# CHAPTER VI

## Implementation

In the chain between development and impact, the greatest deviation from what developers envisioned occurred during implementation. Problems with implementation were not inherent in the products, but rather, related to the extent to which they required changing parents' and teachers' conceptions of mathematics, science, and technology education, and teachers' ability to teach in new ways. However, when well implemented, IMD materials were perceived as having positive impacts.

As noted earlier, we solicited names and addresses of schools using IMD materials from the publishers to assess the implementation and impact of the IMD materials. However, publishers were averse to sharing complete lists of adopters and provided the names of up to 10 schools or teachers who were using the materials. As a result, we cannot assess the breadth of implementation of IMD materials since no universe of adopting schools is available. Further, publishers probably did not provide a random sample of schools, and some teachers in the schools listed had been involved in the development or field-testing of materials. We selected teachers and schools representing rural, urban, and suburban communities from among the names we received.

We conducted focus groups of teachers using the all but three, all supplementary, of the products in the study and we observed in 38 classrooms of those teaching comprehensive materials. Members of focus groups teachers may not reflect a true cross-section of teachers implementing comprehensive curricula because we asked a local contact to invite teachers, and in several cases, the teachers were those most familiar with the materials. Therefore, generalizations cannot be made from the teachers and classrooms visited. The sample's bias toward "good" sites underscores the difficulties of implementation because if such sites have problems, less favorable settings are likely to have more. We believe the focus groups and classroom observations provide valuable information about teachers' assessments of materials, their use in classrooms, the factors influencing implementation, and the perceived impact on teachers and students.

## Content

Teachers using the materials in their classrooms rated the content of the materials similarly to the Expert Panel, but teachers expressed some concerns about both science and mathematics.

Teachers using the mathematics curricula generally praised how well mathematics content was connected to national standards. In addition, teachers were complimentary about the use of manipulatives and how well mathematics and technology were integrated. Teachers gave one comprehensive elementary school mathematics curriculum highest marks because "It was the first one that made a change in mathematics [in the school]."

At the same time that teachers praised the content covered in the IMD mathematics materials, they also expressed some concern. Two comprehensive curricula (one at the elementary level and one at the middle school level) were criticized for not presenting enough basic mathematics facts, while one high school curriculum received mixed reviews from teachers (some positive and some negative) for its use of graphing calculators. In addition, teachers of one very highly rated elementary school mathematics curriculum cautioned others about its sequencing. Because the curriculum so transformed the teaching of mathematics, it was difficult for students who encountered it for the first time in the upper elementary grades and for students who trans-

ferred into the school at mid-year.

Teachers using the IMD science materials also generally gave them high marks, including their linkages with state and national standards, their investigatory approaches, and their conceptual base. Occasionally, an interdisciplinary curriculum at the middle or high school level would be criticized for not having enough mathematics content, but this was rare. The single largest complaint about elementary science materials lay not with the content or the theory behind the content, but rather with keeping track of the contents of science kits provided. Someone had to ensure that the kits were complete so that another classroom of students could use them; for one product, the district shipped the materials back to the publisher to refill and then return to the school.

Teachers also expressed some concern about readability of materials and use of technology, which became barriers to implementation.

### *Implementing IMD Materials as Intended*

The extent of implementation varied between comprehensive and supplemental materials. More comprehensive materials were adopted district-wide than were supplementary materials, requiring that all teachers implement the materials. In these cases, use of the materials and the extent of implementation varied, usually depending upon the teachers' skills and experience and the extent to which teachers were able to engage students. Teachers often needed to move from a didactic to a more investigative teaching pedagogy for both the math and science materials. If teachers were inexperienced, had received little staff development, or were reluctant to change their teaching methods, the materials were less well implemented.

Because supplemental materials were often chosen by the teachers who used them, they were used as enrichment and implemented as they were intended. These supplemental materials included videos, interactive software programs, and manipulatives of various types. However, even teachers who chose products were unaware of materials that enhanced their value. For example, none of the three teachers interviewed knew that a set of curricular materials accompanied Project 6. Similarly, a middle school and high school science supplement also came with curriculum materials at various grade levels, but the schools visited were aware of only one of the half dozen available kits.

### *Factors Facilitating Implementation*

Multiple factors facilitate the implementation of IMD materials. This discussion focuses on the comprehensive mathematics and science materials, as they require the most supports. Among the factors that are often critically important are:

- Extensive and sustained professional development for teachers;
- District and school level support, including visible advocates for the materials;
- High teacher ratings on the quality of the materials; and
- Supportive educational technology.

#### *Professional Development*

Training and support for teachers were crucial to successful implementation of most of the comprehensive mathematics and science curricula. Support mechanisms include initial and ongoing formal training, in-class supports, product networks, and mentor teachers.

Districts and schools implementing comprehensive mathematics and science curricula found professional development to be an essential component of successful implementation. In fact, many teachers and district coordinators believed that it would be impossible to implement these curricula without training. While training involved both pedagogy and content, those sites implementing mathematics curricula placed more emphasis on the need for pedagogical training than did those implementing science products. In interviews, science teachers noted that the field always had a hands-on approach, while mathematics teachers reported less experience in the pedagogy required by IMD materials.

> "The change from traditional instructional techniques to those required by [the project] is drastic. It takes an average of four years to completely change the way instruction is provided. It is like being right-handed and being forced to become left-handed; it's very clumsy and awkward at the beginning, and takes a long time to become proficient." *(Focus Group, Project 5).*

The amount of professional development for comprehensive curricula varied considerably, with most projects receiving somewhere between one and three weeks of initial training. Training was often conducted by developers during summer institutes, with occasional follow up. The prominent role of developers in professional development may be related to the fact that so many of the sites we visited were involved in field tests of the materials.

Teachers noted that while initial staff development is important, it has to be ongoing as teachers use the curriculum throughout the year.

> "Staff development is an essential springboard for using [the product]. It has to be ongoing as you teach through the first year. You need to focus on the math content in each unit and you need staff development to do that. It's not just unit training, however, but learning to understand mathematical concepts that span the units." *(Focus Group, Project 19).*

Teachers responded positively to training in which the materials were modeled for them, they learned just as their students would be learning, and they practiced teaching the model to other participants in the training. Such professional development opportunities led teachers to become engaged and excited about working with students using the materials.

District support for professional development was a key factor in some sites, particularly in large districts where the curriculum was *the* curriculum in mathematics or science district wide. In addition to support from the developer, the district implementing Project 27 has a Professional Development Center that sent out teacher trainers to help classroom teachers with implementation. This site has also had the materials in place for a number of years and has built up a cadre of experienced teachers who now act as teacher consultants to others as they implement the product.

Because supplements are often adopted by individual teachers rather than by schools and districts and their use is optional, teachers tended to receive considerably less professional development unless they had been involved in the pilot or field test. More often, teachers had seen a demonstration or attended a brief workshop on the materials or received no training at all. In several instances, a single teacher had attended a workshop and then conducted a workshop for other teachers in the district (e.g. Projects 6 and 14). Teachers using several other supplements received support through other kinds of networks. For example, Project 20 is tied to a professional association, which regularly scheduled dinners at which participants could share

their experiences using the product, thereby building and supporting a network of users.

In cases in which teachers began using materials before they received training, school-based mentor teachers proved to be invaluable resources.

Projects 2 and 5 had technical support numbers or web sites that offer assistance for sites and/or networking opportunities for teachers. However, use was low. One teacher thought it would not be useful because of 'the unreviewed garbage' that would be on the web.

*District and School Support*

Leadership at the top can make an important difference in the ease with which curricula are implemented at the school level. The way to acceptance of new curricula is smoothed by articulating the importance of the change, building support from teachers, parents, and the community, and providing resources. Such actions can bring about the investment in success similar to that associated with successful adoption processes. Examples of strong district leadership include the district mathematics coordinator in the case study above, who carefully built support from teachers for the curriculum, then backed up the district's decision to adopt it as the mathematics curriculum for all elementary schools by providing extensive professional development and teacher assistance.

Leadership can overcome major barriers to implementation. For example, Project 5 seems to require a visionary to convince teachers, parents, and the community that it provides high value to students because it is so different from traditional mathematics texts and entails such extensive staff development. Teachers in the site we visited received 100 hours of training and support, costing the district $10,000. In a school-wide adoption, the principal of the school implementing Project 17 provided block scheduling time to support implementation.

Centralization of some functions at the district level was also an important support for elementary science curricula, many of which include kits of consumable materials that require replenishing. By taking responsibility for maintaining these kits, districts increased the ease of use for teachers, who did not have to spend time scrounging for materials.

In contrast, the experiences of an urban district that tried to implement Project 17 provides an example of what can happen when these features are not in place. The district decided to adopt this entirely technology-based curriculum. Most schools in the district, however, did not have the appropriate infrastructure, and the district was not forthcoming with additional funds for computers. And, although the district provided staff development, the amount was insufficient to teachers' needs because they were required to learn the technology, the content of the curriculum, and new pedagogical approaches. According to the director of science for the school district, the district has not been able to keep up with the training needs of teachers. Although teachers like the curriculum, it has not been widely used.

*Features of the Materials*

Implementation was enhanced when teachers were positively impressed by the materials. In general, teachers of NSF curricula in both mathematics and science rated the products they were using very highly. In all but a few instances, teachers thought the materials were some of the best they had ever seen or used. Features that particularly appealed to them were: ease of use, an excellent teachers guide, activities that they believed fostered improved student engagement and student learning, and the materials' adaptability for students with diverse abilities and learning styles.

*Educational Technology*

Technology was more prominent in the supplemental materials than in the comprehensive curricula. The three main types of technology are computer programs, CDs, and videos. Both computer simulations and videos help teachers to demonstrate concepts in visual form that are difficult to explain, especially concepts with a high level of abstraction.

> "The hands-on activities and simulations successfully help students to see how what happens at the microscopic level drives what is observed at a macroscopic level. Unless a teacher is really good at describing this relationship, helping students to make that connection can be very, very tough to do, particularly for students who are not ready for abstract thinking." *(Focus Group, Project 16)*

Technology also functions as an important tool to save time and take the tedium out of collecting, recording, and graphing data. It allows students to see their results immediately and leaves more time for discovery and analysis activities.

> "Because of this technology, students are spending less time doing the grunt work of collecting and recording data, and more time on analysis, that is, higher order thinking." *(Focus Group, Project 17).*

## *Barriers to Implementation*

The barriers to implementation include the reverse of the facilitating factors, as well as resistance to the type of curricula represented by the IMD-funded materials. Barriers include:

- Lack of skills and knowledge by teachers, especially for those curricula that include reform-based pedagogy and new (often interdisciplinary) content;
- Active resistance to the curriculum, especially by school staff and parents;
- Lack of alignment between the materials, district curriculum standards, and norm-referenced tests;
- Absence of supportive technology; and
- Lack of other significant resources.

*Teacher Skills and Knowledge*

As noted above, the IMD materials require teachers to adopt reform-oriented pedagogy that is far more student-centered than teacher-centered, more discovery and investigative than direct instruction, and more conceptual than rote. Some teachers adapt to these role changes, while others find the transition far more difficult. As a teacher reported about an IMD-funded high school program:

> "Teaching [the materials] requires a special personality and a special drive and a special person. Someone who picks up the newspaper every night and reads it. Someone who watches TV every night and knows what's going on in the world. omeone who is willing to go out on a limb and have an opinion even though they might get knocked around, but at the same time someone who doesn't have all the answers. You can't have the right answer because there are no right answers for most things. You have to present both sides of the argument. You've got to be

able to let your hair down. Have fun with the kids. Oh, but there are teachers who will stand up and say, '**This** is the way.'" *(Focus Group, Project 2).*

Very often it appeared that the materials changed role expectations in ways teachers found difficult.

"[The product] encourages independent thinking and decision making. Answers are not given. But for teachers this can be very difficult to digest. A major lesson learned is that it is difficult to change the thinking of teachers. Teachers are not used to students getting the answers for themselves." *(Developer Interview, Project 4).*

"[The product] requires teachers to give up control and let students take the lead. The materials can't simply be lectured. The teacher's materials are very extensive—giving very detailed lesson plans and ideas of what to do with problems—but more often than not, the teacher's materials don't give the answers to the questions because there are six different ways that students could answer the problem, and many teachers at first find this disconcerting." *(Developer Interview, Project 5).*

"In order for these materials to be really successful, there needs to be some corresponding change in teacher strategies. The teacher becomes more of a facilitator, rather than being the person who has all of the right answers. There is lots of group work involved in the materials, and the teacher really has to direct the learning. Questions tend to be open ended. There is a low level of interpretation involved in analyzing data sets for there really isn't one right answer to any question posed. A teacher needs to be prepared for the fact that there are multiple ways of looking at the data set, and students will often come up with very different answers, which can be unsettling for some teachers." *(Adopter Interview, Project 30).*

"New curricula cannot be implemented without knowledgeable teachers who understand how science research is done. Most middle school science teachers do not have a strong science background and will not gain one in a five-day workshop. A major lesson learned is that teachers do not easily change their mindset about how they should teach. Reform curricula are student centered as opposed to teacher centered, and the role of the teacher is to facilitate. Many teachers cannot change their style." *(Developer/Publisher Interview, Project 12).*

"Teachers need to know the materials extremely well to do a lesson. You cannot just open the teacher's manual the day of an assignment. You need to read ahead in the lessons because it takes time to understand the program." *(Focus Group, Project 10).*

In districts that mandated a comprehensive IMD curriculum without sufficient professional development and other support, some traditional teachers refused to implement it, and others have implemented only those features most consonant with direct instruction.

*Active Resistance to the Curricula*

The introduction of NSF materials, particularly in mathematics, created considerable controversy in many sites implementing comprehensive curricula. Because decisions to use supplemental materials are typically made at the teacher level and do not represent a single approach to teaching the subject matter, their use has raised little resistance.

Resistance occurred on multiple levels. School board and community opposition to Project 11, for instance, was clear when the materials were adopted as the sole curriculum for the district by the narrowest of margins in the school board vote. When the materials next came up for adoption, a strong back-to-basics constituency group on the board led to a considerable struggle to keep the curriculum in place. Teacher implementation was inconsistent as well. According to the district curriculum coordinator, some teachers opposed the curriculum and tried to sabotage it. Others did not have the deep content knowledge or pedagogical skills to implement it well. Parents of students in those teachers' classes are, understandably, opposed to the materials.

In some districts, either for philosophical reasons or due to teacher, community, and/or parent resistance to the IMD products, the materials were adopted as an "alternative" curriculum, as was true for Projects 17 and 23. In one school implementing Project 17, the principal is its major advocate, and the team implementing the program has received considerable public recognition, causing deep resentment among other teachers who believe the implementing team gets preferential treatment.

Parent resistance to IMD materials arises from concern about content and the lack of homework. Parents in the district implementing Project 19, for instance, believe that computation is not adequately covered. Many also expected and wanted to see their children bring home more traditional homework assignments. In addition to worries about homework, parents in some communities raised questions about their children's preparation for the next level of schooling. Some parents think their children are more challenged by Project 17, but a substantial number also equate learning with memorization. Such parents believe that students require more "rigorous" (i.e., traditional) mathematics in order to be prepared for high school.

When parental concerns were addressed, the most common way of doing so was with ongoing conversations. As one teacher reported:

> "I spend a lot of time in the evenings talking to parents, and both before and after school talking to students. I have to work with parents and students to demonstrate to them that they are learning." *(Focus Group, Project 5).*

In addition, the district adopting Project 19 created a set of materials emphasizing computation that could be used as homework. Districts implementing Project 11 (mathematics) and Project 12 (science) also expressed the desire to strengthen connections to students' homes to overcome parental opposition.

*Lack of Alignment Among the Materials, District Curriculum Standards, and Norm-referenced Tests*

Both the Expert Panel and teachers agreed that the IMD materials were closely aligned with national standards in mathematics and science. However, some users told us the products were not aligned with district standards or with the norm-referenced tests that states and districts continue to use to measure student achievement. Dissatisfaction with the materials developed when these district standards and tests played a major role in the school district. As one teacher noted:

"If standardized testing is fact-based, the curriculum needs to include more facts, not vague themes." *(Focus Group, Project 15 ).*

Until assessment and district-developed standards catch up with reform-focused content and pedagogy, IMD materials will find tough sledding in these school districts.

*Absence of Supportive Educational Technology*

Although technology can facilitate implementation, it can also serve as a barrier. Some teachers found that materials such as videos and computer software were dated when they began using them. Teachers using Project 1, for example, found some of the early computer software products to be archaic and unsophisticated, although more recent offerings from the developer were much improved. Teachers implementing a CD-ROM program (Project 12) found it was not particularly user friendly.

Most sites using computers cited hardware problems as an ongoing barrier to usage as well. Many sites had an inadequate number of computers in the classroom, or had to schedule time in computer labs. This problem was found among both low- and high-wealth districts. In addition, maintaining hardware is a universal problem because either teachers or their students must do repairs when the machines malfunctioned.

*Lack of Resources*

A number of schools struggled with other resource shortages. Some schools were lacking in basic equipment and supplies to conduct laboratories. Many schools had no water source in the classroom, which presented problems for many laboratory-based projects. Students often carried water into the classroom in buckets. Others struggled with more basic shortages, such as not having enough books to go around for their students.

### *Implementation of Non-IMD Materials*

In order to provide comparisons with the IMD-funded materials, we also studied materials that did not receive IMD funding. All the non-IMD materials selected were comprehensive curricula. Further, we selected the materials from state adoption lists from states that have curriculum frameworks or standards in place, increasing the likelihood that the products would hold similar intentions to those funded by NSF. We conducted focus groups and class observations of teachers using a wide range of curricula that were fairly evenly distributed from traditionally-oriented texts (e.g., content is presented, followed by class exercises and homework), to those described as "traditional with a few hands-on activities," to products more similar to IMD-funded materials. Comments made by focus group participants make it clear that some commercial publishers represented in the comparison sample have made efforts to adapt their products to respond to national curriculum frameworks and standards. Staff informally rated the materials as more or less reform oriented, using the framework the Expert Panel used to evaluate the materials.

Teachers in sites using non-IMD-funded curricula were aware of both national curriculum frameworks and standards and the trend towards student-centered, discovery oriented approaches to teaching. Some districts using more traditional curricula had adopted them in the early 1990s, and teachers indicated that their districts either had already adopted or would soon be adopting

new curricula incorporating a greater emphasis on discovery-oriented, hands-on approaches to instruction. One district expects to adopt an IMD-funded curriculum, while others mentioned non-IMD-funded curricula developed by large commercial publishers. One teacher commented on the impact that the movement in the professional community has had on his perception of their school's text:

> When we originally chose this text, we thought it worthy of a 5 (i.e., on a scale of 1-5), but now I'd rate it only a 2. The needs of students have changed, and the material is disconnected from real life situations. The world is data-oriented, and this book does not address that. *(Focus Group, high school mathematics curriculum)*.

Overall, most teachers in the focus groups of non-IMD users were at least moderately satisfied with the curricula their districts are using, with those using more traditional texts tending to be less satisfied. Most curricula were used as intended. However, one middle school science curriculum designed to be comprehensive was used as a supplement in one district we visited. Teachers in that district believed the reading level was too difficult for their students, reflecting an issue that was also raised about IMD materials.

Teachers using more traditional materials praised content coverage, ease of use, and the plentiful practice worksheets that accompany texts. Not surprisingly, focus group participants also reported that teachers in their district feel quite comfortable teaching with these curricula. Criticisms of traditionally oriented texts focused on: inadequate concept development, a lack of variety in instructional techniques, insufficient number of hands-on activities, and failure to make real-world connections for students. Some teachers supplemented the texts with materials intended to address these weaknesses (e.g., teachers in one school supplement their mathematics instruction with an IMD product).

In contrast, praise and criticism of more reform-oriented curricula were similar to that for IMD-developed curricula. Teachers praised them for their: development of concepts, pedagogical approaches, real-world applications, and their capacity to engage students. One teacher, for instance, commented of her curriculum:

> The manipulatives are very good. At all levels, students need some type of hands-on activity. You can't always just work off a ditto sheet—adding, subtracting, and what not. The manipulatives make them think and then they have to find a reason why they got their answer. Then they can show it to you and their classmates as well. *(Focus Group, non-IMD elementary mathematics curriculum)*.

Criticisms tended to focus on insufficient content coverage, lack of drill and practice exercises so that students can attain mastery of concepts, the amount of preparation time the materials require, and the fact that the materials require tremendous change in teacher practice.

Non-IMD-funded materials faced barriers to implementation similar to those faced by IMD-funded materials. In many ways this is not surprising because both the facilitators and barriers generally arose not from the materials, but from school and district policies and practices that affect curriculum use. Users of non-IMD materials mentioned the following as facilitating or serving as barriers to use:

- Professional development
- Adequacy of resources
- Teacher skills, knowledge, and attitude
- Alignment among materials, district curriculum standards, and norm-referenced tests

*Professional Development*

Opportunities for professional development were important to the implementation of the non-IMD materials, although in most instances teachers reported receiving less intensive professional development than did teachers using IMD-funded comprehensive curricula. Many of the IMD-funded districts and schools had been pilot-or field-test sites, and professional development was often conducted by the developer, whereas non-IMD funded professional development, if received at all, was either provided by the publisher or the district. Training for non-IMD-funded materials was more often geared toward covering the content of the curriculum or state and local frameworks than toward pedagogy. The non-IMD materials required less change in classroom practice, overall, than did the IMD materials, and the amount and type of inservice may be related to the nature of the materials.

Insufficient professional development was a barrier to implementation of one of the more reform-oriented non-IMD-funded curricula. In one district, issues arose similar to those that affected the implementation of IMD-funded materials:

> The company supplied the district with some staff development, but because the company was small, they could not offer development for all teachers in the district. The district had to do inservice training on its own….The district made the commitment to do some inservice for some leadership teachers, but it didn't train many teachers. The next year we went into the adoption of Language Arts so that took priority. That's the way it is…The one-shot deal does not work because the teachers were lost. It was a dramatic change for them….We've had a lot of new teachers come in who were given the curriculum and not trained….We probably need more inservice on it for us ourselves to understand what we're doing. It's completely different from the way things were done. [We need] more time in the classroom for the students to process this, too. It is demanding of the time and sometimes very difficult to serve justice to it. *(Summarized from Teacher Interviews, non-IMD elementary mathematics curriculum).*

One teacher in a district that is contemplating a change to an IMD-funded middle school mathematics program was apprehensive about the shift because of the intensive staff development she anticipated the district would be required to provide in order to implement it well.

High school teachers reported receiving less staff development than did middle school and elementary school teachers; in some instances teachers received no professional development at all. Teachers in one school seemed unfazed by this lack of professional development, commenting that high school teachers in their district typically did not receive professional development.

A collegial work environment was mentioned as being important in two sites. In one site, the teachers frequently meet on an informal basis and share ideas about what works in their

classrooms. The three teachers in another school receive district support through a common planning period, which gives them ample opportunity to share ideas about how to use and supplement their texts.

*Adequacy of Resources*

As was true for IMD-funded curricula, the presence or absence of adequate resources made a crucial difference in how well the materials were implemented. In one district, the school board assumed district-wide responsibility for replenishing consumables. The adequacy of the teacher support materials that accompanied the curricula was also important to successful implementation. For example, a high school mathematics curriculum was complimented for including many teaching tools:

> It comes with very good examples—two or three examples and plenty of practice problems. Everything is clearly defined with lots of explanation. They provide us with a lot of extra teaching tools, which are handy—transparences for instructional purposes, a manual for testing, a solution manual, a practice book with additional problems for students to practice, and alternate workbook. *(Teacher Interview, non-IMD high school mathematics curriculum).*

On the other hand, implementation suffered when resources were not available:

> We don't have enough books, and therefore a set of books are shared between classes. The teachers have to juggle the books around when two teachers are teaching the same unit. There is no ownership of books since we don't have class sets so the kids trash them, tearing pages….The kids can't take the books home and study at night. *(Teacher Interview, middle school non-IMD science curriculum).*

*Teacher Skills, Knowledge, and Attitude*

The districts using non-IMD reform-oriented curricula reported more instances of implementation being affected by teacher skills, knowledge, and attitudes than did those using more traditional curricula. One district using an integrated mathematics curriculum in its high schools had pilot-tested another integrated curriculum, but found the mathematics teachers did not have a strong enough background to teach the alternative curricula. In another district, some teachers resisted a more reform-oriented elementary mathematics curriculum because of the tremendous change in pedagogy it required. A teacher using an integrated high school mathematics curricula commented that the main complaint she hears is "a reluctance to give up a certain amount of material, and the integrated curriculum is seen as almost requiring that you do a certain amount of that. And there is still an impression that when you go with the integrated curriculum, they don't give you as much of practice in drills and skills."

One teacher expressed her belief that teacher attitude can have both a positive and negative impact on student learning:

> I think it has to do with the attitude of the teachers, too. If the teacher is having a hard time with it (the curriculum) and being negative about it, it kind of reflects also on student learning. But if the teacher is really excited, motivated to do it, and feeling good about it, the students will, too. This new way of teaching...has

allowed people to see math in a positive way—it's not so threatening.

*Alignment Among the Materials, District Curriculum Standards, and Norm-referenced Tests*

Teachers, even when they liked the more reform-oriented curricula, were critical of inconsistencies among district curriculum standards, the curriculum they use, and the standardized tests that their students are required to take:

> For many teachers, there continues to be a certain sense where the criteria of success is how many students can number crunch effectively. That is still a strong criterion by which they judge the success of a program. "In a sense, we want it both ways. We like to have higher order thinking. We like this idea of an integrated curriculum. We like all these things, but we are very hesitant to pursue that at the expense of students not maintaining the level of skill and effectiveness at working with equations…" "Teachers are going to tend to be pulled toward maintaining testable skills because that is the assessment tool that will determine whether they are doing their job correctly. And so it tends to be, 'How effective am I in being able to get the right answer.'" *(Summarized from Focus Group, non-IMD high school mathematics curriculum).*

This mismatch may drive many of the comments voiced by teachers about the non-IMD-funded projects (and some IMD-funded projects) when they complain that the materials pay insufficient attention to mastery of skills.

## *Summary*

Overall, successful implementation relies less on the materials than on local factors, the existence of appropriate professional development and support, and strategies that gather support for the product from teachers and parents.

When teachers did not receive appropriate professional development, they implemented materials in ways resembling traditional practices. In other settings, where district- or school-level support was great, or where teacher enthusiasm had been developed through the process used to make adoption decisions, implementation was more faithful to developers' intent.

A similar problem exists in terms of community support. When parents are not persuaded of the value of reform-oriented approaches to curriculum and instruction, they present barriers to implementation. They do so by such actions as pressuring teachers and administrators for the type of homework that "looks like" mathematics or science as they knew it. In contrast, communities that work closely with parents experience fewer implementation problems stemming from their objections.