Independent Analysis - PWCS Staff Response to Board Questions Regards Math Investigations and the Board's "Opt In" to Traditional Math Initiative – 10 Feb 2009

The following is an independent analysis of the PWCS Superintendent's Response to the PWCS Board's questions regarding Math Investigations and the proposed "Opt In" to traditional mathematics raised at the 10 Feb 2009 Board work session.

In the PWCS Interim Associate Superintendent for Student Learning and Accountability's 17 Feb 2009 memo to Dr. Steve Walts, Superintendent, the below questions and staff answers were presented.[1] This analysis addresses Part I of the memorandum. Original questions posed are in red. PWCS Staff answers follow, and the independent analysis is provided for the reader.

Memo background; the introductory paragraph:

"*A group of five elementary school principals, including Barry Rosenberg, Swans Creek; Linda Trexler, Neabsco; Jarcelynn Hart, Rosa Parks; Janet Greer, Buckland Mills; Donna Fagerholm, Sinclair; and Gail Hubbard, Gifted Supervisor and Carol Knight, Mathematics Supervisor, met on February 17,2009, to provide the board specific answers to the questions posed at the recent Board work session. Mr. Kris Pedersen, Interim Associate Superintendent, facilitated the meeting.*"

The following represents a compilation of their responses to the questions.

1. Since we have taught both traditional classes and MI classes' years ago, why would it be a problem to do so now? (Lucas)

PWCS Staff Answer: Mathematics has been taught for conceptual understanding in Prince William County for approximately ten years, with teachers moving in this direction. Two distinctly different approaches have not been implemented simultaneously within a single grade level. Teachers have used many different supplemental materials over the years based on their knowledge and what was available to them in their schools. Multiple teaching strategies are included when teaching with *Investigations* and other materials.

Analysis: The question was not answered, and the information given is not factually correct.

- "*Two distinctly different approaches have not been implemented simultaneously within a single grade level.*" The statement is untrue. In fact prior to the 2006-2007 school year some classrooms were teaching Math Investigations while the majority of PWCS classrooms were teaching the "distinctly different approach" in the same grade levels. In response to FOIA (5 Mar 08) PWCS provided data showing that Math Investigations was indeed being utilized in some classrooms at select PWCS elementary schools but not all classrooms in those schools. Clearly two distinctly different approaches had been implemented in the past. The staff response does not answer the question.

3. What exactly does a blended approach mean to each school? (algorithms were not

[1] Memorandum from Kris Pedersen, Interim Associate Superintendent, Student Learning and Accountability to Dr. Steve Walts, 17 Feb 2009

mentioned) (Lucas)

PWCS Staff Answer: A blended approach is an inquiry based teaching and learning program where children are required to learn the algorithms as an integral part of the instruction. In a blended program, students are expected to have a conceptual understanding of the mathematics, should be proficient with procedures and skills, and should be able to solve problems. Administrators must ensure that teachers have an understanding of how Investigations texts can be used with other materials to make all of this happen.

Analysis: The staff asserts that blended means "inquiry based teaching and learning program." Inquiry-based learning is an instructional method developed during the discovery learning movement of the 1960s. An "inquiry-based" approach is a philosophy/ideology wherein The teacher's job is not to provide knowledge, but instead to help students along the process of discovering knowledge themselves.

- The strength of *Investigations* in the multiplication thread is the development of strategies for single-digit multiplication leading to fluency. The primary weakness is that the program does not lead to fluency with the standard algorithm. Although a supplementary activity does a nice introduction to the standard algorithm, relating it to the partial products algorithm and the place value area representation for multiplication, it is a standalone activity that is not mathematically incorporated into the program. The main program continues to develop multiple strategies, unaware that the standard algorithm has been developed, without providing the concentration necessary to provide fluency.
- Investigations handles the topic of the standard algorithm in a one-page supplementation in grade four and one class period in grade five.
- With the help of a one-page supplement, the formulas for the areas of rectangles, parallelograms, and triangles are developed. The work with triangles is weak: the height of a triangle is not defined. There are an inadequate number of good problems.
- The representation of fractions and their addition and subtraction, through representations, is nicely done in Investigations with their clock model and their rectangular grid model. However, this follows weak and confusing work in grades three and four that fails to give students a solid start. Work in *Investigations* is limited to fractions with sums of less than 2 and there is very limited work with mixed numbers, leaving students unprepared to deal with fractions as simple as 11/3. Most importantly, common denominators are not well-developed, leaving students ill-prepared to add arbitrary fractions with what they are taught. Students using this program will not be well prepared to go on in mathematics.[2]

[2] *Independent Study of Washington State K-8 Curriculum Review, Final Report, October 27, 2008,* Strategic Teaching, W. Stephen Wilson, PhD, Johns Hopkins University

- "*Administrators must ensure that teachers have an understanding of how Investigations texts can be used with other materials to make all of this happen.*" Note: the only other materials being used to "blend" *Investigations* with other materials is supplemental materials where Virginia SOL standards are not addressed. Standard algorithms are not required elements of the Virginia SOLs and are not taught in the PWCS *Investigations* approach to learning. Staff has asserted that PWCS elementary school teachers do not understand the traditional algorithms and are not able to neither learn these nor teach them to PWCS students.[3] Notably, PWCS staff *were capable of providing this instruction before the adoption of Math Investigations.*
- An element of the PWCS Mathematics Textbook Selection Guidelines evaluation rubric included the criteria: "Reasoning and Proof – Supports an Inquiry-based approach to learning."[4] Only two of the six textbook/materials considered by the committee were "inquiry-based." The remaining texts were judged on content. At issue is the fact that the staff introduced philosophical criteria (ideological bias) into the text selection process. This resulted in the selection of Math Investigations due to ideological support of "inquiry-based" learning vice merit of the mathematical content in supporting the Virginia SOLs. No other text series reviewed so poorly supports the Virginia SOLs. Math Investigations Grade 5 materials are not approved for instruction by the Virginia Department of Education due to insufficient mathematical content support of the SOLs.

4. What has been done with all of our old traditional math books? (Lucas)

PWCS Staff Answer: Out-of-date and unused math texts are disposed of according to county policies. Some are kept and used as resource materials in the classroom. If they are not out of date, they are also sent to new schools or schools that are in need of textbooks. Just over half of schools report that they have some texts from the last adoption.

Analysis: The question was not answered. Mathematics textbook materials do not become "out of date." The schools have an inventory of textbooks available and each elementary school is capable of answering this question with fidelity. The Board should require a fidelity answer to this question.

[3] PWCS Math Workshop – Multiplication and Division, 19 Feb 2008, Kelly Leadership Center, Ms. Carol Knight & Ms. Linda Zoborofsky proctoring the presentation, Ms. Elizabeth Martinez and Ms. Gail Hubbard attending/monitoring.

[4] *PWCS Response to FOIA Request of February 6, 2008,* Ms. Mary McGowan, School Board Attorney

5. Are the traditional math textbooks in the warehouse, or have they been disposed of? Would the following be a workable scenario: if you have 100 students at the 3d grade level and 25 of those students opt to have traditional math and you have a block of time that math would be taught with three teachers teaching Math Investigations and one of the teachers teaching traditional math, could this not work? (Covington)

PWCS Staff Answers:

Question on traditional textbooks: Please see answer to question 1-4.

Question on workable scenario: Some schools use as many as eight different criteria to Determine class assignments for students at a single grade level. Using a single criterion to establish a class would "track" some children. This would be particularly true if the same group were retained in successive years. There would be no consideration given to diversity that one seeks to have in heterogeneous classes. The possibility of having math become "integrated" into other subject areas would be limited. The one traditional class would be taught in "isolation." Collaborative planning and pacing among staff would be diminished if one teacher was teaching one way with a traditional class and others with the blended approach. It would require d1 teachers on a grade level to be teaching math at exactly the same time.

Analysis: The first part of the question regarding disposition of textbooks remains unanswered. The second part of the question asserts that allowing children to be taught math using traditional materials and conventional instruction would create a "non-diverse track." The answer alludes to the fact that only certain demographic population groups would opt for traditional mathematics instruction. Absent a survey of parents – all parents – the staff's assertion that there would only be one traditional math group "taught in isolation" is based purely on conjecture. A survey of parents would likely reveal overwhelming support for diversity of programmatics (Math Investigations "path" and Traditional "path") in the PWCS schools.

6. How would an opt-out program affect scheduling, our Title 1 students, and our ESOL population in the classroom, if we were to make this change now? MS. Ramirez suggested that a possible option could be a Saturday school. (Ramirez)

PWCS Staff Response: There would be scheduling parameters that would be negatively affected by a separate opt-out program offered concurrently with the current blended approach. The majority of elementary schools operate at capacity. If a school's average class size was twenty-six children and a traditional math class were formed, unless it equaled that average class size, other classes in the school would be constrained. If the opt-in exceeded the average class size, the issue of relocating those few children to other adjacent elementary schools would be difficult. This would be a hardship to those parents. This would be even more difficult if a child was in Title I reading, ESOL, or a special education program as math classes would likely be departmentalized. If the opt-in class was "under" the needed numbers or dropped under after the year started (some schools have a high mobility rate), the other classes would be correspondingly larger. Balancing student numbers would be very difficult. Saturday school, while a creative idea, would not be cost effective in the current budget climate.

Analysis: Addressing the last question first, Saturday school is indeed a creative idea but likely unsupportable by both the staff and would not likely gain any community support. Regarding the first question, the staff response is based on the assumption that the demand (preference) for traditional mathematics would be too low to support normal integration within a given school. As with the Staff Answer to the previous question, absent a survey of parents – all parents – the staff's assertion that there would only be one traditional math group "taught in isolation" is based purely on conjecture. Absent in the response is an acknowledgment that families of ESOL students may actually prefer an Opt In to traditional mathematics in order to enhance parental mentoring at home with a mathematics program that is universal in nature (i.e. traditional) and more reflective of what non-English speakers have learned in their native countries.

7. Mr. Richardson would like to hear from the principals and teachers who have to make it happen; he would like to know what some of the practical issues might be, (Richardson)

PWCS Staff Answer: Planning, implementing, assessing, and professional development become two tracks. Scheduling and organization poses a number of difficulties. The class sizes could be off balance which means some teachers might have 20 students and others could have 30 or more students which is not an instructionally sound practice. Parents having to provide transportation for the transfer students could develop a privileged group as costs of transportation in time and money could be considerable. Some parents won't be able to take advantage of transferring their child because of transportation requirements. Implementation could be a logistical nightmare due to the numbers of families in PWC that move in and out of the county. ESOL, Special Education, and Gifted Education would "turn the clock back" on current inclusion practices. Teacher assignments would be constrained as a school could easily be in the position of "requiring/forcing" a teacher to teach traditional math that he or she does not want to teach. Teachers may seek transfers on the basis that they do not want to teach traditional mathematics. Criteria would change and the balancing of classes would be compromised. It could create homogeneous classrooms. Classrooms could lose their diversity.

Analysis: The Staff Answer intentionally does not present a balanced view of practical issues focusing on only the negatives and rejecting the positive elements of the program. Most notably, nothing is presented in support of the benefits to the student population that demonstrated overwhelming success with traditional mathematics prior to Investigations adoption – the majority of PWCS students as evidenced by SOL results prior to Investigations and SOL results for students still in traditional elementary math classes in current PWCS classrooms and schools.

- "*Planning, implementing, assessing, and professional development become two tracks.*" Planning, implementing, and assessing are already in two "tracks" in PWCS. They have been since the implementation of Math Investigations with the two program coexisting in each elementary school. The only professional development investments being made for mathematics enrichment of staff are reformist mathematics professional development activities. The issue is purely ideological and not grounded in research when the division refuses to provide *balanced* professional development opportunities in traditional mathematics enrichment programs. As with the response to question number 3. above, professional development ought to be provided to enable PWCS staff to learn to comprehend and teach standard universal arithmetic algorithms to children; this would require professional development opportunities in traditional mathematics disciplines.

- Class sizes could easily be balanced. A survey of parents desiring "Math Investigations path," "Traditional Classical path," or "No Preference" would enable schools to balance classrooms as necessary with "No Preference" children. Notably the staff asserts that classrooms with greater than 30 children is not an instructionally sound practice. Yet this is likely to be a reality in PWCS for the 2009-2010 school year.
- The assumption of the development of a "Privileged Group" of students whose parents would bear the costs associated with potential transfers is telling. The underlying basis for the staff's assertion is that those with economic means recognize right now that the Math Investigations program does not support higher mathematics learning and that only those socio-economic groups who can afford to bear transfer costs really want quality mathematics programs for their children. And that somehow, only "privileged" families recognize the need for a better math program for their children.
- No figures are given for the numbers of families who "move into and out of the county." Evidence from those families who have left the county for other "non-Investigations" math districts within Virginia reveals that children leaving the PWCS Math Investigations program and entering schools that use traditional mathematics core programs are behind their peers. Similarly, children entering PWCS Investigations classrooms having had the benefit of rigorous traditional mathematics instruction in other districts are ahead of their peers in comprehension and application of mathematics.
- The concept of "turning back the clock" (ESOL, SPED, Gifted) on inclusion practices is an ominous staff proposition. The assertion is that traditional mathematics is only for privileged classes or groups of students.
- "*Teacher assignments would be constrained as a school could easily be in the position of "requiring/forcing" a teacher to teach traditional math that he or she does not want to teach*." Right now PWCS is universally forcing ALL elementary teachers to teach reformist math without a choice. Teachers were successfully teaching traditional mathematics before the mandatory implementation of the reformist ideology in all PWCS schools. Concerns about teachers teaching curricula using materials and ideology that they did not "want to teach" was not a consideration in mandatory county-wide Math Investigations implementation 3 years ago; why would it be a major consideration now? What data does the staff have to back up this assertion? Many, many teachers would likely prefer the option of teaching traditional mathematics. Preparation time, continued professional development, and classroom orchestration necessary to provide "fidelity of implementation" of Math Investigations is cited by PWCS Staff (pwcsmath.com links to "Mathematically Sane" website – research citing continued problems with Math Investigations implementation across the country).
- *"Teachers may seek transfers on the basis that they do not want to teach traditional mathematics."* Are PWCS teachers permitted to seek transfers currently on the basis that they do not want to teach "Investigations Math?"

- *"It [traditional mathematics] could create homogeneous classrooms. Classrooms could lose their diversity."* This statement on part of PWCS staff is particularly revealing. The implied statement is that that traditional mathematics is only suitable for certain student subgroups; presumably "privileged" subgroups as evidenced in the staff response to similar questions above. What is not said in this response is even more revealing. It is obvious that staff is tacitly acknowledging that the Math Investigations program is a program designed for traditionally lower quartile performing student subgroups and that rigorous traditional mathematics content is reserved for only certain privileged student subgroups. This belief on part of the staff is troubling in many aspects.

8. Now much constant feeding of professional development are we going have to do to sustain this? How much will it cost? Are there any other subjects that we dictate the presentation of the curriculum across the board to all the schools to the extent that we do for math with the Math Investigations approach? If not, why is math differently? Also, if not, do we plan on extending this type of model to some of the other subjects? Are we getting any type of grant money or funds tied to our implementation of Math Investigations? (Trenum)

PWCS Staff Answer: There is constant need for professional development training for new staff who will teach our curricula as well as a continuing need for professional development for all staff to implement and improve effective instructional delivery systems. It is estimated that professional development costs next year will be approximately $250,000 for all 5th grade teachers and new K - 4 teachers. To maintain and improve the levels of mathematics knowledge of elementary teaching staff is estimated to be about $150,000 per year. These costs would exist regardless of what text is being used. Certain Title I funds are designated to support professional development in mathematics. Implementing two instructional programs concurrently at the same grade level to achieve the same curriculum objectives would be costly. Maintenance costs for two separate programs would be difficult to separate, implement, and support logistically. Instructional methodology has normally been the shared responsibility of the school administration, subject supervisors, central support staff, associates, and superintendent. The board has historically approved curriculum objectives and texts to support the accomplishment of those required objectives in the SOL and in the Prince William County curriculum. The Board has not historically required specific instructional methodology or strategies to accomplish objectives. This educator (Mr. Pedersen) knows of no other instances in which the Board has mandated the format of instructional methodology to all the schools to the extent that consideration is being given to the current blended/traditional approach.

Analysis: The staff response does not answer the question.

- The answer states that it will cost $150,000/year for professional development sustainment for PWCS elementary school teachers for mathematics and $250,000 for next year's Grade 5 teachers. The assertion is made that whenever PWCS completes an elementary math text adoption cycle and chooses new materials costs will be approximately $1,500,000 (one million, five hundred thousand) for initial training and recurring costs of $900,000 (nine hundred thousand) for continuation training during a given 6 year text book cycle….for elementary school mathematics! (total of $2.4 million!)

- *"Implementing two instructional programs concurrently at the same grade level to achieve the same curriculum objectives would be costly*." The staff asserts that the funds are indeed tied to a particular *program* (Investigations) vice the professional development of staff in the universal discipline of mathematics. The unanswered question is what professional development costs are associated with traditional mathematics and whether or not such professional development costs were incurred prior to Math Investigations in PWCS?
- *"[Board member Gil Trenum] Are there any other subjects that we dictate the presentation of the curriculum across the board to all the schools to the extent that we do for math with the Math Investigations approach? If not, why is math differently? Also, if not, do we plan on extending this type of model to some of the other subjects?* The PWCS staff did not answer these questions. The staff answer asserts that, "The Board has not historically required specific instructional methodology or strategies to accomplish objectives. This educator (Mr. Pedersen) knows of no other instances in which the Board has mandated the format of instructional methodology to all the schools to the extent that consideration is being given to the current blended/traditional approach." The question raised by Mr. Trenum was whether or not the PWCS staff had dictated such universal presentation of curriculum to ALL schools as has been done with Math Investigations. Again, the staff did not answer Mr. Trenum's questions.

9. Will each school have teachers who will want to teach traditional math? How can we have accountability with regards to the blended or balanced approach? Will a principal ensure that a teacher has full flexibility and be able to use their own professional judgment? (Latin)

PWCS Staff Answer: It would be difficult to find teachers who want to teach traditional math in many of our schools. If a teacher does not want to teach such a class or is forced to teach such a class, it would be difficult to have a high level of accountability. Such a class will be taught in "isolation." Principals know what and how the teachers are teaching.

Analysis: Teachers are currently teaching traditional math in PWCS elementary schools. They have been doing so in each and every PWCS elementary school at all grade levels prior to the 2006-2007 school year when Math Investigations was dictated by staff to become the "exclusive use" curriculum for elementary school mathematics instruction.

- The reader is reminded that PWCS teachers have been "forced" to teach Investigations Math under the direct supervision of the PWCS senior staff.
- There has not been any problem with "accountability" for the past 3+ years since Investigations Math and traditional conventional math have been coexisting in PWCS elementary schools; the assertion that it would be a problem where none exists is disingenuous.
- The view that traditional mathematics would be "taught in 'isolation'" marginalizes the academic discipline. "Gifted student programs" can be said to be "taught in isolation" as only certain students in each school participate in these programs. Yet these are permitted to have "positive connotations." The staff answer suggests the staff is unable or unwilling to make an objective statement regarding mathematics and consider the benefits of such a program for students.