

Writing Strategies in the Process of L2 Computer-Mode Academic Writing with the Use of Multiple Resources*

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This study is an exploratory case study of writing strategies that Korean EFL graduate students in applied linguistics employed in the semester-long process of L2 computer-mode research paper writing with the use of multiple resources. Data for writing processes and strategy and resource use were largely collected from a writing strategy inventory questionnaire and writing logs, which were complemented by a keystroke logging program, video recordings and retrospective recall interviews. The results of the study reveal the influence of genre features and variations across writing stages, strategies, resources, and individual writers. Planning was intermingled with researching. The participants deployed certain strategies only at a particular stage or throughout the whole writing process. The students who had higher education in English-speaking countries used fewer strategies and preferred electronic resources to print resources than those who were educated mainly in Korea. The latter also showed a tendency of employing self-regulatory strategies. Findings from the study suggest that the research paper writing process is resourceful, strategic and individually situated, and it involves complex composing behaviors accompanied by more varied strategies and resources than shown in studies of one-time reading-to-write tasks.

Key words: writing strategy, multiple resources, computer-mode writing, academic writing, research paper, writing process, long-term writing, L2 writing, EFL writing

1. INTRODUCTION

As globalization advances, needs and demands of English academic writing skills have been gradually increasing to be able to share and expand knowledge world-wide (Cargill &

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O'Connor, 2006). In particular, EFL graduate students need to develop academic writing skills in order to write academic papers and theses in English (Choi, 2014; Odo & Yi, 2014; Okamura, 2006), along with linguistic knowledge, procedural knowledge, and genre-based knowledge (Hyland, 2003; Tribble, 1996). According to research on second language (L2) writing, writing strategies, which are components of procedural knowledge, are considered as important as linguistic knowledge (Cumming, 1989; Zamel, 1983).

Writing strategies have been investigated in studies of L2 writing process, revealing a variety of strategies, cross-linguistic strategy transfer, and strategy variations in terms of proficiency levels, writing stages, and task factors (Cumming, 1989; Raimes, 1985; Sasaki, 2000; Wang & Wen, 2002). In recent years, L2 writing strategies have been explored in reading-writing integrated tasks, influenced by the communicative approach, which places a focus on authentic language use, including use of more than one skill at a time (Choe, 2012; McCulloch, 2013; Montelongo & Herter, 2010; Yang & Plakans, 2012). However, the majority of the studies analyzed undergraduate students' strategies found in the process of one-time writing tasks using resources provided by researchers, which do not offer any information regarding writing strategies employed by graduate students during long-term writing processes, using multiple resources, such as research papers. Therefore, graduate students' writing strategies used during a semester- or year-long writing process involving planning, collecting various resources, and writing based on these resources need to be observed.

Writing strategies or behaviors have also been explored in the process of computer-mode writing using electronic tools and resources such as word processors and the Internet, as digital writing is prevalent in the modern society (Hafner, 2014; Hirvela, 2005; Montelongo & Herter, 2010). Studies on graduate students' use of computer and diverse resources, including digital materials, during the writing process have been increasing (Sengupta, 2003; Stapleton, 2010, 2012). Sengupta (2003) explored how Hong Kong graduate students majoring in nursing made use of multiple Internet-based resources to write research papers in English. Stapleton (2010, 2012) investigated Chinese graduate students' composing process or behaviors in an electronic environment. However, these studies did not explore writing strategies employed throughout a semester-long writing process in a naturalistic setting where students utilize digital resources. They have not provided sufficient insights into types of writing strategies and how they are used.

Thus, the present study aims to investigate writing strategies used by Korean EFL graduate students during their computer-mode writing of a research paper, in which they utilize multiple resources including digital-based resources. That is, the purpose of the study is to provide information regarding the types of strategies and multiple resources used and how or when they are used in each writing stage by master's and doctoral students in the field of applied linguistics (TESOL), during their semester-long process of

writing a research paper in English in a naturalistic setting. For this purpose, the participants were required to video-record their writing processes for a semester, whenever they carried out their research paper writing, including reading and searching sources. In addition, the study used a writing strategy inventory questionnaire and a writing log including a resource inventory questionnaire, supplemented by retrospective interviews and a keystroke logging program, *Inputlog* version 6.0, which allows saving information during Internet use.

2. THEORETICAL BACKGROUND AND PREVIOUS STUDIES

Writing strategies are typically viewed as intentional behaviors, that is, actions purposefully selected by writers to achieve a goal or cope with the problems that occur during writing (Manchón, Roca de Larios, & Murphy, 2007), under the influence of the cognitive model of Flower and Hayes (1981). The majority of studies on L2 writing strategies have been conducted in this cognitive orientation. They have revealed a variety of cognitive and metacognitive strategies in the writing process, specifically in writing stages (Chen, 2011). For example, Raimes (1985, 1987) identified ESL learners' writing strategies including planning, rehearsing, rescanning, rereading the assigned topic, revising, and editing. Wong (2005) recognized three types of composing strategies from advanced L2 writers: cognitive, meta-cognitive, and affective strategies. In addition to these strategies, L1 use was also identified as a writing strategy in previous research, which revealed its role in the whole writing process, from planning to revising (Jones & Tetroe, 1987; Wang, 2003), and also in the monitoring process (Wang & Wen, 2002).

Previous research has identified a number of factors as variables influencing the use of L2 writing strategies, such as L2 proficiency and literacy skills (Chien, 2012; Cumming, 1989; Raimes, 1985; Zamel, 1983) and writer-external variables such as task or topic factors (Ellis & Yuan, 2004; Qi, 1998). For example, Zamel (1983) found that more skilled ESL writers employed composing strategies for idea generation and revising strategies at the discourse level, while less skilled ESL writers tended to plan or revise less and pay more attention to language forms, as described in Roca de Larios, Manchón, Murphy, and Marin (2008). L1/L2 writing experiences were also noted as factors affecting revising strategies in Yasuda's (2004) study of ESL Japanese writers' revising processes in naturally occurring academic writing situations. Moreover, task factors, including task demands, appeared to affect the use of writing strategies in the studies comparing different tasks, such as argumentative and letter writing in Cumming (1989), narrative and argumentative writing in Manchón, Roca de Larios, and Murphy (2000), and L1 use as a writing strategy in Jones and Tetroe (1987), Qi (1998), and Choi and Lee (2006).

As L2 reading-writing integrated tasks are prevalent in assessment and academic writing, the use of writing strategies in such tasks have also been widely investigated (Choe, 2012; Esmaili, 2002; Yang & Plakans, 2012). Esmaili (2002) examined ESL students' writing strategies through an interview and a questionnaire in the study of their performance in writing tasks to which reading passages were thematically related or unrelated. He identified 26 strategies, including recalling content from reading, accepting/rejecting viewpoint in reading, generating additional content, and borrowing words or phrases. These strategies suggested how writing is related to reading in reading-to-write tasks, as indicated by the higher scores of writers' performance in the condition of reading thematically related passages. Yang and Plakans (2012) also investigated ESL students' strategy use and writing performance in a TOEFL iBT reading-listening-writing integrated task, using a strategy inventory for integrated writing (SIIW) by writing stages and a structural equation modeling approach. They identified discourse synthesis strategies (e.g., connecting, organizing and selecting strategies), self-regulatory strategies (e.g., monitoring and evaluation), and test-wiseness strategies (e.g., using writing models and patchwriting). Self-regulatory strategy use had a direct contribution to discourse synthesis strategy use and an indirect contribution to the writing performance through discourse synthesis strategy use. Using Yang and Plakans' (2012) SIIW, Choe (2012) explored Korean college students' strategy use and writing performance in a reading-to-write task. This study revealed a higher frequency of self-regulatory strategies and goal-setting strategies than discourse synthesis strategies, and a positive relationship of the former two strategies with the writing performance.

The majority of studies on writing strategies including previously mentioned studies have analyzed writing strategies in one-time integrated tasks with reading passages provided in the task. On the other hand, studies on writing research papers or articles, which require a large amount of research, have explored writing strategies in naturalistic, long-term writing context, in which the writer selects reading materials by themselves and undergoes writing process in their own time and place. Matsumoto (1995) examined Japanese EFL professors' writing strategies in the process of writing a research paper. They frequently incorporated planning and revising strategies; their planning processes were flexible, while the revising processes were recursive, using pay-attention-to-content strategies and multiple revision strategies. They reported no use of L1 (translation strategies), but transfer of L1 strategies to their L2 writing. Matsumoto concluded that writing is a non-linear and dynamic process and it is a non-linguistic but cognitive strategic act. While Matsumoto simply conducted interviews with the participants rather than direct observation of their writing processes, McCulloch (2013) used concurrent think-aloud protocols and retrospective interviews to investigate two ESL graduate students' 18-week processes of writing a thesis using self-selected sources. With a focus on source use in the

reading-to-write processes, she identified six main reading-related strategies such as locating or reading source texts and taking notes. A variety of strategies were recognized, as in the studies of the one-time tasks. McCulloch pointed out that source use in writing begins at the early stage of the reading-to-write process and is a complex behavior of a multi-faceted nature, and this cannot be fully ascertained in one-time tasks. Thus, she strongly suggests further research in a more naturalistic setting, involving a recursive writing process.

As technology advances, L2 writers in academic writing show a tendency of searching references or source materials in electronic environments. Research on L2 academic writing processes has thus been extended to the investigation of web-based resource use or digital literacy (Hafner, 2014; Hirvela, 2005; Li, 2012; Sengupta, 2003; Stapleton, 2010, 2012). Hirvela (2005) conducted a case study of two ESL university students' computer-based reading and writing activities. Both participants engaged in electronically mediated reading across the courses and favored online searches for sources rather than library onsite searches. With a focus on time allotment, Stapleton (2010) also explored a Hong Kong graduate student's 3-week composing behaviors in writing a 4000-word essay in electronic environments for a task prompt selected by the participant and the researcher. Compared to previous research, such as Roca de Larios et al. (2008), Stapleton found that more time was spent on planning and evaluation, while less time was allotted to formulation and revision. Stapleton claims that these findings are related to the use of electronic tools throughout the process, for example, search engines for researching online sources, online dictionaries for formulation, and spelling and grammar checkers for revision. The student also used electronic means of communication for advice or consultation with others. Similarly, Stapleton (2012) conducted another study, a questionnaire survey with Chinese graduate students. The students reported their use of digital media and software in the process of planning, formulation, and revision (e.g., Wikipedia, Google Scholar, or grammar checkers). Similarly, Li (2012) explored Hong Kong undergraduate students' composing behaviors in searching and using web-based sources for their term-final written assignment. He found web-based research strategies including searching with terms, skimming sources on screen, and making indexical notes by copying and pasting. The students used web-based search engines, for example, Google search, which often links to Wikipedia and YouTube.

Findings from the aforementioned studies have provided a picture of EFL students' behaviors of researching, reading, and selecting sources for their academic writing in the digital era. Nonetheless, these studies have not explored writing strategies throughout a semester-long process of academic writing in a naturalistic setting using multiple resources. Therefore, the present study aims to investigate writing strategies employed during a long-term academic writing process, in which writers themselves gather resources and compose by utilizing both print and electronic resources, and provide insights into L2 writers'

composing behaviors in such environments that are more commonly found in the digital era. Furthermore, the study explores whether use of writing strategies varies with L2 student writers' level of disciplinary knowledge, English writing skills, stages of the writing process, and use of resources. The study addresses the following research questions.

1. What writing strategies do Korean EFL graduate students' employ in their semester-long processes of writing an English research paper in computer mode using multiple resources? What strategies do they employ frequently?
2. Does their writing strategy use vary with their writing stages, level of disciplinary knowledge, English writing skills, or use of resources?

3. RESEARCH METHOD

3.1. Participants

Participants for the current study consisted of five Korean EFL graduate students majoring in applied linguistics (TESOL) and enrolled in a master's or doctoral program. Their ages ranged from 22 to 31 and the period of graduate studies ranged from two to four semesters for MA or doctoral programs, as shown in Table 1. They were recruited by controlling for their English writing proficiency, educational background, and field-related knowledge of applied linguistics.

Only a limited number of participants were recruited due to the nature of the data, which required semester-long data collection and difficulty in acquiring each individual participant's video recordings of their entire writing processes. Moreover, in order to control for the effects of subject variables, the study limited the subjects to those who were taking a course with a research paper assignment in English. The participants' field-related knowledge levels were determined based on their educational background knowledge, namely, their prior undergraduate and graduate programs, and the researcher's assessment of their academic performance in their courses and of the content of their research papers.

The participants had taken one to four of the researcher's courses in their undergraduate or graduate programs. D1, a fourth-semester student in an MA-doctoral program, had a lower level of disciplinary knowledge than the other students due to her different disciplinary background. Her understanding of the discipline and field knowledge noticeably progressed over three semesters and she had much more content knowledge compared to her first semester. Nonetheless, her disciplinary knowledge level was classified as intermediate, lower than for the other students, after assessing the content of her research paper. The participants had high English proficiency, as shown by their

TOEFL or TOEIC scores in Table 1. Since TOEIC scores did not include writing scores, their writing proficiency levels were determined by the length of residence, educational background in English-speaking countries, and the evaluation of their submitted research papers as well as their TOEFL or TOEIC scores. D1 did not submit any standardized English proficiency test scores; however, her proficiency level was classified as high since she had native-like proficiency due to her secondary and university education in the USA for nine years.

TABLE 1
Participant Profiles

St. No.	Graduate School Level	Age	Educational Background	English Writing Proficiency	Content Knowledge Level
M1	MA 2 nd semester	24	BA in Applied Linguistics	Intermediate high (TOEIC 960)	Intermediate
M2	MA 4 th semester	25	BA in Applied Linguistics	Intermediate high (TOEFL 113)	Intermediate
D1	MA-doctoral combined 4 th semester	22	BA in Communication (in the USA)	High	Intermediate low
D2	Doctoral 2 nd semester	31	BA and MA in Applied Linguistics	Intermediate high (TOEIC 930)	Intermediate
D3	Doctoral 4 th semester	31	BA in English Language and Literature; MA in TESOL (in Australia)	High (TOEIC 990)	Intermediate high

The participants were taking one of the following doctoral courses offered in the English Education Department at E Graduate School: Seminar in Psycholinguistics in TEFL, and Seminar in Discourse Analysis and TEFL. Both courses were seminar courses with an assignment of a data-based research paper, which must include a review of literature, a minimum of two participants or quantitative data, and a pedagogical implication. The research topics were not controlled by the instructors, as long as they were relevant to the course contents. All participants knew how to use databases or search engines for collecting relevant references for their papers and had no difficulty using word processors.

3.2. Materials

3.2.1. Writing strategy inventory questionnaire

A writing strategy inventory was developed based on strategy types identified in Kellogg (1986), Li (2012), Stapleton (2010), Torrance, Thomas and Robinson (2000), and Yang and Plakans (2012). The researcher and two research assistants, who were doctoral candidates in applied linguistics, scrutinized the writing strategies identified in the aforementioned studies, made alterations to the strategies according to the purpose of the

current study, and added new strategies that were found during computer-mode academic writing using multiple resources. Through a pilot study, writing strategies that seemed to be overlapping or ambiguous were identified and eliminated from the list or modified upon agreement between the researcher and the research assistants; a total of 90 writing strategies were finalized. They were classified into six types (see Table 2): self-regulatory (18 strategies), research (26 strategies), planning (9 strategies), composing (14 strategies), revising (17 strategies) and collaboration strategies (8 strategies) (Chen, 2011; Chien, 2012; de Silva, 2015; Hirvela, 2005; Stapleton, 2010). Two items (No. 25 and 27) were classified into two categories because of their dual functions. For example, Item 27 “While planning, I ask questions regarding the amount/depth of the literature review required in the task” was identified as both a task examination strategy and a collaboration strategy, since it was a case in which a writer consulted with others including instructors or other students about the task (see Appendix A).

TABLE 2
Taxonomy of Writing Strategies by Categories

Categories		Total No. of Items	Item No.
Self-regulatory	Goal-setting	10	2, 3, 4, 5, 6, 12, 16, 17, 18, 67
	Monitoring	7	7, 8, 9, 58, 65, 88, 89
	Evaluation	1	87
Research	Task-related research	1	32
	Topic research	6	20, 21, 22, 23, 24, 30
	Content research	6	31, 38, 43, 50, 60, 69
	Organization research	1	45
	Language research	3	44, 46, 59
	Highlighting/note-taking	2	35, 42
	Saving/organizing sources	4	33, 34, 36, 37
	Printing/organizing sources	3	39, 40, 41
Planning	Task examination	4	1, 13, 25, 27
	Brainstorming (idea generation)	1	19
	Topic selection	2	29, 47
	Organization	1	14
	Outlining	1	48
Composing	Text generation	1	54
	Genre-related formulation	3	49, 56, 57
	Resourcing	7	51, 52, 62, 63, 66, 80, 82
	Paraphrasing	1	64
	Translation from L1 to L2	1	55
	Saving	1	15
Revising	Rereading/reviewing	2	61, 68
	Reformulation	10	70, 75, 76, 77, 78, 79, 81, 83, 84, 85
	Genre-specific modification	4	71, 72, 73, 74
	Editing	1	90
Collaboration	Interaction (scaffolding)	8	10, 11, 25, 26, 27, 28, 53, 86

A writing strategy inventory questionnaire was constructed with 90 five-point Likert scale statements in English, each of which referred to a writing strategy listed in the inventory. For instance, scale 1 was “I never do this”; scale 5, “I do this very often.” For 33 items, along with Likert scale, the participants were also asked to mark the given options that allowed them to specify which types of resources or tools they used for the strategy, including digital journals, sticky notes, email, word processors, and online dictionaries, as Items 60 or 90 in Appendix A. The statements for collaboration strategies contained options to specify who to contact to and how, as in Item 27 in Appendix A.

3.2.2. Writing logs

A writing log was developed in English in case of non-recordable conditions involving non-computer-mode writing, such as use of smartphones, print materials like books, handouts or notebooks, or circumstances that do not allow video recordings of writing processes (see Appendix B). In the writing log, the participants were required to record date, both starting and ending time of each writing session, and progress they made for that session, and to explain the first time they tried writing strategies or resources, if applicable. The purpose of the writing logs was to track the participants’ writing processes and to obtain more specified information about each writing session.

The log included a writing resource inventory questionnaire to collect information related to specific resource types used during writing processes. Types of resources included in the inventory questionnaire were adopted from the types discussed in Stapleton (2010, 2012) and Li (2012), such as Internet sites including YouTube, Wikipedia, online dictionaries, and search engines. Additional resources or resource options were identified, drawing from the researcher and the research assistants’ writing experiences. After careful examination, both paper-based and computer-based resource types were added to the questionnaire (see Appendix B). The first section of the inventory questionnaire asked the participants whether they used the resources listed and why they used them. The second section asked them to write rough percentages to denote amounts of resource use totaling 100 percent; this was to investigate the participants’ perceived ratio of resource types they used during writing.

3.2.3. Keystroking program *Inputlog*

A keystroke logging software program, *Inputlog*, developed by Leijten and van Waes (2012), was used to supplement the analysis of the participants’ strategy and resource use in on-line writing processes. This program consists of three modules, which are a data collection module, a data analysis module, and lastly, a play module. Outputs of *Inputlog*

are compiled from data produced between the MS Word program and the Internet. They provide records of mouse movements, address of Websites visited, and each letter typed with the keyboard. The *Inputlog* output files were used for checking whether the participants had written accurate information on their questionnaires and logs.

3.2.4. Video recording

Writing sessions for the whole process were video-recorded; video recordings supplemented other types of data mentioned above. The purpose of collecting video recordings was to obtain data that could not be recorded through *Inputlog* and questionnaires or logs, such as the participants' behaviors related to their resource use and types of resources they used during writing processes (e.g., smartphones and print materials). Each participant was provided with a portable webcam that used a program compatible with her personal computer. Using the webcam, the participants recorded every session of their writing process including searching and reading reference materials.

3.2.5. Retrospective interview

After the submission of written products, inventory questionnaires and logs, a retrospective interview was conducted in Korean. Questions for the interview consisted of queries about unidentifiable or insufficiently explained strategies employed by the participants, as shown in the following sample interview of D1 about Session 2 researching stage (translated from Korean to English).

Assistant 1: *In the video recording, you were writing something on your notebook while reading articles on screen. What did you write on your note?*

D1: *I wrote notes to help remind me of the things I needed to do when I come back to this task later. It is related to the questionnaire item 9. I also wrote down the outline and direction of my term paper. It was a kind of brainstorming.*

These questions were constructed based on a close investigation of the collected data including the questionnaires, video recordings and outcomes of *Inputlog*. The interview was conducted by two research assistants shortly after each writing session with each individual participant. All the questions and interview processes were audio recorded.

3.3. Data Analysis

The participants' use of strategies and resources was mainly identified and coded in their

written records in the strategy and resource inventory questionnaire, which were completed after each session of the writing process. Their written records in the two questionnaires for each session were cross checked with the video-recording and *Inputlog* output file by the two research assistants. The assistants reviewed the video recording to see whether the participants actually used the strategies and resources recorded in the inventories and whether there was any missing information that could be identified by the assistants in the video recording, but not marked in the inventories. The video recording was also analyzed to determine the writing stage of each session and the approximate timing of computer-mode behaviors so that it could be further clarified in the *Inputlog* output. The *Inputlog* output was also cross-referenced by the assistants with the participants' written records in the two inventories. For example, if the participants used online dictionaries to search words, then *Inputlog* outputs could identify which words they searched for, and whether they searched in English or in Korean. Additionally, the *Inputlog* outputs were analyzed to see specific Websites the participants visited and digital resources they employed during the writing process. Mismatches between the written records in the inventory questionnaires and the video recording and *Inputlog* outputs were clarified during the retrospective recall interviews and the participants' written records were modified whenever necessary.

After the written records in the inventory questionnaires were finalized, strategies and resources were coded by categories in each session of the participants and then by writing stages. The coding of the two assistants was cross examined by each other; all the differences were clarified through discussion and the coding was revised. Descriptive statistics were conducted to examine the pattern of strategy and resource use.

4. RESULTS AND DISCUSSION

In order to analyze writing strategies, the participants' writing processes and resource use were examined to identify the strategies by writing stages and resource types. The five graduate students proceeded to write their research papers in 7 to 11 sessions for a total of 10.3 to 27.6 hours during 26 to 57 days (see Appendix C). There was no clear boundary by writing stages; the writing processes were recursive, as suggested in Flower and Hayes' (1981) cognitive model of writing process and Zamel's (1983) study of L2 writing process. Nonetheless, the processes were divided into three stages according to the main tasks of each session: researching and planning as the pre-writing stage, formulation and in-process revision as the writing stage, and revision and editing as the post-writing stage. The participants' writing strategy use was analyzed according to the three writing stages, as shown in Table 3.

TABLE 3
Writing Strategies by Categories and Writing Stages

Strategies	Research/Planning					Formulation/ In-Process Revision					Revision/Editing				
	M1	M2	D1	D2	D3	M1	M2	D1	D2	D3	M1	M2	D1	D2	D3
<i>Self-regulatory</i>	3.50	2.70	1.34	3.00	1.83	3.33	2.73	1.81	3.13	2.56	3.45	2.64	2.09	2.82	4.45
Goal-setting	3.62	2.57	1.26	2.48	1.89	3.64	2.37	1.50	2.21	2.33	4.80	2.80	3.40	2.60	5.00
Monitoring	3.22	3.00	1.53	4.22	1.67	3.03	3.10	2.11	4.04	2.76	2.60	2.80	1.00	3.40	4.20
Evaluation											1.00	1.00	1.00	1.00	3.00
<i>Research</i>	3.17	3.81	2.59	3.25	3.12	2.10	2.50	1.96	3.94	2.09	1.00	2.00	1.00	3.00	1.00
Task-related research	3.33	5.00	4.40	4.33	3.00										
Topic research	3.22	4.00	2.80	3.67	3.04										
Content research	3.33	3.50	2.30	2.83	4.25	2.72	3.20	3.22	3.17	3.00	1.00	2.00	1.00	3.00	1.00
Organization research	3.67	2.00	1.40	2.00	4.00	1.00	1.40	1.00	4.25	1.80					
Language research	1.50	1.50	1.00	3.67	1.75	2.22	2.40	1.33	4.25	1.35					
Highlighting/ note-taking	3.17	5.00	3.10	3.33	3.50	1.00	1.80	1.00	5.00	1.40					
Saving/organizing sources	3.42	4.00	3.90	2.50	4.25										
Printing/organizing sources	3.56	4.33	1.13	3.44	1.42										
<i>Planning</i>	3.15	3.44	1.69	2.44	2.78										
Task examination	2.50	3.00	1.55	2.00	1.31										
Brainstorming	4.00	4.00	1.80	3.33	3.75										
Topic selection	3.50	3.50	2.00	3.00	4.25										
Organization	3.33	4.00	1.40	2.33	2.50										
Outlining	4.00	4.00	1.80	2.33	5.00										
<i>Composing</i>						2.38	2.77	2.64	3.40	3.16	1.67	4.00	3.00	2.67	5.00
Text generation						2.17	1.40	1.00	1.00	4.43					
Genre-specific formulation						3.67	3.67	4.67	4.67	3.67					
Resourcing						1.58	2.07	2.22	3.71	2.61	1.00	3.50	2.00	3.50	5.00
Paraphrasing						4.67	4.20	3.00	5.00	4.43					
Translation						1.00	2.00	1.00	1.00	1.14					
Saving						2.67	5.00	2.00	1.00	4.60	3.00	5.00	5.00	1.00	5.00
<i>Revising</i>						1.44	1.78	1.83	2.67	1.25	3.18	2.75	1.86	3.64	4.69
Reviewing/ rereading						2.75	2.90	3.00	3.63	2.00	5.00	4.00	1.00	3.00	5.00
Reformulation						1.00	1.55	1.50	3.06	1.00	1.785	2.56	1.89	3.67	4.33
Genre-specific modification						1.00	1.50	1.75	2.38	1.00	4.25	3.50	3.25	2.75	5.00
Editing											3.00	1.00	1.00	5.00	5.00
<i>Collaboration</i>	2.06	3.17	2.00	1.44	1.42	2.17	1.40	1.00	1.00	1.00	1.00	1.00	1.00	1.00	3.00
<i>Mean</i>	2.97	3.28	1.91	2.53	2.29	2.25	2.23	1.83	2.81	2.00	1.97	2.49	1.84	2.59	3.61

Three strategies, including library onsite searches and use of Google Translator for composing and revising, were never used by the participants, though such strategies were

still observed in Stapleton's (2010, 2012) studies of writing processes in an electronic environment. Thus, after these were excluded, the six strategy categories and the eighty-seven individual writing strategies were classified into the three writing stages. Thirty individual strategies (e.g., monitoring, language research, and rereading) were classified into more than one stage.

4.1. Self-Regulatory Strategies

Self-regulatory strategies included goal-setting, monitoring, and evaluation strategies (see Table 2). They were widely employed across the stages, since they may not be specifically more relevant to any particular stage (see Table 3). The participants tended to monitor their writing throughout the whole writing process, especially while composing ($M = 3.01$), as a high frequency of monitoring was noted at the writing stage in Chen (2011). Interestingly, they used goal-setting strategies at the post-writing stage most ($M = 3.72$), though they were dominant in the pre-writing stage in the reading-to-write task to determine how to integrate the source texts in Plakans (2009).

Individual variations related to educational experiences in English-speaking countries were also noted in self-regulatory strategy use: M1, M2 and D2, who were educated mainly in Korea, deployed monitoring strategies at the pre-writing and writing stage, but not D1 and D3, who had experience with higher education in English-speaking countries. Across the three stages, M1 constantly set a goal and D2 repeatedly continued to monitor her writing. These two students appeared to control their writing behaviors most, utilizing self-regulatory mechanisms. This may be attributed to their motivation for academic studies or personal learning styles, as shown by M1's interview excerpt below.

M1: *It is my first time to write a research method section in detail. Also, I am taking a research methodology course this semester. I want to apply what I am learning from the course to my paper and write a good paper. So, I try to keep setting a goal. And I think goal-setting can reduce my work load, decreasing redundant or unnecessary work. That is, goal-setting is time-saving work for me. I often set a goal for my academic work.*

On the other hand, D1 and D3 used goal-setting strategies at the post-writing stage; D3 employed all three self-regulatory strategies at the post-writing stage. D3 stated the time pressure had led her to use such strategies more in the last session of her writing process.

D3: *I used self-regulatory strategies toward the end because of the due date for the term paper. I was in a hurry to finish the work in time so I tried to find some errors or*

mistakes in the writing close to the deadline. At the last session of my writing process, I employed more monitoring and evaluation strategies. I think time pressure could be one of the main reasons for using those strategies.

4.2. Research Strategies

Research strategies were mainly utilized for the pre-writing stage ($M = 3.19$) to do web-based research for the task, topic and content, except for content research strategies, which were also deployed at the writing stage (see Table 3). This was reflected in the use of resources such as journal databases including EBSCOhost, ERIC and university library databases and print and online journals, as shown in Appendix C. None of the participants used Google Scholar, though it was found to be Hong Kong students' favorite database in Stapleton (2010, 2012). Print books or e-books were not the main source materials for the participants of the study, though Chinese MA students still used 30 percent of the information stored from library books in Stapleton (2012).

Before composing, moreover, the participants read or skimmed through searched materials and then electronically saved and organized them or highlighted and took notes of important points in computer or paper mode, as in Li (2012). Individual writer variations were smaller in the use of research strategies at the pre-writing stage. This can be attributed to the nature of the writing task since a great amount of research is prerequisite to writing a research paper. The participants, except for D2, did not appear to mix researching with composing. Nonetheless, a discrepancy between the two groups by educational background and study styles was also manifested. M1, M2 and D2 printed out and organized searched source materials and read them offline; they still preferred hard copies of sources, as M2 expressed why she favored print articles over digital ones below.

M2: Most of the time, I print articles and carry them around to read whenever I want. It is just more convenient that way, since they are lighter than electronic devices like laptops, for instance. Also, I find it easier to focus with paper than on a screen.

They clearly had a preference for print articles throughout the writing process, but more toward the end of the process.

To contrast, D1 and D3 rarely read print materials; they favored soft copies and electronic storage of sources, like Chinese MA students in Stapleton (2012). During their study abroad, they did not have a printer and electronically read and saved source materials, which seemed to have become their study habit. When they participated in this research, they did not have a printer at home, while M1, M2, and D2 all had one. D1 explained that digital reading was her habit acquired from her undergraduate studies in the USA.

D1: *Back when I was an undergraduate student, I did not have a printer in my apartment. Students in the States, including me, seemed to prefer using laptops or tablets rather than printing out readings for classes. I think this became my habit now. I still carry around my tablet and do not own a printer.*

Distinctive features of D2's research strategies were also manifested in her use of content research across the three writing stages, despite her relatively extensive content knowledge. She often employed organization research, and highlighting and note-taking strategies at the writing stage.

4.3. Planning Strategies

Planning strategies were employed only for the pre-writing stage, contrasting with Matsumoto's (1995) study of Japanese EFL professors, whose planning was flexible and tentative and changed during the writing process. These strategies were more evident from the two MA students ($M = 3.30$) than from the doctoral students ($M = 2.30$), though their pre-writing sessions were shorter (see Appendix C). This result is contrary to the findings from previous studies that unskilled writers plan less (Cumming, 1989; Raimes, 1987; Roca de Larios et al., 2008; Zamel, 1983). The MA students generated ideas through brainstorming, organized their ideas, and outlined their papers. They attempted to plan their paper more consciously according to the task requirement and evaluation criteria. This might result from their lack of experience in writing a research paper, unfamiliarity of the task, and their perceived task demands, which is supported by the finding that they deployed collaboration strategies at their early stages, as explained by M1 below.

M1: *As I said before, this is my first time to write a research paper that requires me to write research methodology in detail. So, I needed some helps from those who had experiences in writing a methodology section. I asked my professors and classmates to see whether my research design was appropriate for my research topic. Also, as I haven't written a 20-page-long research paper, I am overwhelmed by the task. So, I asked my classmates about the desirable proportion of each section of a research paper.*

These findings are supported by the L2 composing behaviors noted from low-achieving Taiwanese students in Chien (2012), who read the prompt, attempted to interpret the task, and generated ideas more substantively than high-achieving ones.

Variations among the three doctoral students were further noted; D3 tended to use

planning strategies ($M = 3.36$), whereas D1 rarely deployed them ($M = 1.71$) and D2 did not depend on planning strategies ($M = 2.60$) as much as self-regulatory ($M = 2.98$) and research strategies ($M = 3.40$). Such differences might be accounted for by their personalities and work styles, as expressed by D3 and D2 in the interview excerpts below.

D3: *I think it is related to my personality and my personal habit. I am a real planner. I like to plan and monitor everything while I'm working on something. Because I do believe planning can improve my work, avoiding making mistakes.*

D2: *I tend to set general goals to achieve and check whether I have completed them such as finishing the introduction part. But I rarely plan specific aspects of my writing in advance. I don't often use the planning strategies listed in the inventory.*

4.4. Composing Strategies

Composing strategies were frequently used for the writing stage, as the composing time was substantial. D1, who incorporated strategies throughout her writing process much less frequently than the other students, often employed composing strategies.

D1: *I think that composing is the hardest and the most important part of writing. No matter how thoroughly I research, if I cannot put them in proper words and in an organized manner, the quality of my paper would be low. So I try to do well by using more strategies and putting more thoughts and efforts into the process.*

The dominant composing strategies were genre-specific formulation ($M = 4.07$) and paraphrasing ($M = 4.26$). In order to meet the task requirements and evaluation criteria, the participants of the current study attempted to write their papers as an appropriate research paper. They also attempted to paraphrase source texts to avoid plagiarism as much as possible. On the other hand, the five graduate students seldom employed translation strategies, that is, they rarely typed ideas or words in L1 and then replaced them with words in English, like the Japanese EFL professors in Matsumoto (1995). They did not use an online translator such as Google Translator, unlike the Chinese MA students in Stapleton (2012).

The two MA students did not frequently deploy electronic language search strategies as part of their resourcing strategies ($M = 1.43$), as can be inferred from a small portion of their use of online dictionaries recorded in their writing logs. Meanwhile, D1 and D2 utilized word processor synonym tools or online dictionaries, primarily the Naver English Dictionary, which is the most prevalent online dictionary in Korea, in order to search for synonyms, collocations, appropriate or right expressions or sample sentences, or to widen

vocabulary range ($M = 3.48$). D3 substantially utilized an online dictionary including a corpus, Gary's Home, at her seventh session when writing the literature review and methodology section and finishing the introduction. In a retrospective interview, she explained her use of Gary's Home: it was a new Website she learned from a course she was taking in the semester and she wanted to try it out.

Saving strategies, that is, making additional electronic storage of drafts to not lose them, were often employed by the students, especially at the revision and editing stage, except for D2. D2 never saved any supplementary electronic copies of her drafts, as predicted from her resource use pattern.

Interestingly, three of the participants (M2, D2, and D3) who had more substantive field-specific content knowledge (see Table 1) sometimes deployed resourcing strategies ($M = 2.99$), namely, writing references in the APA style at the writing stage. They used these strategies more intensively at the post-writing stage to revise the reference format ($M = 4.00$).

D2: *Writing references in the APA style was required in the research paper assignment as one of the evaluation criteria in the course, so I was trying to use it as accurately as possible. Since I was writing most of the references after writing the conclusion at the post-writing stage, I kept checking references in the articles read before and searched correct reference forms in the APA style while revising my paper.*

The infrequent use of text generation strategies, except for D3, was contrary to the expectation based on the participants' English writing proficiencies that they would first write without any concerns with grammaticality and then revise their writing later. Only D3, who was relatively more proficient in L2 writing, typed sentences without concern about grammar errors and then revised them afterwards.

D3: *I don't worry much about grammaticality of writing during composing. I just typed whatever ideas occurred in my head not to lose them. Later I can return to them and revise them if necessary.*

4.5. Revising Strategies

Revising strategies were the main strategy type for the post-writing stage due to their nature. Two of the doctoral candidates (D2 and D3) were heavy users of these strategies. At the end of the writing process, the five participants, except for D1, constantly reviewed and read their writing for local and global revision, including reorganizing language units and sections ($M = 3.60$). In contrast, D1 constantly reviewed her writing to revise expressions

while composing rather than while revising. She did not print out her drafts to check errors, even in her final session.

At the post-writing stage, the students tended to revise their papers by section and corrected their language errors ($M = 3.40$). They utilized word processor review tools for revision ($M = 3.80$), but not other electronic tools such as online dictionaries and word processor synonym tools ($M = 2.00$), except for D2 and D3 ($M = 3.38$).

M1: As I had already found some words or synonyms from online dictionaries, such as the Naver Dictionary at the composing sessions to paraphrase the expressions from the original sources, I didn't need any further search for vocabulary in the revision stage. In revising, I used MS Word Review tool because I thought they indicated major language errors. And I believed they were quite reliable in finding lexical and grammatical errors.

The participants also modified their papers to make them more appropriate as a research paper by changing the degree of author voice, the tone of arguments and genre-specific expressions ($M = 3.75$).

D1: I took a college-level research writing course when I was a freshman in the States. In this course, we were introduced to concepts of hedging and we learned not to sound too certain or strong. Importance of using appropriate tone and words according to each genre of writing was emphasized so much that I always try to keep that in mind when I write, especially with research papers. I think this experience affected a lot when I was using these strategies.

As for editing strategies, three of the students (M1, D2, and D3) checked their papers for any possible plagiarism using web tools such as Copykiller or Turnitin.

4.6. Collaboration Strategies

Collaboration strategies were rarely used, though a third of the Chinese MA students indicated the helpfulness of electronic collaboration with peers in Stapleton (2012). The participants in this study appeared to communicate with their course instructors and classmates mainly in person to gain more information on the requirements and evaluation criteria of the research paper assignment, especially at the initial sessions of the writing process. They also attempted to seek help from the instructors about the appropriateness of their research topics. D3 contacted a person off campus for proofreading her paper. M2 was a heavy user of collaboration strategies at her early stages to elicit help from her

instructor, classmates and other friends outside of class to find the expected amount and depth of the literature review and how to gather relevant materials, often electronically through emails or smart phone messengers.

M2: I have a habit to make things clear before I start working on my writings. By sharing my thoughts with others, I often get related ideas from my instructor, classmates, or other friends outside of class. Especially, if I know someone who has done working on the task or topic that I am writing on, I get a lot of help from him or her. I do believe that collaboration helps me to bring more high-quality and organized ideas.

5. CONCLUSION AND IMPLICATIONS

The present study has examined Korean EFL graduate students' semester-long processes of computer-mode research paper writing to explore their strategy and resource use. Findings from the analysis of the strategy use illustrate strategy type-specific or writing stage-specific and individual writer variations. The students tended to more frequently employ strategies in the pre- and post-writing stage than the main writing stage. Certain strategies were employed recursively throughout the whole writing process or only at particular stages. Within strategy category, furthermore, the students utilized certain sub-categories at specific stages, which was often closely connected to their resource use.

Since this is an exploratory study of five graduate students in a naturalistic setting, findings from this study may not be generalizable to other contexts. Nevertheless, they shed light on L2 research paper writing process in a naturalistic setting. They reveal that the process is resourceful, strategic and individually situated, and it involves complex composing behaviors accompanied with more various strategies and resources than revealed in studies of one-time reading-to-write tasks. The process relied on electronic resources in the digital era. The results of the study also provide meaningful observation of strategy use pattern and resource use, which were influenced by the genre-specific features of the research paper, writing stages, the nature of strategies and resources, and individual writer factors such as educational background, disciplinary knowledge, experience in research paper writing, L2 writing proficiency, study habits or style, personality, and motivation. The research paper writing process was a recursive process of composing intermingled with researching and reading. Web-based research was prevalent, though preference for reading on-screen or in print varied with the participants' educational experiences and study style. The nature of writing sessions also influenced the diversity and types of resources deployed.

Different findings of the current study from previous studies including Stapleton (2010, 2012) and Li (2012) suggest a greater influence of the advanced electronic environment on the L2 research paper writing process, which leads to a distinctive pattern of writing strategy and resource use, including no library onsite searches. They also indicate different Internet resources favored by L2 writer groups from different L1 backgrounds or Internet cultures, as indicated by different use pattern of web resources such as Wikipedia or Google Scholar.

The current study has several limitations in addition to the small sample size. The effectiveness of strategies or resources was not explored, i.e., the study did not examine whether the strategies or resources employed by the participants were effectively used and which strategies or resources were useful. Further studies are thus needed on this issue. They also need to explore how the selected strategies or resources are related to written products or they enhance the quality of the products. Since the study placed a focus on the writing process, it did not investigate strategies related to selecting or eliminating source materials or contents, as in Li (2012). For example, the study did not explore whether the participants searched with appropriate key words effectively. Further studies may provide insight into strategies related to searching and using source materials. Since the study explored the process of research paper writing in applied linguistics, the results would have been discipline-specific. Future studies across disciplines are needed to examine disciplinary variations in the research paper writing process. The current study did not investigate whether electronic resources enhance the efficiency of writing process. Stapleton (2012) states that electronic tools and resources may enhance cognitive efficiency by making a trade-off between composing activities by reducing cognitive load of certain activities. It may be worthwhile to explore how such tools or resources assist the L2 writing process. Such a study can provide meaningful pedagogical implications for research paper writing.

The results of the study imply the importance of researching, reading, resource-utilization skills and writing skills in the L2 research paper writing process in a digital era. EAP writing courses should thus be designed to satisfy the needs of L2 graduate students by extending the contents to include such skills. They should also incorporate genre analysis, as shown by the influence of the target genre on strategy and resource use. As expressed by a participant upon data submission, a strategy or digital resource inventory can be provided to L2 students to become aware of diverse strategies and resources and deploy them appropriately to their writing context. The individual writer variations revealed in the study further suggest that EAP writing instructors should understand the impact of electronic environments and students' educational backgrounds and study styles on the academic writing process.

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APPENDIX A

Sample Questions of the Writing Strategy Inventory Questionnaire

Item	Never	Rarely	Sometimes	Often	Very often
3. I set up my own standards of the paper as an author (e.g., content-depth/sufficiency, level of native-like expressions, etc.).	1	2	3	4	5
21. I use web search engines (Google, Naver, etc.) to gather general information, terms, or words about the prospective research topics.	1	2	3	4	5
27. While planning, I ask questions regarding the amount/depth of the literature review required in the task.	1	2	3	4	5
	to (professors/friends in school/friends outside school/other: _____)				
	(by email/in person/both/other: _____)				

36. I create a Hangul or MS Word file to copy and paste all the relevant information from articles or books to refer to whenever I need.	1	2	3	4	5
49. I write my paper appropriately for characteristics of research articles (e.g., format, organization, linguistic features, tone, etc.).	1	2	3	4	5
52. While writing, I use the Hangul or MS Word Synonym tool when I try to paraphrase or avoid using the same words.	1	2	3	4	5
60. While writing, I read topic-related articles or books to find relevant contents that I want to write.	1	2	3	4	5
	in (electronic format/printed format/both)				
61. While writing on the computer, I constantly reread to revise each sentence/paragraph	1	2	3	4	5
83. While revising, I use the Hangul or MS Word Review tool to check for grammatical errors, word counts, etc.	1	2	3	4	5
90. I check my paper for any possible plagiarism.	1	2	3	4	5
	by using (websites/software programs)				

APPENDIX B

Sample Writing Log of D1: Session 3

WRITING LOG				(You may write in English or Korean or both.)	
Date	Time Start	Time End	Total Time	Accomplished (progress)	First time tried writing strategies including strategies for using resources (If listed on the Strategy Inventory, please write down the number of the strategy)
6/3/15	4:27 PM	6:27 PM	120 mins	-Gathered more previous studies to use them when I write LR -Got an idea of how to analyze data from RAs	Use of Web search engines to look for unknown terms/concepts found in RAs during research

WRITING RESOURCES INVENTORY			(You may write in English or Korean or both.)	
1. Please <u>check</u> whether you used any of the resources listed below. Also, if yes, please check <u>all</u> the <u>options</u> that apply to you.				
Writing resources	YES	NO	Choose <u>ALL</u> of the resources that you used today for writing.	Write why you used the resources.
Books	✓		① paper books ② e-books ③ other (Please specify): _____	I referred to textbooks for accurate definitions of terms/concepts.
Articles	✓		① printed articles ② online articles ③ other: _____	I read RAs to see if they are appropriate for my paper.
Internet websites	✓		① search engines (Google, Naver, other: _____) ② blogs ③ Wikipedia ④ Google Translator ⑤ Slideshare ⑥ other: _____	I looked for terms/concepts that I wasn't familiar with.
Online dictionaries	✓		① Naver English Dictionary ② Daum English Dictionary ③ Oxford Dictionary ④ Cambridge Dictionary ⑤ Longman English Dictionary ⑥ other: _____	I looked for definitions of some unknown words.
Journal databases	✓		① EBSCOhost ② ERIC (ProQuest) ③ JSTOR ④ RISS ⑤ DBpedia ⑥ university library databases ⑦ other: _____	I researched articles for my paper.

Online videos	√	① TED ② YouTube ③ other: _____
Others	√	① novels ② magazines ③ newspapers ④ other: _____

2. What writing resources did you use? Write the rough percentages to denote amounts of resources usage totaling 100%.

1) Books 10% 2) Articles 40% 3) Internet websites 5% 4) Online dictionaries 5%
5) Journal databases 40% 6) Online videos 0% 7) Others 0%

APPENDIX C

The Writing Process and Resource Use of the Participants by Session

St. No.	Session No.	Recorded Time (mins)	Writing Stages	Task	Main Resources
M1	S1	400	Pre-writing	Researching PR; summarizing	JDB, OJ, PJ
	S2	170		Creating RQs	JDB, OJ, PJ
	S3	60		Reading PR; creating an outline	PJ, EB
	S4	410	While-writing	Writing LR	OJ, PJ, JDB, OD, B, IW
	S5	215		Writing LR	OJ, PJ, JDB, OD, B
	S6	60		Finished writing LR	OJ, PJ
	S7	90		Writing M	OJ, PJ
	S8	100		Finished writing M	PJ, B
	S9	90		Finished writing Intro	PJ, OD
	S10	60		Post-writing	Revising and editing
M2	S1	146	Pre-writing	Searching PR; planning; writing Intro, LR, and M	OJ, PJ, JDB
	S2	263	While-writing	Writing LR	OJ, PJ, JDB, IW, OD
	S3	188		Data collection	JDB, OJ, PJ, IW
	S4	68		Data analysis	S, OJ, PJ, IW
	S5	481		Writing R and D	OJ, PJ, JDB, IW, OD
	S6	109	Writing C; revising	OJ, PJ	
	S7	69	Post-writing	Revising and proofreading	OJ, PJ, OD
D1	S1	42	Pre-writing	Brainstorming; searching topics	JDB, OJ
	S2	47		Searching PR	JDB, IW
	S3	75		Researching PR; developing research materials	JDB, OJ, B
	S4	28	While-writing	Researching PR and methods	JDB, OJ, B
	S5	48		LR, researching, writing RQs, outlining; developing research materials	OJ, JDB, B, IW
	S6	100		Writing Intro, researching, LR, data collection	B, OD, IW
	S7	128		Writing LR and M, analyzing and editing data	OJ, B, IW
	S8	200		Writing M, R, C, and Ref section, analyzing and editing data	OD, OJ, B
	S9	20		Post-writing	Revising; reorganizing; proofreading
D2	S1	35	Pre-writing	Searching PR	JDB, OJ, PJ, B
	S2	105		Searching PR and research topics	JDB, OJ, IW

	S3	252		Searching PR and setting a goal	OJ, PJ, JDB
	S4	148	While-writing	Writing the LR	OJ, PJ, JDB, W, OD
	S5	102		Writing the LR	OJ, PJ, OD
	S6	232		Writing M	OJ, PJ, OD, IW
	S7	311		Writing Intro, R, and C	PJ, OD, IW
	S8	139	Post-writing	Revising; proofreading	PJ, OD
D3	S1	38	Pre-writing	Searching PR	OJ, PJ, JDB
	S2	55		Outlining each section and starting to write LR	OJ
	S3	30		Searching and planning	OJ, JDB
	S4	131		Writing LR and creating RQs	OJ, JDB
	S5	93	While-writing	Writing LR	OJ
	S6	60		Writing LR and Intro	OJ
	S7	120		Writing LR and M; finished writing	OJ
	S8	80		Intro	
	S9	16		Checking Ref	OJ
	S10	195	Post-writing	Writing M and R	OJ
	S11	50		Finished M, R, and D	PJ, S
			Revising and proofreading	OD, S	

Note. PR = previous research; O = outlining; RQ = research question; Intro = Introduction; LR = literature review; M = Methodology; R = results; D = discussion; C = conclusion; Ref = reference; WP = whole paper; JDB = journal database; OJ = online journal articles; PJ = print journal articles; B = print book; EB = e-book; OD = online dictionary; IW = Internet Website; S = software program

Applicable levels: Tertiary

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