Raising Grammatical Consciousness by Color-Coding to Improve English Reading Performance

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This study was designed to examine whether focusing on the important grammatical elements in a sentence, such as a verb and its subject, by color-coding will raise grammatical consciousness and whether raised grammatical consciousness will help Korean learners improve their English reading performance. Grammatical consciousness was assessed by the grammar tests, such as finding a correct word and choosing a correctly derived word (e.g., noun to verb or verb to adjective), while reading performance was measured by the TOEIC reading tests. Color-coding was employed to help learners pay focal attention to the grammatical elements while reading a text and it was expected to help them understand the text easily by processing visually and linguistically. The participants in the color-coding group were compared with those who learned the grammar lessons in the traditional way without color-coding. After the intervention, the color-coding group showed significant improvement both in the grammar test and the reading test, whereas the control group did not improve reading performance even with the promoted grammatical knowledge.

I. INTRODUCTION

Reading is one of the essential skills for the second language (L2) learners and even for the first language (L1) learners to succeed in an academic world, but unfortunately, it is not acquired unconsciously and naturally as walking (Palincsar & Perry, 1995; Pressley, 2000). Students, especially second language learners, should learn to read because for them, "reading may be both a means to the end of acquiring the language, as a major source of comprehensible input, and an end in itself, as the skill that many serious learners most need to employ" (Eskey, 2005, p.563).

Then, how can students learn to read effectively? There is a great amount of research on
reading: reading processes, reading and vocabulary, reading and grammar, reading and background knowledge, reading and reading strategies, and so on (Eskey, 2005; Pressley, 2000). Among these various factors, this study intends to better understand the relationship between grammar and reading, considering the fact that teaching reading in an L2 stemmed from teaching grammar, based on one of the earliest teaching methods, Grammar Translation Method (Fotos, 2005). In other words, this study aims to discover whether raising grammatical consciousness will help learners improve their reading performance.

To raise grammatical consciousness in this study, learners are instructed to color-code the essential grammatical elements in a sentence (i.e., a verb and its subject) while reading; because the big difference between Korean and English lies in the order of a verb and its complements, and because finding out a verb and its subject will help learners understand the structure of a sentence, but not too much in grammatical details, to grasp the gist of the sentence. In other words, paying focal attention, or noticing, is very important in learning because learners cannot learn anything that is not noticed (Williams, 2005). In order to help Korean learners notice a verb and its subject in each sentence, they are asked to color-code using different colored tags: e.g., a yellow tag for a verb, a red tag for its subject, and a blue tag for a conjunction, if any. By physically putting a colored tag on a word, color-coding while reading will help students raise their grammatical consciousness, which is expected to ultimately improve reading performance.

Color-coding has been used in various fields (e.g., indexing topics with different colors and differentiating phonemes in fidel charts). However, in this study, color-coding is newly suggested as one of reading strategies (Lee, 2007) to promote grammatical consciousness. Also, it is expected to improve students' reading performance, based on the dual coding theory. Coding dually (visually and linguistically) helps them understand a text more easily than coding only linguistically (Sadoski & Paivio, 2004). Izumi (2002) and other researchers (e.g., White, 1998) found out that textual enhancement would be effective when followed by supplementary output actives or explicit instruction. Thus, according to their recommendation, I decided to let students enhance their text (i.e., marking a subject and its verb explicitly while reading) instead of offering enhanced input. In other words, color-coding is output enhancement rather than input enhancement (Doughty, 2003; Gass, 2003) because learners themselves put colored tags on a text. It is expected to help them process the meaning along with forms better than those who did not color-code.

Therefore, this study assumes that learners should learn how to color-code to pay their attention to the important grammatical elements in a text and that dually coded output can raise their consciousness of the essential grammatical forms, resulting in comprehending the text effectively.

Based on the assumption, this study examines (1) whether helping learners pay focal
attention to grammatical elements (a verb and its subject) by color-coding will raise their grammatical consciousness, which will be measured by grammar tests, and (2) whether the raised grammatical consciousness will ultimately help improve their reading performance. This study addresses the following research questions:

(1) Do significant differences exist in pre- and post-test scores of grammar proficiency between the color-coding group and the control group? In other words, is color-coding significantly related to changes in grammatical knowledge?

(2) Do significant differences exist in pre- and post-test scores of reading comprehension (Test of English for International Communication; TOEIC Reading) between the color-coding group and the control group? In other words, is color-coding (grammatical knowledge) significantly related to changes in reading performance?

II. LITERATURE REVIEW

In this section, the previous studies on the important themes of this study are presented: (1) reading processes and Dual Coding Theory, (2) consciousness, and (3) form focused instruction and Output Hypothesis.

1. Reading Processes and Dual Coding Theory

There have been great efforts to understand reading processes (Goodman, 1968; Pressley, 2000; Rumelhart, 1977, 2004; Sadoski & Paivio, 2004). One of the important lines of research in L1 reading involves top-down, bottom-up, and interactive processing. Top-down processing views readers’ reading process is based on their prior knowledge or schematic knowledge (Pressley, 2000). Readers make predictions what the given text will be about, based on a graphic display, and then they check whether their predictions were right while reading the text (Goodman, 1968).

In contrast, bottom-up processing considers readers to start decoding the physical elements of the given text, such as the words, phrases, and sentences, to derive the meaning of the text (van Dijk & Kintsch, 1983). Readers analyze the input, letter by letter and word by word, transforming character-level representation to deep structural representation, to derive the meaning (Gough, 1984).

As Gough (2004) emphasized, neither strictly bottom-up processing nor strictly top-down processing can explain how readers read. Interactive processing describes that readers use both top-down and bottom-up processing to compensate for what they need in each stage (Grabe, 1991). In other words, they use both, but beginning readers tend to
depend on bottom-up processing more than top-down processing while good readers are likely to process in a top-down way than a bottom-up way (Lin, 2002). Moreover, good readers keep monitoring whether they decoded words correctly while reading (Baker & Brown, 1984).

The research on top-down, bottom-up, and interactive processing of L1 reading has also been applied to understand L2 reading processing (Bernhardt, 2000; Brantmeier, 2002; Grabe & Stoller, 2001). Various factors, such as personality types (Abraham & Vann, 1987) and cultural background (Pritchard, 1990), have been examined to discover their effects on L2 learners' reading processing. Many L2 reading researchers agree that interactive processing is helpful for L2 learners to understand a text by using both the text-driven and knowledge-driven processes (Bernhardt, 1991; Carrell, 1988).

Another key line of research in reading includes the Dual Coding Theoretical model (DCT; Sadoski & Paivio, 2004). They addressed that helping readers code the written input both verbally and visually because readers understand dually coded words (i.e., concrete words like table and ball), both in linguistic and in visual (imagistic) semantic systems, more easily than abstract words (e.g., kindness and perfection), coded only in linguistic semantic system. “In DCT, the two codes are assumed to be independent and additive in their effects, predicting that concrete language should be nearly twice as comprehensible and memorable as abstract language, other factors being equal” (Sadoski & Paivio, 2004, p.1343).

Based on the DCT, Boers, Eyckmans, and Stengers (2007) used the etymological association to help learners associate figurative idioms with proper mental images (coding visually) which were considered to be stored in memory with their verbal expressions; they recommended teaching the etymological association not only to comprehend the given figurative idioms, but also to figure out a new figurative idiom. Carrell (1987) showed that using visual materials was effective to teach students to understand a text, and visual materials were more helpful for poor learners than successful learners (Pearson & Fielding, 1991). Steffensen, Goetz, and Cheng (1999) compared visual images and emotional responses when reading an L2 (English) text with those when reading an L1 (Chinese) text and observed the similar dual coding processes while reading two languages. In other words, L2 learners will benefit from dual coding as Sadoski and Paivio (2004) showed in L1 reading.

2. Consciousness

Most would agree that awareness (consciousness) helps students learn a language and use strategies to read well, at least in the earlier stages of learning (Chamot, 1998; Cohen, 1995; National Capital Language Resource Center [NCLRC], 1996; O'Malley & Chamot,
1990; Oxford, 1990; Oxford & Cohen, 1992); because “attention to formal features in the input plays an important role in SLA” (Izumi & Bigelow, 2000, p.239).

Awareness (or consciousness) has been used to explain the differences between strategies and skills (or processes); according to Schmeck (1988), skills mean capabilities or abilities that can be expressed in behavior (i.e., something you can do); in contrast, learning strategies refer to a sequence of conscious procedures for accomplishing learning (i.e., something you decide to do to learn). Cohen (1995) pointed out that students’ behaviors are processes, not strategies, if students are no longer conscious of doing the behaviors to learn a language, which emphasizes the importance of consciousness – and awareness – on strategies. Strategies usually involve conscious, intentional plans to implement skills. Reading is also an “intentional, deliberate, and purposeful act” (Mokhtari & Reichard, 2002, p. 251).

While many theorists have defined consciousness differently, Schmidt’s (1994a) definition is well known in the field of L2 learning and widely employed. He classified consciousness into intention, attention, awareness, and control. Oxford and Leaver (1996) adapted these four dimensions of consciousness for strategy instruction while adding one more condition: no consciousness (also called blind strategy instruction). They distinguished focal attention from peripheral attention and addressed that learners should transform general attention to focal attention through explicit, effective strategy instruction because attentional resources were limited, compared to the amount of activities around us. Schmidt (1994b, 2001) emphasized the importance of the focal attentive processing or focal awareness of a structure. He called this noticing, which is essential for acquiring forms, and explicit or formal instruction is necessary for those at higher levels or for older children, adolescents, and adults (Doughty, 2003; Jourdenais, Ota, Stauffer, Boyson, & Doughty, 1995; Oxford & Lee, 2007; Schmidt, 1995, 2001).

Many empirical studies have investigated on explicit strategy instruction (Block, 1992; Carrell, 1984; Chamot & O’Malley, 1994a, 1994b; Ikeda & Takeuchi, 2003; Jimenez, Garcia, Pearson, 1996; Oxford, Cho, Leung, & Kim, 2004; Oxford & Leaver, 1996). Providing input deliberately planned by teachers to help learners pay their focal attention to certain features of an L2, which refers to consciousness-raising (Sharwood Smith, 1981, 1993), is believed to promote their L2 knowledge. Williams (2005) also addressed the effectiveness of the explicit instruction, the processing instruction procedures of VanPatten, where “learners are exposed to input containing relevant problematic structures, but they are also explicitly instructed as to how the structures should be processed” (p.678). According to Norris and Ortega’s (2000) meta-analysis on the instruction type, explicit instruction helped learners improve more than implicit instruction.
3. Form Focused Instruction and Output Hypothesis

Language teachers nowadays tend to choose meaning oriented instruction based on Communicative Language Teaching rather than form focused language instruction, such as Grammar Translation Method and Audiolingual Method. However, sometimes, helping learners concentrate on certain forms is necessary especially when teaching grammar, so some researchers have addressed the importance of paying attention to linguistic form in a meaningful context (Long & Robinson, 1998).

Unfortunately, as just noted, our attentional resources are limited to be used both forms and meaning equally, so our focal attention is expected to be selectively drawn to meaning before forms (VanPatten, 2002). While L2 learners do not have to pay much attention to form when reading a text in their L1, they tend to focus on grammatical elements while reading for content (Skehan & Foster, 2001). Thus, L2 researchers have made great efforts to find out how to help learners use their limited attentional resources effectively (Doughty, 2001; Oxford & Leaver, 1996, Robinson, 2003; Schmidt, 1994b, VanPatten, 2002; Wong, 2003). Enhancing input (e.g., underlining, italicizing, capitalizing, using different fonts, and bold facing) has been proposed since it is considered more explicit than input flood while being less explicit than explaining rules directly (White, 1998). Various studies using enhanced input (Gass, 2003; Doughty, 2003) have shown positive (Doughty, 1991; Jourdenais et al., 1995; White, 1998) and negative (Izumi, 2002; Jourdenais, 1998; Leow, 2001; Wong, 2003) influences on learners’ acquisition of meaning and grammatical forms. Language learners can benefit from this kind of form focused instruction because the form focused instruction helps their focal attention allocated to the acquisition of both forms and meaning; paying focal attention is essential for learning (Robinson, 2003; VanPatten, 2002).

While quite a few researchers examined effects of textual enhancement on form processing, few tested whether textual enhancement had any positive influence on meaning processing (Jourdenais et al., 1995; White, 1998). For example, Jourdenais et al. (1995) enhanced the input regarding Spanish preterit/imperfect, which showed positive effects on intake of the forms, but they did not examine effects on meaning processing. White (1998) also saw partial effects on the learning of English possessive determiners, but did not test influences on meaning processing.

In addition, based on VanPatten’s (2002) input processing theory, in contrast to the DCT, enhanced input enforced learners to pay too much focal attention to the enhanced expressions to understand the general ideas of a text. However, without enhanced parts, L2 learners’ attention would be depleted from processing meaning, resulting in a poor acquisition of necessary grammatical forms (VanPatten, 2002).

Compared with the amount of research on input (comprehensible input, enhanced input, and so on), only a few studies have addressed the importance of output in L2 learning.
(Izumi & Bigelow, 2000; Swain, 2005). This Output Hypothesis (Swain, 1985) was proposed to enhance the theories about input rather than replace. Language output will make learners pay attention to the forms (i.e., monitoring) to check whether their messages were expressed as they intended; therefore, utilizing output effectively will help learners acquire the necessary forms in addition to processing the meaning because they tend to use their attentional resources minimally to comprehend a text without processing important syntactic structures (i.e., forms), otherwise (Izumi & Bigelow, 2000). Izumi and his colleagues used learners' underlining to measure their noticing of the target form while reading the text, and their participants ultimately performed better on the production test than those who took the comprehension test without reconstructing the target forms (Izumi, Bigelow, Fujiwara, & Fearnow, 1999)

In sum, the previous studies regarding the important themes in relation to this study were briefly reviewed. This study assumes that learners should learn how to pay their attention to the important grammatical elements in a text in order to understand its meaning (form focused instruction) and that visually coded output (the DCT and the Output Hypothesis) might promote learners' focal attention (consciousness-raising) to the essential syntactic patterns in a sentence (i.e., a verb and its subject), resulting in comprehending the text effectively.

III. METHOD

This section describes (1) participants and settings, (2) instrumentation, (3) data collection procedures, and (4) data analysis procedures.

1. Participants and Settings

The data was collected in Seoul, Korea in 2006. Two-year college students with intermediate to low reading proficiency were recruited because awareness (consciousness) has been helpful for beginners (Chamot, 1998; Cohen, 1995; NCLRC, 1996; O'Malley & Chamot, 1990; Oxford, 1990; Oxford & Cohen, 1992) and visual materials were more helpful for poor learners than good learners (Pearson & Fielding, 1991). The two-year college is specialized in engineering and information technology, so the students are not highly motivated to learn English.

The participants in the two sections of the TOEIC reading course were randomly assigned as the color-coding group and the control group. The ages of the students in the color-coding group ranged from 19 to 27 while those in the control group, from 20 to 25, and they were all freshmen. In the color-coding group, 18 (9 female and 9 male) out of 26
students were analyzed, and the rest eight (7 female and 1 male) students who did not participate in color-coding practices more than three times were excluded when analyzing the results. In the control group, 21 (14 female and 7 male) out of 34 students were analyzed because the rest 13 (11 female and 2 male) students were absent more than three times.

2. Instrumentation

1) Grammar Worksheet

In order to promote the participants' grammatical knowledge, six different grammar worksheets were used. Each worksheet consisted of simple sentences (i.e., one verb and its subject) and complex sentences (i.e., two or more verbs and their subjects with conjunctions). The difficulty of each text was balanced by Fry's (1977) readability graph: the first text was appropriate for 14 year old native English speakers; the second for 16; the third for 18; the fourth for 16; the fifth for 17; and the sixth for the 15. The participants were expected to have low reading proficiency, and the texts with various levels of difficulty were prepared.

Both the color-coding group and the control group learned the importance of finding the important grammatical elements, such as subjects, verbs, and conjunctions. While the control group read and translated each sentence with analyzing it grammatically in the traditional way (without focusing only on verbs and subjects), the color-coding group read and translated each sentence with color-coding a verb and its subject.

2) Pre-test and Post-test: Grammatical Test to Assess Grammatical Consciousness

A pre-test was administered to measure the participants' initial grammatical knowledge. It consisted of 56 multiple choice questions, such as finding a correct word for the given sentences, choosing a correct form (number or tense) of a verb, and finding a correctly derived word (e.g., noun to verb or verb to adjective), and 22 open questions to write down correct words for the given sentences. These questions were excerpted from the course book, *Rules for TOEIC* by YBM Si-sa. After the intervention, the participants in both groups took the post-test, written similarly to the pre-test (chosen from the same course book), in order to see how much their grammatical knowledge improved.

3) Pre-test and Post-test: The TOEIC Reading to Assess Reading Performance

Along with the pre-test and the post-test to measure grammatical knowledge, the participants in both groups took the TOEIC reading comprehension tests before and after
the intervention. They were the trial tests for helping learners practice to take the TOEIC by YBM Si-sa. Each test was composed of 100 questions: choosing proper words or expressions for the given sentences, finding words to correct the mistakes in the given sentences, and answering the questions after reading the given texts.

3. Data Collection Procedures (Intervention)

Based on the previous observation that Korean learners were encouraged to learn English reading when they could use their prior knowledge of English grammar (Lee, 2007), the author planned to teach how to pay focal attention to important grammatical elements to improve reading performance in the end. The intervention continued for one semester: two hours a week for 15 weeks.

Before the intervention, the participants took the same pre-tests to measure their baseline knowledge in grammar and in reading comprehension.

From the third week to the 13th week, they learned to read, focusing on the important grammatical elements, (in this case, a verb, its subject, and a conjunction, if any) with the six different worksheets. Both group studied with the same worksheets. After the control group was given some time to read each text by themselves, the teacher taught grammar related to the text with writing on the blackboard and the students took notes, which is one of the traditional ways of teaching reading. The participants in the color-coding group put a color tag on a verb and its subject while reading by themselves (enhancing their output), and then the teacher taught grammar with checking whether they color-coded words correctly.

After the intervention, both groups took the same post-tests to see how much their grammatical knowledge and reading performance were improved.

4. Data Analysis Procedures

To discover any significant quantitative differences, the participants in the color-coding group and the control group were compared in terms of grammar proficiency, measured by the grammar tests, and reading performance, assessed by the TOEIC reading comprehension tests. To find out how much the two groups improved, the independent t-tests and the split-plot ANOVA were run and follow-up comparisons (paired t-tests) were also conducted when needed. When conducting follow-up comparisons, the alpha values were adjusted according to the number of the pairs compared (e.g., when comparing two pairs, the .05 alpha value was divided into 2, resulting in .025).
IV. RESULTS AND DISCUSSION

In this section, the results of each research question were presented and the relevant issues were discussed. The reliability of the grammar pre- and post-tests was quite high (alpha=.87, N of cases=39), and so was that of the reading pre- and post-tests (alpha=.77, N of cases=39).

1. Do significant differences exist in pre- and post-test scores of grammar proficiency between the color-coding group and the control group?

The difference of the grammar pre-test scores between the color-coding group (N=18) and the control group (N=21) was not significantly different (t=1.54, df=37, p=.133); in other words, their grammatical knowledge of the important structure of a sentence (verbs, subjects, and conjunctions) was similar before the intervention. After the intervention, the color-coding group had significantly higher scores in the grammar test than the control group (t=2.11, df=37, p=.042).

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pre-test</th>
<th></th>
<th>Post-test</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Color-Coding</td>
<td>18</td>
<td>71.67</td>
<td>18.17</td>
<td>84.56</td>
<td>16.78</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>62.62</td>
<td>18.49</td>
<td>71.76</td>
<td>20.53</td>
</tr>
</tbody>
</table>

In order to find how the intervention is related to this difference, the split-plot ANOVA was conducted. As Table 2 shows, "time" (post-test to pre-test) had significant main effect (F=26.73, df=1, p=.000), which means that the grammar proficiency of the participants in both groups improved after the intervention. However, as table 3 shows, there was no significant main effect in "group," which means that both groups showed the similar pattern of improvement throughout the semester (i.e., the control group showed higher scores in the post-test than in the pre-test, just as did the color-coding group). Moreover, since there was no interaction effect between "time" and "group," no follow-up tests were needed.

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>2352.31</td>
<td>1</td>
<td>2352.31</td>
<td>26.73</td>
<td>.000</td>
</tr>
<tr>
<td>Time * Group</td>
<td>68.01</td>
<td>1</td>
<td>68.01</td>
<td>.77</td>
<td>.385</td>
</tr>
<tr>
<td>Error (Time)</td>
<td>3256.18</td>
<td>37</td>
<td>88.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 3

<table>
<thead>
<tr>
<th>Source</th>
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<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>409258.69</td>
<td>1</td>
<td>409258.69</td>
<td>675.92</td>
<td>.000</td>
</tr>
<tr>
<td>Group</td>
<td>2311.81</td>
<td>1</td>
<td>2311.81</td>
<td>3.82</td>
<td>.058</td>
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<tr>
<td>Error</td>
<td>22403.03</td>
<td>37</td>
<td>605.49</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To summarize, the instructions focusing on grammatical knowledge helped the participants raise their grammatical consciousness significantly, regardless of the type of grammar instruction. It was a very effective way for promoting grammar proficiency to help the students focus on the important grammatical elements of sentences (verbs, subjects, and conjunctions), both by color-coding (student-centered) and in the traditional way (teacher-centered). In the discussion part below, more comparisons are conducted to find out whether the color-coding had any additive effect on grammar or reading.

2. Do significant differences exist in pre- and post-test scores of reading comprehension (TOEIC Reading) between the color-coding group and the control group?

As in the grammar pre-test, the difference of the reading pre-test scores between the color-coding group (N=18) and the control group (N=21) was not significantly different ($t=1.72$, $df=37$, $p=.093$); in other words, their reading performance, measured by the TOEIC reading test, was similar before the intervention. After the intervention, the color-coding group had significantly higher scores in the reading test than the control group ($t=3.43$, $df=37$, $p=.003$).

### TABLE 4

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Color-Coding</td>
<td>18</td>
<td>34.89</td>
<td>7.28</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>31.29</td>
<td>5.77</td>
</tr>
</tbody>
</table>

In order to find how the intervention is related to this difference, the split-plot ANOVA was conducted. As Table 5 shows, “time” (post-test to pre-test) had significant main effect ($F=18.87$, $df=1$, $p=.000$), which means that the reading performance of the participants in both groups improved after the intervention. Also, as Table 6 shows, there was significant main effect in “group” too ($F=8.60$, $df=1$, $p=.006$), which means that the color-coding group improved more than the control group throughout the semester.
TABLE 5
Tests of Within-Subjects Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
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<td>362.67</td>
<td>18.87</td>
<td>.000</td>
</tr>
<tr>
<td>Time * Group</td>
<td>96.41</td>
<td>1</td>
<td>96.41</td>
<td>5.02</td>
<td>.031</td>
</tr>
<tr>
<td>Error (Time)</td>
<td>711.13</td>
<td>37</td>
<td>19.22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE 6
Tests of Between-Subjects Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>96346.39</td>
<td>1</td>
<td>96346.39</td>
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<td>Group</td>
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<tr>
<td>Error</td>
<td>2838.33</td>
<td>37</td>
<td>76.71</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Moreover, since there was significant interaction effect between “time” and “group,” follow-up tests were needed to see when (either in the pre-test or in the post-test, or in both tests) the color-coding group showed significantly higher scores in reading than the control group. Two pairs were compared, so the alpha value was adjusted to .025 (.05/2): (1) the post-test with the pre-test of the color-coding group and (2) the post-test with the pre-test of the control group. As Table 7 shows, the color-coding group showed the significant improvement in the post-test ($p<.025$), compared to the pre-test, but the control group did not.

TABLE 7
Simple Effects of the Time (TOEIC Reading Scores within Each Group)

<table>
<thead>
<tr>
<th>Group</th>
<th>Paired Differences</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color-Coding</td>
<td>Post-test – Pre-test</td>
<td>6.56</td>
<td>6.72</td>
<td>4.14</td>
<td>17</td>
<td>.001</td>
</tr>
<tr>
<td>Control</td>
<td>Post-test – Pre-test</td>
<td>2.10</td>
<td>5.72</td>
<td>1.68</td>
<td>20</td>
<td>.109</td>
</tr>
</tbody>
</table>

To summarize, while the instructions focusing on grammatical knowledge helped the participants in both groups raise their grammatical consciousness significantly, the raised grammatical knowledge helped only the color-coding group improve their reading performance.

3. Discussion

Interesting was that color-coding was effective to help the participants improve reading performance more than grammatical knowledge, even though it could have worked in the opposite way. In other words, because color-coding was having the students put colored
tags on the important grammatical elements in a sentence, it was expected to be effective for promoting grammar knowledge directly, but it improved the students' reading performance indirectly.

Then, did color-coding have no effect on grammar knowledge at all? In order to answer this, the students who were absent more than three times were compared with those who were not. As mentioned in the Method section, those who were absent more than three times in both groups were excluded when analyzing the results. In terms of the control group, those who participated in all the intervention sessions (Control-all) showed significant improvement in the grammar test, but not in the reading test, whereas those who were absent more than three times (Control-absent) did not improve in neither test. In contrast, in terms of the color-coding group, those who participated in all the intervention sessions (CC-all) showed significant improvement both in the grammar and reading tests, whereas those who were absent more than three times (CC-absent) improved only in the grammar test.

In terms of reading performance, only CC-all showed significant improvement, whereas CC-absent and Control-all did not improve even though their grammatical knowledge was significantly promoted. As mentioned in the results of the research question 1, it might be possible that focusing on the important grammatical elements in a sentence (without color-coding) was enough to promote grammatical knowledge.

However, if color-coding had no additive effect, Control-absent also had to show significant improvement at least in the grammar test, as did CC-absent. Even though CC-absent did not participate in all the sessions, their grammatical awareness might have been raised somewhat by color-coding more than those who did not experience color-coding at all. Therefore, color-coding seems to be more effective to promote grammatical consciousness than not-color-coding, since it encourages students to pay focal attention to the important grammatical elements by putting color-tags on them.

<table>
<thead>
<tr>
<th>Group</th>
<th>Post-test – Pre-test</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC-all</td>
<td>Grammar Test</td>
<td>12.89</td>
<td>9.63</td>
<td>5.68</td>
<td>17</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Reading Test</td>
<td>6.56</td>
<td>6.72</td>
<td>4.14</td>
<td>17</td>
<td>.001</td>
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<tr>
<td>CC-absent</td>
<td>Grammar Test</td>
<td>19.00</td>
<td>12.11</td>
<td>4.44</td>
<td>7</td>
<td>.003</td>
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<tr>
<td></td>
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<td>6.57</td>
<td>1.72</td>
<td>7</td>
<td>.129</td>
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<tr>
<td>Control-all</td>
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<td>15.71</td>
<td>2.67</td>
<td>20</td>
<td>.015</td>
</tr>
<tr>
<td></td>
<td>Reading Test</td>
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<td>5.72</td>
<td>1.68</td>
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<td>.109</td>
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<tr>
<td>Control-absent</td>
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<td>.61</td>
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<td>.557</td>
</tr>
<tr>
<td></td>
<td>Reading Test</td>
<td>.77</td>
<td>2.86</td>
<td>.97</td>
<td>12</td>
<td>.352</td>
</tr>
</tbody>
</table>

In addition, if color-coding had the influence similar to simply focusing on grammatical
elements without color-coding, then Control-all should also have improved their reading performance as did CC-all. Based on the fact that only those who participated in all the color-coding activities got significantly higher scores at the reading post-test, color-coding seems to work as a reading strategy (rather than a simple grammar strategy) to help learners process the meaning at the same time of processing the forms. In other words, as expected before conducting this study, because it involves dual coding, visually and linguistically, and because it encourages students to pay focal attention, color-coding seems to be an effective reading strategy, helping the students grasp the gist of each sentence quickly by making them focus on the grammatical elements in addition to the teacher-centered explanation. Color-coding seems to be especially effective to answer those types of reading comprehension questions in the TOEIC (e.g., choosing proper words or expressions for the given sentences, finding words to correct the mistakes in the given sentences, and answering the questions after reading the given texts).

To sum, raising grammatical consciousness by color-coding helped the Korean students ultimately improve their reading performance. Therefore, it is recommended that reading teachers should employ grammar activities, through which students could understand the structure of each sentence to grasp the gist rather than they should focus on grammatical details too much. In this study, color-coding was suggested as one of such grammatical activities, and it also proved its effectiveness as one of reading strategies. Since the Grammar Translation Method has been criticized, reading teachers have tended to avoid employing grammar in their lessons, but what can raise learners’ grammatical consciousness is necessary to improve reading performance.

V. CONCLUSIONS AND SUGGESTIONS

This study contributed to better understanding of the relationship between grammatical consciousness and reading performance. Students did not have to concentrate on grammar in detail while reading, but they had to understand how a sentence is composed to understand the entire text. To do so, color-coding the important grammatical elements in a sentence was very helpful for students not to forget to use their raised grammatical consciousness while reading. Therefore, reading with paying focal attention and with utilizing visual and linguistic sources actively (dual coding) to understand a text worked in a positive way for the Korean participants with low reading proficiency.

This study showed that helping learners pay focal attention to grammatical elements raised their grammatical consciousness, which was shown by the improved scores at the grammar post-test, and that the raised grammatical consciousness ultimately helped improve their reading performance. Also, color-coding showed its effectiveness as a reading strategy because only those who participated in all the color-coding activities
showed significant improvement in reading performance.

The participants in this study had pretty low reading proficiency, and it is very encouraging that their grammar and reading performance improved. As the previous research suggested, this study also showed that raising consciousness helped beginners improve their reading (Chamot, 1998; Cohen, 1995; NCLRC, 1996; O’Malley & Chamot, 1990; Oxford, 1990; Oxford & Cohen, 1992), and that visual materials effectively helped the poor readers (Boers et al., 2007; Pearson & Fielding, 1991). Color-coding, which encouraged the learners to code dually, was one of the ways to read a text effectively, as well as to raise grammatical consciousness.

This study has several limitations to be noted. First, the instruction in this study was conducted by the researcher. The results might have been different when being taught by a teacher other than this researcher, thus, future research involving different teachers may be needed. Second, grammatical awareness can be raised by different ways from color-coding too, so it should be studied what other good ways there would be to raise grammatical consciousness and to improve reading performance. Third, by and large, the standard deviations in the grammar tests were bigger than those in the reading tests. Qualitative considerations are necessary for understanding what might have caused this tendency to both groups (e.g., why the students showed somewhat even degree of improvement in reading, but not in grammar). Fourth, it has only a few participants, so caution is needed not to generalize the results. Instead, it has implications in that the statistical significance shows a tendency that color-coding can help learners raise grammatical consciousness and improve reading performance. Thus, further research on color-coding is recommended based on this exploratory study. Lastly, two-year college students with low reading proficiency participated in this study, so more studies are needed to find out whether other samples (e.g., middle school students or Japanese students) with different reading proficiency would benefit from color-coding.

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