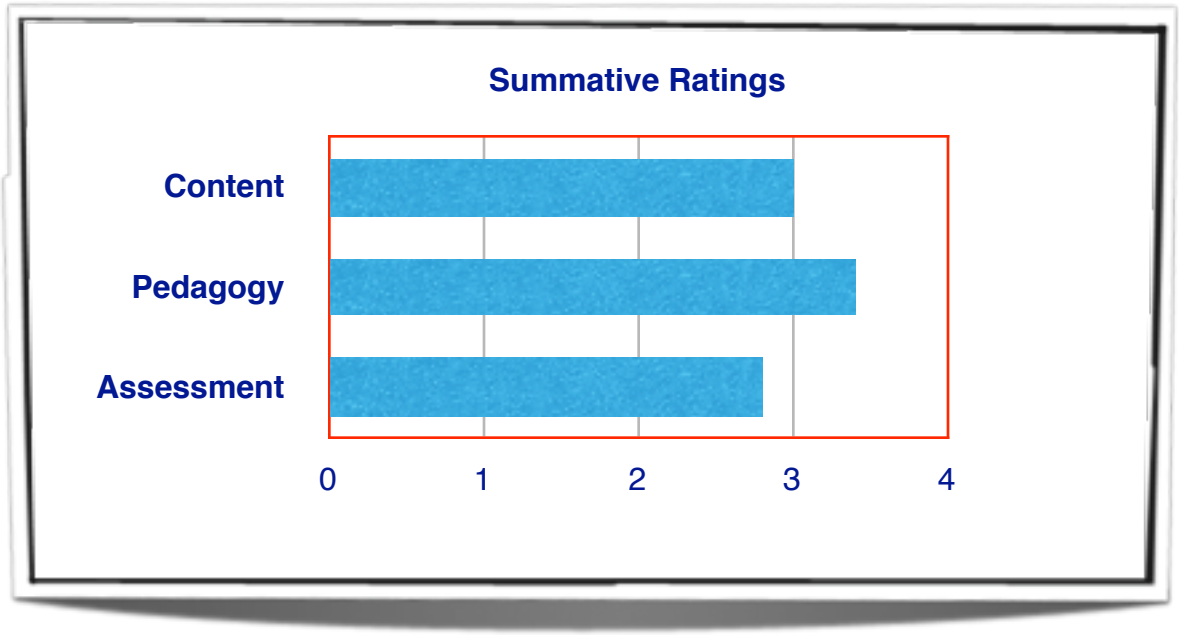
Curriculum Materials Review
Delaware Mathematics Coalition

Name:	*Interactive Mathematics Program*
Authors:	Fendel, Resek, Alper, & Fraser
Publisher:	Key Curriculum Press
Copyright:	2nd Edition, 2009



☐ Not Recommended
☑ Recommended

	Commentary
Rationale	The Delaware High School Curriculum sub-committee recommends the *Interactive Mathematics Program* for due consideration as a curricular option that is likely to promote an advanced level of success for all high school students if implemented as intended. This recommendation is based upon the fact that *IMP* features a total commitment to problem-based learning without, at the same time, sacrificing mathematical rigor. Mathematically rich and memorable contexts are utilized as settings for a carefully articulated series of problems through which students engage and learn important concepts. High expectations are established and maintained for the learner with routinely challenging problems central to both classwork and independent work including homework and the always challenging "Problem of the Week." Collaborative problem solving is expected with "'group worthy tasks" central to every lesson. The teacher materials are quite clear about the critical role of the teacher in supporting a collaborative problem-solving culture in the *IMP* classroom. Thematic units anchor important mathematical topics with chapters on algebra, geometry and statistics logically interleaved throughout the four years of this curriculum. In 1999, *IMP* received recognition from the US Department of Education as an "exemplary program."

	Commentary
Content	The mathematical content is delivered through the use of a series of tightly connected problems set in both whimsical and real-world contexts with many of these activities judged to be both "memorable and thought provoking." Most learning goals, while thoughtfully described in the teacher materials though seldom explicitly stated in the student text, were found to be carefully developed through problem-solving activities with conceptual understanding preceding procedural fluency in all cases. The use of technology is supported but, reviewers noted, not a feature of every lesson. Because students are given free reign to use multiple problem-solving strategies, our panel agreed that the teacher will need to play a major role in maximizing the considerable potential of these materials and that significant and sustained professional development is probably a must.
Pedagogy	The *Interactive Mathematics Program* exemplifies a problem-based pedagogy featuring routinely challenging problems likely to promote genuine collaboration and communication among students. As one reviewer put it, "problems are posed that force students to find meaning, not memorize steps in a process" and another panel member concluded that the problem-based nature of the lessons "could give students ownership of the ideas." The highly-contextualized nature of *IMP* - a single problem-solving situation is often developed and exploited across several successive lessons - was judged likely to capture student's attention and be rich enough to support the development of important mathematical ideas. However, there was some uneasiness that this reliance on thematic units might hinder generalization and transfer to other contexts. Because this curriculum is carefully crafted as one in which students make sense of new mathematical ideas by constantly engaging and solving challenging problems, i.e. it is an especially pure example of problem-based learning, many teachers will be required to re-conceptualize their practice in rather profound ways to use these materials to full advantage.
Assessment	The In-Class summative assessments are not the strongest points of this curriculum as they do not always seem to fully reflect the challenging nature of this curriculum. The curriculum seems, instead, committed to the development of student portfolios. *IMP* provides several culminating activities, referred to as supplemental activities, to unite the learning goals of each chapter. These activities are highly sophisticated and appropriately challenging and could be used in both a formative and summative context. They offer the student an opportunity to apply his or her new found knowledge *and* to extend his or her thinking in a transfer task scenario. These supplementary activities, not the formal assessments, allow an instructor to evaluate the depth of knowledge and understanding a student has acquired throughout the curriculum. Upon completion of one or several supplemental activities, an instructor could evaluate a student's level of understanding on each specific learning goal much more effectively. This use of a portfolio of mathematical products also provides the student multiple opportunities to be metacognitive about his or her learning and to monitor and reflect upon his or her progress. The student would then enter his final "project" in his or her portfolio to demonstrate understanding of the material.

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Support	The teacher resources are very thorough including notes about specific questions to ask students and suggestions related to how a task should be implemented (e.g. “consider acting out the concept of Alice’s growth doubling…”). There are also notes related to student errors and misconceptions. The authors acknowledge the different yet mathematically acceptable responses that students may devise and there is also a sense that the teacher is responsible for understanding these different responses and helping students make sense of and connecting them. The lesson summary is explicitly detailed in the teacher notes as well. The online *IMP* site includes a forum for teachers that are using the resources, suggestions related to formative assessments for each unit, pacing notes and an activity note that describes the mathematics in the lesson and how the mathematics fits into the progression of the lessons in the unit. According to the authors, this is probably the most thoroughly field tested high school mathematics program available. Every lesson was used with real teachers in professional development settings before being deployed in the classroom. The lessons were field tested over a period of four years during which students were interviewed, observed, and revisions to the text made in response to these data. Research regarding the effectiveness of *IMP* can be found at http://www.mathimp.org/downloads/IMPWhitePaper.pdf
Organization	The *Interactive Mathematics Program* is delivered through a series of highly thematic units in which a central organizing context both engages the learner and delivers the mathematics. Topics in algebra, geometry, trigonometry, statistics and discrete mathematics are interleaved across the *four years* of the program with the fourth year also containing true pre-calculus topics such as the transformation and composition of functions and an introduction to limits. An example of such a thematic unit from Year I would be The Pit and the Pendulum - Standard Deviation and Curve Fitting and from the second year, Cookies - Systems of Equations and Linear Programming. Fittingly, the very first unit in the first year of the program is called Patterns - Functions, Reasoning and Problem Solving, highlighting the program’s focus on learning and developing mathematical reasoning through problem solving.