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EDCI 856

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Introduction

I reviewed three K-5 mathematics curricula to determine the best curriculum for use in K-5 classrooms in Fairfax County Public Schools (FCPS). FCPS is a large school district located outside Washington, DC in Virginia. It is the 12th largest school district in the United States with over 160,000 students enrolled. The diverse population of students includes African American (10.8%), Asian American (17.4%), Hispanic (16%), and White (50.2%). There are large numbers of students with limited English proficiency (22,868) and receiving special education services (24,000). A little less than 20% of the students in FCPS receive free or reduced price lunch, but 35 elementary schools have over 35% poverty and receive Title I funding. There are a total of 136 elementary schools in FCPS. The teachers at those schools vary in their educational background and number of years of teaching experience. They all work under federal and state guidelines governing education.

Selection Criteria

I developed a questionnaire to use in the evaluation of the three curricula (see Appendix A). There were 11 questions on the questionnaire. Each question was rated on a scale of 1 (low) to 4 (high) with a total of 44 points possible for the overall rating. The questions were developed using a number of resources including Choosing a Standards-Based Mathematics Curriculum (Goldsmith, Mark, & Kantrov, 2000, p. 145-146), On Evaluating Curricular Effectiveness (National Research Council, 2004), and The Virginia Department of Education’s Review of Textbooks and Instructional Materials (2005).

The first question asked if there were research studies to back up the program’s effectiveness. It was important to determine if there was any empirical evidence to support the use of any of the three programs. The second question asked if the program addressed the...
Virginia Standards of Learning (SOL). This was important because all FCPS schools must teach the SOL. Schools are accountable to this, and their students are tested on the standards at the end of the school year. Sanctions are in place for schools that do not meet Annual Yearly Progress goals. The curricula that the schools use must help the students learn the standards.

Questions 3 and 4 were designed to help me review the mathematics content and pedagogy in the programs. Since time did not allow me to take an in depth look at all the content strands and topics, I chose two topics that were crucial to student learning at grades K-5: basic facts & algorithms and fraction concepts. These questions were adapted from Choosing a Standards-Based Mathematics Curriculum (Goldsmith et al., 2000, p. 145-146). The questions asked how basic facts, algorithms, and fraction concepts were presented and developed in the programs. This helped me to determine the instructional approaches of the three programs and the types of understanding that children were expected to gain.

Question 11 also helped me to assess the instructional practices and learning theory incorporated within each curriculum. It was important that the curricula included the National Council of Teachers of Mathematics (NCTM) process standards (2000) of representation, connections, communication, reasoning and proof, and problem solving. I also was looking for a balance between conceptual understanding and procedural skill. Manipulative and technology use was another consideration.

Question 6 on the questionnaire was asked to determine if professional development for teachers was built into the programs. How do the programs support teachers with different experience and mathematical knowledge? I believe that teachers need tremendous support in order to provide quality instruction to students. The textbooks should be one source of this support and should include information on mathematics content and pedagogy. The remaining
questions on the questionnaire helped me to assess the organization and structure of the materials, support for parents, and student assessment practices.

Description of Curricula

I chose to evaluate *Everyday Mathematics* (EM) (University of Chicago School Mathematics Project, 2001a, 2001b, 2001c, 2002a, 2002b, 2002c, 2002d, 2002e), *Investigations in Number, Data, and Space* (TERC, 1998) and *Saxon Math* (Hake & Saxon, 2001a, 2001b; Larson, 2004). Two of the three programs (EM and *Investigations*) were developed with funds from the National Science Foundation. FCPS adopted *Everyday Mathematics* as one of three approved elementary textbooks in 2001. *Investigations* was adopted as a supplemental text. *Saxon Math* was not adopted, but one elementary school received special permission from the school board to use the textbook. Evaluating these three programs was beneficial to me because it helped me to become more familiar and articulate about the programs. FCPS will be adopting textbooks again in the near future. This comparison report may be useful in that adoption process.

*Everyday Mathematics*

EM was designed by the University of Chicago School Mathematics Project over an eleven year period from 1985 – 1996. A team of authors developed the entire curriculum, K-6, which is in contrast to how most curricula are developed, simultaneously by a different team of authors at each grade level. The grade level curricula were developed sequentially, one at a time, beginning with kindergarten (Carroll, 1998; Isaacs, Carroll, & Bell, 2001). The slow development of the program allowed time for the authors to conduct field studies on each grade level, make revisions to the program, and build the program from one grade level to the next. This resulted in a cohesive, comprehensive curriculum.
EM instruction is implemented in a spiraling manner, revisiting topics throughout the school year and in subsequent school years. Each time a topic is repeated, it is revisited at a slightly higher level and in a different context (Fuson, Carroll, & Drueck, 2000; University of Chicago School Mathematics Project, 2002b). The program is implemented through individual, small group, and whole class activities. Activities include hands-on explorations, student discussions, and interdisciplinary projects. Students use tools such as white boards, measuring devices, manipulative materials, and calculators. Problem solving, mental computation, and invented algorithms are major foci of the EM program. Students invent and justify solution strategies for problems that are set in real-life contexts.

Investigations

The Investigations curriculum engages students in deep exploration of meaningful mathematics topics. Each grade level includes six to eleven units in which students solve mathematical problems using concrete materials and technology. Each unit is conducted over two to eight weeks and includes work in at least three mathematical strands. The curriculum emphasizes deep mathematical thinking rather than superficial exposure to fragmented topics. Communication of mathematical ideas orally and in writing is also a focus.

The program is implemented through hands-on investigations. There are no student textbooks, but a set of resource guides for teachers. The resource guides include descriptions of the mathematics in the units, pedagogical information about how students learn the content, and sample classroom dialogues. Students work individually, in small groups, and in whole class settings. Students are encouraged to create their own strategies for solving problems. Mathematical reasoning and justification are an integral part of the instructional process. Basic
facts and skills practice occurs through games and “10-Minute Math” activities which are in addition to the investigations.

*Saxon*

Saxon Math takes a spiraling approach to mathematics instruction. The curriculum is introduced in carefully sequenced small pieces called increments that are then repeated and practiced over time. There is an emphasis on procedural skill and rote memorization. Each lesson has a distinct structure: the meeting, fact practice, the lesson, and guided practice. In the meeting, students participate in activities such as recording the daily temperature, looking at calendar patterns, telling time, counting money, and solving the problem of the day. Fact practice includes timed tests and practice with partners. In the lesson, new concepts are introduced through guiding questions and demonstration. Manipulatives are used. Individual, small group, and whole class instruction is included. Guided practice consists of completing a written worksheet. Teachers work with the whole class to guide students through the worksheet one question at a time. A homework page that is similar to the guided practice is assigned four days per week. The instruction for all parts of the lesson is fast paced. The teacher’s manual is scripted to help teachers present the lesson.

*Research Review*

I conducted a search for comparative research studies involving *Everyday Mathematics*, *Investigations*, and *Saxon*. I used the George Mason library databases ERIC, PsycINFO, Digital Dissertations, and Dissertation Abstracts. I also looked for studies on the publishers’ websites, the Mathematically Correct website, the K-12 Mathematics Curriculum Center website, and in
Standards-Based School Mathematics Curricula: What Are They? What Do Students Learn?
(Senk & Thompson, 2003). The results of my research analysis are shown in Table 1.
Table 1.

Results of Analysis of Research Studies of Three Curricula.

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<thead>
<tr>
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<th>Type of Study</th>
<th>Statistical Analyses(^a)</th>
<th>Results(^b)</th>
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<td>Journal</td>
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<tr>
<td>5</td>
<td>Dissertation</td>
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*Everyday Mathematics*

<table>
<thead>
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<th>Results(^b)</th>
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<tr>
<td>10</td>
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*Investigations*

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<td>Report</td>
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</table>

\(^a\)Indicates whether statistical analyses were conducted as part of the study. (Y = yes, N = no) More than one Y/N indicates more than one comparison within the study. \(^b\)Results of statistical analyses. + indicates a statistically significant difference, 0 indicates no statistically significant difference. Note: See Appendix B for list of studies.
As Table 1 indicates, I found five studies of *Everyday Mathematics*, five studies of *Investigations*, and six studies of *Saxon*. The EM studies were the most rigorous and showed the most effect. Three of the EM studies were from refereed journals. One was a dissertation in which methodology and findings would have been scrutinized by a team of professors working under university guidelines. Four of the five EM studies included statistical analysis. Study 2 did two statistical analyses. Study 3 did seven statistical analyses. The results of eleven statistical analyses in four EM studies showed that EM students did statistically better than students using traditional curricula with the exception of one analysis which showed no significant difference.

Two of the five *Investigation* studies were dissertations in which some standard of review would have been expected. One was a paper presented at the Annual Meeting of the American Research Association. Four of the five studies used statistical analyses. The results of eight statistical analyses in four studies showed that *Investigations* students fared significantly better than students using traditional curricula on half of the comparisons. The other four comparisons showed no significant difference.

Two of the *Saxon* studies that I found were reports done by Mathematically Correct. These reports did not include statistical analyses. Four of the studies did include statistical analyses. One was a paper presented at the Annual Meeting of the Mid-South Education Research Association. Two were school board reports for Oklahoma City Public Schools. I did not find these studies to include rigorous methodology or serious review processes. Three of the four studies found that Saxon students did significantly better than students using other curricula. The third analyses showed no significant difference.
Content Review

*Everyday Mathematics.* EM received an overall rating of 43 in my review (see Appendix C). The program was strong in all areas of review. It addressed most of the Virginia SOL and was adopted by the state. The instructional philosophy included a balance of conceptual understanding and procedural skill. Lessons included problem solving, use of multiple representations, and student dialogue. Basic fact and algorithm development was taught through the use of invented strategies. Procedural fluency and standard algorithms were also stressed. Fraction instruction began in kindergarten at a conceptual level. Real world contexts were used to present fraction ideas and other mathematical content.

The EM teachers’ guides and student materials were well organized and easy to use. The lessons had a basic structure which included attention to new concept development and review of previously learned concepts. Adequate support for communicating with parents was included. The assessment pieces were strong, but more student self-assessment could be included. The materials were mathematically accurate and free from bias.

A particular strength of the program was support for teachers’ development of mathematical content and pedagogical knowledge. Mathematical content and pedagogy were discussed at the beginning of each unit. Additional discussions were included in the Teacher’s Reference Manuals (University of Chicago School Mathematics Project, 2002a, 2002b). Essays on mathematical topics such as number, counting, basic facts, algorithms, mental arithmetic, and measurement were available to help teachers understand worthwhile mathematics concepts.

*Investigations.* The *Investigations* program received an overall rating of 37 in my review (see Appendix D). The one great strength of the program was the delivery of instruction. Students investigate important mathematical concepts at deep levels. They interact with each
other and mathematical content to explore mathematical ideas. Mathematical connections are made through these investigations.

The program had some weaknesses, however. One weakness was that it did not address many of the Virginia SOL. The second grade curriculum was weak, showing no evidence of addressing one-third of the 26 SOL at that level. The fifth grade program was so weak that the state did not adopt *Investigations* at that level. While the teacher materials were organized and relatively easy to use, I did not find them as teacher friendly as the EM or *Saxon* materials. Another drawback was that one unit at each grade level required the use of computers. This could be problematic for teachers who do not have access to computer labs.

*Saxon.* The *Saxon Math* program received an overall rating of 31 in my review (see Appendix E). A great strength of the program was the ease of use of the program materials. The structure and organization of the program materials allowed inexperienced teachers and teachers without much knowledge of mathematics to implement the program effectively. Teachers could follow the scripted lessons verbatim or use them as a guide to instruction. The student materials were also well-organized and easy to understand.

The Saxon program addressed all of the SOL with the exception of one or two at each grade level. There were adequate resources for communicating with parents including daily homework pages. Multiple assessment options were routinely scheduled as part of the lessons. There were no portfolio assessments or student self-assessments. I considered this a weakness of the program.

The major weaknesses of the program, however, were the instructional practices and learning theories exhibited in the lesson activities. The lessons were repetitive to the point of monotony. There was a focus on procedural skill over conceptual understanding. Even the
concept topics were taught in a procedural way. Manipulatives were used, but technology use was scarce. The pace of the lessons seemed so fast that it didn’t allow time for the students to think or process the material being presented to them. The whole group guided practice did not allow differentiated instruction for students who did not grasp the concepts right away or students who were ready to move on. Overall, I believe Saxon would help students develop procedural fluency, but it would not help them make sense of mathematics. Students would not develop conceptual understanding, mathematical reasoning skills, or a productive disposition towards mathematics.

Recommendation and Conclusions

I believe that Everyday Mathematics is the best choice of curricula for the students and teachers in Fairfax County Public Schools. I have presented this recommendation in a persuasive argument for the school board (see Appendix F). EM received the highest rating on the evaluation questionnaire. My research review showed EM studies to be of higher quality and rigor than studies of the other two curricula. Statistical analyses in those studies showed EM students to fair better than students using other curricula. Research showed that EM students develop computational fluency, as well as mathematical reasoning and problem-solving skills.

My content review found EM to have strengths in all the criteria areas listed on the questionnaire. EM had the instructional philosophy that I was looking for and that I think will enable Fairfax County students to learn mathematics with understanding. While Investigations had a similar instructional philosophy, it did not have the same ease of teacher use or support for teachers’ knowledge of mathematics content and pedagogy. Saxon Math, on the other hand, had materials that were very teacher and student friendly, but had an instructional approach that ran counter to my beliefs about quality mathematics teaching and learning. I highly recommend
Everyday Mathematics. I believe it will serve the teachers and students in Fairfax County Public Schools well.
References


Chicago: SRA/McGraw-Hill.
Appendix A

K-5 Mathematics Adoption Evaluation

Curriculum:  

Overall Rating:

Rate each question: 1 2 3 4  List comments when appropriate.

Low  High

1. To what extent do research studies back up the program’s effectiveness? Rating:

2. Does the program address the Virginia Standards of Learning (SOL)? Rating:

3. How does the program model, explain, and develop understanding of basic facts & algorithms? Rating:

4. How does the program develop understanding of fractions? Rating:

5. Are the program materials teacher friendly? Rating:
   - Directions are clear, easy to understand throughout the lessons
   - Teachers’ guide is well organized, easy to use
   - Information regarding support/supplementary materials is accessible and sufficient

6. To what extent does the program help teachers develop their own mathematical content and pedagogical knowledge? Rating:

7. Are the program materials student friendly? Rating:
   - Visually appealing, easy to understand
   - Provides good directions for students
   - Language made accessible to all students
   - Readability is developmentally appropriate

8. Does the program provide resources for communicating with parents? Rating:

9. Does the program provide multiple assessment options that are aligned to the instruction? Rating:

10. Do the program materials present content in an accurate, unbiased manner? Rating:
   - Free of content and production errors
   - Appropriate representation of diverse groups (racial, ethnic, cultural, linguistic), males and females, people with disabilities, and people of all ages

11. Do the program materials emphasize the use of effective instructional practices and learning theory? Rating:
   - Lessons include problem solving
   - Concepts are introduced through concrete experiences that use manipulatives and other technologies
   - Students use a variety of representations to connect mathematical concepts
   - There is a balance between conceptual understanding and procedural skill
   - Lessons include student interaction and discourse
Appendix B

List of Studies Used for Research Review

*Everyday Mathematics*


*Investigations*


http://www.secondaryenglish.com/recipeformath.html


K-5 Mathematics Adoption Evaluation

Curriculum: *Everyday Mathematics*  

Overall Rating: 43

Rate each question: 1 2 3 4  
Low High  

List comments when appropriate.

1. To what extent do research studies back up the program’s effectiveness? Rating: 4  
   Three of the four research studies were from refereed journals. Four of the studies included statistical analysis. Eleven comparisons were conducted. All of the statistical analyses (with the exception of one) favored EM over the comparison group.

2. Does the program address the Virginia Standards of Learning (SOL)? Rating: 4  
   According to the Virginia Department of Education, EM at grades K-5 addresses all the SOLs except 1.5, 1.13, 1.15, 2.3, 2.22, 2.24, 3.2, 3.11, and 5.12. EM was adopted by VDOE.

3. How does the program model, explain, and develop understanding of basic facts & algorithms? Rating: 4  
   EM emphasizes conceptual understanding. Students practice basic facts through fact triangles and games. Standard algorithms are introduced after students understand the concept of the operation and have invented their own algorithms. EM introduces a focus algorithm for each operation. These are not the traditional algorithms, but are easy to understand and use. Students are expected to master the focus algorithms: partial sums, trades-first subtraction, partial products, and partial quotients.

4. How does the program develop understanding of fractions? Rating: 4  
   Work with fractions begins in kindergarten at a conceptual level. Real world contexts are used to present fraction ideas. Fraction problems are solved primarily using concrete materials. Pictorial and symbolic representations are used, but with lesser emphasis. Multiple solution strategies are encouraged. Connections are made among fractions, decimals, and percents. Paper and pencil computation with fractions is delayed until fourth grade in order to give students the opportunity to build their conceptual understandings. Rates and ratios are also introduced at fourth grade. Common-denominator algorithmic approaches for addition, subtraction, and division of fractions are formally introduced in fifth grade. EM does not emphasize the traditional “least common denominator” approach. Finding a “quick common denominator” is encouraged. While students informally solve multiplication of fraction problems at the lower grades, an area model of multiplication of fractions is introduced at fifth grade, and students develop the traditional algorithm.

5. Are the program materials teacher friendly? Rating: 4  
   - Directions are clear, easy to understand throughout the lessons  
   - Teachers’ guide is well organized, easy to use  
   - Information regarding support/supplementary materials is accessible and sufficient
6. To what extent does the program help teachers develop their own mathematical content and pedagogical knowledge? Rating: 4
Math content and pedagogy are discussed at the beginning of each unit. Additional discussions are included in the Teacher’s Reference Manual. Essays on mathematical topics such as number, counting, basic facts, algorithms, mental arithmetic, and measurement help teachers understand mathematical concepts.

7. Are the program materials student friendly? Rating: 4
- Visually appealing, easy to understand
- Provides good directions for students
- Language made accessible to all students
- Readability is developmentally appropriate

8. Does the program provide resources for communicating with parents? Rating: 4

9. Does the program provide multiple assessment options that are aligned to the instruction? Rating: 3
There are a variety of formal and informal assessments including interviews, written tests, and portfolio items. Student self-assessment is weak.

10. Do the program materials present content in an accurate, unbiased manner? Rating: 4
- Free of content and production errors
- Appropriate representation of diverse groups (racial, ethnic, cultural, linguistic), males and females, people with disabilities, and people of all ages

11. Do the program materials emphasize the use of effective instructional practices and learning theory? Rating: 4
- Lessons include problem solving
- Concepts are introduced through concrete experiences that use manipulatives and other technologies
- Students use a variety of representations to connect mathematical concepts
- There is a balance between conceptual understanding and procedural skill
- Lessons include student interaction and discourse
Appendix D

K-5 Mathematics Adoption Evaluation

Curriculum: Investigations in Number, Data, and Space

Overall Rating: 37

Rate each question: 1 2 3 4 List comments when appropriate.

1. To what extent do research studies back up the program’s effectiveness? Rating: 3
   Five research studies were found. Two were reports, two were dissertations, and one was a conference paper. Four of the five research studies used statistical analysis, conducting 8 comparisons. Four of the 8 statistical analyses favored Investigations. The other half showed no difference.

2. Does the program address the Virginia Standards of Learning (SOL)? Rating: 2
   According to the VDOE, Investigations addresses all the SOLs at grades K-4 with the exception of K.9, K.16, 1.15, 2.12, 2.13, 2.15, 2.16, 2.17, 2.19, 2.24, 3.17, 4.10, 4.12. Second grade was particularly weak, showing no evidence of about 1/3 of the 26 objectives. VDOE adopted Investigations at grades K-4. It was not adopted at grade 5. An SOL analysis was not available for this reason. I conducted my own and found no evidence of the following SOLs at fifth grade: 5.6, 5.8, 5.9, 5.11d, 5.11e, 5.15d, 5.15e, 5.21, and 5.22. All of the missing SOLs were addressed in earlier grades with the exception of 5.6, 5.9, 5.21, and 5.22.

3. How does the program model, explain, and develop understanding of basic facts & algorithms? Rating: 4
   Investigation focuses on conceptual understanding by having students develop their own strategies for solving problems. Multiple strategies are encouraged so students can check their accuracy by using a different strategy. Fluency and accuracy are encouraged. Meaningful practice of basic facts through activities and games is provided. Emphasis is on development of efficient computational strategies and appropriate notation that students understand and can explain.

4. How does the program develop understanding of fractions? Rating: 4
   Conceptual understanding is developed through problem-solving activities beginning at grade 2. Real world contexts are used. Concrete materials, pictorial, and symbolic representation are used. Different fraction models are studied: area models, linear models, set models, division models. Students develop “fraction sense.” A fifth grade unit emphasizes relationships among fractions, decimals, and percents. Students add and subtract fractions using their own methods in fifth grade. Proportion and ratio are explored in fifth grade.

5. Are the program materials teacher friendly? Rating: 3
   - Directions are clear, easy to understand throughout the lessons
   - Teachers’ guide is well organized, easy to use
   - Information regarding support/supplementary materials is accessible and sufficient

Computer programs are used in many of the units, in fact required for one unit at each grade level. This creates a management problem for the teacher who must have access to a computer lab in order to teach the lessons. The unit books are easy to follow and well organized. An index at each grade level would be an improvement.
6. To what extent does the program help teachers develop their own mathematical content and pedagogical knowledge? Rating: 3
Investigations was created to be a tool for professional development. Each unit contains a section describing the mathematical content in the unit. Each lesson describes the mathematical emphasis in the lesson. Teacher notes provide practical information about the mathematics content and pedagogy. Dialogue boxes provide sample classroom discussions. Teachers must have a deep knowledge of mathematics content and pedagogy to teach using the methods employed in Investigations. Additional professional development opportunities would be necessary. Ongoing dialogue with other teachers would be important.

7. Are the program materials student friendly? Rating: 4
- Visually appealing, easy to understand
- Provides good directions for students
- Language made accessible to all students
- Readability is developmentally appropriate

There is no student textbook. A student workbook is available for additional cost. Many reproducible handouts are provided. The handouts are appropriate and useful during the lessons.

8. Does the program provide resources for communicating with parents? Rating: 3
Family letters and homework suggestions are provided.

9. Does the program provide multiple assessment options that are aligned to the instruction? Rating: 3
Open-ended End-of-Unit Assessment Tasks are included. Grading rubrics are available online. The assessment tasks provide an opportunity for teachers to assess mathematical thinking and reasoning. Because the tasks are open-ended, it would take considerable time to complete them and grade them. Checklists of mathematical concepts and skills are provided to be used during instruction. Student self-assessment occurs at the end of each unit when students are asked to choose an assessment item to add to their portfolio. Students write summary comments about their work in the unit. Some multiple-choice (standardized-test-like) assessment could be developed to help students prepare for high-stakes state assessments.

10. Do the program materials present content in an accurate, unbiased manner? Rating: 4
- Free of content and production errors
- Appropriate representation of diverse groups (racial, ethnic, cultural, linguistic), males and females, people with disabilities, and people of all ages

11. Do the program materials emphasize the use of effective instructional practices and learning theory? Rating: 4
- Lessons include problem solving
- Concepts are introduced through concrete experiences that use manipulatives and other technologies
- Students use a variety of representations to connect mathematical concepts
- There is a balance between conceptual understanding and procedural skill
- Lessons include student interaction and discourse
Appendix E

K-5 Mathematics Adoption Evaluation

Curriculum: Saxon

Overall Rating: 31

Rate each question: 1 2 3 4 List comments when appropriate.

Low High

1. To what extent do research studies back up the program’s effectiveness? Rating: 2
   Six research studies were found. None were refereed journal articles or dissertations which
   would have had stringent review processes. Five of the studies were reports, and one was a
   conference paper. Four of the six studies used statistical analyses. Three of the four favored
   Saxon over the comparison group. One showed no difference.

2. Does the program address the Virginia Standards of Learning (SOL)? Rating: 4
   According to the VDOE, Saxon addresses all the SOLs at grades K-5 with the exception of
   K.16, 1.15, 1.17, 2.14, 2.22, 3.20, and 5.12. Saxon was adopted by VDOE.

3. How does the program model, explain, and develop understanding of basic facts &
   algorithms? Rating: 2
   Students take fact assessments once a week. They practice facts using fact cards. They are
   expected to memorize the facts: grade 2 – addition, grade 3 – subtraction and multiplication,
   grade 4 – division. Algorithms are stressed. Algorithms are taught for mental computation
   (e.g., When we add using mental computation, we add the tens’ digits first.). Traditional
   algorithms for addition and subtraction are taught in second grade. Traditional algorithms for
   multiplication and division are taught in third grade.

4. How does the program develop understanding of fractions? Rating: 2
   Fraction instruction begins in kindergarten with identifying halves and fourths. Students add
   and subtract fractions in third grade. Multiplication and division of fractions is introduced in
   fifth grade. Area and set models are used. The concepts are presented using direct instruction
   rather than investigation or exploration.

5. Are the program materials teacher friendly? Rating: 4
   • Directions are clear, easy to understand throughout the lessons
   • Teachers’ guide is well organized, easy to use
   • Information regarding support/supplementary materials is accessible and sufficient

The lessons are scripted. Teachers can follow the scripts verbatim or use them to guide their
lessons. Inexperienced teachers would have no trouble using this program.

6. To what extent does the program help teachers develop their own mathematical content and
   pedagogical knowledge? Rating: 1
   The only support teachers receive is reading the scripted lessons. The lessons could build
   their procedural knowledge, but not their conceptual knowledge.
7. Are the program materials student friendly? Rating: 4
   - Visually appealing, easy to understand
   - Provides good directions for students
   - Language made accessible to all students
   - Readability is developmentally appropriate

8. Does the program provide resources for communicating with parents? Rating: 4
   Parent letter at the beginning of the year. Homework pages four days a week. Parents are expected to check homework and help their child correct errors, practice number facts with their child, and monitor their child’s performance on assessments.

9. Does the program provide multiple assessment options that are aligned to the instruction? Rating: 3
   Written assessments occur every fifth lesson (once a week). Oral assessments occur every tenth lesson, but are not graded. Fact assessments occur every fifth lesson. Individual Assessment Recording Forms are provided. Suggestions are provided for weighting different kinds of assessments for report card grading. The written assessments are in a short answer format. There is no performance assessment (with the exception of the short oral assessments), authentic assessment, portfolio assessment, or student self-assessment.

10. Do the program materials present content in an accurate, unbiased manner? Rating: 4
    - Free of content and production errors
    - Appropriate representation of diverse groups (racial, ethnic, cultural, linguistic), males and females, people with disabilities, and people of all ages

11. Do the program materials emphasize the use of effective instructional practices and learning theory? Rating: 1
    - Lessons include problem solving
    - Concepts are introduced through concrete experiences that use manipulatives and other technologies
    - Students use a variety of representations to connect mathematical concepts
    - There is a balance between conceptual understanding and procedural skill
    - Lessons include student interaction and discourse

Lessons are very repetitive to the point of monotony. There is a focus on procedural development over conceptual understanding. Even the conceptual topics are taught in a procedural way. Manipulatives are used, but technology use is scarce. There is no calculator use until fourth grade. Teachers ask questions of students, but responses are expected to be quick with not much time for thought. There is little student discourse. Students are occasionally put in groups to work, but the work is more independent than cooperative. Many of the worksheets are done as a class together, one problem at a time. I think students would not learn how to pace themselves with this format. Also, smarter students would become bored and want to move ahead. Slower students might be lost if the teacher moved at a faster pace than they need.
Appendix F

Persuasive Argument

I evaluated *Everyday Mathematics; Investigations in Data, Number, and Space;* and *Saxon Math* to determine the best curriculum for use in Fairfax County Public Schools’ K-5 classrooms. *Everyday Mathematics* received the highest rating in my review. It will help all students in Fairfax to develop deep understandings of important mathematical ideas while enabling them to become proficient in the Virginia Standards of Learning.

*Everyday Mathematics* was developed over time by a team of authors. This is in contrast to how most curricula are developed, simultaneously by a different team of authors at each grade level. The grade level curricula were developed sequentially, one at a time, beginning with kindergarten. The slow development of the program allowed time for the authors to conduct field studies on each grade level, make revisions to the program, and build the program from one grade level to the next. This resulted in a cohesive, comprehensive curriculum.

Research studies conducted on *Everyday Mathematics* have found that students who use the program do better than students using other curricula. Students develop computational fluency, as well as mathematical reasoning and problem-solving skills.

The program materials are teacher and student friendly. They include resources to build teacher knowledge, support differentiation of instruction, facilitate communication with parents, and assess student learning.

Instruction is implemented in a spiraling manner, revisiting topics throughout the school year and in subsequent school years. Each time a topic is repeated, it is revisited at a slightly higher level and in a different context. The program is implemented through individual, small group, and whole class activities. Activities include hands-on explorations, student discussions,
and interdisciplinary projects. Students use tools such as white boards, measuring devices, manipulative materials, and calculators.

Conceptual understanding and computational fluency are emphasized in the *Everyday Mathematics* program. Problem solving, mental computation, and invented algorithms are used to facilitate students’ mathematical understandings. Students are expected to communicate their mathematical thinking to others as well as master basic facts and focus algorithms.

I highly recommend *Everyday Mathematics* as the curriculum that will take Fairfax County students to new levels of mathematical understanding.