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The Effects of Interactive Note-taking on Increasing Rigor and Student Achievement for High-School Foreign Language

Laura Droms

Mountain View High School,
Gwinnett County GA

Abstract

This study examined the effects of interactive note-taking, a method that relies on student interaction with teacher-provided notes, on student test scores and critical thinking skills in the high-school Spanish classroom. It also examined how interactive note-taking affected students' confidence in note-taking and critical thinking skills and their level of participation in the classroom. Over a five-week period, interactive note-taking was implemented in one class (n = 29) while traditional foreign language methods were used in another class (n = 32). Changes in student evaluative performances were determined by comparing pre-intervention test scores to test scores during the intervention period. Pretest and posttest scores on a critical thinking skills test were used to determine the effects on critical thinking skills. Surveys were used to ascertain the effects on students' confidence, and field notes and participation data were used to assess the quantity and quality of student participation in the classroom. Results indicated an increase in student test scores, critical thinking skills, and the quantity and quality of student participation with the use of interactive note-taking, but no significant differences were found for student confidence.

Are high-school teachers effectively equipping students with the skills to be critical thinkers or just teaching them to regurgitate information to which they have been exposed? In order to be successful in college or the workplace, students must be adept at critical thinking skills, yet in a newsletter article, the Center for Comprehensive School Reform and Improvement (CCSRI, 2006) reported that enrollment in remedial programs in colleges and job-training is staggeringly high, with 28% of students in four-year colleges and 42% in two-year colleges requiring remediation. This strong indicator of being unprepared for post-secondary work has led to a cry for increased rigor in high school classrooms. Rigor, however, is difficult to define and is not easily measured by standardized test scores. In *Teaching What Matters Most,* Strong, Silver, and Perini (2001) offer one of the best definitions of rigor stating "rigor is the goal of helping students develop the capacity to understand content that is complex, ambiguous, provocative, and personally or emotionally challenging" (p. 7). The challenge facing schools today is how to apply this and similar definitions to the high school curriculum.

The school for the current study is part of a diverse, urban school district. This school outlined as one of its goals the establishment of a standard for rigor across the curriculum in hopes that it would give students the confidence to enroll in more AP courses. As a strategy for reaching that goal, the school created a K-12 vertical team to pilot an interactive note-taking (INT) program. INT is a type of split-page note-taking. Notes addressing important concepts are provided on the right side of the note-taking page. On the left side of the note-taking page, students are encouraged to interact with the information found on the right side. The left-side activities range from focused practice, to summarization of new information, to application of information into new and creative situations. While note-taking has been widely accepted as an important tool for success and a means for learning new information in an academic setting, it has not often been associated with rigor. Hess, Jones, Carlock, and Walkup (2009) found that rigor increases as a result of participating in critical-thinking activities. Effective note-taking employs critical thinking, such as filtering and organizing new information, so that it can be integrated into existing knowledge (Makany, Kemp, & Dror, 2009; Marzano, 1993). Therefore, it may be suggested that note-taking can become a rigorous exercise that enhances learning and may even produce new pathways of thinking. This postulation provides the impetus of the present study, the purpose of which is to determine if INT is a rigorous classroom activity that increases student performance in foreign language and improves critical thinking skills, student confidence, and class participation.

Review of the Literature

Rigor and Critical Thinking Skills

Some school districts, administrators, and even teachers, have misinterpreted a call for increased rigor to be a call for increased course requirements. However, what is actually needed is an increase of rigorous content and activities at the classroom level (Center for Comprehensive School Reform and Improvement, 2006). In an attempt to clarify rigor and assess the application of rigorous processes in the classroom, Hess et al. (2009) designed a cognitive rigor matrix combining Bloom's Taxonomy of Educational Objectives and Webb's Depth of Knowledge model. Progressing from basic recall activities to higher-order critical thinking activities is an effective way to increase rigor in the content of classroom instruction (Hess et al., 2009; McCollister & Sayler, 2010). In a review of critical thinking strategies, Marzano (1993) identified information-processing strategies as one of the primary methods used for increasing critical thinking in the classroom, and includes note-taking as a method of information processing. Even though some forms of encoding, such as recall, are low-level, conscious encoding strategies that encourage linking and the creation of mental images are high-level activities (Marzano, 1993). Note-taking, if appropriately designed to encourage linking, can facilitate the encoding process.

Note-taking Strategies

There is an extensive body of literature concerning the effectiveness of note-taking and the associated activity of reviewing notes. Kobayashi (2006) completed a meta-analysis focused on the effects of note-taking and note-reviewing interven-

tions on student learning and found that the greatest effect on student learning was when notes were provided to students. Further, he found the benefit of intervention was greater with high-school students as compared to undergraduate students. These findings support the importance of testing innovative note-taking interventions especially with high-school students.

When analyzing strategies such as hierarchical organization and problem-solving are built into note-taking, students are able to process new information more thoroughly. Marzano (1993) reported that note-taking can be a strategy for analyzing and understanding the hierarchical organization of new information, but students must be able to effectively organize and analyze this information. Huxham (2010) found that certain lecture activities, such as PowerPoint slides and interactive opportunities (a problem presented by the lecturer for students to analyze and discuss), were more likely than others to cue student note-taking and produce more thorough notes. Titsworth (2004) also recognized that teacher cues for these analyzing strategies could affect student note-taking and, more specifically, the effectiveness of student notes, increasing both the amount of detail and organizational points.

The findings of Titsworth (2004) may also help explain why the use of graphic organizers that improve student organization of information, such as the one in Robinson et al. (2006), are successful in improving student achievement. Robinson et al. found that students with partial graphic organizer notes (which encourage the use of analytical strategies) outperformed students with completed graphic organizers. These students also converted from linear to graphic note-taking at higher proportions than those students receiving completed graphic organizers. The success of these partial graphic organizers contradicts to some extent the findings of Kobayashi (2006) because the students provided with completed graphic organizers did not perform as well as those with partial notes, suggesting that while having some notes provided is beneficial, full notes are not.

In a specific study on the effects of guided note-taking, Cardetti, Kahmsemanan, and Orgnero (2010) found that the mean scores for mathematics students using partial notes were higher on all the examinations than the mean scores for students not using partial notes, with the greatest difference being on the final cumulative exam. While mathematics and foreign language may not seem similar on the surface, they both require skill building and relational understandings that accumulate throughout the course, requiring understanding and mastery before advancing. Due to this similarity, the success of partial notes in mathematics is significant for foreign language. The use of partial notes or similar strategies could have similar results in increasing student achievement in foreign language.

One of the benefits of the usage of partial notes documented in the student surveys from the Cardetti et al. (2010) study was that prepared notes allowed students to be more attentive to the lecture and less focused on writing all that they heard. Konrad, Joseph, and Eveleigh (2009) also found in their meta-analysis of guided notes that most students preferred guided notes, possibly because guided notes reduced frustration that students often feel when trying to keep up with note-taking in class. By freeing up some of a student's working memory with the provision of some of the notes, the cognitive load for a note-taking task is decreased. Cognitive load is naturally high in a foreign language classroom because the language of instruction is

not the first language of students, so implementation of any strategy that reduces the cognitive load has the potential to improve student performance.

In addition to partial notes, the use of non-linear notes has been shown to reduce cognitive load in note-taking because non-linear notes make connections between ideas more apparent visually than linear notes. These visual connections allow students to store information spatially, as well as verbally, in memory (Katayama & Robinson, 2000). Markany, Kemp, and Dror (2009) found that non-linear note-takers outperformed linear note-takers in several areas, but of statistical significance were the findings on comprehension and metacognition in which non-linear note-takers were able to summarize what they heard more coherently and were more positive about their own note-taking abilities. Katayama and Robinson (2000) had similar findings when comparing students using graphically-organized notes and outline notes at varying levels of completeness. While they did not find an advantage to graphically-organized notes on the factual test, students using graphic organizers did outperform students using outlines on application tests. These findings highlight the benefit of non-linear note-taking strategies for activities and assessments that involve higher levels of critical thinking.

The use of Cornell notes, in which students record various cognitive levels of information in sections, is another note-taking strategy that can promote higher-order thinking. This use of higher-order thinking and summarization encourages students to be more rigorous in their note-taking methods (Hess et al., 2009; Marzano, 1993; McCollister & Sayler, 2010). Donohoo (2010) studied the use of Cornell notes in ninth and tenth grade science classes. After training students to use Cornell notes, course grade averages increased 10%-12% over the previous semester and 100% of students passed the course midterm using Cornell as compared to 70% of students passing who did not use Cornell notes (Donohoo, 2010). These increases show that increasing rigor in note-taking can increase student test scores.

Some final note-taking strategies to be addressed in this review are parallel note-taking strategies. Three studies using various versions of parallel note-taking showed that students believed these methods to be helpful for understanding and processing new information. Pardini, Domizi, Forbes, and Pettis (2005) found that after being taught the parallel note-taking method as a way to interact with Webnotes (instructor-provided lecture notes online), 67% of all responses concerning student use of Webnotes referred to interacting with the notes or annotating the notes at some point. Stencel (1998) reported that students felt that interactive lecture notebooks allowed them to concentrate on the presentation and participate more in learning new information. In addition, students had the opportunity to summarize daily and clarify understanding. Wang (2000) found that both teacher and students found double entry notebooks to be rewarding and helpful. The limitation for all three of these studies is that the results did not provide empirical evidence that the use of parallel note-taking, interactive lecture notebooks, or double entry notebooks actually contributed to student achievement. Rather, qualitative data of student self-reported satisfaction and feelings of success with these note-taking methods merit validation via other sources of supporting data.

Peer Collaboration

The advantage to both parallel note-taking and interactive lecture notebooks is that they emphasize interaction. Note-taking is typically thought of as an individual activity, but research suggests that collaboration with peers may increase the effects of good note-taking strategies. Huxham (2010) tested various note-taking cues to see how they affected the quality of student notes. The highest quality of notes that demonstrated completeness and understanding came from the interactive window cue that incorporates students' own thoughts and small group discussions, supplementing the words of the lecturer.

Little research exists on annotations, collaboration, and note-taking specifically in a foreign language classroom. However, Jones (2006) analyzed the effects of collaboration and annotation on increasing student recall and recognition of vocabulary and propositions from a recorded listening activity in a French class. Even though she found that collaboration did not increase performance on a low-level processing activity such as vocabulary recall or recognition, it did significantly increase performance on the higher-level processing activity of summarization. Further, in examining the notes of all students, Jones found that students in the collaboration and annotation group produced more notes than other groups in the study.

Although extensive research exists on note-taking, research is very limited on the effects of using note-taking to promote critical thinking in the foreign language classroom. The purpose of this study is to examine the effects of INT on student test scores, improvement in critical thinking skills, student confidence in note-taking abilities, and student participation during class in the high-school foreign language classroom. The following research questions guide this study:

1. Does the use of INT in foreign language instruction improve student test scores in high-school foreign language classes? If so, how significant is the improvement?

2. Does the use of INT improve critical thinking skills for students in high-school foreign language classes? If so, how significant is the improvement?

3. Does the use of INT improve students' confidence in note-taking and critical thinking activities? If so, how significant is the improvement?

4. Does using INT change student participation in the classroom? If so, how is the participation changed?

Methods

Participants

Sixty-one students attending a public high school in an urban area of the Southeastern United States volunteered for this study. All were enrolled in Honors Spanish II classes taught by the researcher and were assigned to the classes by a computerized scheduling program. The students had been taught Spanish I by different teachers. None of the students had been taught by the teacher-researcher in the past.

The two classes were randomly assigned to either the control group or the INT group. Students in both groups represented primarily eleventh and twelfth grade.

In the control group there were 16 sophomores, 14 juniors, and 2 seniors. In the INT group there were 16 sophomores and 13 juniors. The student participants represented both regular and gifted ability levels and were ethnically diverse. The average end-of-course grade in Spanish I for the control group was 89.25 (SD = 5.96), and the average end-of-course grade in Spanish I for the INT group was 91.90 (SD = 3.75). Table 1 shows the demographic characteristics for both the control group and INT group. The researcher participated in this study as a teacher-researcher, providing instruction in both classes and designing and administering assessments and surveys.

Table 1

Demographic Data of Participants

Group	Ethnicity			Gender		Designations	
	Black	White	Other	Male	Female	Reg. Ed.	Gifted
Control	8	16	8	15	17	22	10
INT Group	5	15	9	13	16	18	11

Intervention

Students were assigned to classes by convenience sampling, followed by a random assignment of classes to the control group or INT group. Both the control and INT groups received instruction by the same teacher and were taught the vocabulary and grammar concepts concerning daily routines and clothing as presented in Prentice Hall's *Realidades 2*. The groups spent equal time on each component of the unit (i.e., vocabulary, grammar, culture).

Prior to the start of the intervention period, all students were given a pretest on critical thinking skills and a confidence survey (see Appendices A & B[1]). Both groups were administered the same regular course assessments, such as quizzes and chapter tests, throughout the intervention. Student classroom participation in both groups was also monitored daily by the teacher throughout the intervention period with the use of a tally instrument (see Appendix C[1]). After the intervention period, students in both groups were given a posttest on critical thinking skills and the confidence survey.

Students in the control group practiced vocabulary using activities from the textbook or activities created by the teacher-researcher. These activities included traditional activities used in the foreign language classroom, such as surveys, partner exercises, reading activities, and writing exercises. New grammar concepts were introduced using the textbook ancillary grammar videos. Following the grammar videos, the teacher-researcher gave brief ten-minute lectures on the concepts. To practice new grammar concepts, students used textbook activities and teacher-created practice worksheets. During the six days of in which students rotated through student learning centers, students participated in review activities for 25 minutes before beginning center activities. Center activities included reading, writing, and application tasks related to the chapter that were completed while working with a small group of peers.

Students in the INT group were taught using INT 12 times during the inter-

vention period. The first eight INT lessons were given during the first 14 days of the intervention and lasted for full 50-minute class periods. There were four INT lessons per chapter, one related to vocabulary, two related to grammar, and one based on a reading activity. Vocabulary INT lessons included a lesson using the *Videohistoria* from the text. Students were given a cloze version of the video script on the right side of the page. Using prior vocabulary knowledge, students completed the script and interacted with it on the left side, illustrating some scenes, summarizing others.

After completing the notes, students watched the full video to verify and confirm understanding. Grammar INT lessons covered a variety of grammatical concepts, but all grammar lessons included notes on the right side and practice opportunities for students on the left side. The left-side activities included tasks such as illustrating reflexive versus non-reflexive verbs, creating personal examples of sentences using *ser* and *estar*, graphic organizers of possessive adjectives, etc. For the reading INT lessons, students were given articles related to the unit topics to read. The texts of the articles were provided on the right side, while on the left side, students identified main ideas, illustrated styles described in the article, selected advice that was most pertinent to their own lives, etc. Following the reading of both articles, students were given summarizing activities and personalization activities in which they defended choices they had made. During the six days of centers, the students were given INT lessons four times for half of the class period (25 minutes). These four lessons were based on review of grammar concepts in the unit. The other two days of centers, the INT group did the same activities as the control group.

For each INT lesson, students were given split-page note sheets containing teacher notes on the right side and opportunities for student input on the left-side. Students completed left-side activities on their own, but were given the opportunity to collaborate with peers while completing six of the INT lessons. Collaboration opportunities were given so that students could work together to negotiate and create meaning for left-side activities. During these lessons, the classroom was arranged so that students could easily rotate through various collaborative partners.

All students completed the same in-class mini-projects to practice the new vocabulary and grammar. Both classes participated in six days of 25-minute centers based on applications of new skills prior to the unit test. All students participated in the same review games and were given the same review materials prior to all unit assessments (tests and quizzes).

Data Collection Techniques

Evaluative assessments. Each of the assessment measures was a combination of multiple-choice and fill-in-the blank formats. Each measure contained modified sections of assessment activities created by Prentice-Hall for the *Realidades 2* textbook series. Each of the assessments was reviewed by teachers of the same course for peer validation. Spanish II quizzes (Quiz 2A and Quiz 2B) administered during the unit contained 25 questions pertaining to the vocabulary and grammar from their respective sections of the unit and the 50-question Spanish II test assessed all of the concepts from the both quizzes. Since the students often cannot understand the questions prior to starting a unit because they have not learned the vocabulary or grammar, a pretest of this content is primarily a guessing game and not a reliable way

to measure improvement. Therefore, a pretest was not given to either group. To establish that both groups were equivalent prior to the intervention, baseline achievement data was established by analyzing the scores of both groups on the unit one test (pre-intervention). The same statistical analysis was performed on the scores for the unit two test (post-intervention) and compared to the baseline data to evaluate differences in test scores.

Critical thinking skills test. Marzano (1993) and Hess et al. (2009) identified classroom activities that could be used to enhance critical thinking skills. Using these activities as examples, the researcher developed a Critical Thinking Skills Test (CTST) (see Appendix A[1]). The questions for both the pretest-form and the posttest-form instruments were the same, but the cultural reading selections used as the basis for the two test forms were different. Students were asked to identify main ideas and supporting details of the texts, explain the relationship between these elements, and compare the new information learned in the texts to their own cultural experiences. The open-ended sections of the CTST were scored using the scoring rubrics included in those sections. The CTST was validated by peer review and pilot-testing with five students. This peer review and pilot-testing generated feedback for the researcher to establish content validation of the CTST instrument, strengthening interpretations that link student responses to critical thinking skills.

Confidence survey. The Student Confidence Survey (SCS) is a 20-question Likert-scale survey in which ten questions address note-taking confidence and ten questions address confidence in critical thinking skills (see Appendix B[1]). Skill ratings ranged from 1 *(strongly disagree)* to 5 *(strongly agree)*. As with the CTST, this survey was developed by the researcher and validated by peer review and pilot-testing with five students. The SCS was administered to both classes before and after the intervention period.

Participation ratio. The class participation ratio score was a collective score determined daily by dividing the total number of student comments and responses by the total number of questions asked by the researcher. The researcher kept a tally of teacher questions and student comments on a clipboard during each class period during the intervention

Quality of participation (QOP) tally. In order to compare the quality of student participation and interaction during class, question-type and response-type tallies were collected using the QOP tally form (Appendix C[1]). The QOP allowed the researcher to record the types of questions being asked of students as well as the complexity of student responses. At the end of the intervention period, the daily tallies were compiled and graphed according to response-type for each group.

Fieldnotes. Reflective field notes were recorded daily by the researcher after teaching each class session involved in the study. The researcher recorded information concerning on-task or off-task behaviors of students in the class and the observed level of participation. A process for identifying emergent patterns and themes in the data was used to code field notes.

Results

The data collected in this study compared students learning high-school Spanish without the use of INT to students learning Spanish with the use of INT. The results were based on the analysis of the data collected from chapter quizzes and tests, a critical thinking skills test, and a confidence survey. The results of the chapter quizzes, tests, and the critical thinking skills test were analyzed by computing the mean and standard deviation of each assessment and performing a two-tailed t-test between the control group and INT group. The SCS responses were also averaged and two-tailed t-tests comparing the pre-intervention and post-intervention responses within each group were performed. The amount and type of participation were analyzed by graphing the results, and the daily journal notes were reviewed and coded for themes. This data was used to determine the effectiveness of INT in the high-school foreign language classroom.

The Unit 1 test was used as a pretest to establish a baseline for student test score data. Table 2 shows the means and standard deviations for the baseline assessment given to both the control group and the INT group. Although the mean score of the INT Group was higher than that of the control group, there was not a statistically significant difference between the two groups ($p = .05$).

Table 2

Baseline Test Score Data

	Unit 1 Test		
	M	*SD*	*p*
Control Group	88.16	9.95	.05
INT Group	92.86	8.50	

During the intervention period, two chapter quizzes and a unit test were used to determine the effectiveness of INT on student test scores. A comparison of the scores of these assessments between the control group and the INT group are shown in Table 3. On the first assessment during intervention, the 2A Quiz, the mean score of the INT group ($M = 85.66$) was higher than the mean score of the control group ($M = 80.44$), but the difference was not statistically significant ($t(59) = -1.58$, $p = .12$). On the second assessment (2B Quiz) and the third assessment (Unit 2 Test), the differences between the mean score of the INT group and the control group were statistically significant ($t(59) = -3.13$, $p = .00$, $t(59) = -2.27$, $p = .03$).

Table 3

Comparison of Test Scores during Intervention Period

	2A Quiz			2B Quiz			Unit 2 Test		
	M	*SD*	*p*	*M*	*SD*	*p*	*M*	*SD*	*p*
Control Group	80.44	13.31	.12	69.50	18.70	.00**	79.47	15.05	.03*
INT Group	85.66	12.34		82.83	13.97		87.24	11.24	

*$p < .05$, ** $p < .01$

The effect size of the intervention was determined by calculating Cohen's d for each of the three assessments. Early in the intervention, the intervention had a medium effect ($d = 0.41$) on student performance on the written test, increasing scores in the intervention group by approximately 6%. An average INT student at this point in the intervention could be expected to outscore 66% of students in the control group. At the end of the intervention, the use of INT still had a medium effect ($d = 0.59$) on the unit test scores, although the effect was stronger. An average student using INT could be expected to outscore almost 73% of students in the control group, and the INT intervention increased scores approximately 10%.

In order to determine the effectiveness of INT at improving critical thinking skills, students were given both pretest and posttest forms of the CTST. At the start of the intervention, the difference between the pretest scores of the two groups was not statistically significant ($t(59) = -0.03$, $p = .97$), establishing that the groups were comparable. At the end of the intervention, there was a greater difference between the two groups, but it was not statistically significant ($t(59) = -1.79$, $p = .08$). Table 4 shows the results for the pretest and posttest for the control group and Table 5 shows the results for the INT group. Although the comparison between the groups was not statistically significant, there was a significant difference ($t(56) = -2.34$, $p = .02$) between the pretest and posttest scores of the INT group. The difference between the pretest and posttest scores of the control group were not statistically significant ($t(62) = -0.59$, $p = .56$).

Table 4

Control Group Comparison of CTST Pretest and Posttest

	M	SD	t-value	p
Pretest	12.19	2.22	−0.59	.56
Posttest	12.53	2.45		

Table 5

INT Group Comparison of CTST Pretest and Posttest

	M	SD	t-value	p
Pretest	12.21	2.53	−2.34	02*
Posttest	13.45	1.33		

*$p < .05$

The SCS, which takes into account both note-taking confidence and confidence in critical thinking skills, was administered before and after the intervention period to determine if the use of INT improved student confidence in either of these areas. Since the SCS was anonymous, the responses for each item of the pre-intervention and post-intervention surveys were averaged and compared. The first ten items addressed confidence in note-taking. For items 2 and 7, a lower average indicated higher confidence. For all other items, a higher average indicated greater confidence.

In the control group, although six responses indicated greater confidence in

the post-intervention survey, the difference between the pre-intervention and post-intervention responses was not statistically significant for any statement. For the INT group, seven responses indicated greater confidence in the post-intervention SCS. Even so, the difference between pre- and post-intervention responses was not statistically significant. Among the INT group responses, the gains on the averages for item 5 (+ 0.51), "When given notes, I am comfortable adding my own thoughts to the notes," and item 10 (+ 0.48) "I am comfortable learning new information through the process of note-taking," were larger than those of any of the other items, and larger than any change in averages of the control group. The full results for both groups are provided in Appendix D[1].

The last ten items of the SCS addressed confidence in critical thinking skills. While some of the response averages increased for both groups, such as item 5 "I am confident that I can make comparisons between different ideas," neither group had differences that were statistically significant. The full results for both groups are provided in Appendix E[1].

Throughout the course of the intervention student participation was recorded through participation ratios, use of the QOP tally instrument, and field notes to determine if using INT increased both the amount of classroom participation and the quality of student participation in the classroom. Although data were collected each day during the intervention period, the results for class participation ratio scores and QOP tallies are only from days where the instruction between groups was different. In Figure 1 the participation ratio scores between the control group and the INT group are shown.
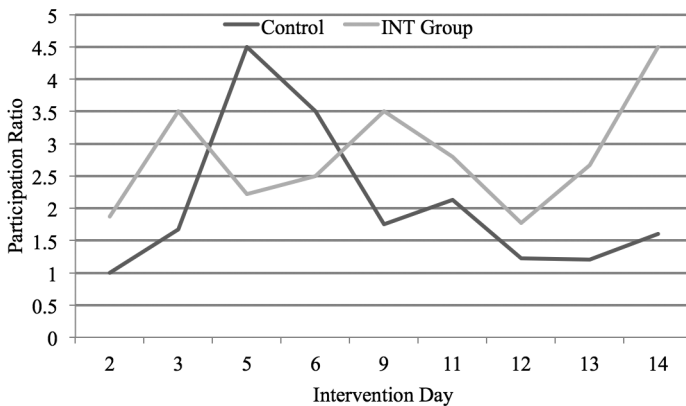

Figure 1. Participation ratio scores. The mean participation ratio score for the control group was 2.06 (*SD* = 1.18). The mean participation ratio score for the INT group was 2.82 (*SD* = 0.88).

There was a wide variation among the daily ratio scores of the control group with the highest ratio score of 4.5 occurring on the fifth day of the intervention. The daily ratio scores of the intervention group were also varied with the highest ratio score of 4.5 occurring on the fourteenth day of the intervention period. The ratio scores of the INT group were consistently higher than those of the control group with the control group having a higher ratio only twice, on intervention days five and six.

Data results drawn from tallies using the QOP differed between the control group and INT group. Of the types of student classroom participation, single-word responses (eg., *sí, no, el desodorante*) and high-frequency lexicalized expressions (eg., *me gusta, ¡claro que sí*) were determined by the teacher-researcher to be lower-level thinking responses based on the fact that they did not require students to create innovative utterances. Sentence-level, paragraph-level, and general comments were grouped as higher-level thinking responses. The results of the QOP are presented in Figure 2. The INT Group not only had more incidences of higher-level thinking responses ($n = 88$), but also more incidences of responses overall ($N = 143$) than the control group ($n = 33$, $N = 95$).
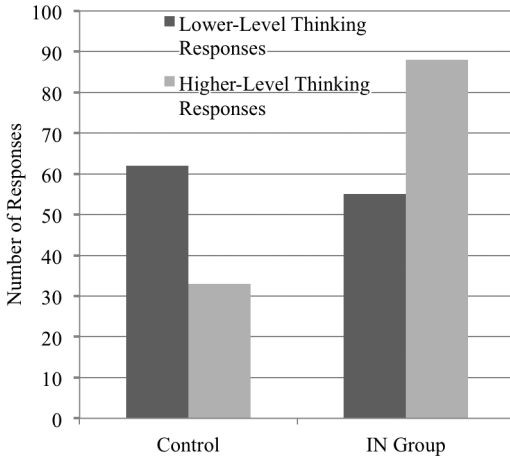

Figure 2. QOP results.

Teacher field notes related to on-task behavior and level of student participation in the class were also used for data collection. Based on the analysis of these field notes, the researcher drew inferences indicating that students in the INT group were more actively engaged during class than the control group. On several note-taking days, only about half of the students in the control group were taking their own notes while all students in the INT group were actively completing the left section of their notes. The researcher also inferred that the INT group had greater diversity of participation due to a higher number of different students participating and contributing to the lessons compared to the control group. These interpretations additionally support the researcher's assertion that the design of the INT lessons inspired more variety in the quality of student participation in the classroom and provided more student support, thereby encouraging significantly greater student participation.

Discussion

Student test scores in Spanish and critical thinking skills increased as a result of the INT intervention. By providing opportunities for students to interact with new information and process that information in a variety of ways, student test scores and critical thinking skills significantly increased. As a group, the INT students had higher test scores on all three assessments. Although the differences between the

control group and INT group were not statistically significant on the critical thinking skills assessment, there was a statistically significant difference (p = .02) between the pretest and posttest of critical thinking skills in the INT group, suggesting that INT can improve critical thinking skills. In this study, one possible explanation for the lack of a significant difference between groups is the high number of gifted students in both the control and intervention groups. The pretest scores for both groups showed that students already had good critical thinking skills, so there was little room for improvement in this area for some students.

INT also had a significant effect on the type and quality of student participation in the classroom. There was a notable difference in both the amount of classroom participation between the control group and the INT group and the type of participation between the two student groups. There was also a marked difference in the level of engagement in note-taking activities as recorded in the researcher's field notes. The significantly higher number of higher-level thinking responses in the INT group supports the hypothesis that INT activities provide more opportunities for critical thinking than traditional activities and that the INT activities cultivate the confidence in students to participate at a higher cognitive level in the classroom.

The data results did not show a statistically significant increase in student confidence in note-taking and critical thinking activities for the INT group. However, although there were no statistically significant increases for either group in the area of note-taking confidence, the change in responses for item 5 ("…I am comfortable adding my own thoughts…") and item 10 ("I am comfortable learning new information through…note-taking") in the INT group was noteworthy and greater than any response changes in the control group. Other studies (Markany et al., 2009; Pardini et al., 2005; Stencel, 1998; Wang, 2000) have concluded that non-traditional note-taking methods have a positive impact on students' perceptions and attitudes about their own note-taking. In the present study, the increase in responses for items 5 and 10 on the posttest form of the SCS supports that earlier research, as student responses for the INT group indicated that they feel more comfortable adding their own thoughts to their notes and learning new information through note-taking after the experience with INT.

Since the INT activities required greater application of critical thinking skills than the traditional activities used with the control group, one would expect increased student confidence in this area. However, the survey results did not indicate any significant change in student confidence in the area of critical thinking skills. Although student performance in critical thinking skills did improve, it might be suggested that there is a lag time between improvement and confidence; but such a claim merits further inquiry into lag times between actual improvement and perception of improvement.

As a result of INT, students significantly increased their scores on assessments in Spanish language classes. As reported in Cardetti et al. (2010), increases in student test performance continue to grow over time in courses where skills build on each other, such as mathematics. Since acquisition of a foreign language is based on skill-building over time, the teacher-researcher purports that student test performance would continue to increase, becoming more statistically significant over time. This study shows that INT had a significant impact on increasing critical thinking skills.

Given that finding, this teacher-researcher believes that as students become more competent in their own critical thinking, the rigor of classroom activities can be increased. As teachers are able to increase the rigor of classroom activities, student learning is also increased.

Findings from this study also show that the quality of student participation in classroom activities increased in rigor with nearly three times the amount of higher-level thinking responses occurring in the INT group than in the control group. Although the results did not show a significant impact on student confidence in note-taking and critical thinking activities, this teacher-researcher believes that over time, these results would continue to increase and become more significant as well, especially given a context of ongoing opportunity to advance these skills through the INT method.

INT combines many different strategies of note-taking methods that have been shown in previous research to be effective (Donohoo, 2010; Huxham, 2010; Jones, 2006; Katayama & Robinson, 2000; Pardini et al., 2005; Robinson et al., 2006; Stencel, 1998; Wang, 2000). In this study, INT had a positive impact on student achievement, critical thinking, and student classroom participation. These results have inspired this teacher-researcher to incorporate INT into all of her other classes. While the use of INT in every class session may be unrealistic, its incorporation on a regular basis is a worthwhile endeavor. Other foreign language teachers, as well as teachers from other disciplines and among various grade-levels, should consider incorporating INT into their own teaching repertoire as a way to increase rigor in the classroom and improve student achievement and critical thinking abilities.

There are limitations to this study that should be considered when determining the reliability of these results. The study was conducted over a five-week period, a limited period of time to observe significant changes in critical thinking skills or student confidence. Future research could focus on a longitudinal study to examine whether the effects of INT continue to increase. Further, the study was conducted solely in foreign language classrooms, and these student groups did not include any special needs students. Future research could improve the reliability of this study by increasing the number of student study participants and by expanding the participants to include students from additional subgroups representing the school-aged population. There is a compelling need for extending this research into other disciplines, grade-levels, and school settings as there is presently very limited research specifically focused on INT. The educational profession-at-large would certainly benefit from further inquiry into INT and its academic benefits.

Endnotes

1   See https://www.dropbox.com/sh/oa62r1v3fgrju06/g9ivzgiWQO

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