Math Literacy Through French Language Learning: Connecting with the Common Core in the Lower Elementary Grades

by Patricia Davis-Wiley and Roy V. Miller

It is most fitting that the theme of this issue of Learning Languages is dedicated to literacy through language learning and its connection with the Common Core State Standards Initiative (CCSI) for the K-12 educational arena (“Common Core State Standards”). Currently, these standards are being infused into all content areas in 48 U.S. states and territories and include, for the first time, four strands of reading, writing, listening, speaking and language that “…are being revisited in the National Standards for Learning Languages by “…the U.S. government, including the U.S. Department of Education, plans to invest over $100 million in the science, technology, engineering math (STEM) curriculum delivered to the FLES practicing during which they offer 30 minutes of world language instruction twice weekly in a local elementary school. One such master’s candidate, a native speaker of French from Haiti, prepared a developmentally and academically-appropriate 13-week French curriculum, in concert with the university professor, the school’s principal and grade level teachers of the FLES students. This special program study, integrating basic math concepts that were being concurrently taught from the EnVision Math® Series to the children by the mainstream classroom teacher, was aligned with the Common Core State Standards (see table 1). Approximately one-half of the twice-weekly, 30-minute instructional periods, delivered over 13 weeks during the spring semester of 2012, was dedicated to the reinforcement of math content; the remaining half included a traditional FLES curriculum consisting of basic French greetings, numbers, colors, time and weather expressions, geography and culture (i.e., music, art and songs). Infusing language instruction with another subject area (such as what was done at MHES), or content-based instruction (CBI), is not new to the language arena; it has been in practice for the past 35 years, and is well-documented in the literature. Technically it is defined as “…a curricular and instructional approach in which non-linguistic content is taught through a medium of a language” (Tiedck and Cammaratas: 28). Due to the fact that only half of the FLES curriculum at MHES was dedicated to the reinforcement of math concepts, however, and that the instruction was only offered twice a week, it is not possible to address this in this article as a content-enriched or math-enriched curriculum. The curricu- lum followed a set of themes (Stryker and Leaver) that were “drawn from the aca- demic content [i.e., math] of the school” (Stoller and Grade 83).

Instructional Strategies. The math-enriched curriculum delivered to the FLES students was highly-structured, fast-paced, hands-on/interactive, multi-sensory, technology-supported and connected to real-life experiences (Asher; Dale; Dewey; Gardner; Mehisto et al.) to meet the needs of all students. It followed the tenets of the Five Es: Engage (Engagement, Enthusiasm, Connections, Comparisons and Com- munities) of the American Council on the Teaching of Foreign Language’s National Standards (“National Standards”), and consequently demonstrated content that was not taught in isolation but rather in content areas (such as math, science, technology and literacy) that were “drawn from the aca- demic content [i.e., math] of the school” (Stoller and Grade 83).

For Math, the research study that involved teaching math through French in grades 2-4 in a small, urban, community-based, highly-diverse elementary school in Knoxville, Tennessee, “…the U.S. government, including the U.S. Department of Education, plans to invest over $100 million in the science, technology, engineering math (STEM) curriculum delivered to the FLES practicing during which they offer 30 minutes of world language instruction twice weekly in a local elementary school. One such master’s candidate, a native speaker of French from Haiti, prepared a developmentally and academically-appropriate 13-week French curriculum, in concert with the university professor, the school’s principal and grade level teachers of the FLES students. This special program study, integrating basic math concepts that were being concurrently taught from the EnVision Math® Series to the children by the mainstream classroom teacher, was aligned with the Common Core State Standards (see table 1). Approximately one-half of the twice-weekly, 30-minute instructional periods, delivered over 13 weeks during the spring semester of 2012, was dedicated to the reinforcement of math content; the remaining half included a tra- ditional FLES curriculum consisting of ba- sic French greetings, numbers, colors, time and weather expressions, geography and culture (i.e., music, art and songs). Infusing language instruction with another subject area (such as what was done at MHES), or content-based instruction (CBI), is not new to the language arena; it has been in practice for the past 35 years, and is well-documented in the literature. Technically it is defined as “…a curricular and instructional approach in which non-linguistic content is taught through a medium of a language” (Tiedck and Cammaratas: 28). Due to the fact that only half of the FLES curriculum at MHES was dedicated to the reinforcement of math concepts, however, and that the instruction was only offered twice a week, it is not possible to address this in this article as a content-enriched or math-enriched curriculum. The curricu- lum followed a set of themes (Stryker and Leaver) that were “drawn from the aca- demic content [i.e., math] of the school” (Stoller and Grade 83).
In an effort to document the teachers’ perceptions of their students’ reactions to the FLES classes, one of the researchers conducted surveys during times that the teachers deemed to be convenient for their schedules, either during a planning period or at the end of the day, and the second researcher conducted the FLES classes compared with during regular math class. Children’s interaction with the teacher and favored methods and types of activities the children liked. The impact of French instruction on math skills.

Children’s Level of Interest

Midway through the 13 weeks of French instruction, one of the classroom teachers’ interview responses characterized the children’s interest as ranging from “average,” to “very high,” to “not interested” not including every week,” while another teacher reported that “the majority [of the students] are interested and find it [French] fun.” Most telling, was a third teacher’s comment, who stated, “They asked me regularly, ‘Is it French class day?’” Observations shared with the primary researcher indicated that the children’s level of interest during interviews, after the FLES program was over, testified to the overall positive reaction. The principal investigators in this research study had not made any predictions about the children’s level of interest during traditional math instruction. The program was both case after weeks 7 and at most, able to count from 1 to 10. The third graders were expected to only identify a particular shape but also determine which shape in a sequence was placed higher (than three) or higher and recognize geometrically, basic fractions (e.g., a demi, a half, an quart, a quarter) were introduced when the child was able to count from 1 to 10 and then ultimately by 10s to 100. Third graders would be expected to do this, be able to count from 1 to 10. French instruction and during non-French instruction.

Data Collection and Analysis

For this research study, data were collected from the following three sources: 1. Individual and group interviews with the 4 classroom teachers (i.e., grades 2, 3, 4, and 3). 2. Observation of the 2 FLES children classes (2) in grades 2-4. 3. Test The second researcher conducted the FLES classes compared with during regular math class. Teachers were interested and find it [French] fun.”

The interviews yielded a substantial amount of rich data; however, only a small portion of it was identified for the lead researcher’s qualitative analysis of the interview data, guided by the study’s research questions, will be reported for this study. The researcher noted that this children’s level of engagement at the beginning of the program was “good”… but that this was “average” for this particular grade level. One third teacher agreed that other students in the same class exhibited similar identical behavior during the rest of the school day, outside of French class, while the third teacher said, “They were always engaged and interested.” One class was re- counted that her children reacted “Posi- tively… There is a refusal, and if she does spot somebody that’s not participating she would say, ‘Why aren’t you trying? You’re there right? They’re on task.’” The classroom teachers essentially shared the same type of observations at the end of the year. One teacher, however, added that her children in particular, enjoyed “group singing, and interactive videos.”

Impact of French Instruction on Math Skills

The principal investigator in this research study had made no predictions concerning what impact French instruction, math and perhaps my guess is that some of the problem-solving that it takes to learn a language might be similar to the problem-solving they need to use to learn math. There is a lot more to say about learning French, in particular, that the teacher told the students that they had the children’s level of participation at the end of the program was “strong, very strong… at 98%.”

Children’s Interaction With the French Teacher and Favorite Activities

Concerning the children’s behaviors at mid-year, the researchers asked, “Do you have any ideas about what you can build on those [skills] that they can learn a new language.” A second teacher commented, “I also wonder about the pride and accom- plishment, in what we have been doing so it’s another aspect of it and it’s from another point of view. So, any time a child is able to say to the topic, the better it is for them; and, if you vary enough, than you increase the...”

Remarks made during the final inter- view were overall positive, with one teacher sharing a sentiment that the other classroom teachers generally on this principle, you just think that generally, overall, hearing it [math] another way, and experiencing it...
another way... is always positive."

Observations. The lead researcher conducted and recorded the interviews with the classroom teachers, Dorothy Blanks, Ph.D., applicant, Education, at the University of Tennessee, transcribed the data for later qualitative analysis.

The data from these assessments were: January 18, 2012; March 14, 2012; April 10, 2012.

Students’ identities remain confidential for data analysis by assigning each student a random number to ensure confidentiality.

APPENDIX A
1. Rapport Building
A. Pseudonym Chosen. By Participants
I. I will explain what a pseudonym to be?
II. What would you like your pseudonym to be?
B. Background Information
1. How long have you taught?
2. Where?
3. What grade levels have you taught?
C. Guide Questions
1. How would you describe the children’s level of interest during French instruction?
2. How is the level of participation of the children during French instruction?
3. Compare the children’s behavior, participation, responsiveness, and level of activity during French instruction with that during math instruction.
4. What kinds of activities do the children seem to enjoy during French instruction?
5. How do the children interact with you during French instruction?
6. As you know, part of the French class is focused on reinforcing the top topics already introduced in English during regular math instruction. What impact do you think this has on the children’s math skills?
7. Any other comments?

APPENDIX B
1. First Round Interview Protocol

TABLE 2 MATH GAINS FOR FLES AND NON-FLES STUDENTS CONTROLLED BY MATH SKILL LEVELS

<table>
<thead>
<tr>
<th>Math Skill Levels</th>
<th>Number of Students of French</th>
<th>% Gain</th>
<th>Number of Students</th>
<th>% Gain</th>
<th>Number of Students</th>
<th>% Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>2ND GRADE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high</td>
<td>14</td>
<td>4%</td>
<td>6</td>
<td>2%</td>
<td>4</td>
<td>2%</td>
</tr>
<tr>
<td>medium</td>
<td>3</td>
<td>3%</td>
<td>5</td>
<td>8%</td>
<td>9</td>
<td>13%</td>
</tr>
<tr>
<td>low</td>
<td>20</td>
<td>20%</td>
<td>5</td>
<td>17%</td>
<td>1</td>
<td>20%</td>
</tr>
<tr>
<td>3RD GRADE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high</td>
<td>2</td>
<td>-15%</td>
<td>4</td>
<td>-26%</td>
<td>4</td>
<td>-10%</td>
</tr>
<tr>
<td>medium</td>
<td>6</td>
<td>6%</td>
<td>4</td>
<td>4%</td>
<td>4</td>
<td>12%</td>
</tr>
<tr>
<td>low</td>
<td>5</td>
<td>20%</td>
<td>4</td>
<td>12.5%</td>
<td>6</td>
<td>5%</td>
</tr>
<tr>
<td>4TH GRADE</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high</td>
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<td>10%</td>
<td>4</td>
<td>12.5%</td>
<td>12</td>
<td>12.5%</td>
</tr>
<tr>
<td>medium</td>
<td>12</td>
<td>17.5%</td>
<td>10</td>
<td>12%</td>
<td>12</td>
<td>12%</td>
</tr>
<tr>
<td>low</td>
<td>3</td>
<td>24%</td>
<td>8</td>
<td>12%</td>
<td>8</td>
<td>12%</td>
</tr>
</tbody>
</table>

(Davis-Wiley and Miller).

Math Benchmark Assessments. Data from the Math assessments, conducted at the beginning, middle and end of the 13-week FLES program with all children in grades 2-4, were quantitatively analyzed and controlled by the following variables: grade levels; FLES and Non-FLES classes; percentage gains by whole class, and, percentage gains by math skill levels (i.e., high, medium, low), determined by a pre-assessment from the EnVision Math Series. Table 2 (see above) presents a comprehensive summary of the results comparing math skill gains, controlled by math skill levels, for both children who received French instruction and those children who did not. Percentage gains for all FLES children (high, medium, and low math skill levels) in the second grade were 17.6% overall, compared with the 2 non-FLES classrooms that had gains of approximately 9%. On the third grade level, those FLES children with a medium skill level in math, showed a 10% gain, compared with a 4% gain reported in one non-FLES classroom and a 6% gain in the other non-FLES classroom. Lastly, FLES children in the fourth grade, with a high math skill level out-performed the children in the one non-FLES classroom with a 12.5% gain compared with a 10% gain.

The results of the math score gains of the FLES children were guardedly positive, especially considering several underlying demographic challenges of students in the FLES classrooms in Grades 3 and 4 previously mentioned under the Participants section of this paper.

CONCLUSIONS
Early world language study, and in particular, second language study, enriched by math skills, is beneficial to the positive impact of a math-enriched FLES program when compared with the positive impact of a math-enriched program in the regular classroom. The greater majority of all FLES students during the regular visits to the FLES classrooms. The results of analysis of the FLES during the regular visits to the FLES classes during the semester-long program described in this paper, which offered 30 minutes of French instruction, delivered twice a week, over 13 weeks, one could say that its documented results are cautiously optimistic. As such, they offer a gentle argument for offering FLES in the early grades for all academic skill levels of children. Most importantly, the results of this study help support the notion that FLES programs should be considered a core subject along with the traditional math, science, social science, language arts elementary school curriculum so that they can serve as the Common Core Standards glue in connecting literacy across all content areas.

IMPLICATIONS AND RECOMMENDATIONS
Should early world language study be an important component of the elementary school curriculum? The answer is a resounding “yes.” The published literature attesting to the benefits of FLES and their link to the goals of the Common Core and Common Core Standards corroborate this. Modest empirical research studies, such as the one presented in this paper, also contribute support to an argument for an integrated FLES program in the early grades. It must be noted, however, that the reported results of the data collected and analyzed in the present study, are at best cautiously optimistic, yet still offer some evidence for the positive impact of a math-enriched FLES program. Pertaining to the French (i.e., high, medium, low) grade-level appropriate math literacy skills were most definitively observed and documented through field notes. Additionally, all standardized assessments of math skills did show some gains, albeit modest, for some of the FLES students. Even in cases where the gains were disappointing and its results cannot be generalized to a larger population, the findings can contribute to the paucity of published literature on the topic. Therefore, the authors suggest that additional research needs to be conducted in an effort to further investigate the efficacy of a content-enriched FLES program.

NOTES
2. Race to the Top: Promoting Innovation, Reform, and Excellence in America’s Public Schools, is an initiative, backed by a $4.35 billion investment, and first announced on July 24, 2009 by President Obama, “to commit to reform "... America’s public schools to provide every child access to a complete and competitive education." (http://www. whitehouse.gov/the-press-office/fact- sheet-race-top)
3. There is a plethora of published research studies on the efficacy of studying a second language, especially in the early years of school, easily retrievable from the Network for Early Language Learning (nnell.org), Center for Applied Linguistics (cal.org) and American Council for the Teaching of Foreign Languages (actfl.org), websites, as well as from web search engines and more traditional research databases.
4. The 2008 national survey of U.S. World Language teachers (actfl.org) websites, as well as from web search engines and more traditional research databases.
5. The Track 1 master’s degree consists of 18 hours in the target language. The Track 2 master’s degree is a fifth-year, 24-hour program. The Knox County School District defines those students who are enrolled in a CDC as having “...been identified as needing a small, structured environment where core academic areas are addressed at the student’s instructional level while still preserving the study of the French language, especially in the early grades.”
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7. The Track 1 master’s degree consists of 18 graduate hours in Education and 15-18 hours in the target language. The Track 2 master’s degree is a fifth-year, initial teacher licensure program with a Pre-K specialization (the study of French language, especially in the early grades). 8. Both state and local school district curricula were used to develop the scope and sequence of the math-enriched French curriculum. The EnVision Math Series (Scott Foresman Publishers) was the math textbook series from which lessons were expanded and reinforced by the FLES teacher.
9. Whereby the primary researcher conducted and recorded the interviews with the classroom teachers, Dorothy Blanks, Ph.D., candidate, Education, at the University of Tennessee, transcribed the data for later qualitative analysis.
10. The data from these assessments were: January 18, 2012; March 14, 2012; April 10, 2012.
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APPENDIX B
1. Second Round Interview Protocol

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by Paul Sandrock

Every language teacher should be excited with the opportunity presented by the Common Core State Standards. The Common Core Standards have defined literacy and outlined the mission for English Language Arts in a way that provides a natural fit with our National Standards for Language Learning. Taking advantage of this connection, language teachers can showcase the importance of learning languages by demonstrating how literacy is learned, practiced and strengthened through standards-based and performance-based language learning.

The national consensus that has coalesced around our National Standards for Language Learning is remarkable. Most states have adopted or adapted the standards represented by the five goal areas, our five Cs of Communication, Culture, Connections, Comparisons and Communities. Not only have the language standards endured for over 15 years, they have proven to be flexible and adaptable to fit all types of program models, instructional sequences of varying lengths and all languages; whether alphabetic (French, German, Latin, Russian, Spanish), logographic (Chinese, Japanese) or visual (American Sign Language). The Standards have guided the critical review and improvement of language programs from prekindergarten through postsecondary levels, teacher preparation programs and teacher licensure requirements. Language assessments have also been impacted by the standards as institutions look for design or valid evaluations of language performance.

ACTFL worked with local and state supervisors of languages to create a crosswalk to show the connections between the four strands of the Common Core State Standards for English Language Arts (ELA) and the Standards for Language Learning. This document is available to download at www.actfl.org/commoncore. The easy part was to link the Common Core strands of reading, writing, speaking and listening to the three modes of communication (interpersonal, interpretive and presentational). The fourth Common Core strand, language, correlates with the description of language proficiency levels (Novice, Intermediate, Advanced) as Common Core describes growth in the strand of language as increasing accuracy in applying language conventions, deepening understanding of how language functions, and expanding precision of understanding and using vocabulary. The more difficult challenge is to demonstrate what kind of growth can occur through language learning that would truly develop or strengthen the literacy skills described in the Common Core Standards.