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Public Perception: New Math and Reform Mathematics

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ABSTRACT

Since connections are made in the public mind between current reform efforts in mathematics education and the changes of the past which were collectively called "new math,", the purpose of this paper is to examine these two movements more closely. First, the beginning of both movements is examined, including not only a look at the supporters of each movement, but also an examination of their initial motivations. Next, the implementation of each movement is described, both by profiling the main features and by looking at how they were actually put into practice. Lastly, the impact of these movements is detailed, by characterizing some of the reactions they generated. Since a well-informed public is crucial to issues of educational reform, clarifying the features of the respective movements is one way to help smooth the journey towards improved mathematics education.

Introduction

When the Portland Public School District voted in 1999 to adopt a different mathematics curriculum, a list of Frequently Asked Questions (and answers) was made available for public information. The second question addressed the concern: "Is this 'New Math' or some other kind of experimental program?" (Clark, 1999). This question reveals the link in the public mind between the current changes in math education and the changes of the past which were collectively called "new math" by many.

Why would the public make such a connection? For one thing, the media feeds this perception: A New York Times article, for example, described reform efforts in mathematics education as being "a cousin of the 'new math' popular in the 1960's" (Hartocollis, 2000, p.1). Newsweek portrayed California's back-to-basics approach as a reaction against "this generation's version of 'new math'" (Kantrowitz & Murr, 1997), and even the phrase "New-New Math" is frequently applied to contemporary trends, which the U.S. World and News Report described as producing the "dumbing-down of math education" (Leo, 1997). Also, Maclean's magazine gave the label "new new math" to the National Council of Teacher of Mathematics' "wave of curricular reforms" (Sheppard, 1998), and *Time* said this label recalls "the ill-fated New Math fad of the 1960s and '70s" (Ratnesar, 1997). It is easy to see how people today get the sense that New Math has a strong bearing on current efforts to reform mathematics education; these latter efforts will be collectively referred to in this paper as Reform Mathe-

matics, to use a term employed by both advocates and opponents (Clopton, 2001; Van de Walle, 1999). As the Wall Street Journal stated succinctly: "Not surprisingly, the New New Math has a lot in common with the Old New Math" ("Math Wars," 2000).

each movement will be described, as well as their respective implementation and impact. Some implications for the future of math education as well as connections to larger issues in educational reform are offered in conclusion.

Table 1. *Comparison of Inception*

	New Math	Reform Mathematics
When	• Origins in the 50s & ending in 70s • Prominent catalyst: Sputnik launch (1957)	• Origins in 80s & ongoing • Prominent catalyst: Publications like *Agenda for Action* (1980) and *Nation at Risk* (1983)
Why	• New developments in mathematics • Increased federal money • Dissatisfaction with traditional math	• New research in how people learn math • Increasing technological developments • Dissatisfaction with traditional math
Who	• Primarily mathematicians • Interested in creating more mathematicians	• Primarily math educators • Interested in mathematics for all

Garnering public support for educational reform efforts cuts across all subjects, and the topic of mathematics provides an excellent example of why the need for such support is so acute: Rhetoric, often fueled by the media or vocal parental critics, often drowns out and distorts the message of educators. After all, as some of the earlier quotations show, comparisons of New Math to Reform Mathematics are not meant as flattery. Indeed, because "the public memory of the 'new math' period in mathematics education is, to this day, an image of mistakes and failures" (Fey & Graeber, 2003, p. 498), it is appropriate to not only examine this comparison more closely, but to advocate for changes in public perception so that essential tenets of Reform Mathematics might be more clearly articulated. Therefore, the purpose of this paper is to explore the two movements of New Math and Reform Mathematics, illuminating some commonalities among and differences between them, and to emphasize the importance of changing public perception as it relates to mathematics education. To accomplish this purpose, the inception of

Inception

Looking first at the origins for New Math and then for Reform Mathematics, the goal is to shed light not only on when the movement began taking shape, but also on why it occurred and who were some of the main people and organizations behind its development. Table 1 presents a brief comparative overview, which is then supported by further details within this section.

New Math

When – It is difficult to put a firm date on the beginning of New Math, because of the variation in time spans which are offered in reference to this movement. The National Advisory Committee on Mathematical Education recommended that the term "new math" should be used as a historical label for a variety of math education developments which took place "between 1955 and 1975," but by also describing New Math as a "vague phenomenon", it seems that even these years are open to

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interpretation (NACOME, 1975, p. 22). Others agree that the New Math was not so much a distinct entity as a label for an era when many changes were taking place (Stanic & Kilpatrick, 1992). While some put the origins of New Math in the early fifties (Hirschi, 1977) and others point to the late fifties (Lindquist, 1980), Usiskin (1985) goes the farthest in terms of narrowing down the date of inception by claiming "the new math was sparked by the launch of Sputnik in October 1957" (p.1). This claim is contradicted by Davis (1967), who cites J. Goodlad in asserting that "it was not Sputnik that started it all" (p.3). Although acknowledging the popular benchmark of the 1957 Sputnik launch, Rosskopf (1970) wrote that "it is difficult to say where it all began in the 1950s" (p. 23).

Why - Examining some of the motivating factors helps to see why New Math would emerge sometime in the fifties. Dissatisfaction with the status quo was already present, and the traditional teaching of mathematics prior to the fifties was generally seen as unsuccessful (Kline, 1973; Kraus, 1978). Mathematics education was seen as a failure in part because the traditional curriculum did not adequately reflect contemporary mathematics - it reflected antiquated mathematics (Bidwell & Clason, 1970; Kline, 1973). Emerging themes from the field of math - themes such as structure, proof, generalization, and abstraction - were underrepresented: "In other words, the mathematics curriculum was extraordinarily out of date" (NCTM, 1970, p.69).
Prompted by the Educational Testing Service (ETS), a Commission on Mathematics appointed by the College Entrance Examination Board (CEEB) made recommendations stressing the need for major reforms in the school curriculum to bridge the gap between school and college math (Bidwell & Clason, 1970; Rosskopf, 1970; Kilpatrick, 1997). These changes were needed "so that secondary school curricula would better reflect facets of pure and applied math" (Fey & Graeber, 2003, p.492). Further motivation for New Math was provided by the federal government, which played a pivotal role in the fifties by creating new organizations such as the National Science Foundation (NSF) in 1950, and by passing legislation like the National Defense Education Act in 1958. The NSF contributed subsequent financial support to new and experimental curriculum, and continued to increase its activities in mathematics education in the late fifties (NCTM, 1970; Lappan & Wanko, 2003).

Who - The proponents of New Math included, as mentioned above, the NSF as well as the CEEB, whose report was called "one of the most influential policy leadership documents of the 'new math' period" (Fey & Graeber, 2003, p. 495). Other advocates include the University of Illinois Committee on School Mathematics (UICSM), which was founded in 1951 to investigate problems with the secondary school curriculum (NCTM, 1970). Also, the School Mathematics Study Group (SMSG) came into being in 1958 and became the "largest and most prominent of the new math curriculum reform projects" (Kilpatrick, 1997, p.956). Although the SMSG was a result of a meeting of "eminent research mathematicians" who were interested in improving school mathematics (Rosskopf, 1970, p. 25), the advisory committees for the SMSG actually reflected a wide variety of interests. For example, among the 26 members of the first committee were people representing "all areas of mathematics education: college, high school, experimental programs, the NCTM, and the [CEEB's] Commission on Mathematics" (NCTM, 1970, p. 75).
The main force behind New Math, however, really seems to be mathematicians (Stanic & Kilpatrick, 1992). As Hart (1985) puts it, "pure mathematicians were the major proponents" of New Math (p.336), and it is worth noting that the Cambridge Conference consisted mostly of pure mathematicians (NCTM, 1970). This fits with the

motivations and timeline suggested earlier: If World War II brought an "unprecedented growth in mathematics" (NCTM, 1970, p.70), and many new applications and theories of math were being expounded, the most natural source of enthusiasm for these developments would be from within the field of math.

Reform Mathematics

When - Looking next at Reform Mathematics, a similar difficulty occurs in locating the origins chronologically. There is support for putting the origins of Reform Mathematics in the eighties, since the NCTM's Agenda for Action was released in 1980, and this document pointed out needed direction in math education (NCTM,1980). Also, the year 1983 saw the publication of *A Nation at Risk*, which lamented broad practices in overall education, not just in mathematics. Kilpatrick (1997) mentions how the latest reforms had been building up for over a decade, and he cites *A Nation at Risk* as helping to set the tone of reform. Certainly, just like Sputnik helped link 1957 to New Math, the NCTM publication of its Curriculum and Evaluation Standards helped link 1989 to Reform Mathematics, but in actuality there were contributing forces at work prior to those years. M. Battista (1999) claims "the movement to reform mathematics education began in the mid-1980s" (p. 426), but he also goes on to cite the 1989 release of the Standards as the "most conspicuous component of reform." Certainly Newsweek portrayed Reform Mathematics as being based on the 1989 Standards (Kantrowitz & Murr, 1997), and *Time* concurred that "it all started in 1989" (Ratnesar, 1997). It does seem likely that the ideas behind Reform Mathematics were percolating even earlier than the eighties, however, and Hill (1983) noted that "the mathematics education community seemed to be groping for a clearer focus and sense of direction" (p. 1) even in the seventies.

Why - Among the motivating factors in the Reform Mathematics, a key similarity to New Math is the reaction against the status quo - the sense of dissatisfaction with what mathematics was taught and how it was being taught. The "documented failure of traditional methods of teaching mathematics" (Battista, 1999, p. 426) is a clear echo of sentiments in the fifties. The Back-to-Basics movement of the seventies was seen by some as a terrible failure (Offner, 1978; O'Brien, 1999), and alarm was expressed at the poor performance of students on international math tests (Sheppard, 1998). The 1989 NCTM Standards were seen as a response to "the consistently poor math scores of U.S. Children" (Ratnesar, 1997). Data used to show low achievement included those gained from the National Assessment of Educational Progress (NAEP) and the Second International Mathematics Study (SIMS). Other motivations for change came not so much from developments within mathematics as from developments in mathematics education, and this is attributable to the increased activity of the mathematics education research community (Lester & Lambdin, 2003). Research into the ways in which people learn mathematics has strongly influenced both the content and the pedagogy which characterizes Reform Mathematics (O'Brien, 1999; Hartocollis, 2000). Also, increasing technological developments, with a look towards the meeting the needs of the future, helped motivate Reform Mathematics (NCTM, 1989; NCTM, 1980). Finally, although by the early seventies "distrust of federally funded materials was increasing" (Lappan & Wanko, 2003, p. 918), again the availability of federal funds has and continues to help drive Reform Mathematics.

Who - Included among the many proponents of Reform Mathematics is the NSF, which again provided support for new curriculum (Battista, 1999). Naturally, the NCTM is seen as the main figurehead in

Reform Mathematics, based on the numerous references to their 1989 Standards as being the genesis of the movement. Kilpatrick (1997) assigns much of the leadership in Reform Mathematics to the NCTM, but in looking at the people who make up that organization and who makes contributions to its publications, it is clear that there is a broad spectrum represented: Educators, math educators, school teachers, mathematicians, and more (Apple, 1992). The 1989 Standards were actually developed by groups comprised mainly of teachers (Romberg, 1992a). In minimizing the role of parents in these documents, however, the NCTM effectively marginalizes these critical stakeholders: As Peressini (1998) notes, "parents receive minimal attention in the analysis and prescriptions that are advanced by the organization" (p. 568). Certainly parents are not currently said to be ardent advocates of Reform Mathematics at this time. Neither could it be said that the mathematicians are the major proponents of Reform Mathematics, and this is a big distinction from New Math. Instead, many critics of Reform Mathematics are mathematicians such as James Milgram, who, in written testimony to the U.S. Congress, claimed that "the level of mathematical understanding on the part of the mathematics educators on this panel was unimpressive" (Milgram, 2000, p.1). In developing its Principles and Standards for School Mathematics (PSSM) for release in the year 2000, the NCTM asked major math organizations like the American Mathematical Society (AMS) to work with its own Commission in shaping the document (Wu, 1997). Thus, the PSSM was "written with significant input from mathematicians" (Addington, Clemens, Howe, and Saul, 2000, p. 1073). A final key group which transcends the NCTM and has a vested interest in Reform Mathematics is the mathematics education research community mentioned earlier: This group vastly sharpened its professional identity during the seventies (Lester & Lambdin, 2003).

Implementation

Having looked at some of the defining issues of when, why, and who, the next step is to examine what were some of the key features of the content and intended pedagogy for each movement and the extent to which they were or have been implemented. Table 2 presents a brief comparative overview, again supported by further details within this section.

Table 2. Comparison of Implementation

New Math

Content – Among the content of

Table 2. *Comparison of Implementation*

	New Math	Reform Mathematics
Content	• Associated w/ characteristic themes: o Heavy on set theory & logic o Precise language & symbolism • New topics like probability & statistics	• Transcends easy characterization: o More attention on topics like data analysis o Less attention on topics like long division • New focus on use of technology
Pedagogy	• Socratic, or Discovery learning • Deductive approach • Understanding principles instead of relying on rote memorization	• Constructivist interpretation • Active rather than passive approach to learning • Priorities on conceptual understanding as well as problem solving and applications
Extent	• Perception is of widespread use • Reality is that few curricula actually reflected tenets of New Math, with questionable implementation	• Perception is of widespread use • Reality is that few curricula actually reflects tenets of Reform Mathematics, again with questionable implementation

New Math curricula, there was an emphasis on unifying concepts like sets, relations, and functions, tied with a strong sense of structure (Kilpatrick, 1997). Set theory and axiomatics, were seen as essential ingredients to add to the school curriculum, and also served as a "framework around which to reorganize that curriculum" (Stanic & Kilpatrick, 1992, p. 412). New Math was also structured to lend itself to precise language and heavy symbolism, and among specific new topics recommended were logic, modern algebra, probability, and statistics; actual materials included set theory, different base systems, congruences, and symbolic logic (NACOME, 1975; Kline, 1973; NCTM, 1970). Other adjustments to the contents were the merging of plane geometry with solid, and the placing of trigonometry within the second-year algebra course (Usiskin, 1970). The first course in UICSM's four-year curriculum contained the distinction between number and numeral, as well as properties of number systems like the commutative property (Bidwell & Clason, 1970).

Pedagogy - Regarding pedagogy, the Socratic, or discovery, approach received much attention in New Math (Price, Kelley, & Kelley, 1977). As supported by psychologist J. Bruner, discovery learning's essential tenet was that "the learner discovers things for himself" (Bruner, 1960). Math teachers were urged to use discovery learning, which was naturally opposed to a passive acceptance of statements about math (Fey, 1979). The deductive approach was incorporated so that students could start with axioms and prove conclusions - Not only in geometry, but in arithmetic, algebra, and trigonometry (Kline, 1973). While the SMSG did not explicitly experiment with pedagogical methods, the UICSM did encourage student discovery as an instructional procedure (Hale, 1961; Begle, 1973). In fact, "discovery teaching and learning became the hallmark of the UICSM program" (NCTM, 1970, p.254). Thus, some key features of New Math included the change of content to reflect a rigorous development, and a set of unifying mathematical principles. Also, students were to gain an understanding of these principles instead of simply relying on rote memorization (Crabtree, 1997).

Extent - Of all the facets to the implementation of New Math, the most striking is the extent of implementation. From the many current references to New Math, and copious literature on the movement, it is easy to get the idea that New Math was widely used in an extremely high number of schools: New Math "swept the country" (Hart, 1985, p. 334), and "introduced millions of students to math arcana like set theory and congruences" (Ratnesar, 1997). Kline (1973) agrees that hundreds of texts were written and that millions of children were being taught New Math, with "tens of thousands of teachers" having experience with it (Mueller, 1966, p.621). A picture of widespread use is painted: Even in the midst of the movement, the UICSM had the view that the nation's school were "ready to move in large numbers" towards the curriculum of the New Math (Hale, 1961, p.618). Therefore, given the references suggestive of massive usage, it is all the more surprising to realize how many questions abounded concerning the extent of implementation of New Math. That is, in the individual classrooms, there was little research to show how New Math had been put into practice (Price et. al., 1977; Hirschi, 1977). New Math actually seems never to have made it into the majority of schools (Kline, 1973): Kilpatrick (1997) wrote that "in most classrooms the reforms were never really tried" (p.957), and Hirschi (1977) claimed that New Math was not taught in any "significant percentage" of schools (p.244). The NACOME also questioned the extent to which New Math was actually used, and others suggested that nationwide data was needed to explore the question (Fey, 1979; Hirschi, 1977).

Reform Mathematics

Content - Although the NCTM Standads do not encompass all aspects of this movement, they have functioned as an umbrella which covers a broad spectrum of common elements (Apple, 1992). Thus, the content advocated across the spectrum of documents from the 1989 to the 2000 Standards give a reasonable representation of the general tenets commonly held for the Reform Mathematics movement. Whereas New Math had some defining content themes (such as set theory and properties of number systems), the themes for Reform Mathematics transcend easy characterization. In the 1989 Standards, for example, there were degrees to which certain content should receive increased or decreased attention. Probability and statistics were to be emphasized more, while computational skills like long division were to be emphasized less. Modeling and data analysis are two other examples of content to receive more attention, and another broad theme of Reform Mathematics' content is an emphasis on the uses of technology (NCTM, 2000). Many of these changes were guided by parallel changes in society: For example, as we increasingly become a data-driven culture, bound up in technology completely unavailable a generation ago, the mathematical needs have likewise changed.

Pedagogy - While the content of Reform Mathematics may differ in emphasis from that of traditional curriculum, it is in the method of teaching that this movement draws the most distinction. Advocating real-life applications and problem solving, Reform Mathematics curriculum encourages students to reason and communicate mathematically (NCTM, 2000): In this movement, "students must learn mathematics with understanding, building new knowledge from experience and prior knowledge" (p. 20). Labels are easy to come by, and constructivism fits the bill: the name is derived "from the view that learning is primarily a process of concept construction and active interpretation" (Schifter & Fosnot, 1993, p.8). In Reform Mathematics, students are to personally develop their own math ideas and make their conclusions, and these ideas "must be personally constructed by students as they try to make sense of situations" (Battista, 1999, p.429). Romberg (1992b) wrote that Reform Mathematics posits learning not as the absorption of others' knowledge, but as something which much be actively constructed by the learner. The sense of math learning as an active, rather than passive, process - whereby relevant problem situations are used to help students "actively construct knowledge" (Kilpatrick, 1997, p. 959) - is no doubt among the defining characteristics of Reform Mathematics.

Extent - Even though there are materials and training which model Reform Mathematics tenets, however, there is again (just as in New Math) a question as to how widespread is the actual use of Reform Mathematics curriculum, or how well the materials are being used. Like in New Math, the perception may be that Reform Mathematics is a dominant movement in America, just as it is supposed to be "flowing like hot lava" in Canada (Sheppard, 1998). *Time* magazine expected nearly half of elementary students to be under the influence of Reform Mathematics in 1997; it mentions how the NSF spends $10 million a year on curricular materials, which can be used by the 40 states that had instituted Reform Mathematics programs in their schools (Ratnesar, 1997). Yet there is no real evidence that constructivism has allowed Reform Mathematics to become a full-scale revolution in math education (Kilpatrick, 1997). O'Brien (1999) contends that Back-to-Basics has not only always been the dominant approach in schools, but that it continues to be dominant. As he notes, activity-based math is "unknown in the majority of American classrooms"

(p.435). When O'Brien asked colleagues in various states what proportion of elementary school classrooms were actually constructivist-minded, the figures were never above 20%. For all the talk about Reform Mathematics, it seems less likely there is widespread practice of its core features, and more likely "traditional mathematics teaching...is still the norm in our nation's schools" (Battista, 1999, p.426).

Impact

Among the many components of education that can be impacted by large-scale reform efforts, such as inservice and preservice teacher training, federal or state funding, the components most relevant to this paper are the public and academic reactions, with a special concern for public perception to changes in educational policy and practice. Once again, Table 3 presents a brief comparative overview for New Math and Reform Mathematics, supported by further details within this section.

New Mathematics

Public Reactions -In looking at the impact New Math had, it is easy to agree with Kilpatrick (1997) that "reaction was swift" (p.956), but it is important to remember that the beginnings of New Math were difficult to define with precision. The tone of a 1956 *Time* magazine article expressed optimism at the New Math movement, and concerning public opinion, F. Mueller (1966) reports that 1956-65 were the "happy years" for New Math (p. 620). There were discussions about parental difficulties in helping their children with the New Math, and a result was the publication of books helping explain the math to the parents (Rosenthal, 1965). In 1962, a memorandum against New Math was signed by 75 mathematicians and published (Kline, 1973). By1965, more reservations about New Math began to manifest themselves to a broader audience: Under the title "Trials of New Math," UICSM's Max Beberman was reported by Time to have been concerned that New Math was lessening students' abilities to compute (Mueller, 1966). Furthermore, Beberman said that New Math failed to relate to the real world, that it emphasized "esoteric branches of mathematics at the expense of fundamentals," and that he "feared that 'a major national scandal' may be in the making" (Kline, 1973, p.110). In fact, the era of New Math is seen as a sort of black eye in the history of math education - if not scandalous, then at least a poor show (Fey & Graeber, 2003). The movement was widely ridiculed, and Offner (1978) affirms the popular conception of New Math having had "disastrous results" (p. 211). Back-to-Basics became the refrain in the seventies, and "New Math overwhelmingly was rejected" (Crabtree, 1997).

Academic Reactions - It is likely, however, that most schools never seriously embraced New Math and thus had nothing to reject: Aside from the experimental curriculum of SMSG and UICSM, commercial publishers were only producing texts with superficial changes (Hirschi, 1977). New Math increased the attention given to test scores, and this concern was reflected throughout the seventies (NCTM, 1980; Carpenter, Coburn, Reys, and Wilson, 1975). Residual effects of New Math are also seen in some of the symbolism and terminology of today's curricula, and even courses such as precalculus are a testament to New Math's impact (Kilpatrick, 1997). Another big impact was that New Math helped further develop the math education community (Stanic & Kilpatrick, 1992). Kline (1973), towards the end of his book describing the failure of New Math, called for leadership from people who are experienced in both math and education. With a conciliatory spirit, New Math advocates were encouraged to work with those of the Back-to-Basics approach for the common goal of improved math instruction (Kraus,

1978).

Reform Mathematics

Public Reactions – Analysis of the impact of Reform Mathematics must be prefaced by the comment that, unlike New Math - which had some form of conclusion at least in the seventies (NACOME, 1975) - this movement is still ongoing. Opposition to Reform Mathematics has indeed been building, but Kilpatrick (1997) writes that "this time around, the negative reaction to reform proposals and activities has been slow to come" (p. 958). Because of the advent of the internet as a popular information medium, more and more criticism and reactions against Reform Mathematics are posted on the web (Sheppard, 1998; Kilpatrick, 1997).

Even an anti-reform letter, signed by many mathematicians just as in the era of New Math, can be found online (Mathematically Correct, 2005). Critics ascribe labels such as "math lite," "fuzzy math," and "fuzzy crap" to the Reform Mathematics efforts (Crabtree, 1997; Black, 2000). Given the negative connotations of New Math, it can be seen why most references to Reform Mathematics as "New New Math" are not generally intended as endorsements (Ratnesar, 1997; Leo, 1997). Traditionalists, who advocate a Back-to-Basics approach, are gaining momentum in their revolt against Reform Mathematics, and California recently enacted state standards that reflect this traditional approach (Crabtree, 1997; Cossey, 1999). Public opinion remains a miasma of distorted perceptions. In particular, the role of parents has remained limited, and relegated to discussions in which they are "addressed as barriers to mathematics education reform" (Peressini, 1998, p. 568)

Academic Reactions - One effect thus far has been the continued development of new curricula, and while there are many reform-based materials available, it is still unclear how well Reform Mathematics is actually being implemented in the classroom (O'Brien, 1999). Most commercial texts "consist of traditional curricula with enough superficial changes" so that publishers can say their materials are consistent with Reform Mathematics (Battista, 1999, p.433). Curcio (1999) supports this claim, maintaining that although new curricula "may claim to support the reform efforts, many are pseudo attempts at fulfilling the goals of reform" (p. 3). Another effect of the movement is to again assert the primacy of test scores in the public eye. Low scores in the Third International Mathematics and Science Study, for example, cause critics to blame Reform Mathematics and clamor for improvements in basic skills (Cossey, 1999; Crabtree, 1997). Reform Mathematics also highlights the position of the math education community (Lester & Lambdin, 2003), and Battista (1999) calls for decisions on curricula to be placed in the hands of professional math educators. Calls for different groups to work together toward

Table 3. *Comparison of Impact*

	New Math	Reform Mathematics
Public Reaction	• Many parents & mathematicians concerned • Media gives voice to concerns • Overwhelming sense of rejection	• Many parents & mathematicians concerned • Media and Internet gives voice to concerns • Intense ongoing debate involving stakeholders
Academic Reaction	• Mainstream curricula has limited carryover • Promoted development of math education research community • Increased attention to test scores	• Mainstream curricula has limited carryover • Highlights position and continued development of math education research community • Increased attention to test scores

the common goal of better math education have been frequently heard (Wu, 1997; Battista, 1999).

Connections & Conclusion

Like in New Math, there is a strong interacion between public opinion and the Reform Mathematics movement. The Agenda for Action acknowledged this importance, mentioning that such public opinion needs to be well-informed (NCTM, 1980). Others affirm the need for educating the public in the ways of Reform Mathematics (Jacob & Akers, 2000), and Battista (1999) cites the public lack of knowledge about Reform Mathematics as one of the main impediments of the movement. Isolated examples of alleged failings of Reform Mathematics are cited in the push to return to traditional teaching, and this reaction is spearheaded by well-organized groups of extremely vocal critics (O'Brien, 1999; Battista, 1999). In fact, writes Van de Walle (1999), "Ten years after NCTM's release of the Curriculum and Evaluation Standards for School Mathematics, this country is having a wrenching debate about what should be taught in mathematics and how it should be taught. Debate has degenerated to 'math wars'" (p. 1). It is this effect, the public perception quagmire of the Math Wars, which remains a contentious source of consternation to the Reform Mathematics community, for whom the current challenge is to "convince the general public of the credibility of their work" (Lester & Lambdin, 2003, p. 73). This challenge pervades the field of mathematics education, and is valid for many other disciplines besides mathematics.

In fact, when looked at in the larger context of educational reform, we see the same dynamic of misrepresentation, inflamed rhetoric, and public criticism connected to a range of specific topics and directed at public education in general. Writing over a decade ago, Cuban (1990) describes ongoing attempts at educational reform that "has continued unabated in this [20th] century" (p. 3). He notes familiar and persistent debates over teacher-centered versus student-centered instruction, and mentions the many metaphors for students such as the "blank slate" or the "rich clay" or the "flourishing garden." What is particularly interesting is his attention to historical cycles, and how in the mid-1800s educational reformers reacted against "teacher-centered instruction with its emphasis on a textbook" (p. 4). As he invokes images of cyclical reform, and the picture of the swinging pendulum, it is easy to place the Math Wars in a sort of historical context amongst those many general educational reforms attempts that have preceded the current era and those that will follow. Cuban specifically mentions the need for public support, noting that "without credibility, there is no chance of the schools being viewed as successful" (1990, p. 11). In focusing squarely on the issue of public confidence in education, Loveless (1990) describes the fervency of educational reform critics and defenders, citing clichés that transcend disciplines, such as how "education now stresses 'higher level thinking and problem solving, not rote learning'" (p. 128). He stresses that "despite the endless rhetorical wars waged by critics and defenders of public schools, [...] research on public attitudes toward education in confined to a handful of texts and articles" (p. 128). This lack of research on public attitudes suggests that what we see playing out in the media is truly a war of rhetoric without a winning strategy.

In conclusion, Addington (2000) may be right in saying that reforming math education is "like turning the Titanic around with a canoe paddle" (p. 1072), but caution is in order when comparing Reform Mathematics to New Math. The Titanic, like New Math, sunk: Reform Mathematics remains afloat. Though sharing some commonalties, Reform Mathematics should not be seen as a mere revisitation of New Math. In fact, Re-

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form Mathematics is not New Math. Even a group critical of Reform Mathematics, California's Mathematically Correct, notes in its website that New Math "has nothing to do with the changes to math education today" (2005, p.1), but the common public association remains. To gain a public willing to advocate for Reform Mathematics, it makes sense to listen to their concerns and to be able to articulate the perspectives of the ongoing movement to improve mathematics teaching and learning. It is important for the future of math education to continue defining and clarifying Reform Mathematics efforts, and to draw distinctions between contemporary programs and those of the past. Romberg envisioned decades to fully enact the goals of the 1989 Standards, which he helped author (Ratnesar, 1997). Over fifteen years later, it is clear that Reform Mathematics has a long way to go; the path will be smoother and the burden made lighter if the baggage of the New Math stigma is shed. Since a well-informed public is crucial to issues of reform, clarifying the features of the respective movements is one way to help further the journey towards improved mathematics education for all.

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