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Hypothesis Generation and Hypothesis Testing: Two Complementary Studies of EFL Writing Processes

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In this chapter, I reflect on my inquiry process for two complementary studies (Sasaki, 2000, 2002); the former represents a hypothesis-generating exploratory study and the latter a hypothesis-testing confirmatory study. Both of these studies fall under the category of *quantitative* research “where generalizability from the sample to the population is the aim” (Newman & Benz, 1998, p. 10). In terms of content, they deal with Japanese EFL (learning English in a non-English-speaking environment) learners’ English writing processes.

My inquiry process for these two studies is typical of the one I have often employed when the target of research has not previously been extensively studied. In such a case, it may be difficult to formulate specific hypotheses to be tested, but researchers may still want to find out whether some patterns exist in the given situation of interest. Researchers can then explore the collected data and formulate some operational hypotheses, which could later be confirmed or disconfirmed using another sample from the same population.

I first learned to use such an exploratory-to-confirmatory sequence when I was trained to use factor analysis for my doctoral dissertation (Sasaki, 1991, 1996). According to Kim and Mueller (1978), *exploratory* factor analysis is used when “the researcher may not have any idea as to how many underlying dimensions there are for the given data,” whereas *confirmatory* factor analysis is used “as a means of testing specific hypotheses” (p. 9)—for instance, regarding possible numbers and relations of

underlying factors.¹ Exploratory factor analysis is often used as a preparatory step for a following confirmatory factor analysis (Bollen, 1989).

Later when I had to plan other types of quantitative research, I realized that this exploratory-to-confirmatory sequence could be applied to studies that did not involve factor analysis. Sasaki (2000, 2002) represent one of those sequences I have used for the study of L2 writing. They followed a typical quantitative research procedure of planning—data collection—data analysis—writing up the paper (Isaac & Michael, 1981). In this chapter, however, I describe not only such a procedure for each study, but also the problems (both expected and unexpected) I encountered while conducting the study and how I managed to solve them. By doing so, I hope to encourage some of the readers not to give up their research projects just because they are faced with such problems.

SASAKI (2000): AN EXPLORATORY STUDY

Preparatory Steps

From 1992 to 1994, I was involved in several studies that investigated factors affecting the quality of Japanese university students' English writing (e.g., Hirose & Sasaki, 1994; Sasaki & Hirose, 1996). While I was conducting these product-oriented studies, I also became interested in the *processes* of how these students produced their L2 texts and how these processes might change over time. I looked at previous studies and found that a number of studies had already examined the composition processes of ESL (learning English in an English-speaking environment) learners with heterogeneous educational and cultural backgrounds. However, few studies at that point had examined Japanese EFL learners' L2 writing processes both cross-sectionally and longitudinally. Consequently, I decided to conduct an exploratory study using a relatively small sample. From the results of the previous studies that examined mainly ESL learners, I tried to select as the targets of analysis as many aspects as possible of the participants' writing behavior that might potentially be important for characterizing their writing processes.

There was also a methodological problem I needed to solve before conducting this exploratory study. Traditionally, it has been common to use concurrent think-aloud protocols while participants are writing a composition for the purpose of collecting microlevel writing process data in the

¹A *factor* in this context means a hypothetical common trait shared by several observed variables. For example, several listening comprehension test scores may share a common trait of listening ability.

fields of both L1 and L2 composition studies (e.g., Emig, 1971, for L1 studies; Cumming, 1989, Raimes, 1985, for L2 studies). Thus, I tried this method with some of my potential participants, but they found it difficult to talk and write in their L2 at the same time. I realized that the think-aloud method may not be the best for collecting writing process data when participants' L2 writing ability is low and when they are not accustomed to verbalizing their thinking process.

Fortunately, my former co-author, Keiko Hirose, introduced me to a promising method developed by Anzai and Uchida (1981) for L1 Japanese writers. Having realized that it was difficult to collect concurrent think-aloud data from Japanese child participants, Anzai and Uchida conducted a well-designed empirical study and developed a method for collecting *retrospective* protocol data that could provide detailed information about what a participant was thinking about while writing. Because the participants were asked to talk just after they finished writing while looking at the composition they had just written, their writing process was not greatly disturbed. They were asked to explain what they had been thinking about at each pause longer than 2 seconds. These pauses had been hand recorded by a research assistant sitting beside the participants while they were writing. Because a writing process is a continuous but unpredictable act, I thought that asking the participants what they had been thinking about every time they stopped writing would be an effective way of probing their thinking process.

A Pilot Study

At this point, I conducted a small-scale pilot study using five participants from a sample population similar to the one I intended to use for the exploratory study. I wanted to know whether Anzai and Uchida's (1981) method would be truly applicable to my potential participants. Overall, it was a great success. All of the participants, including a few shy ones, contributed ample composing process data for analysis.

Based on the results of the pilot study, I also revised Anzai and Uchida's method to better fit my own study. First, I decided to ask participants to talk about their writing processes when they stopped writing for longer than 3 seconds instead of the original two because I had discovered that the period of 3 seconds was the shortest I could correctly measure. Second, I decided to limit the writing session to about 30 minutes because I noticed that the participants would get too tired to think properly if the total time for writing and the subsequent question-and-answer sessions exceeded 2 hours. Finally, I decided to use a video camera to record the participants' writing behaviors, including their hand movements, instead of just recording their writing behaviors while sitting beside them. Watching the video-

tapes of their own writing behaviors helped the participants remember what they were thinking about at each pause better than just looking at the compositions they had written.

Conducting Sasaki (2000)

Having gained confidence in the effectiveness of the main method I would use, I proceeded to plan the basic research design of the exploratory study at the beginning of 1996. The first thing I had to do was select the participant groups. For the same reasons I had selected as many targets of analysis as possible for this study, I selected as many target participant groups as possible that seemed important for eventually building a comprehensive model of Japanese EFL learners' writing processes. I thus ended up comparing three paired groups: experts versus novices, more versus less skilled student writers, and novices before and after two semesters of instruction (see Fig. 6.1). I wanted to include the *expert group* (defined as those whose "professional work included regularly writing English re-

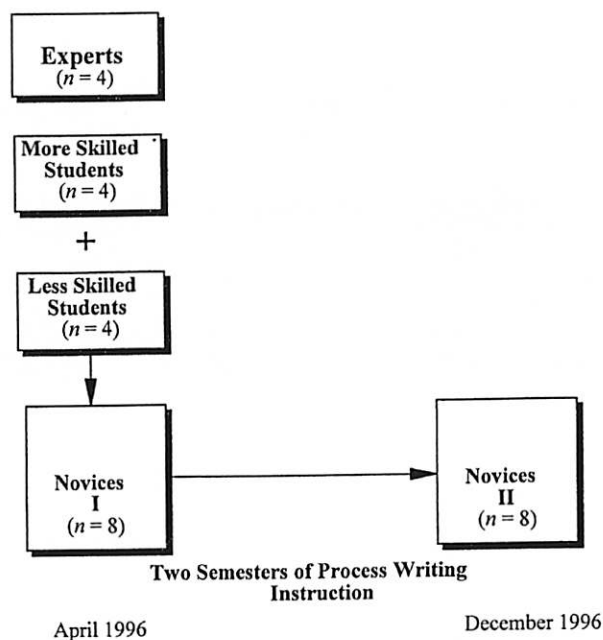


FIG. 6.1. The basic research design of Sasaki (2000) that compared three paired groups of experts versus novices, more and less skilled student writers, and novices before and after two semesters of process writing instruction.

search papers while their life was anchored in Japan," Sasaki, 2000, p. 265) in this study because I believed that their writing ability, not that of native speakers, should be the ultimate goal to be aimed at by EFL students, my target student groups. I decided to have two student groups with different writing ability because similar groups had behaved differently in the previous product-oriented studies (Hirose & Sasaki, 1994; Sasaki & Hirose, 1996). Finally, I wanted to find out the effects of process-writing instruction because I was interested in possible longitudinal changes in the students' writing processes and how they might still differ from the experts' writing processes. Unfortunately, however, I could not obtain a control group to compare with the novice group regarding improvement in L2 writing ability because at that time all freshmen at the university where I was planning to collect data were supposed to receive two semesters of process writing instruction. It was ethically impossible to ask for a control group that did not receive the instruction. This was a problem caused by my using intact groups, but I had to give up the idea of checking the true effects of the process writing instruction, and I resolved to simply observe the novice students' changes over the two semesters because my participants were, after all, real human beings who were entitled to receive a good education.

The next thing I had to decide before actually conducting Sasaki (2000) was the sample sizes of the selected participant groups. When I was conducting the pilot study, I learned that collecting data for this type of study was quite time-consuming (it took about 2 hours to collect data from one participant and about 10 to 15 hours to transcribe the tape-recorded participants' protocols for one session), so I decided to have only four expert writers, four more skilled writers, and four less skilled writers for this exploratory study. Based on the results of a writing assignment that was different from the task used for this main study, the more skilled writers were selected from the top one third of a sample of 45 students and the less skilled writers from the bottom one third. I also collapsed the more and less skilled writer groups into one novice group to be compared as a whole with the expert group at the beginning of the study because the more and less skilled writer groups were similar in that neither had received much L2 writing instruction, including instruction on matters such as "organizing a paragraph centered on one main idea" (see Sasaki, 2000, p. 265). In other words, these two student groups could be collectively called *novices* in terms of their L2 writing instruction history, although their L2 writing ability was quite different (see Fig. 6.1).

In 1996, Keiko Hirose helped me collect the experts' data, and I collected the novices' data both before and after the instruction. We asked each participant to write an English composition in a quiet room. The four experts and the eight novice students wrote an argumentative composi-

tion according to Prompt 1 about the issue of school uniforms. The eight student writers then wrote in response to Prompt 2 about the Japanese people's celebrating Christmas after the two-semester instruction period ended (see Appendix B of Sasaki, 2000).

Before the participants started to write, we obtained permission to videotape them while they were writing. We then began to videotape them with the camera focused mainly on their hand and pencil movement. As in Anzai and Uchida (1981), we waited until the participants started to write the first words of the composition before asking them several questions about their planning, such as what they were trying to write at that time and whether they had decided what they were going to write in the beginning, in the middle, and in the end. When they answered the questions, they were told that their answering time would not be included in the 30 minutes allocated for writing. After the first question session, we let them continue writing until they finished. Right after they had finished, the participants were again asked, in slightly different words, whether they had planned the beginning, the middle, or the ending part of their composition before they started to write down the first word. This second question session was conducted to check the reliability of the data for the first session. After this second question session, the researcher and each participant watched the participant's writing process on videotape together. On the videotape, every time the participants stopped writing for longer than 3 seconds, we asked them to explain, in either Japanese or English, what they had been thinking about. This continued until they finished the entire process of writing shown on the tape. The participants' accounts were all tape recorded and subsequently transcribed.

Using the data obtained from these writing sessions, I compared the three paired groups of participants (experts vs. novices, more vs. less skilled student writers, and novices before and after the instruction) in terms of writing fluency, quality/complexity of their written texts, their pausing behaviors while writing, and their strategy use. As was typical with an exploratory study, I did not intend to use any inferential statistics to test the significance of the results, so I did not have to consider restrictions related to applying inferential statistics such as adjustment of the alpha level by a Bonferroni correction for multiple comparison (Tabachnick & Fidell, 1996). I examined all groups of participants and all aspects of writing behaviors that seemed worth examining.²

²I ended up using some nonparametric procedures when appropriate and necessary (e.g., I used the Wilcoxon Mann Whitney test to compare the experts' composition subscores with those of the novices; see Sasaki, 2000), following the advice of one of the reviewers for *Journal of Second Language Writing*, where the paper was eventually published.

Results of Sasaki (2000)

Among the seven results obtained from Sasaki (2000), the last two ("both global and local planning guided the experts' and novices' writing processes" and "the experts' global planning and partial adjustment of such planning while writing was based on their elaborate but flexible goal-setting and assessment of the characteristics of the given task," p. 282) were a product of my searching through the data for behavioral differences among the different groups. These behavioral characteristics were not quantifiable, but seemed important to distinguish among the groups. I judged that I was justified in presenting these as additional and legitimate results because this was an exploratory study. As in the "specification search" process used in confirmatory factor analysis after it has been found that "the hypothesized model does not fit" (Long, 1983, p. 68), I explored the data without being guided by an explicit, predetermined theory or hypothesis. Of course, however, I was aware that all the findings presented in the prior summary "must be viewed as tentative, in need of verification, with a second, independent sample" (Long, 1983, p. 68).

GETTING SASAKI (2000) PUBLISHED

I finished writing the first draft of the study and submitted it for publication to the *Journal of Second Language Writing (JSLW)* in January 1999. At the end of July of the same year, I received a letter from the editors saying that one reviewer rejected my paper and the other accepted it with revisions. It further said that the editors would give me a chance to revise and resubmit the paper under the condition that this would not guarantee that they would publish it. I had to respond to six pages (single spaced) of the editors' and reviewers' comments. They included such questions as, "What exactly is new in this paper?" and a number of detailed reasons why my paper was not worth publishing. I have to confess here that I could not start to revise the paper for 2 months because I was so shocked by those comments.

In August 1999, I returned to these comments once again, having remembered that reviewers' comments, no matter how harsh they might have sounded, had always improved my past papers in some way. After reading the comments several times, I determined that I could probably address all of them if I spent enough time on them. I decided to resubmit the paper to the *JSLW* and revised it following the editors' and reviewers' advice (see also Sasaki, 2001, 2003). I thus improved the literature review section, changed some terms (e.g., from *more efficient writers* to *more*

skilled writers), gave more detailed explanation where necessary, rewrote the parts that were misleading, corrected the grammatical errors, and addressed the limitations of the study more clearly. Finally, I removed the section called "A Model of L2 Writing Processes" because I agreed with the editors and one of the reviewers in that it was much too early to present an empirical model of L2 writing processes based on the temporary findings that might have fit only the small sample used in this exploratory study (although one of the reviewers liked it very much).

I submitted the revised version in March 2000. On June 28, 2000, I received an e-mail letter from the editor of the *JSLW* again with comments, as well as two additional reviewers' comments. This time both reviewers accepted the paper with revisions. Many of these revisions were minor, but some required me to conduct nonparametric statistical procedures where applying them was possible (recall Note 2). I finished all the necessary revisions and resubmitted the final draft on July 7, 2000, the deadline set by the *JSLW* editors. The paper was published in the last issue of the 2000 volume of the journal.

SASAKI (2002): A CONFIRMATORY STUDY

Preparatory Steps

Before I could conduct the confirmatory study following Sasaki (2000), I needed to determine its exact research design. The first step I had to take was to determine the hypotheses to be tested. The main purpose of this study was to confirm the findings of the previous exploratory study (i.e., Sasaki, 2000), but I had to restate them in the form of several hypotheses so they could be individually tested for statistical significance. I accordingly formulated the following eight hypotheses (Sasaki, 2002):

1. EFL writing experts write longer texts at greater speed than EFL writing novices.
2. After two semesters of process writing instruction, neither the quantity nor the speed of the novices' writing improves.
3. The experts spend a longer time before starting to write than the novices.
4. After the instruction, the novices spend a longer time before starting to write.
5. While writing, the experts stop to reread or refine their expressions more often than the novices, whereas the novices stop to make local plans or translate from L1 to L2 more often than the experts.

6. After the instruction, the novices stop to reread more often while making fewer local plans. However, they still have to stop to translate from L1 to L2 as often as before.
7. The experts tend to plan a detailed overall organization (i.e., Global Planning), whereas the novices tend to make a less detailed plan (i.e., Thematic Planning).
8. After two semesters of process writing instruction, the novices learn to do global planning, but it is qualitatively different from the experts' global planning. (pp. 54–55)

These eight hypotheses basically determined the entire research design of Sasaki (2002). They indicated that I needed to collect data consisting of: (a) the participants' compositions, (b) time that the participants spent before starting to write and time that they spent writing the whole composition, and (c) the participants' retrospective accounts of what they were thinking about when they stopped writing. Unlike the exploratory study, I decided not to compare more and less skilled writers partly because I did not want to make the research design of the confirmatory study too complex for the application of statistical procedures (the design was already complex enough with so many variables to be investigated) and partly because I found in Sasaki (2000) that the differences between the more and less skilled writers were similar to those between the expert and novice writers, which were to be examined in this confirmatory study (see Fig. 6.2).

After having settled on this basic design, however, I still needed to determine several other details before conducting the actual study. First, I

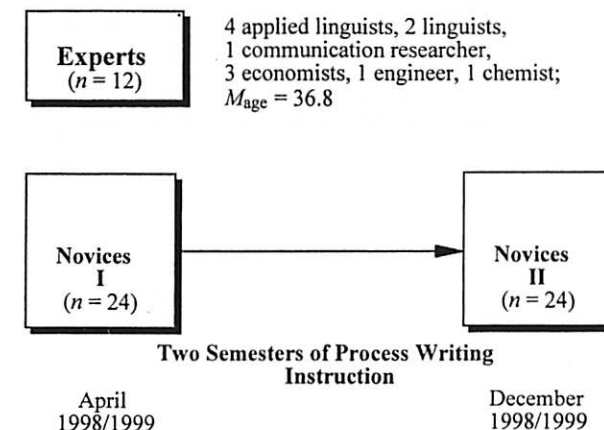


FIG. 6.2. The basic research design of Sasaki (2002) that compared two paired groups of experts versus novices and novices before and after two semesters of process writing instruction.

had to decide on the sample sizes of the target participant groups: novices and experts. Of course the larger the sample sizes, the better for applying parametric statistical procedures (Hatch & Lazaraton, 1991). However, as in the case of Sasaki (2000), it was not easy to collect the data from a large sample. In the end, I concluded that 12 experts and 24 novices would be the maximum number of participants I could collect data from even if I spent the next 2 years doing so. I also concluded that these sample sizes would be large enough (though not ideal) to apply inferential statistical procedures to if I collected the data carefully.

A third issue I needed to consider was whether to revise the data-collection procedure I had used for the exploratory study. Because it had been revised once based on the results of a pilot study (see the study cited earlier), there was not much to be improved. However, I decided to use two video cameras instead of one for recording the participants' writing behaviors. Because it was sometimes difficult for the participants to see which part of the texts they were working on in the exploratory study, I judged that using two video cameras with one focusing on the participants' hand/pencil movement and the other focusing on the overall writing behavior, including their eye/head movements, would provide additional clarity.

A fourth point I needed to determine before actually conducting Sasaki (2002) was whether I should alternate the two prompts with half of the 24 novices before and after the instruction (i.e., half of them receiving Prompt 1 before the instruction and Prompt 2 after the instruction, with the other half receiving Prompt 2 before the instruction and Prompt 1 after the instruction). If I did so, I could have avoided possible topic effects on the students' composition scores and their use of writing strategies. In fact one of the *JSLW* reviewers claimed that I should have done so for Sasaki (2000). However, if I had alternated the prompts for the novice I group (before the instruction), I also would have had to alternate the prompts for the expert group for a fair comparison. In such a case, I would have had to consider the possible effects of these two different topics on the participants' use of writing strategies. Previous studies (e.g., Carter, 1990; Cumming, 1989; Flower, Schriver, Carey, Haas, & Hayes, 1992) had suggested that writers may change their writing strategy use in response to different topics. In the end, I decided not to alternate the prompts for the novices. On the other hand, I used similar but different prompts for novices I and II (after the instruction) because I was afraid that maturation effects caused by giving the same prompt before and after the instruction (e.g., the novices might have thought about the topic over the two semesters) might be stronger than possible topic effects (especially when Prompts 1 and 2 were intended to induce similar argumentative writing; see Sasaki, 2000; Sasaki & Hirose, 1996). This compromise was a real dilemma, but I concluded that topic effects, if they existed at all, would be larger for the expert-novice (intergroup) comparison than for

the novices I and II (intragroup) comparison. Of course, I was aware that comparing novices I and II could be problematic because of possible topic effects, and I mentioned this as one of the limitations of Sasaki (2002) in the Results and Discussion section.

Finally, I had to determine appropriate statistical procedures for testing the eight hypotheses. At this point, I consulted with Yasuko Nogami, a psychometrician. She suggested that as an important preliminary step I should check the normality of the data distributions, which is one of the most critical conditions for applying parametric statistical procedures (Bohrnstedt & Knoke, 1988; Hatch & Lazaraton, 1991). She especially emphasized the fact that time-ratio values and strategy token-ratio values, like the ones I was planning to use in Sasaki (2002), tend to have skewed distributions, and that these values can acquire more normal distributions by logarithmic transformation (Iwahara, 1997). Only after the data satisfied the condition of normal distribution could I consider applying parametric procedures. If not, I had to use nonparametric procedures, although they were not as powerful (Hatch & Lazaraton, 1991). As parametric procedures for testing Hypotheses 1 through 6, which dealt with continuous data, Yasuko suggested that I use *t* tests with adjusted alpha levels based on a Bonferroni correction (Tabachnick & Fidell, 1996). For testing Hypotheses 7 and 8, which dealt with frequency data, she suggested using a chi-square test for comparing the experts and novices and using McNemar's test for comparing the novices before and after the instruction.

Conducting Sasaki (2002)

It took me 2 full years (1998 and 1999) to collect the necessary data for Sasaki (2002). For the expert group, I found 12 EFL expert writers (10 men and 2 women) as I had planned. Unlike in the exploratory study, I was able to find expert writers in different professional fields (with a mean age of 36.8 years; see Sasaki, 2002). For the novice group, I lost two candidates who dropped out of the university, which decreased the sample size of the novice group to 22. They were all 18-year-old college freshmen majoring in British and American studies when the study started. Fortunately, the overall characteristics (e.g., age, L2 proficiency, L2 writing ability) of both the expert and novice groups were similar to those of the exploratory study.

I finished collecting all the necessary data in January 2000. Following Yasuko Nogami's advice, I checked the normality of the distributions of the time-ratio and strategy-frequency ratio data by comparing them with those of their corresponding logarithms by the Shapiro-Wilks distribution-normality test (SPSS Incorporated, 1994). Because the values after logarithmic transformation in both ratio cases were more normally distributed, and because they satisfied the normal-distribution condition for applying *t* tests, I consequently used these values for the statistical tests. Among the eight hy-

potheses set up in the beginning, six were confirmed and two were partially confirmed with some writing strategies used unexpectedly by the participants (see Sasaki, 2002, for a summary of the findings).

Getting Sasaki (2002) Published

I finished writing the first draft at the end of 2000. I had been invited to submit a chapter for a book entitled, *New Directions for Research in L2 Writing: Volume II of the Studies in Writing Series*, to be published by Kluwer Academic, and I decided to submit this draft as a candidate for this chapter. Fortunately, the editors accepted it as the chapter, but here again I had to go through what the editors called a *multilayer* review process: I had to revise the draft first according to three internal reviewers' (i.e., those whose chapters would be included in the same book) comments, second according to two external reviewers' comments, and finally the editors' and the series editor's comments. I received the internal reviews in the middle of February 2001, and I had to finish the revision by the end of March of the same year. Just as when I had to revise Sasaki (2000) in response to the *JSLW* reviewers' comments, I expanded the literature review, added more examples and explanation, corrected some mistaken descriptions, clarified some descriptions, and removed unnecessary parts while responding to 72 comments.

I subsequently received the two external reviewers' comments in the middle of May 2001. This time the reviewers focused mainly on the content and organization of the chapter except for one suggestion to improve statistical validity of the intercoder agreement. Although I basically followed the reviewers' advice, I sometimes disagreed with them and did not change the draft as they had suggested. In particular, I did not follow one reviewer's suggestion that I should "leave out the pre-posttest comparison" because I had not alternated the two prompts before and after the instruction. As I mentioned earlier, I had my own principled reasons for not alternating the prompts. I decided to keep the comparison, but added the acknowledgment in the Results and Discussion section that "comparing novices I and II could be problematic because of possible topic effects" (Sasaki, 2002, p. 58).

QUESTIONS FOR FURTHER STUDIES

I submitted the final version of the draft on September 2, 2001, and the book containing my chapter was published early in the following year. This should be the end of my story in this chapter. However, as many researchers experience with their studies, even the confirmatory study's results left me with more questions unresolved than I had originally asked. At a macrolevel, the results "cover only part of the complex mech-

anism of L2 writing processes" (Sasaki, 2002, pp. 76–77). As I stated in the Conclusion section, they should be complemented by the results of future studies that investigate other sample populations of different L1/L2 and educational/cultural backgrounds using different types of writing under different conditions.

At a microlevel, I became interested in answering some of the questions I had come across when analyzing the data of Sasaki (2002). For example, I found that the novice students significantly changed after two semesters of process writing instruction in terms of writing ability and strategy use. Then I wondered how they would further change or remain unchanged 1 more year after or even 3 years after the initial study when they are ready to graduate from the university. From the same data, I also found that the novices learned to do global planning after the instruction. Then I wondered how they felt about such a writing style change. Did they like it or not like it? Would they continue to keep that style 1 year later or even 3 years later?

Such an extended length of observation and the participants' own internal emic perspectives are characteristic of qualitative research (Miles & Huberman, 1994), but are not typical of quantitative studies. A follow-up study with such an additional qualitative perspective, however, would be helpful for understanding more deeply the results I obtained in Sasaki (2002). In this sense, I agree with Newman and Benz' (1998) claim that quantitative and qualitative approaches are on an "interactive continuum" (p. 20), and that they should complement each other to achieve higher quality research. On this qualitative–quantitative research continuum, "the qualitative analysis with its feedback loops can easily modify the types of research questions that will be asked in quantitative analysis research; and the quantitative analysis results and its feedback can change what will be asked qualitatively" (p. 25). According to Newman and Benz, my two prior questions are located in a typical "feedback loop" going from quantitative to qualitative approaches. Thus, I am currently conducting such a follow-up study³ of Sasaki (2002) while again facing numerous problems. My hope is that this one step further will eventually lead to a comprehensive L2 writing process model that will be useful for both researchers and teachers in the L2 writing field (Cumming, 1998).

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³This study has now been published as Sasaki (2004).

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