 (higher-proficiency), experimental group 1 (lower proficiency), experimental group 2 (mid-proficiency), and experimental group 3 (higher-proficiency).

First, the two-way mixed ANOVA showed a statistically significant difference between pretest ($M = 10.52$, $SD = 1.33$) and posttest ($M = 11.31$, $SD = 1.00$) regardless of the group. In other words, participants across groups showed significant improvement in macro-organization of the story over time.

Two-way mixed ANOVA results revealed that there was a statistically significant interaction between the groups and time on macro-organization (i.e., WWW, WHAT2, and HOW2 in connection to stages of the genre), $F(5, 92) = 2.407$, $p < .05$, partial $\eta^2 = .116$, which indicates a small effect size (within-subject contrasts). It can be inferred that the starting proficiency levels of groups had a stronger impact on the performance of some aspects of macro-organization than on others. It also indicated a significant effect on the time variable, $F(1, 92) = 35.229$, $p < .05$, partial $\eta^2 = .277$, large effect size. On this basis, the timing of the tests administered, pretest and posttest in this case, has a statistically significant but small impact on the macro-organization of the writing quality regardless of the type of group. Tests of between-subjects effects showed that the differences in types of groups had a significant main effect on scores of macro-organization, $F(5, 92) = 4.371$, $p < .05$, partial $\eta^2 = .192$, medium effect size. Though increases in mean scores were observed for all groups, differences in improvement between groups were found to be insignificant.

Productivity – Number of words

The number of words for each written document was calculated to examine effects of the socio-cognitive intervention program on productivity (i.e., Consistent recall of rhetorical goal and audience through 'why' questions helped students write longer stories). Two-way mixed ANOVA found that participants performed significantly better in the posttest ($M = 283.23$, $SD = 94.50$) as compared to the pretest ($M = 211.42$, $SD = 83.57$), $F(1, 92) = 60.74$, $p = .000$, partial $\eta^2 = .398$,

large effect size, regardless of groups. In other words, participants generally wrote longer texts in their posttests than in their pretests.

Also, there was a statistically significant difference in the number of words written between groups, $F(5, 92) = 12.51$, $p = .000$, partial $\eta^2 = .405$, large effect size. Further, one-way ANOVA revealed that in the pretest as well as the posttest, control group 3 presented the lengthiest texts. In the pretest, all other groups wrote significantly fewer words than control group 3 ($M = 142.5$, $SE = 25.12$, $p = .000$). In the posttest however, experimental groups 1 and 2 wrote significantly fewer words than control group 3. Therefore, it can be inferred that though a general trend of increased number of words can be observed in experimental groups 1 and 2, participants in experimental group 3 demonstrated the most significant increases in number of words in comparison, $F(1, 92) = 60.74$, $p = .000$, partial $\eta^2 = .398$, large effect size. Thus, the results suggested that the socio-cognitive intervention program has the most substantial impact on the lowest-achieving students on number of words in narrative writing.

Number of different words (expected random 50)

We examined the number of different words (expected random 50) to determine the impact of the socio-cognitive writing program on language productivity as regards number of different words produced in a piece of narrative writing.

Through two-way mixed ANOVA, it was found that participants performed significantly better in posttest ($M = 125.67$, $SD = 37.24$) compared to pretest ($M = 102.89$, $SD = 35.08$), $F(1, 92) = 42.69$, $p = .000$, partial $\eta^2 = .317$, large effect size, regardless of groups. In other words, participants generally used more diverse vocabulary in their posttest than in their pretest.

In addition, differences between groups had a significant main effect on the number of different words, $F(5, 92) = 17.77$, $p = .000$, partial $\eta^2 = .491$, large effect size. One-way ANOVA showed a statistically significant difference in number of different words between groups in the pretest, $F(5, 92) = 14.60$, $p = .000$, partial $\eta^2 = .442$, large effect size, as well as in the posttest, $F(5, 92) = 11.36$, $p = .000$, partial $\eta^2 = .382$, large effect size.

In the pretest, control group 1 ($M = 74.40$, $SE = 8.51$, $p < .05$) displayed significantly fewer different words than all three experimental groups. Second, control group 2 ($M = 91.88$, $SE = 9.51$, $p < .05$) and 3 ($M = 86.72$, $SE = 5.38$, $p < .05$) displayed significantly fewer different words than experimental groups 2 ($M = 129.32$, $SE = 6.17$, $p < .05$) and 3 ($M = 138.06$, $SE = 6.72$, $p < .05$). Lastly, experimental groups 2 and 3 displayed significantly more different words than all groups other than between themselves in the pretest.

In the posttest, it can be seen from the means that most participants increased in number of different words over time. Experimental groups 2 and 3 performed significantly better at number of different words compared to all three control groups after treatment. Therefore, it could be inferred that the socio-cognitive writing program may have a more significant impact on students in experimental group 3.

Complexity

MLT, DC/T, and MLC were analyzed to examine the impact of the socio-cognitive writing program on syntactic complexity (i.e., The 'why' questions helped students elaborate on the ideas).

Complexity by length (MLT)

Regarding the mean and standard deviation of the MLT in the pretest and posttest, only control group 1 (low-achieving) improved in the MLT in the posttest, while control groups 2 and 3 decreased in MLT. As for the experimental groups, an increase in number of T-units was observed across all experimental groups, with experimental group 1 showing the most improvement. Two-way mixed ANOVA indicated no significant difference in performances between the pretest and the posttest, and no significant difference among groups either. Based on mean and the results of the two-way mixed ANOVA, it can be inferred that the socio-cognitive writing program had no noticeable impact on the MLT in the duration of the study.

Complexity by subordination (Dependent clauses per T-unit)

Based on the means and the results of the two-way mixed ANOVA, it can be inferred that the socio-cognitive writing program had no noticeable impact on the MLT in the duration of the present study.

A one-way ANOVA was conducted with proficiency level as the independent variable, and the DC/T as the dependent variable for the pretest and the posttest, respectively. The results indicate no significant effect of proficiency level on the DC/T, $F(5, 92) = 2.256, p > .05$, partial $\eta^2 = .109$ for the pretest, but a significant and medium effect in the posttest, $F(5, 92) = 2.570, p = .03$, partial $\eta^2 = .123$. Post hoc test showed no significant differences between all groups.

Complexity by clausal elaboration (Mean Length of Clause)

Two-way mixed ANOVA showed no statistically significant differences between pretest and posttest in MLC, $F(1, 92) = .119, p = .730$, partial $\eta^2 = .001$. One-way ANOVA also yielded no significance in MLC between pretest and posttest. Though differences are not significant, experimental groups 1 and 3 obtained higher means in MCL scores in posttest, whereas only control group 1 obtained higher means in MCL scores in posttest.

Accuracy

Under the socio-cognitive writing program, students needed to use the right words and sentences in order to achieve the rhetorical goal of the story. Number of capitalization, spelling, and punctuation errors were calculated and divided by 100 words to remove sample size effect. For capitalization errors, two-way mixed ANOVA showed no significant difference between pretest ($M = 1.07, SD = 1.53$) and posttest ($M = 0.71, SD = 1.27$). However, there is significant difference between groups in the pretest ($F(1, 92) = 4.849, p = .001$, partial $\eta^2 = .209$, medium effect size) and posttest ($F(1, 92) = 3.228, p = .010$, partial $\eta^2 = .149$). A notable comparison can be made in the mean scores of capitalization errors between the control and experimental groups. Only control group 3 (high-proficiency) produced fewer capitalization errors in the posttest amongst the control groups, whereas all experimental groups produced fewer such errors in the posttest.

For spelling errors, two-way mixed ANOVA showed that there was a significant difference between pretest ($M = 2.98, SD = 3.33$) and posttest ($M = 1.95, SD = 2.58$) regardless of groups. Participants across groups showed significant improvement in spelling over time. It also indicated a significant effect on the time variable, $F(1, 92) = 44.671, p = .000$, partial $\eta^2 = .327$, large effect size. On this basis, it can be inferred that participants' number of spelling errors reduced over time regardless of groups. Tests of between-subject effects showed that the differences in types of groups had a significant main effect on mean scores of spelling errors, $F(1, 92) = 9.516$,

$p < .05$, partial $\eta^2 = .341$, large effect size. This main effect was the impact of groups on scores from all tests combined. Further, one-way ANOVA showed that the difference in proficiency levels between groups has a significant impact on spelling scores, $F(1, 92) = 7.849$, $p = .000$, partial $\eta^2 = .299$, large effect size. However, no significant differences in means of spelling errors can be observed when compared between groups.

For punctuation errors, two-way mixed ANOVA showed no significant difference between pretest ($M = 0.90$, $SD = 0.91$) and posttest ($M = 0.76$, $SD = 0.97$). Tests of between-subjects effects showed that the difference in types of groups had a significant main effect on mean scores of spelling errors, $F(1, 92) = 11.822$, $p < .05$, partial $\eta^2 = .391$, large effect size. A notable finding in the mean scores of punctuation errors was that control group 3 (high-proficiency) produced more punctuation errors in the posttest as compared to all other groups. One-way ANOVA showed that there were significant differences between groups in the pretest ($F(1,92) = 7.671$, $p = .000$, partial $\eta^2 = .294$, large effect size), and the posttest ($F(1,92) = 8.102$, $p = .000$, partial $\eta^2 = .306$, large effect size).

Discussion

This study investigated the effect of a socio-cognitive writing program on fourth grade students in Singapore. The overall findings suggest that the socio-cognitive writing program generally has positive effects on macro-organization, complexity, productivity, and accuracy such as capitalization and punctuation errors.

Macro-organization

Significant improvements in the mean scores of participants in the experimental groups on macro-organization suggest that the socio-cognitive writing approach is effective in helping low-achieving students improve in macro-organization in the following ways.

First, the WWW, WHAT2, HOW2 + WHY mnemonic chart was found to be useful in guiding students' story planning in line with the seven-element story scale adapted from Harris and Graham (1996), which improved students' narratives in logical ordering of ideas and increasing number of key elements that made their stories more interesting, developing more in posttests as compared to pretests.

Second, it appears that the mnemonic chart not only helped students elaborate their stories based on the topic and pictures provided, but also developed their ability in self-regulating their writing process, with the use of charts to plan, write, and revise their compositions. This result is consistent with findings of previous studies where socio-cognitive writing programs using the SRSD model were found to be effective in enhancing low-achieving students' story scalability (Graham et al., 2005; Harris et al., 2006; Saddler et al., 2004; Sawyer et al., 1992).

One noteworthy finding is that students in experimental group 1 (low-proficiency) showed the most improvement between pretests ($M = 10.05$, $SD = 1.50$) and posttests ($M = 11.15$, $SD = 1.35$) as compared to experimental groups 2 and 3. This suggests that the intervention program had the most significant impact on students with the lowest proficiency level in their macro-organization.

Although all low-achieving students showed improvements in macro-organization in their posttest writing, the difference in increment in mean scores and standard deviations were not significant between groups, as opposed to findings of previous studies. This could be attributed to differences in designs of studies. For instance, in studies conducted by Saddler et al. (2004) and Graham et al. (2005), students were presented with only one picture as a writing prompt on which they were instructed to base their narrative story. In contrast, students in the present study were given a topic and a series of three pictures as writing prompts in each writing task, which may reduce the possibility of deviation in story scale amongst groups of varying proficiency levels.

Productivity

Number of words and number of different words were examined to investigate effects of the socio-cognitive writing program on productivity. With respect to number of different words, it was found that experimental groups 2 and 3 performed significantly better compared to all other groups after treatment. The present study revealed that students generally wrote longer texts in the posttest regardless of groups. This finding is consistent with Saddler et al. (2004) wherein struggling second grade writers were also found to write longer texts in posttests.

Although students in control group 3 wrote the longest texts in both pretest and posttest, their increment was comparatively lower than all other groups. Further, the increment in length of text negatively correlated with proficiency levels amongst control groups but positively correlated with proficiency levels amongst experimental groups. While experimental groups 1 and 2 wrote significantly shorter texts than control group 3 in the posttest, experimental group 3—with effect size .398—did not. This finding suggests that the socio-cognitive writing program is effective for students of experimental group 3 in terms of productivity.

Moreover, there was no statistically significant difference between the control groups and the experimental groups in text length in the posttest. This is consistent with findings of Harris et al. (2006) in that no significant differences were observed after comparisons between SRSD-only and SRSD without goal setting and self-monitoring students. Our findings contradict Graham et al. (2005), who found that not only did the SRSD-only students write more complete stories than their peers in the comparison group, but their papers were longer and qualitatively better. Harris et al. (2006) postulated that differences in results could be partly due to participants' ages (second-graders) whereas Graham et al. (2005) worked with third-graders. It was suggested that because students were younger, they were “not ready either academically or cognitively to take full advantage of the relatively sophisticated set of processes” (p. 331). If this hypothesis were true, fourth grade students in the present study should have been relatively more capable of utilizing the mnemonic chart and SRSD model to improve their writing. As this was not the case, it might be explained by the difference in participants, and the method of execution of the intervention program. The two previous studies were targeted at students with learning disabilities and involved significantly fewer participants, while the current study involved students with no apparent learning disabilities and a larger sample pool. Previous studies were performed over much longer periods: five months for the 2005 study; and 20 minutes per session over 9 to 11 weeks for the 2006 study; while the current study was conducted over three weeks with 60 minutes per session. This may suggest that further research is required involving the socio-cognitive writing program targeting other primary school students who do not have learning disabilities.

Complexity

MLT (complexity by length), DC/T (complexity by subordination), and MLC (complexity by clausal elaboration) were measured and analyzed to determine the effect of the intervention writing program on syntactic complexity. Two-way mixed ANOVA showed that no statistically

significant difference could be found in all three measurements of complexity between the pretest and posttest among control and experimental groups. This result is supported by Houck and Billingsley (1989) who demonstrated that there were no significant differences in syntactic complexity between students with learning disabilities and normal achievement (fourth, eighth, and eleventh grade students).

Despite the lack of statistical significance, only control group 1 (low-proficiency) showed improvements in MLT in posttest (pretest $M = 11.77$, $SD = 2.28$, posttest $M = 14.93$, $SD = 9.09$), while control groups 2 and 3 obtained lower mean scores in their posttest compared to pretest. This suggests that the traditional teaching approach may not be effective in improving complexity aspect, especially mean length of clause, in control groups 2 and 3. All three experimental groups showed some improvement in their posttest, with experimental group 1 demonstrating most increment in mean scores (pretest $M = 12.32$, $SD = 4.69$, posttest $M = 14.10$, $SD = 6.74$). Similar trends of improvement in mean scores were also observed for the same groups in MLC, with control group 1 and experimental group 1, both of lowest proficiency levels in their respective groups, performing better than their counterparts.

This observation that students with lowest proficiency levels made the most improvement in some aspects of syntactic complexity in effect is related to the findings of macro-organization. This association is plausible because students would obtain higher scores in macro-organization by elaborating on character development, setting, or conflict in narrative stories.

Accuracy

Accuracy was measured in terms of number of errors in capitalization, spelling, and punctuation per 100 words according to the writing coding scheme for overall writing quality (Wagner et al., 2011). Although two-way mixed ANOVA tests showed no significant differences between pretests and posttests in capitalization and punctuation errors only in spelling errors, low-achieving students were found to make generally fewer errors in all three categories in their posttest writing. Control groups 1 and 2 made more capitalization errors, and control group 3 made more punctuation errors in posttest. It can be inferred that the improvement observed in low-achieving students might not be due to the practice effect.

This regression trend in capitalization and punctuation errors observed amongst control group students could be explained by the trade-off hypothesis (Skehan, 2009). The hypothesis is based on the assumption that learners may face difficulties in focusing on both form and meaning simultaneously as they learn to use a language (Skehan & Foster, 1997) due to attention limitation (VanPatten, 1990). It was argued that improved performance in one area among complexity, accuracy, and fluency may be at the expense of performance in other areas (Skehan & Foster, 1999; Skehan, 2009), depending on learners' prioritizations of decisions, characteristics of tasks, and task conditions (Skehan & Foster, 1999). An increased attention in fluency may be associated with either higher complexity or increased accuracy, but not both (Skehan & Foster, 2001). In the current study, control groups 1 and 2 with lower and medium proficiency levels showed improvements in macro-organization, productivity that determined fluency, complexity by MLT (control group 1), complexity by MLC (control group 1) but produced more capitalization errors in posttest writing. These findings are consistent with Skehan's trade-off hypothesis (2009), as evident through their improvement in complexity and fluency but not accuracy. As Skehan (2009) suggested, it is unusual for learners to improve in all three areas concurrently.

Conclusion

This study sought to investigate the impact of the socio-cognitive writing program on the quality of writing among fourth grade students in Singapore. The quality of writing was measured in terms of macro-organization of the story, productivity, complexity by three means, and accuracy. Results indicated that low-achieving students benefitted from such a writing program. Posttest writing of low-achieving students featured more development in key story elements, use of more different words, lengthier texts, and exhibited improvement in accuracy in terms of reduction in number of errors in capitalization, spelling, and punctuation, albeit less significant improvement in syntactic complexity. These results support the argument for teaching writing through socio-cognitive approaches with integrated SRSD models in primary school writing classrooms. The accomplishment of low-achieving students in this study may suggest that other low-achieving students from more senior grades who possess adequate academic and cognitive abilities may also benefit from such writing programs. Existing evidence-based research that investigates the impacts of the socio-cognitive approach on young pupils' writing is scarce. The current study significantly contributes to the literature of this important yet largely neglected approach for the subject problem.

The current study, however, has a number of limitations. First, it was conducted at one neighbourhood primary school, among primary four pupils. The conclusions drawn may not be immediately generalizable to other student populations. Further research targeted at other primary schools, for pupils in different stages of their studies, will advance our understanding of pupils' reception of the socio-cognitive approach to writing in broader contexts. Another limitation is the limited amount of intervention (i.e., three one-hour lessons), due to the tight teaching schedule of the school curriculum. Further studies could extend the duration of the intervention programme, particularly more practice with pupils in forming the required thinking processes in writing under the guidance of their teachers, which could be more helpful.

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