

**A Political Decision Making Process on Curriculum Reform in
Mathematics in Secondary Schools That Have Not Achieved
Adequate Yearly Progress (AYP) Status**

by

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Abstract

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This research was conducted using a multi-case study analysis of four school districts in Western Pennsylvania. All four of the school districts were placed under the guidelines of the Educational Empowerment Act (Act 16) due to a history of low tests scores and poor student achievement. These school districts were also placed on the State's Warning List due to the fact that they did not meet the measurable objectives of Adequate Yearly Placement (AYP) on the PSSA. This research focused on strategies used in the four schools in order to improve student performance on the mathematics section of the eleventh grade PSSA. This research utilized a variety of strategies in the process of data collection; interviews, a review of the school district report card as listed with the Pennsylvania Department of Education, a review of newspaper articles, and discussions with my research advisor used in the triangulation process of the data in order to provide case studies that contained depth and would provide a more accurate account of the phenomena that occurred within the districts. In the interview process in all four districts, a member of the central office administration, a member of the building level administration, and a secondary mathematics teacher were interviewed in order to provide accounts of improvement efforts for student achievement from a variety of personnel responsible for decision-making. In order to limit the amount of error within the interview process a documenter was used to provide assistance, as well as all of the interviews were taped. This proved a great deal of assistance in the interpretation of data collected during the interview. Through the research and the analysis of data this researcher was able to provide several conclusions; funds provided from Act 16 that were used to improve student achievement were most useful when the districts involved worked collaboratively with all educational stakeholders in the development of a long range plan to improve student achievement in mathematics; often districts are unable to maintain consistency in teaching and administrative staff and this has a negative effect on student achievement; and there are a variety of "pre-packaged" programs that are available for district purchase, each district must review these programs with all members of the staff and then decide which programs meet their needs.

TABLE OF CONTENTS

CHAPTER	Page
I. REVIEW OF LITERATURE	
Decision Making.....	2
Political Decision Making	4
Inputs	6
Objects of Support	9
Outputs	14
Feedback Loop	16
Relationship of Political System to Mathematics	17
Curriculum Reform	
Pennsylvania's Response to the Mandates	34
of NCLB	
Great Mathematics Debate	48
Recent History of Mathematics Reform	51
The School's Role in the Reform Process	58
II. METHODOLDGY	
Introduction	63
Statement of Problem	66
Definition of Terms	66
Research Questions	70
Design of Study	71
<i>Voice of Reason</i> – District One	76
<i>Road Best Taken</i> – District Two	89
<i>In Need of Change</i> – District Three	108
<i>It Takes a Village to Raise a Child</i> – District Four	127
III. SUMMARY, IMPLICATIONS FOR POLICY AND PRACTICE, AND REFLECTION	
Summary of Research Questions	143
Cross-Site Analysis	150
District Review	153
Implications for Policy and Practice	157
Personal Reflection	163
Summary	167
Bibliography	169

The literature review establishes a foundation beginning with a brief overview of the decision-making process. The focus then moves to decision-making within a political system. The work of David Easton (1965) becomes the theoretical framework for the discussion of decision-making within the political system.

Decision-Making

As we examine our nation's educational systems we notice that due to the pressures placed by federal and state policies, mathematics curriculum reform is a priority. Decisions that are made by political systems throughout the United States will have a dramatic effect on schools and students for years to come. Griffiths (1967) states the central function of administration is directing and controlling the decision-making process. It is not only control in the sense that it is more important than other functions, but it is control in that all other functions of administration can best be identified in terms of the decision-making process. This demonstrates the importance that is associated with decision-making. However, decision-making must be more than just control, it must also be concerned with the process. If we expand the concept of decision-making to include, on one hand, the process by which a decision is arrived at, and on the other hand, to include the process by which we implement or make the decision "work", and if we further recognize that this is a continuing, dynamic process rather than an occasional event, then decision-making becomes the basis of all managerial actions (Livingston, 1953).

We must then examine what the decision-making process entails. Griffiths (1967) defines six steps of decision-making; (1) recognize, define and limit the problem; (2) analyze and evaluate the problem; (3) establish criteria and standards by which a solution will be evaluated or judged

as acceptable and adequate to the need; (4) collect data; (5) formulate and select the preferred solution or solutions-test them in advance; and (6) put the preferred solution into effect.

Lipham (1974) created a decision-making model in which he identified three dimensions in the decision-making process. He identified the three dimensions as: decision content, decision stages, and decision involvement. Decision content includes those issues that are central to the function of the organization. Decision stages begin with the problem identification, moving to problem definition, then to the determination of alternatives, making the decision choice, implementing the decision, and finally, evaluating the decision effectiveness. Decision involvement includes a review of who was involved in the decision-making process and the amount of involvement that select groups or persons were able to have in the implementation of the decision.

There are also limits that are set on decision-making in order to improve the caliber of decisions that are made. The limits are as follows:

1. Definition of Purpose

When the purpose is set forth clearly, the members of an organization are prevented from making certain decisions and are channeled toward making certain other decisions. The clarification of purpose provides a definite limit on the decisions made within the organization.

2. Criterion of Rationality

The individual can be rational in terms of the organizational goals only to the extent that he is able to pursue a particular course of action; he has a correct conception of the goals of the organization, and is correctly informed about the conditions surrounding his

actions. Attempts are made to select individuals who have an inclination to accept the goals of the organization; they are submitted to an intensive program of indoctrination (orientation); they participate in programs of indoctrination over a long period of time (in-service); they perform according to the standard operating procedures or written rules and regulations of whatever the organization may be.

3. Conditions of Employment

An individual is employed by an organization for a particular position. In effect, the conditions of employment are a limitation upon the decisions that person can make or have input.

4. Lines of Formal Authority

Lines of formal authority must be understood by all in order that each individual will know who makes what decisions and which decisions will affect a person directly. This prevents problems when people are accountable to more than one person, when lines are not clear, or when several people believe they are responsible for an area.

5. Relevant Information Provided

Others need to be involved in the decision-making process and need to be provided with relevant information. Those persons or groups which are not provided with information will not participate in the decision-making and often feel resentment towards that decisions or actions that were made since they had no “voice” in the process.

6. Time Limits

All organizations work under the constraints of time limits. This constraint limits the number of people in the organization that can be involved in the process and also the amount of time for the process to evolve. There is always a time constraint in regards to the effectiveness of a decision within an organization (Tannenbaum, 1950).

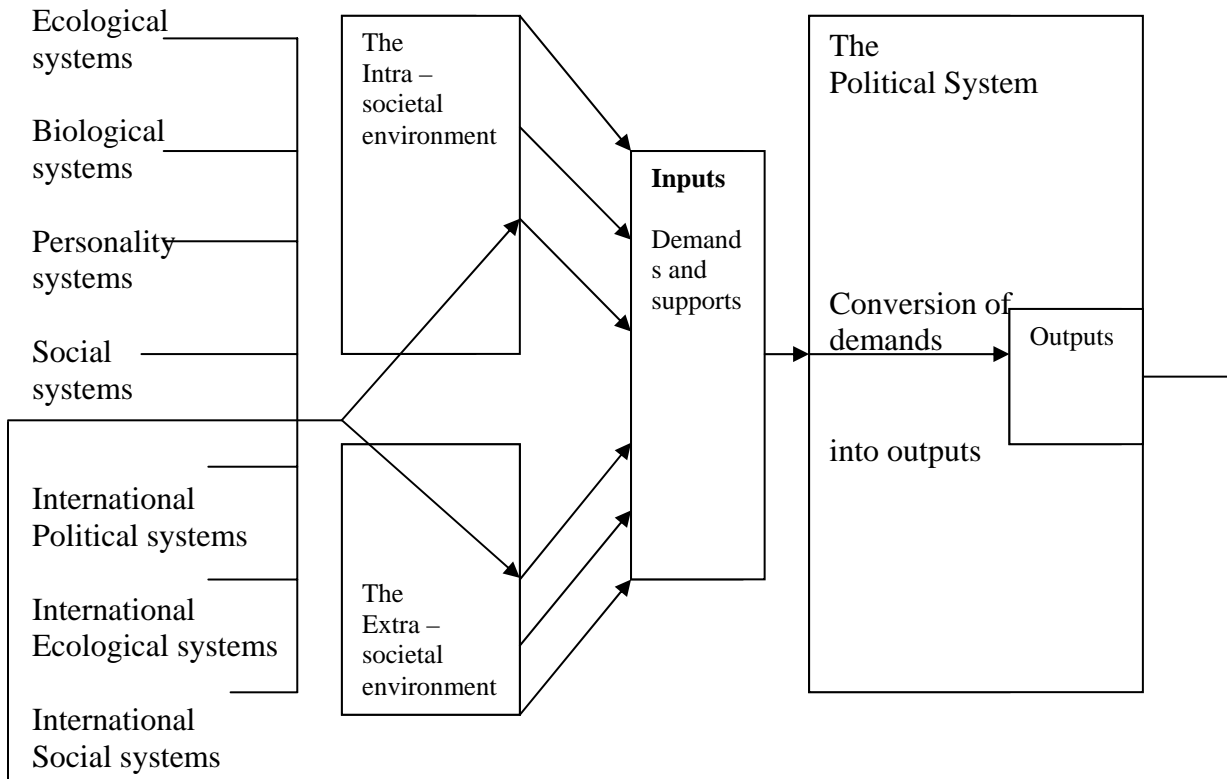
Political Decision-Making

It is useful to interpret political life as a complex set of processes through which certain kinds of inputs are converted into the types of outputs we may call authoritative policies, decisions, and actions (Easton, 1965). (See Table 1) A political system can be designated as those interactions

through which values are authoritatively allocated for a society; this is what distinguishes a political system from all other systems that may be a part of its environment. This environment is divided into two parts, the intra-societal and the extra-societal. The intra-societal consists of those systems in the same society as the political system. Intra-societal systems would include sets of behaviors, beliefs, and attitudes that could be called the economy, culture, social structure, or personality of the organization; they are functional systems of the society with respect to which the political system is itself a component. The second part of the environment, the extra-societal, includes all systems that lie outside of the given society itself. They have no direct relationship with the society, but can and do affect the environment (Easton, 1965).

Table 1

A Dynamic Response Model of a Political System (Easton, 1965)



The Systemic Feedback Loop

The relevant sequence in Table 1 is a stimulus-system response-outcome, demands and supports cause a disturbance, the system feels impact, its members respond or fail to respond, and the resultant state of affairs reveals the effectiveness with which the system has managed to cope with the stress (Easton, 1965). The affects that are transmitted across the boundaries of a political system towards some other system are the outputs, and they become the inputs of the new system (Easton, 1965).

In order for political system to survive or be described as persisting, they must successfully fulfill two requirements, (1) they must be able to allocate values to a society, and (2) induce most members to accept these allocations as binding, at least most of the time. These are the two essential variables of political systems (Easton, 1965). It is with this knowledge of the essential variables that we are able to establish how and when disturbances act upon the political system to threaten or stress it. Stress occurs in the political system when the essential variables are pushed to a critical range. This means that something is happening in the environment that causes the system not to fulfill one of its essential functions (Easton, 1965),

Inputs

The major environmental influences on a political system are the inputs. Without the inputs it would be difficult to delineate the precise operational way in which the behavior in the various sectors of society affects what happens in the political sphere. Inputs concentrate and mirror everything in the environment that is relevant to political stress (Easton, 1965). Therefore, inputs could be interpreted as any external event to the system that alters, modifies, or affects the

system in any and every possible way. Inputs create the new material on which the political system acts in order to create outputs. It is helpful to view inputs in two major categories; demands and supports. Through the fluctuations in the inputs of demands and support we shall find the effects of the environment transmitted to the political system (Easton, 1965).

Demands as Inputs

A demand is an expression of opinion that an authoritarian allocation with regard to a particularly subject matter should or should not be made by those responsible for doing so. Demands may be very specific or general in nature (Easton, 1965). A group of taxpayers who do not wish that a tax-increase be added in the district is an example of a demand that is placed on a political system. Demands serve to bridge the gap between political and non-political life. Using the example of the taxpayers, if they only discuss their dislike of the proposed tax increase in their homes the stress on the political system is much different than if they choose to protest higher taxes at a public school board meeting. Demands may act as stressors on a political system in two different ways. The first is to the extent that the demands remained unfulfilled they lead to the decline of support for the political system. The relationship between demands and outputs may be so out of balance as to stimulate active opposition to the political community. The reasons for failure to satisfy demands may be quite varied. The resources may not be equal to the task or the authorities might be unresponsive to the demands of various political segments of the society. The second way is when a system is confronted with a situation in which the input of the information conveying the demand becomes too great for the responsible member of the system to process for possible conversion into decisions; the system

cannot help but operate under the danger of collapse. When this occurs the system is said to be designated as excessive volume stress. It is not just the volume that creates this type of stress; it can also be the content of the kinds of demands that have a bearing on the capacity of the system to produce decisions (Easton, 1965). When excessive volume stress occurs, outputs prove insufficient to hold the minimal support of the politically significant members and the organization can be severely damaged (Easton, 1965). It is imperative that we are able to count the frequency with which demands upon the political system are made, this is done in two ways; (1) the frequency with which a single demand is repeated in the specific interval under consideration and (2) the number of different kinds of demands that occur (Easton, 1965). The frequency of repetition of a demand is an important indicator because without it we would be unable to give value and weight to the demand under consideration in the political system. The demand for higher test scores in public schools has been a reality for many years, however it was not until this demand was heard from parents, government agencies, and various other educational constituency groups that it was given the value that it currently has in our society.

Support as an Input

Support becomes the major variable linking the political system to an environment. It allows us the opportunity to have a common vocabulary referring to the transaction between a political system and the environment (Easton, 1965). The input of support is divided into two categories as supportive actions (overt support) and supportive attitudes and sentiments (covert support). Overt support is defined as the external actions of a person that promote goals, ideas, institutions, actions, or persons. All types of observable behavior are placed in this category. As a measure

of overt support, a variety of indicators are used; the number of members that an organization has; the regularity with which citizens perform their obligations; manifestations of open hostility; and expressions of preferences for other systems through emigration of separatist activities (Easton, 1965). Support may also be demonstrated in ways that are not observable. A person may possess a frame of mind or attitude with respect to others or an object, but one cannot tell their support through the person's actions. The idea of loyalty is an example of covert support; one can be loyal to a nation, school, or family without demonstrating it in an observable action. Support is a function not only of action or intensities of feelings, but of the numbers of members who share and do not share those same feelings (Easton, 1965).

Fluctuations in support may stress a system in three ways; (1) without support for some authorities, demands could not be processed into outputs; (2) without support, it would be impossible to assume some kind of rules and structure where demands are converted into outputs; and (3) support is vital in order to create cohesion within the membership and the development of the political community (Easton, 1965). The support required by the politicians and the intellectuals who are politically active may be as little as three percent of the total organization. In other words, a small minority putting in quantitatively sufficient support can keep a political system functioning (Easton, 1965).

Objects of Support

Easton (1965) identifies three "political objectives" that are necessary in order for a system to persist. The three objects of support are political community, regime, and the authorities.

The Political Community

Political communities will refer to that aspect of a political system that consists of its members seen as a group of persons bound together by a political division of labor. This division of labor creates a complex web of communications and political relationships that help to form social and political ties (Easton, 1965). The existence of a political system must include a plurality of political relationships through which the individual members are linked to each other and through which the political objectives of the system are pursued (Easton, 1965). Karl Deutsch (1954) describes a political community as a “community of social interaction supplemented by both enforcement and compliance. It is a community of persons in which commands are supplemented by habits of compliance that are sufficiently widespread and predictable to make successful enforcement in the remaining cases of noncompliance probable and at an economically and culturally feasible cost.” Haas (1958) adopts a definition of political community to describe a condition in the relationship of political groups such that “specific groups and individuals show more loyalty to their central political institution than to any other political authority in a specific period of time and in a definable geographical space.” The support of the political community fluctuates and support can be lost in a number of ways; strife, emigration, or group separation (Easton, 1965).

Regime

The regime represents relatively stable expectations, depending on the system and the state of change with regard to the range of matters that can be handled politically, the rules as norms

governing the way these matters are processed, and the positions of those through whom binding actions may be taken on these matters (Easton, 1965). Every system needs to develop a set of formal or operating constraints that are generally accepted by rulers and ruled alike and that give what are and are not permissible goals, practices, and structures in the system. In order for outputs to be accepted as binding, the members would need to accept some basic procedures and rules relating to the means through which controversy over demands was to be regulated and work out guidelines for settlement (Easton, 1965).

The regime places constraints on the political interaction in all systems. This is accomplished through three components; values (goals and principles), norms, and the structure of authority (Easton, 1965). Every regime consists of a broadly defined underlying set of political values and principles. These may be articulated or implicit and they impose constraints on the purposes for which the energies and the resources of the organization may be used (Easton, 1965). Politically effective members of the organization lend their support to the expression and the elaboration of values and if these values are not rejected by other members of the system, they will form the limits within which the day to day policies will be expected to confine themselves (Easton, 1965). Values limit the range of alternative goals that a system might pursue or even norms by which it might adhere. If members of a system do not share political values, at least the dominant political values impose some constraints upon the actions that can be taken and on the structure of the regime itself (Easton, 1965).

The second major component of the regime is the norms. The norms specify the way in which the members of a system are expected to behave in political life; how they are to go about putting in demands, helping to process them into outputs, and influencing their implementation (Easton, 1965). There are two types of norms that are categorized within regimes. The first types of norms are customary or effective norms, these norms offer general direction regarding right and wrong ways of behaving in political life but they have never acquired the kind of binding support that would convert them into laws. They are operating rules that are firmly entrenched within a system and are affected by the environment of the society. The second types of norms are legal or formal norms, these are operating rules that take on a formal status. These norms represent formal prescriptions that are embodied within legal rules and written documents and serve to either limit the range of variations possible or act as sanctions to force members into conformity with ideals (Easton, 1965). If the members of a system fail to support some kind of regime, this lack of support would drive the essential variables beyond a critical range and thereby prevent the system from operating (Easton, 1965).

The final part of the regime is the structure of authority. The general membership of the system expect that the authority will accept the moral responsibility for undertaking to make and implement binding decisions, as defined by the culture (Easton, 1965). There are many reasons why the membership may accept the authority to make a decision; fear, lethargy, loyalty, tradition, or expediency. Typically in political systems, the capacity of authorities to rule is clearly connected to an ingrained belief, usually transmitted across the generations in a socialization process that the occupants of the political authority have the right to command and

the other members of the system have the right to obey (Easton, 1965). The influence of the occupants of authority roles in the conversion of demands into outputs will depend on the specific relationship between them and other members of the society (Easton, 1965).

The Authorities

If no system is able to persist without assuring itself of a minimal flow of support toward the regime, including the structure of authorities, then there is equal likelihood that a system could survive if it failed to support occupants for these authority roles. Every system must be prepared to support some members who will be ready, willing, and able to pay special attention seeing to it that differences are settled or handled in some way that is acceptable. Alternatively, these specific members must be able to mobilize enough support for themselves if they are to have the power to formulate and implement their decisions (Easton, 1965). The occupants of authority roles need to be distinguished from all other roles. Those occupants include members of the system who conform to the following criteria; they must engage in the daily affairs of the political system; they must be recognized by most members of the system as having the responsibility for these matters; and their actions must be accepted as binding most of the time by most of the members as long as they act within the limits of their roles (Easton, 1965). These occupants will be called the authorities (Easton, 1965). The influence of the authorities in the conversion of demands into outputs will depend on the specific relationship between them and the other members of the system. If a system is to be able to deal with the daily affairs of converting demands into binding outputs, it is not enough for the members to support the political community and regime. The support must be for the given authorities of which the

political community and regime is composed (Easton, 1965). This does not mean that the authorities must be the most influential members of the political system; they can perform their task of governing as long as they have the support of the most powerful members. However, if the members of the system are unable to provide enough support for some set of authorities who can assume responsibility for the day to day affairs of the system and provide initiative and direction in identifying problems and taking steps towards their resolution, then the system is in danger of collapsing (Easton, 1965).

Outputs

Outputs represent not a terminal point in the internal process of the political system but rather a transaction between the system and the environment (Easton, 1965). It is a misconception to believe that the outputs signify the end of the political system; this would make the output a type of outcome for the demands of the system and therefore a product, rather than a point of transaction. Outputs should be seen as mechanisms through which authorities in a political system reach out to cope with problems created by external changes as they are reflected through changing demands and support (Easton, 1965). The inputs serve to summarize or mediate the disturbances and changes taking place in the environment, and the outputs serve to conceptualize the ways in which the system acts back upon the environment, and indirectly upon itself, by modifying succeeding inputs and demands (Easton, 1965).

The outputs are the activities through which the resources and energies of the members of the system may be organized, focused, and committed. The actions of the authorities may have a

special significance in the political system; therefore the authorities must be identified as the producers of the outputs in a political system (Easton, 1965). There are many reasons why the authorities are identified as the producers of the outputs; (1) other members of the system may engage in political activities that may affect the flow into the environment, however these actions are not outputs, they may be categorized as demands, support, or outcomes; (2) outputs are a special type of political behavior or activity because through them persons who occupy roles of authority are able to exercise control or direction over other members of the system; and (3) demands and expressions of support and hostility in a political system are usually directed to the authorities. If the authorities do not have an understanding of information conveyed by the demands and supports, an essential variable of the political system would not be met and the system could be damaged (Easton, 1965).

Outputs may be viewed as the authorities maintaining themselves in a position of power in the face of competitors or as an integral component in the struggle for power among politicians. Since it is only those occupants of the roles of authority that can produce outputs, the struggle to acquire or maintain the role of the authority depends on the support of the politically influential members and a majority of the members of the society. However, outputs cannot be used just to maintain political power; they must also be viewed as genuine and rationally developed concepts that are developed by the authorities of what would be in the best interest for the political system (Easton, 1965). Output success will tend to stimulate support; output failure- the lack of perceived or felt correspondence between outputs and demands- will tend to erode support. The success or failure of outputs in winning the supportive response of members will depend on the

extent to which the outputs are able to meet the current demands of the members or anticipate and abort possible future demands by preventing grievances from arising (Easton, 1965).

Feedback Loop

The feedback loop will refer to two interlocked processes; first, the regulative outputs of a system and their consequences; and second, the information itself that is fed back about the state of the system and the consequences flowing from whatever regulations or adjusting actions have been undertaken by authorities (Easton, 1965). The feedback loop has a number of parts; it consists of outputs by the authorities, a response on the part of the members of the society, the communication of information about this response to the authorities, and finally, possible succeeding actions on the part of the authorities thereby creating a new round of inputs (Easton, 1965).

The feedback loop will identify a set of processes composed of information and related outputs and their consequences that enables the political system to control and regulated the disturbances in a system (Easton, 1965). Information is a vital part of the feedback loop for the authorities; first, the information will need to describe the general state of the system and its environments; and second, the authorities must have accurate information regarding the effects and the results of their specific actions that have been taken in the way of outputs (Easton, 1965). This feedback has been described as “the property of being able to adjust future conduct by past performances” (Weiner, 1954).

There are many types of feedback loops that are within the political system, the one that is most critical in the political system is the systemic feedback loop. This is the feedback loop that includes the authorities, their goals, and the politically relevant members in a system whose support the system must depend on for its persistence over time (Easton, 1965). The system feedback loop is one in which the outputs flows from the political system and may return to the system through the point from where it started. Each transaction with its environment is in the form of an output, followed by the feedback of information about the consequences, added to the knowledge that a system acquires that enables a system to explore and discover new ways for dealing with its problems on the basis of past and present behavior (Easton, 1965).

Relationship of the Political System to Mathematics Curriculum Reform

New decisions makers and new decision making must be treated as priorities, where the decision makers include students, teachers, parents, government officials, and administrators, and the issues range from program accountability to diagnostic analysis of learning programs for individual students, with an emphasis on equity and validity (Lesh and Lamon, 1992). Even though mathematics educators and policymakers have come to realize that piecemeal approaches to curriculum reform are not sufficient, the same realization must be related to assessment. Recent policy statements from relevant professional organizations and governmental agencies have made significant progress toward clarifying the nature of the most important goals of instruction and assessment (Lesh and Lamon, 1992).

The No Child Left Behind Act of 2001 (NCLB) holds states, school districts, and schools more accountable for improving student performance than any other educational legislation in our Nation's history. NCLB is the latest reauthorization of the Elementary and Secondary Education Act of 1965, it includes new standards, testing, and sanctions provisions designed to bring better performance and new accountability to the local school districts and schools. Accountability is more defined than it has ever been in federal law (perhaps in some areas unrealistically specific); nonetheless, the meaning of NCLB will be defined by the states and in the regulations promulgated by the Department of Education (Rudalevice, 2003). The NCLB also specifies the nature of state accountability systems placing states at risk of losing their share of Title I funds if they do not base accountability on annual performance in math and reading and measure programs in a manner determined by the federal government (Fuhrman, 2003).

Many people have questioned why the federal government was reluctant- until the passage of NCLB- to insert itself permanently into reform efforts. Explanations that have been offered for this reluctance are the great diversity of school systems, the dependence of schools on their local communities, political pressure, or the constitutional commitment of Americans to local control of educational institutions. There must also be awareness that the reform movements of the last twenty years greatly impacted the development and implementation of NCLB. The ideals of standards, performance-based accountability, adequate yearly progress, and high stakes testing, to name a few, are not new to federal educational reform movements.

In the early 1980's, there was a growing concern about the quality of our nation's schools. There was a sense that something had to be done to improve educational standards in our country. The galvanizing event was the publication of *A Nation at Risk* in 1983 (Ravitch, 2000). *A Nation at Risk* was a landmark educational reform literature that brought forth a federal challenge to state governments to conduct reforms on a large scale. Emphasis was placed on the teaching of traditional academic subjects, increasing the number and quality of science and math courses, and changing the career path of teachers with the primary goal of promoting excellence (Ravitch, 2000). All students were expected to reach and attain a higher level of standards, especially in the areas of math and science. *A Nation at Risk* took as a given the promise that "all, regardless of race or class or economic status, are entitled to a fair chance and to the tools for developing their individual powers of mind and spirit to the utmost" (Ravitch, 2000). The commission that developed *A Nation at Risk*, led by then Secretary of Education Terrell Bell, held that four aspects of schooling needed to change: content, expectations, time, and teaching. The commission recommended that all high school graduates study the "new basics"- four years of English, three years of mathematics, science, and social studies, a half-year of computer science, and two years of a foreign language for those students who were planning on attending a post-secondary institution (Ravitch, 2000).

The standards for teachers also needed to be improved and teacher education programs needed to be restructured. Often many teachers were drawn from the lower quarter of college graduates and were not qualified to teach. *A Nation at Risk* sounded the alarm for change and the public quickly demanded reforms in education. However, *A Nation at Risk* was just a report and did not

include any accountability factors for those states or schools that did not follow the recommendations. Furthermore, *A Nation at Risk* called for no new federal dollars and in fact, the federal share for elementary and secondary education declined by 6% (Ravitch, 2000). State and local governments were given the responsibility for providing funding and the autonomy to raise student achievement to these standards. A majority of the results of *A Nation at Risk* were limited to a change to a longer school day and/or school year, increase in graduation requirements, and the addition of core curriculum classes, but the sweeping reform that was called for never occurred.

As the reforms suggested from *A Nation at Risk* were fading, the call for educational reform received a renewal when President George H. Bush and the nation's governors met at Charlottesville, Virginia in September of 1989 to discuss the state of education in the United States. At this educational summit, the nation's governors agreed to adopt six national goals, they called this plan America 2000 because it was to set the tone for educational reform for the twenty-first century. Two of the goals targeted higher academic achievement for all students, while the others defined targets for high school graduation rates, school readiness for younger children, adult literacy, and reducing substance abuse and violence in schools (Fuhrman, 2003). This was a dramatic shift because American education had been accustomed to keeping all children in school as long as possible without setting any real standards of achievement. The federal government and states would focus their policies on results, defined as student learning, and schools and localities were expected to exercise their judgment and expertise to achieve those results. Only in cases of outright failure would the federal government or the states

intervene in the affairs of local schools and then only to remedy immediate cause and leave (Elmore, 2003). This idea became the cornerstone of educational reform, that the duty of the government was to regulate and reward results and it was the job of the school to produce them.

The Department of Education awarded grants to organizations of scholars and teachers to develop voluntary national standards in seven subject areas (science, history, geography, the arts, civics, foreign language, and English). These voluntary national standards were supposed to describe what children should be expected to learn in every subject area and at all grade levels and were to be “world class” so that our students could compete with students from around the world in all academic areas. These voluntary national standards were intended to create a framework of academic expectations that would be utilized by teachers, students, textbook publishers, and test makers (Ravitch, 2000). They would be used by states as a guide in the development of their own standards. The ideal of national standards met with a great deal of political opposition. For some the standards did not contain enough information for students, while others thought that the standards were too specific, and others did not like the connotation of “world class” being added to the standards. The effort to create national voluntary standards revealed the deep fissures within academic fields, as well as the wide gap between avant-garde thinkers in the academic world and the general public (Ravitch, 2000).

With the election of William Clinton as President, it was believed that the process of establishing a system of national standards would be continued. While serving as governor, William Clinton, was a leader at the educational summit in Charlottesville and many believed that he would

continue to support the goals of America 2000. However, President Clinton brought new changes to federal policies and unveiled his Goals 2000 proposal for systemic or standards-based reforms (Vinovskis, 2003). Goals 2000 called for the drafting of ambitious state content standards, development of related academic curriculum, and the creation of rigorous academic assessments. The alignment of these standards, curriculum, and evaluations at the state level provided for the framework of the Goals 2000, but also on the reauthorizing of Title I in 1994. The emphasis was now on ensuring that all students reach the high standards just focusing on at risk children (Vinovskis, 2003).

Goals 2000 also provided aid to local school districts to raise student achievement (Jennings, 1998). Another piece of the Goals 2000 was the creation of a federal board to review and certify the new state and national standards, however President Clinton did not appoint anyone to the board and when the Republicans took control of Congress in 1994 it was abolished (Ravitch, 2000). All of the standards that had been drafted had no organization to evaluate them and there was no formal review process. Thus, while the Clinton administration had called for and implemented a new approach to improving American education; it did not support the effort through research and long-range planning and development. Both parties were content to let the target goals of Goals 2000 lapse.

In 1994, the Improving Americas Schools Act (IASA) became law reauthorizing the Elementary and Secondary Education Act of 1965 for five years and tying for the first time state funding under Title I to the creation of content and performance standards. The notion of adequate

yearly progress (AYP) also was implemented under IASA , though it was very vague, requiring only that AYP “result in continuous and substantial yearly improvement of each local education agency and school sufficient to achieve the goal of all children served under this part meeting the states proficient and advanced levels of performance.” In IASA, academic progress was primarily linked to a series of tests for all students measuring the proficiency levels in subjects of the states choosing. The guidelines were not too specific regarding testing, with one test to be given between grades 3 and 5, another to be given between grades 6 and 9, and a third between grades 10 and 12. No national baseline was set for these tests, so that the federal government could not examine the results from a national perspective. The IASA reflected the national momentum that was begun by the publication of *A Nation at Risk*, and continued through America 2000 and Goals 2000, in regards to standards-based reforms. It also dealt with the increasing concerns regarding reliance on a single test, including the likelihood that many schools would be judged as effective or ineffective on the basis of changes on test scores due to random fluctuations. The IASA accountability provisions were:

- Eliminating the annual testing using one test and replacing it with testing in three progressive grades.
- Including a requirement that test scores be disaggregated by multiple categories.
- Removing federal guidelines for measuring annual school performance and minimum progress, instead requiring each state to define “how good is good enough” in terms of a schools AYP, resulting in many different approaches among states. (Wennig, Herdman, and Smith, 2000)

According to IASA, state standards were to be in place by the 1997-1998 school year and assessment along with the objectives of AYP, by 2000-2001. The Secretary of Education was authorized to penalize states that failed to meet the timelines by withholding their administrative portion of their Title I funds, but this was never done. School districts were authorized to take mild corrective actions against schools failing to make AYP, presuming that AYP had been defined, this also did not happen.

The NCLB reauthorizes the ESEA for 12 years and continues the standards-based reform approach of the IASA, but the emphasis on accountability has been heightened to an extent never before witnessed in educational reform. Title I, Part A of the NCLB is intended to help insure that all children have the opportunity to obtain a high quality education and reach proficiency on challenging state academic standards and assessment (NCLB, 2001). Title I funds can only be used for effective educational practices. Title I school-wide and targeted assistance programs are required to use effective methods and instructional strategies that are grounded in scientifically based research (NCLB, 2001). The term scientifically based research is a very important component of the NCLB legislation and is mentioned more than 100 times in the Act. This reflects the increasing calls in Congress during the 1990's for more scientifically based education programs, as well as more rigorous and objective program evaluations (Vinkovskis, 2000). School improvement plans, professional development, and technical assistance that districts provide to low performing schools must be based on strategies that have a proven record of effectiveness and are based in scientific research.

The three areas that this researcher will focus on in the NCLB legislation are accountability, report cards, and assessment. This researcher will review the mandates of the NCLB legislation and then compare the policies and practices of the Pennsylvania Department of Education listed in the Pennsylvania Consolidated State Application Accountability System Workbook in meeting the federal mandates.

Accountability

The NCLB is designed to help all students meet high academic standards by requiring that states create annual assessments that measure what children know and can do in grades three through twelve in reading and mathematics, with science to follow in 2006-2007 (Bracey, 2003). These assessments based on challenging state standards will allow parents, educators, administrators, policymakers, and the general public to be able to track the progress of every public school in the nation. The NCLB tightens provisions concerning adequate yearly progress (AYP) by requiring states to specify annual measurable objectives to measure student performance to insure that all groups of students disaggregated by poverty, race and ethnic groups, disability, and English proficiency data reach proficiency in reading and mathematics the year 2014. States must develop and implement a single, statewide accountability system that will be effective in ensuring that all districts and schools make AYP and hold accountable those that do not. Schools that do not make AYP will be identified for increasingly rigorous sanctions designed to bring about meaningful change in instruction and performance (NCLB, 2001). In order to accomplish this, states must establish a definition of AYP that each district and school is

expected to meet. States must specify annual objectives to measure the progress of schools and districts to insure that all disaggregated groups of students reach proficiency levels by 2014. Schools are responsible for testing 95% of the students in each of the disaggregated groups; however the states are accountable for setting the number of each group in order for schools to have to differentiate the data (NCLB, 2001). If a subgroup is too small to yield statistical reliable information or if it will compromise the individual identity of students (groups of less than 10), the results will not be used for disaggregated APY but they will be aggregated at the school district level. In addition NCLB specifies that states must develop AYP objectives consistent with the following provisions of law:

1. States must develop AYP statewide measurable objectives for improved achievement for all students and for specific disaggregated subgroups; economically disadvantaged, students from major racial and ethnic groups, students with disabilities, and students with limited English proficiency.
2. The objectives must be set with the goal of having all students proficient or above within twelve years (by the end of the 2013-2014 school year).
3. AYP must be based primarily in state assessments, but must include one other academic indicator.
4. The AYP objectives must be assessed at the school level.
5. School AYP results must be reported separately for each disaggregated group of students so that it can be determined if each student group met the AYP objective.
6. At least 95% of each disaggregated group must participate in the state assessment.

7. States may aggregate up to three years of data in making AYP delineations (Linn, Baker, and Bitebenner, 2003).

A more detailed definition of AYP by Wennig (2003) mentions:

1. Each state, using data from the 2001-2002 school year must establish a starting point for measuring the percentage of students meeting or exceeding the state's proficient level for academic achievement. In establishing this starting point, the state must use the higher of either the proficiency level of the states lowest achieving group or the proficiency level of the students in the school at the 20th percentile in the state among all schools ranked by the percentage of students at the proficient level.
2. States must develop annual measurable objectives that are consistent across schools and student groups and increase in increments over twelve years, with the first increase to occur not more than two years and the remaining increases to occur in not more than every three years.
3. States must establish a uniform procedure for averaging data over multiple years and across grades in school.

The trend in performance-based accountability systems exemplified by NCLB is toward more desegregation of results by level of performance and type of student directing attention away from average school performance levels and towards the way that schools serve specific populations of students (Elmore, 2003). A school or school district makes AYP if:

- At least 95% of each student subgroup takes the state assessment (states, school districts, and schools may not systematically exclude 5% in any given group from the state assessment) and either,

- The school or district and each student in the subgroup meet the states annual measurable objectives and other academic indicators, or
- If students in a subgroup do not meet the states annual measurable objectives, but qualify under the ‘safe harbor’ provision. The “safe harbor” provision is when the percentage of the students in a subgroup below proficiency decreased by at least 10% from the proceeding year and that the subgroup made progress on one or more of the state or schools district’s academic indicators (NCLB, 2001)

What about schools that fail to meet AYP? The NCLB has specific sanctions for those schools and school districts depending on how many consecutive years that a school has failed to make AYP.

- Schools that have failed to make AYP for two consecutive years must be identified as in need of improvement. Students in these schools must be given an opportunity to transfer to another public school that has not been identified for improvement. Also, schools must spend at least 10% of their Title I Part A funds on professional development for the school’s teachers and principal that directly address the academic achievement problem that caused the school identified for improvement. The local school district is responsible for transportation of students from schools of improvement to those that are not.
- If a school fails to make AYP for a third consecutive year, students from low-income families must be given the opportunity to use Title I funds to obtain supplemental educational services from public- or private-sector providers.

- If a school fails to make AYP for a fourth consecutive year, the school is labeled in need of corrective action. These actions must include at least one of the following; replacing school staff, implementing a new curriculum (with appropriate professional development), decreasing management authority at the school level, lengthening the school day and/or the school year or reorganizing the school internally.
- If a school fails to make AYP for a fourth consecutive year the state must also take corrective actions that must include at least one of the following; deferring programmatic fund or reducing administrative funds, implementing a new curriculum (with professional development), replacing personnel, establishing alternative governance structures, appointing a receiver or trustee to administer the district in place of the superintendent and school board, or restructuring or abolishing the school district.
- Finally, if a school fails to make AYP for a fifth consecutive year, the school is in restructuring. The school district must initiate plans to fundamentally change restructure the school. The restructuring of the school may include reopening the school as a charter school, replacing most or all of the school staff who are relevant to the failure to make AYP, or turning over the operation of the school to the state or a private company with a proven record of effectiveness (NCLB, 2001)

States and school districts must provide technical assistance to schools identified as school improvement, corrective action, and restructuring. States are required to reserve portions of their

Title I funds to benefit schools that fall into one of the three categories. State assistance must include; establishing school support teams, designating and using distinguished principals and teachers to provide assistance, and devising additional methods to provide assistance (NCLB, 2001).

Report Cards

NCLB requires states to develop state and local report cards that will include student performance information that will be disseminated annually. States must produce and disseminate annual report cards that provide information on how students are achieving overall as well as by disaggregated groups. These report cards must include:

- State assessment results by performance level, showing a two year trend for each subject and grade tested, with a comparison between annual objectives and actual performance for each student group.
- Graduation rates for secondary students and other academic indicators that the state chooses.
- Performance of school districts on AYP measures including the number and names of schools identified as in need of improvement.
- Professional qualifications of teachers in the state, including the percentage of classes in the state that are not taught by highly qualified teachers and percent of teachers teaching with emergency or provisional credentials. There must also be a comparison of highly qualified teachers teaching at high and low income schools (NCLB, 2001).

Each school district must also prepare and disseminate annual report cards that include information on student achievement for the district and for each school. The annual school report cards must also contain information on the school(s) identified for improvement.

Assessments and Standards

The NCLB requires that by the year 2005-2006, states must develop and implement annual assessments in reading and mathematics in grades three 3 through 8 and at least once in grades 10 through 12. By the 2007-2008 school year, states must test students in science three times during their scholastic careers; once in grades 3 through 5, once in grades 6 through 9, and once in grades 10 through 12. These assessments must be aligned with the state academic content and achievement standards and involve multiple measures, including measures of higher-order thinking skills and understanding. States must have developed reading and mathematic standards and science standards need to be developed and implemented by the end of the 2006 school year (NCLB, 2001). Another assessment that states are responsible for participating in is the National Assessment of Educational Progress (NAEP) test for students in fourth and eighth grade. NAEP, originally known as “The Nation’s Report Card”, is the only nationally representative and continual assessment of American student progress. Since 1969, NAEP has provided assessments in reading, mathematics, science, writing, history, geography, and other fields. Scores on the NAEP are tied to the original 1969 test, thus making it possible to compare student achievement over time (NCES, 1999). It should be noted that NAEP has no relationship with or correlation to a state’s AYP.

State assessment must provide for the inclusion and participation of all students including students with disabilities and with limited English proficiency. State assessments must provide for reasonable accommodations for students with disabilities or limited English proficiency, including providing native language versions of the assessment if possible. Beginning with the 2002-2003 school year, states must insure that districts administer tests of English proficiency – that measures oral language and reading and writing skills in English- to all limited English proficient students. However, students who have resided in the United States for three consecutive years must be assessed in English in the area of reading and writing.

The state assessment system must produce results disaggregated by gender, major racial and ethnic groups, limited English proficiency, migrant status, disability, and status as economically disadvantaged. The assessment system must also produce individual student interpretive, descriptive, and diagnostic reports. States must report an itemized score analysis to districts and schools. States must insure that these reports and other results of state assessments administered in one school year are available to school districts before the beginning of the next school year. The assessment results must be provided in a manner that is clear and easy to understand and be used by school districts, schools, and teachers to improve the educational achievement of individual students.

The focus on performance-based assessment is a centerpiece of the NCLB legislation. States are mandated to develop their own standards and assessments to hold schools and school districts

accountable for student achievement. The mandate that schools must continue to make AYP objectives until, by 2014, 100% of a school's students must be proficient. There has been a great deal of differentiation of data and range in state-by-state percentages of schools needing improvement. In explaining this differentiation we must remember that NCLB permits states to (1) establish their own curriculum goals, (2) assess student mastery of those goals using state-chosen tests, and (3) determine the levels of proficiency students must display on the federally required tests (Popham, 2003). If we examine student proficiency on the NAEP we will discover that in most states somewhere between 20% and 30% of students test in the proficient range (Elmore, 2000). Robert Linn, the co-director of CRESST (Center for Research, Evaluation, Student Standards, and Testing) at the University of Colorado and at UCLA, was asked how long it will take to get 100% proficiency if we continue at the same rate we have improved for the last decade. Looking at the area of mathematics, Linn observed that at last decades rate of improvement we can attain 100% proficiency in the fourth grade by 2056, in the eighth grade by 2060, and the twelfth grade by 2166 (Elmore, 2003).

Conclusion

The notion of NCLB is that given enough pressure from the accountability system and some additional resources, the schools will improve and the goals will be met. One can agree that that schools should improve and that holding schools accountable will contribute to the improvement, but still argue that having the goal of 100% student proficiency is unrealistic. Although many states have established performance standards for their tests, the standards were set without

knowledge that they would be used to determine AYP objectives or that substantial sanctions would be associated with not meeting AYP targets (Linn, 2000). Furthermore, having a goal that is unattainable and that one that standards have not been specifically designed for can do more to demoralize school staff and public confidence in schools than to motivate to greater effort.

Pennsylvania's Response to the Mandates of NCLB

In all states that are seeking Title I, Part A funds, a state must develop an education plan to meet the mandates of the NCLB legislation. This plan must be developed in consultation with school districts, administration, teachers, and parents. The state education plan must include state-adopted challenging academic content standards and achievement standards in at least the following subject areas;

- Mathematics
- Reading/Language Arts
- Science

Pennsylvania has already developed and approved challenging content standards in the following areas (See Table 2).

Academic Standard	Date Approved
Arts and Humanities	January 11, 2003
Civics	January 11, 2003
Economics	January 11, 2003
Family and Consumer Science	January 11, 2003
Geography	January 11, 2003
Health and Physical Education	January 11, 2003
History	January 11, 2003

Environment and Ecology	January 5, 2002
Science and Technology	January 5,2002
Reading, Writing, Listening, and Speaking	Already part of Chapter 4
Mathematics	Already part of Chapter 4

Table 2 – List of Academic Standards approved in Pennsylvania

These standards were developed by teachers, with opportunities for comment given to school districts, administration, parents, and the general public (PDE website, 2003).

Pennsylvania’s accountability system includes every public school and local education agency (LEA), with a goal of 100% of all students attaining proficiency by the end of the 2013-2014 school year. This system is a part of Chapter 4 of Title 22 of the Pennsylvania School Code. The stated purposes of Chapter 4 are to establish rigorous academic standards and assessments to facilitate the improvement of student achievement and to provide parents and communities a measure by which school performance can be determined (22 Pa. Code 42). All students in the Commonwealth are expected to participate in the state assessments, with an exception of those students granted a religious exemption (22 Pa. Code 42). The state education plan must also demonstrate that the state has implemented academic assessments as follows;

- Present through 2004 school year- mathematics and reading/language arts once a year in grades 3-5, 6-9, and 10-12.
- 2005-2006 school year – mathematics and reading/language arts every year in grades 3-8 and at least once on high school.

- 2007-2008 school year – mathematics and reading/language arts as mentioned above, and science at least once in grades 3-5, 6-9, and 10-12 (PDE, 2003).

Pennsylvania has adopted a single accountability system for assessing achievement of the academic and content standards known as the Pennsylvania System of School Assessment (PSSA). The PSSA currently includes mathematics and reading/language arts assessments and is administered to students in grades 3, 5, 8, and 11. There is also a PSSA writing assessment given to students in grades 6, 9, and 11. In order to meet the mandates of NCLB, the reading/language arts and mathematics assessments will be expanded to include all students in grades 4, 6, and 7 by the 2005-2006 school year. A science assessment will be administered to students in grades 4, 7, and 10 by the 2007-2008 school year (PDE, 2003).

The PSSA allows accommodations for students with mild disabilities as stated in their IEP's, however, the Pennsylvania Alternative System of Assessment (PASA) is designed for those students with more severe disabilities where the IEP states that the PSSA is not appropriate. The administration of this assessment is based upon six rigorous criteria and is aligned to the Pennsylvania Academic Standards. The PASA is appropriate for students who have significant cognitive disabilities and who require intensive instruction and extensive support in order to perform and/or participate meaningfully and productively in the everyday activities of integrated school, home, community and work environments. These students require substantial modification of the general education curriculum as well as instruction in areas not presently

assessed by the PSSA (PDE, 2003). The decision about participation in the standard statewide assessment, whether it is the PSSA or the PASA, is made by the IEP Team. The criteria listed below in Table 3 should guide the IEP Team’s decision-making. Using the Criteria Table, only students who have YES marked in all six of the boxes should be considered for the PASA.

CRITERIA	YES	NO
By September of the present school year, is the student in grade 5, grade 8, or grade 11?		
Does the student have significant cognitive disabilities?		
Does the student require intensive instruction to learn?		
Does the student require adaptation and support in order to perform and/or participate meaningfully and productively in the everyday life activities of integrated school, home, community, and work environments?		
Does the student require substantial modifications of the general education curriculum?		
Does the student’s participation in the general education curriculum differ greatly in form and/or substance from that of most other students (different objectives, materials, or activities, for example)?		
TOTAL:		

Table 3 – Criteria for PASA (PDE, 2003)

If the PASA is not appropriate for the student, then the student must take the PSSA. The ½% of the students that will participate in the PASA will be included in the accountability reporting at the school and LEA levels. This is consistent with the NCLB regulations that allow up to 1% of the students permitted to be measured against standards that are not at grade level. Pennsylvania

will also be expanding the PASA to grades 4, 6, and 7 in order to remain consistent with the NCLB legislation.

In regards to limited English proficient (LEP) students, Pennsylvania is working in collaboration with other states to develop an English Language Proficiency assessment that will meet the requirements of NCLB (PDE, 2003). This assessment will include a program evaluation to determine student progress and achievement of proficiency. It is anticipated that the English Language Proficiency assessment will be available by the spring of 2005. Currently, LEA's in Pennsylvania are required to administer, at the end of every school year, a State-approved English language proficiency assessment that measures the domains of comprehension, listening, speaking, reading, and writing (PDE, 2003). LEP students will be included in the overall accountability systems in the same manner as the other students. Thus, the assessment results of every LEP student enrolled in the school for a full academic year (identified as being enrolled in the same school from October 1 of a school year until the end of the testing period) will be included in the school's, LEA's, and State's results. All LEP students are required to take the statewide assessment and will receive results regardless of the duration of enrollment in a particular school (PDE, 2003). This mandate is much more stringent than the NCLB guidelines which require LEP students that have been enrolled in a school for three consecutive years to take the English version of the reading/language arts assessment. Pennsylvania does not currently have a native language version of its state assessments; therefore, students must take the English version of the reading/language arts assessment with or without accommodations.

All assessments other than the PASA are based upon the grade-level academic content standards in which the student is enrolled. Pennsylvania does not have, nor is it considering an “out of level” assessment. The results of assessments taken by students with disabilities are counted in the same manner as other students, with no adjustments or accommodations to the score.

The state education plan must also contain achievement standards that;

- Align with the state’s academic content standards.
- Describe a basic level of high achievement (proficient and advanced) that determines how well children are mastering material in state academic content standards.
- Describe a basic level of achievement to provide complete information about the progress of lower achieving children toward mastering proficient and advanced levels of achievement (PDE, 2003).

Pennsylvania has aligned the assessments with the content standards and developed a rubric based on four levels of student achievement: advanced, proficient, basic, and below basic. The definitions of the four levels are as follows:

Advanced – Superior academic performance indicating an in-depth understanding and exemplary display of the skills included in the Pennsylvania Academic Standards;

Proficient – Satisfactory academic performance indicating a solid understanding and adequate display of the skills included in the Pennsylvania Academic Standards;

Basic – Marginal academic performance, work approaching, but not yet reaching, satisfactory performance, indicating partial understanding and limited display of skills included in the Pennsylvania Academic Standards; and

Below Basic – Inadequate academic performance that indicates little understanding and minimal display of the skills included in the Pennsylvania Academic Standards (PDE, 2003).

Pennsylvania has produced a State Report Card for the first time that reflects where Pennsylvania stands on key indicators of academic achievement and teacher quality for the 2002-2003 school year. The report card contains the following data:

- Statewide reading and mathematics performance averages on the PSSA at the 5th, 8th, and 11th grade levels overall and by gender, race/ethnicity and economic status.
- Highly Qualified Teacher Information.
- Attendance and graduation rates.
- Data such as those found in the report card helps PA school districts and PDE focus on specific groups of students who are currently not meeting academic standards (PDE, 2004).

The State and School Report Card Bill (Act No. 153 of 2002) incorporates the reporting requirements of NCLB into the Pennsylvania School Code. It transforms the school profiles into a state report card, and the report card is published on the Department of Education website to

insure that the citizens are aware of the progress in the schools. The required data elements for the state report card are as follows:

1. Information, in the aggregate, on student achievement at each proficiency level on the State academic assessments (disaggregated by race, ethnicity, gender, disability status, migrant status, English proficiency, and status as economically disadvantaged, except that such disaggregation shall not be required in a case in which the number of students in a category is insufficient to yield statistically reliable information or the results would reveal personally identifiable information about an individual student).
2. Information that provides a comparison between the actual achievement levels of each student subgroup and the State's annual measurable objectives for each such group of students on each of the academic assessments.
3. The percentage of students not tested (disaggregated by student subgroup, except that such disaggregation shall not be required in a case in which the number of students in a category is insufficient to yield statistically reliable information or the results would reveal personally identifiable information about an individual student).
4. The most recent 2-year trend in student achievement in each subject area, and for each grade level, for the required assessments.
5. Aggregate information on any other indicators used by the State to determine the adequate yearly progress of students in achieving State academic achievement standards disaggregated by student subgroups.
6. Graduation rates for secondary school students disaggregated by student subgroups.

7. Information on the performance of LEAs in the State regarding making AYP, including the number and names of each school identified for school improvement.
8. The professional qualifications of teachers in the state, the percentage of such teachers teaching with emergency or provisional credentials, and the percentage of classes in the State not taught by highly qualified teachers, in aggregate and disaggregated by high-poverty compared to low-poverty and the bottom quartile of poverty in the State (PDE, 2003).

The information in Table 4 highlights student academic performance in mathematics for the Pennsylvania State Report Card for the 2002-2003 School Year (PDE, 2004):

Table 4. Mathematics – State Standard 35% Proficient and Advanced

	Number of Students	Participation Rate (%)	Below Basic (%)	Basic (%)	Proficient (%)	Advanced (%)	Advanced and Proficient (%)
All students	407,115	97.6	26.1	21.5	29.0	23.3	52.3
Gender							
Males	206,760	97.5	26.1	20.4	28.8	24.7	53.4
Females	197,028	97.9	26.0	22.6	29.3	22.0	51.3
Race/Ethnicity							
White	318,584	98.3	19.7	21.2	32.1	27.1	59.2
Black	56,265	94.9	55.6	23.7	15.6	5.0	20.6
Latino/Hispanic	8,467	98.5	15.2	16.4	27.1	41.2	68.3
Native American	529	97.1	35.0	23.1	27.0	14.9	42.0
Other Groups							
IEP	52,604	95.1	67.8	17.7	10.7	3.8	14.6
LEP	6,859	96.9	53.6	20.5	17.0	8.8	25.8
Migrant	1,305	98.0	55.9	20.8	17.1	6.3	23.4
Econ. Dis.	115,879	96.1	46.1	24.4	20.7	8.8	29.5

It is evident through the release of this report card that Pennsylvania still has much work to do in order to ensure that all of the disaggregated groups that are being assessed are meeting the mandates of NCLB in mathematics. It should be noted that in the results of all the disaggregated groups with the exception of Asian students, LEP students, and migrant students, students performed at a higher level academically in reading than in mathematics.

Pennsylvania has remained consistent with the objectives of the NCLB legislation by ensuring that every student becomes proficient in mathematics and reading by 2013-2014 based on assessment participation of 95% or greater overall and for each subgroup. Pennsylvania has established measurable objectives to assess the AYP of every public school and LEA within the state. The Pennsylvania accountability system includes all of the federally required subgroups (PDE, 2003);

- All students
- Students with Individual Education Plans
- Limited English Proficient students
- Economically Disadvantaged students
- Major racial/ethnic groups
 - a. White (Non-Hispanic)
 - b. Black/African-American (Non-Hispanic)
 - c. Latino/Hispanic
 - d. Asian or Pacific Islander
 - e. Native American or Alaskan Native
 - f. Multicultural

The starting point for AYP in reading/language arts and mathematics were calculated based on the 2001-2002 assessment data results. The Commonwealth has established separate starting points in reading/language arts and mathematics for measuring the percentage of students meeting or exceeding the State's proficient level of academic achievement. The starting points are based on the higher of the following percentages of students at the proficient level; (1) the

percentage in the State of proficient students in the lowest-achieving subgroup; or (2) the percentage of proficient students in a public school at the 20th percentile of the State’s total enrollment among all schools ranked by the percentage of students at the proficient level (PDE, 2003). The starting points for proficiency are 35% proficient in mathematics and 45% proficient for reading/language arts. Pennsylvania has chosen not to have the first incremental increase for three years (2005) and then to have incremental increases every two years until 2011, and then annual incremental increases until 2014. Table 5 outlines the AYP measurable objectives in mathematics and reading.

ASSESSMENT YEAR	MATH	READING
2002	35	45
2003	35	45
2004	35	45
2005	45	54
2006	45	54
2007	45	54
2008	56	63
2009	56	63
2010	56	63
2011	67	72
2012	78	81
2013	89	91
2014	100	100

Table 5 – AYP Measurable Objectives until 2014 (PDE, 2003)

Pennsylvania has also added additional academic indicators as mandated by NCLB as a requirement for schools and LEAs to reach AYP goals each year. In the elementary and middle schools, improved child attendance rates will serve as the additional academic indicator. Schools and LEAs that either improve their attendance rate from the previous year, or are at or above 95% will make AYP. In secondary schools, graduation rate will be used as the additional academic indicator. Schools and LEAs that either improve from the previous year, or are at or above the 95% rate will make AYP. This academic indicator will be measured over time comparing the number of students that are graduating to the total number of students entering the ninth grade class four years earlier (PDE, 2003).

There has been a great amount of debate among states regarding the number of students that should be used in the subgroup in order for that data to be disaggregated and reported. It was a fear of the states that if the number of students were set too high, it would eliminate large percentages of schools from having to report disaggregated data on various subgroups. If the number were too low, there would be a possibility that individual student identities would be identified rather than subgroups. Pennsylvania has set the minimum number of students for subgroups for accountability at 40, the minimum number of students for reporting is 10 (PDE, 2003). However, no school shall be excluded from analysis, school with subgroups lower than 40 but greater than 10 will use two or three consecutive years of data in determining AYP calculations. These schools will need to meet the same accountability standards as schools with numbers of 40 or above in their subgroups (PDE, 2003).

Pennsylvania has established a system of rewards and sanctions for public schools and LEAs that are aligned with NCLB. State law will provide for schools and LEAs to be recognized as distinguished and given recognition and/or monetary rewards if they meet and/or exceed AYP targets for two consecutive years. Use of the monetary rewards will be based on collaboration between staff and administration. Those schools that do not meet AYP targets are subject to the sanctions described earlier in this chapter. All schools are affected by the goal of meeting AYP targets, Pennsylvania has adopted a “feeder school” approach to hold schools that do not administer statewide assessments (K-2, K-3, and K-4) accountable for student performance. This approach was implemented at the beginning of the 2003 school year, and will involve determinations based on student-level (rather than school-level) aggregate data. Scores at the tested grade will be tracked to the previous school where the student attended (PDE, 2003).

Pennsylvania has developed an alternative system for schools to use to demonstrate academic growth as an appeal basis for AYP status (PDE, 2003). The Pennsylvania Performance Index (PPI) allows schools to demonstrate academic growth across the full range and continuum of achievement – not limited solely to proficiency by the increase of scores on the performance multiplier index. The PPI assigns weights to the percentage of students at the different levels and sub-level of the PSSA (PDE, 2003). There are six descriptive categories used to rate student performance. Each is associated with a specific range on the performance index multiplier from 0 to 1 (PDE, 2003). The goal of the Commonwealth is to have all students attain a performance index of 1 by the year 2014 in order to achieve the national goal set forth by NCLB.

(See Table 6). Each Pennsylvania school and school district will be able to demonstrate academic growth by the extent to which their scores related to the performance index changes from one year to another, compared to the improvement target for the same period (PDE, 2003). Unlike the Safe Harbor provision, the PPI has yet to be approved by the federal government as a means for exempting schools and school districts from meeting the measurable yearly goals of AYP.

GRADE	Math Scaled Score Range	Reading Scaled Score Range	Performance Multiplier Index	Performance Level
5	>= 1300	>= 1300	1.0	Proficient
5	>1234 and <=1299	>1229 and <=1299	.8	High Basic
5	>1169 and <=1234	>1159 and <=1229	.6	Low Basic
5	>934 and <=1169	>929 and <=1159	.4	High Below Basic
5	>0 and <=934	>0 and <=929	.2	Low Below Basic
5			0	Untested
8	>= 1300	>= 1300	1.0	Proficient
8	>1239 and <=1299	>1204 and <=1299	.8	High Basic
8	>1179 and <=1239	>1129 and <=1204	.6	Low Basic
8	>939 and <=1179	>914 and <=1129	.4	High Below Basic
8	>0 and <=939	>0 and <=914	.2	Low Below Basic
8			0	Untested
11	>= 1310	>= 1290	1.0	Proficient
11	>1244 and <=1309	>1214 and <=1289	.8	High Basic
11	>1179 and <=1244	>1139 and <=1214	.6	Low Basic
11	>939 and <=1179	>919 and <=1139	.4	High Below Basic
11	>0 and <=939	>0 and <=919	.2	Low Below Basic
11			0	Untested

Table 6 – Pennsylvania Performance Index (PPI) (PDE, 2003)

The “basic elements” of Pennsylvania’s state education plan were approved on June 2, 2003, this documented that the Commonwealth was aligned with the mission and vision of the NCLB legislation. However, the realities of the affects of NCLB are that many schools are not meeting

the target goals set by AYP in Pennsylvania. (see Table 7).

Category	No. of Schools
Making AYP	1,696
Making Progress	21
Schools in Need of Improvement	
Warning (Year 1)	771
School Improvement I (Year 2)	155
School Improvement II (Year 3)	2
Corrective Action (Year 4)	11
Corrective Action (Year 5)	130

Table 7 – Schools Making and Failing to Reach AYP Targets (2003)

Pennsylvania must now work to remedy the situation caused by the mandates of the NCLB legislation, many schools and LEAs will be in need of receiving technical assistance from the State. The next few years are crucial in the continuing reform of education in Pennsylvania.

The Great Mathematics Debate

The discussion over school mathematics curriculum has been one of the fiercest debates in education history. These debates continue today over the teaching and the learning of school mathematics within American classrooms. In order to understand the scope of the debate we must examine the definitions of mathematics curriculum, an examination of the discipline of mathematics, a review of the recent history of mathematics curriculum reform, and then examine mathematics in the schools. All of these factors play an important role in the debate of school mathematics and its relationship to student performance and school and school district accountability.

To highlight the perspectives regarding curriculum, four characteristics of the school and its program are considered;

1. Schools are goal directed. Schools for all children are historically recent and were created to transmit aspects of the culture to the young and to direct students toward and provide them with an opportunity for self-fulfillment.
2. Schools are places where conceptions of knowledge are distributed and maintained. One important decision that must be made by those who organize schools is what to teach. The decision must grow out of a consensus on what is important for the young to know.
3. School is a place of work, where students, teachers, and administrators act to alter and improve the world; produce positive social relations; and realize specific human purposes. For example, it is assumed that knowledge will be acquired via some deliberately created activities organized and managed by the teacher.
4. The work in schools is carried out by using an establishment of technology (Popkewitz, Tabachinck, and Wehlage, 1982)

These factors are ever present in the curriculum debate regarding the discipline of mathematics. It is the curriculum and teaching methods that are at the forefront of the discussion of school mathematics curriculum reform. In order to examine curriculum we must first develop an operational definition of what school mathematics curriculum entails. Romberg (1992) defines mathematics curriculum as an operational plan for instruction that details what mathematics students need to know, how students are to achieve the identified goals, what teachers are to do to help students develop their mathematical knowledge, and the context in which learning and teaching occur. Romberg (1992) further states that the curriculum problem for any discipline

including mathematics is that “deliberate teaching requires choices as to what to teach” and that “choices must be made at two levels; first at the level of determining whether a specific discipline will be chosen as a school subject; and second if it is selected, what aspects should be included in the curriculum.” There is no doubt that mathematics should be selected to be taught in schools, the debate is about what aspects of the discipline of mathematics should be taught, at what grade levels, and how should they be taught.

At the very heart of the debate regarding school mathematics is the discussion of what is mathematics? Mathematics has been created and developed by humans over the past 6,000 years. Mathematical objects were developed in response to social problems and have contributed to the development of contemporary society. For over 2,000 years, mathematics has been viewed as a body of infallible truth far removed from the affair and values of humanity. However, the importance of the development of mathematics, next to the invention of language itself, is the most subtle, powerful, and significant achievement of the human mind (Romberg, 1992). This view of mathematics is not shared by all society most of the population perceive mathematics as a fixed body of knowledge long set into final form. Its subject matter is the manipulation of the numbers and the proving of geometrical deductions. It is a cold and austere discipline that provides no scope for judgment and creativity. These views are undoubtedly a reflection of the math that is taught in schools rather than an insight into the discipline itself. These views are limiting to the student of math, because they are often held by persons who make decisions regarding school mathematics (Romberg, 1992). However, this is not the true essence of mathematics as seen by others. Battista (2001) states “mathematics is first and

foremost a form of reasoning. In the context of analytical reasoning about particular types of quantitative and spatial phenomena, mathematics consists of thinking in a logical manner, formulating and testing conjectures, making sense of things, and forming as well as justifying propositions, inferences, and conclusions.” Mathematics needs to be studied in living contexts that are meaningful and relevant to all learners, it is not a fixed set of numbers but instead an empirical science (Romberg, 1992). Mathematics can also be defined as a language, as a particular kind of logic structure, and as a body of knowledge about numbers and space, as a series of methods for drawing conclusions, as the essence of our knowledge of the physical environment, or as an amusing intellectual activity (Romberg, 1992).

Recent History of Mathematic Reform

The quality of mathematics and science achievement of students in America has been a major area of concern for the last fifty years. The need for reform in the area of mathematics was demonstrated by decreasing test scores and a national feeling of the American public that our schools were not producing highly skilled graduates that would allow the United States to compete internationally. The perceived culprit was the American school system and the way in which students were taught and learned in a traditional classroom. The mathematical content taught in the traditional mathematics classroom finds students spending most of their time attempting to learn traditional computational procedures (Battista, 2001). Scope and sequence charts that specify procedural objectives to be mastered by students at each individual grade level were produced. The goal for students was that they sequentially mastered one concept and skill after another one, thus defining mathematics as a discipline controlled by strict ordering,

memorization, and repeated practice of skills and concepts (Romberg, 1992). The work and role of teachers and students is usually very complementary in the traditional classroom. The role of the teacher is to transmit knowledge, and the role of the student is to receive it, then to regurgitate it on demand. The result is that the traditional classroom focuses on competition, management, and group aptitudes, the mathematics taught is assumed to be a fixed body of knowledge that students will absorb (Romberg, 1992).

American schooling is notoriously resistant to the kinds of fundamental changes in its core values and practices that are implied by the mathematics education reform movements (Nelson, 1997). These reform movements called for the abandonment of curricula that promote thinking about “mathematics as a rigid system of externally dictated rules governed by standards of accuracy, speed, and memory (Battista, 2001). The new programs of mathematics should operate under the premise that student learning does not need to occur under passive reflection. The new program should expect students to be active and passionate learners. It should constantly extend learners by having them make, test, and validate conjectures. The work of students should no longer be a matter of acting within somebody else’s structures, answering somebody else’s questions, and waiting for the teacher to check responses. Nor should it be evaluating knowledge according to wrong or right answers. The mathematical knowledge that is created must “fit” with that mathematical knowledge already created by the student, and that which does not fit will create conjecture (Romberg, 1992). When we examine the recent history of mathematics reform in the United States we cannot help but be aware of the similarities of the New Math reform of the 1950’s, the *Curriculum and Evaluation Standards for School*

Mathematics developed by the National Council of Teachers of Mathematics (NCTM) in 1989, and the subsequent revision to the Standards, the *Principles and Standards for School Mathematics* developed by NCTM in 2000. The three reforms were very similar in that they were caused by discourses that were occurring in society that called for a change in the teaching and learning of mathematics.

The New Math grew out of research conducted in several universities in the 1950's. In 1955, there was a call by the Commission on Mathematics, a group that was equally consisted of high school teachers, math educators, and mathematicians, for a curriculum that would better prepare students for college (Loveless, 2001). However, it was not until the Soviet launch of Sputnik in 1957 that the New Math program received national priority. School districts, specifically the lack of adequate math and science programs, took the blame for the sudden realization that there was a shortage of workers in highly skilled fields and that the Soviet Union was producing skilled workers at a much faster rate (Loveless, 2001). Congress allocated millions of dollars in funds as part of the National Defense and Education Act (NDEA) that provided resources for research to improve the teaching of mathematics and other related fields in public high schools across the country. The New Math program was already being developed and received national prominence as a means for improving mathematics education in the United States. In respect to content, the New Math was primarily concerned with getting students to understand the structure of mathematics. Even though the New Math utilized a great deal of hands-on materials, the objective was for the students to be able to grasp the abstract principal that was being taught. Advocates of the New Math program called for a "meaning-centered" approach to mathematics

that focused on the meaning of a particular abstract principal and the structure of mathematics and casts the traditionalist views of memorization and repeated practice in a negative light. The New Math program received legitimacy because of the reputation of its founders' and administrators', it was never encoded in state policies or standards (Battista, 2001). After 25 years in the spotlight, the New Math program was no longer viewed as relevant for schools.

The 1980s was a time of national insecurity over America's place in the world and the relationship of global economic competition to the performance of students in our schools. There was a movement to reform school mathematics in response to the documented failure of traditional mathematics teaching, to curriculum changes necessitated by the widespread availability of electronic computers and calculators, and to substantial progress in the scientific study of mathematical learning (Battista, 2001). The focusing event that energized the American public to demand change in public schools was the publications of *A Nation at Risk*, in 1983 (Loveless, 2001). This report documented the decline of the nations test scores and warned that the American education system was "being eroded by a tide of mediocrity that threatens our very future as a nation and a people." The NCTM called for the development of new standards that would define what students should know and be able to do, the public was supportive and ready to try these standards (Loveless, 2001). The implications of the vision of the NCTM Standards go far beyond what would result if many individual classrooms changed, one by one. Rather, they imply a new intellectual culture for schools, a culture that legitimizes and supports curiosity and challenge as the engines of learning, continuous exploration of mathematics and mathematical thinking on the part of both students and teachers, an orientation of reflection

toward one's teaching and children learning, and intellectual collegiality among teachers and between the teachers and the administration (Nelson, 1997). In the 1990s, the NCTM Standards began to receive criticism from mathematicians, businessmen, and parents that school graduates were not prepared because they did not have an understanding of basic mathematic principles (Battista, 2001). There was also a criticism of the Standards because they described the manner in which teachers should teach, but were very vague when detailing what content students should learn. However, unlike the New Math, the NCTM Standards were very much a part of public policy and statewide standards. The future of the NCTM Standards was very cloudy.

The *Principles and Standards for School Mathematics* released by NCTM in 2000 was in response to the overwhelming criticism that the original standards received at the end of the 1990s. These principles and standards were developed in order to calm the fears of detractors regarding the new ways of teaching and learning. The principles and standards seem to seek to compromise the role of traditional held values of teaching and learning and a constructivist view of teaching and learning. In the NCTM publication, *Principles and Standards for School Mathematics (2000)*, school mathematics is addressed in six themes;

1. Equity – Excellence in mathematics education requires equity – high expectations and strong support for all students. All students must have the opportunity to study and support to learn mathematics. Equity does not mean that all students receive identical instruction; instead it demands that reasonable and appropriate accommodations be made to promote access and attainment for all students. High expectations can be achieved in

part with instructional programs that are interesting for students and help them see the importance and utility of continued mathematical study for their own future.

2. Curriculum- A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across grade levels. A coherent curriculum effectively organizes and integrates important mathematical ideas so that students can see how the ideas build on, or connect with other ideas, thus enabling them to develop new understandings and skills. Learning mathematics involves accumulating ideas and building successively deeper and more refined understanding. A school mathematics curriculum should provide a road map that helps teachers guide students to increasing levels of sophistication and depths of knowledge.
3. Teaching- Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well. To be effective, teachers must know and understand deeply the mathematics that they are teaching and be able to draw on the knowledge with flexibility in their teaching tasks. Teachers must also create an environment where serious mathematical thinking is the norm. Teachers must also carefully observe students, listen to their ideas and explanations, develop mathematical goals, and use all of this information to base instruction.
4. Learning- Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge. One of the greatest findings in research is that conceptual understanding is an important component of proficiency, along with factual knowledge and procedural facility. Mathematics makes more sense

and is easier to remember and to apply when students connect new knowledge to existing knowledge in meaningful ways. Students learn more and learn better when they take control of their learning by addressing their goals and monitoring their own progress.

5. Assessment- Assessment should support the learning of important mathematics and furnish useful information to both the teachers and the students. The Assessment Standards for School Mathematics presented six standards about exemplary mathematics assessments. They addressed how assessments should; reflect the mathematics that students should know, and be able to do,

- enhance mathematical learning,
- promote equity,
- be an open process,
- promote valid inferences, and
- be a coherent process.

6. Technology- Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances student learning. School students can learn more mathematics more deeply with the appropriate use of technology. Technology should not be used as a replacement for basic understanding and intuitions; rather, it can and should be used to foster those understandings and intuitions.

The single most compelling issue in the history of school reform issue is to the change in the epistemology of mathematics in the school, the sense on the part of the teachers and students of what the mathematical enterprise is all about (Romberg, 1992)

The Schools Role in the Reform Process

Schools are the essential transformation mechanisms between life in the family and life as an adult. Schools should prepare students to be productive citizens (Romberg, 1992). Mathematics in American schools was a collection of hierarchically arranged concepts and skills. Scientific management has resulted in hierarchical classifications and taxonomies of mathematical knowledge (Romberg, 1992). However, mathematics is much more than classifications and taxonomies, mathematics must be viewed and taught in schools from a cultural perspective that:

- mathematics consists primarily of human mathematical problem posing and solving, an activity that is accessible to all. Consequently, school mathematics for all should be certainly concerned with human problem posing and solving,
- mathematics is a part of human culture, and the mathematics of each culture serves its own unique purposes, and is equally valuable. Consequently, school mathematics should acknowledge the diverse culture and historical origins and purposes of mathematics,
- mathematics is not neutral, but laden with the values of its makers and their cultural contexts, and users and creators of mathematics have a responsibility to consider its effects on the social and natural world,
- consequently, school mathematics should explicitly acknowledge the values associated with mathematics and its social uses. Learners should be aware of implicit social messages in the mathematics curriculum and should have the confidence, knowledge, and skills to be able to understand the social issues of mathematics (Ernest, 1991).

The role of the student and teacher has changed dramatically within the educational reform movement. Rather than viewing (1) mathematics as the absorption of a series of facts and mastering of procedural manipulations and (2) teaching as the provision of conditions for absorption and practice, teachers and students are now meant to view mathematics as a subject that can be reasoned out and make sense. Reformers want mathematical classrooms to function as mathematical communities in which students have the opportunities to reason mathematically, communicate with others about mathematical ideas and opinions, and make connections among mathematical ideals and between mathematics and their own daily lives (Nelson, 1997). This view is supported by the NCTM vision of the classroom environment as a place where inquiry, sense making, and problem solving is occurring. Teachers provide students with numerous opportunities to solve complex and interesting problems, to read, represent, discuss, and communicate mathematics, and to formulate and test the validity of personally constructed math ideas (Battista, 2001). The NCTM Standards (1989) states, “we are convinced that if students are exposed to the kinds of experiences outlined in the Standards, they will be given Mathematical power.” This term denotes an individual’s ability to explore, conjecture, and reason logically, as well as the ability to use a variety of mathematical methods effectively to solve the non-routine problems. This notion is based on the recognition of mathematics as more than just a collection of concepts and skills to be mastered, but it includes methods of investigating, reasoning, communicating, and a reliance on past knowledge and experience (NCTM, 1989). A student that is “mathematically powerful” as an outcome of their schooling has a deeper understanding of mathematics than a person who is mathematically literate or one

who has memorized concepts, skills, and numbers. This student has the ability to grasp the implications of many mathematical concepts and utilize these concepts in their daily lives and assign a personal meaning to these concepts.

The role of the teacher is to support, promote, encourage, and in every way facilitate the creation of knowledge by the student. The NCTM has published a *Professional Standards for Teaching Mathematics* manual in which the teachers demonstrated being proficient in:

- selecting mathematical tasks to engage students' interests and intellect,
- providing opportunities to deepen their understanding of the mathematics being studied and its applications,
- using, and helping students use technology and other tools to pursue mathematical investigations
- seeking, and helping students seek connections to previous knowledge and developing new knowledge, and
- guiding individual, small group and whole class work (NCTM, 1991).

Studies of teachers in the process of changing their teaching to support children's construction of mathematical knowledge indicate that many teachers begin with the following beliefs:

- that students are "empty vessels" waiting to be filled. This belief evolves toward a belief that students are intellectually generative, with great capacity to pose their own questions and develop their own solutions to problems,

- that students learn by being told what to do. This belief evolves toward a confidence that students will learn through their own effort and can take great responsibility for their own learning,
- that mathematics consists of a series of isolated facts and topics in a certain order. This belief evolves toward a view of mathematics as a flexible network of ideas, with many interconnected, that can be approached in a variety of ways, and
- that instruction should follow the textbook and the teacher's responsibility is to cover the material. This evolves toward the belief that instruction should be built on what students know and can do, and focus on important questions and ideas in the field (Nelson, 1997).

Research on learning shows that most students cannot learn mathematics effectively only by listening and imitating, yet most teachers teach that way. Students actually construct their own individual understanding based on new experiences that enlarge the intellectual framework in which ideas can be created. Mathematics becomes useful to a student only when it has been developed through a personal intellectual engagement that creates new understanding (NRC, 1989). This speaks to the idea that reform literature has developed a new conception of knowledge itself and how students learn mathematically. Learning proceeds through the individual's construction of understanding of a concept, not by accepting facts and rules from a teacher or a textbook. Teaching therefore is the facilitation of knowledge construction, not the delivery of information and the opportunity to practice (Nelson, 1997).

The reform movement has called for a shift in content from learning only skills and procedures to being able to use mathematical knowledge to help solve problems, a shift in teaching from disseminating information to enabling students learn using student thinking as the platform, and a shift in assessment from an end of the unit evaluation to using the results of the assessment to inform the teacher and the learning process (Burrill, 2001). Now learning is seen as the process of thinking through puzzling and often difficult ideas, and teaching as providing resources and guidance for such thinking. Students and teachers are viewed as being engaged in creative activities requiring judgment, classrooms are now the locus of intellectual debate and discussion that can stretch far beyond the classroom walls and the prescribed class time (Nelson, 1997). When learning is disconnected from personal sense making, most students are overwhelmed in their attempts to memorize countless rules for symbols. Even worse, the students lose sight of what symbol manipulation implies about real-world quantities (Battista, 2001).

Chapter II – Introduction

The mandates of the *No Child Left Behind Act of 2001 (NCLB)* clearly set the tone for academic reform in all states, school districts, and schools throughout the United States. States and public school systems have the responsibility of implementing the mandates of NCLB and ensuring that student performance is in accordance with the goals of the legislation. This latest reauthorization of the *Elementary and Secondary Education Act (ESEA)* includes new standards, testing, provisions, and sanctions designed to improve student performance and educational accountability. In Pennsylvania, the Department of Education proposed an accountability system to ensure that all schools are meeting the goals of the adequate yearly progress (AYP). At this time, the proposed state system has not been approved by the Federal NCLB leaders. Those schools that do not meet the goals of AYP are listed and are supposed to be provided with additional resources to enable them to meet the stated goals. Those school districts and schools that continue to not meet the measurable AYP goals face sanctions which include an initial warning to the possible takeover of the school district by a state-run committee. Pennsylvania has chosen to use the Pennsylvania System of School Assessments (PSSA) as its tool for measuring student performance in relation to the approved academic standards for students in grades three through eight. These annual assessments allow members of the educational constituency groups to follow student performance and also demonstrate how members of the various disaggregated groups are performing on state assessments.

The area of school mathematics has been one in which federal and state governments have demonstrated an interest in for the past 50 years. There have been many reform movements

which have attempted to shape the identity of mathematics taught in our nation's classrooms. A theological good-versus-evil hue colored the state's math reforms, which included the introduction of new frameworks in 1985 and 1992. Familiar themes emerged pitting a child centered ideology emphasizing "real life" problem-solving against the boring, factory floor experience of arithmetic drills and pencil and paper computations. With reform mathematics, students would use calculators and manipulatives to understand the numeric relationships. They would read and discuss the mathematical problems in an effort to understand not just computational value, but how this knowledge applies to life. These reforms are being met with opposition by those who claimed that this new "fuzzy math" do not teach students the basics for using school mathematics. Opponents use declining test scores and examples of teachers not teaching arithmetic principles. In 2000, in response to the public criticism, the National Council of Teachers of Mathematics (NCTM) revised its framework to blend traditional instruction with many of the components of the reform movements, placing greater emphasis on arithmetic, computation, and pen and pencil algorithms (Gordon, 2003).

In an effort to meet the goals of adequate yearly progress set by the federal and state governments, school districts and schools have had to change and adapt some of their policies and practices. Thus the process of decision making within the educational organization has come under a great deal of scrutiny by many members of the educational community. The key position of the community is that the central function of administration is the controlling and directing of the decision making process. Griffiths (1967) states that it is central in that all other functions of the school district and school can best be interpreted in terms of the decision making

process. Thus the decision making process in the development and improvement of curriculum and instruction is at the front of the educational agenda in today's society.

All school districts and schools face a tremendous challenge in making sure that they meet the mandates of the NCLB legislation. The NCLB legislation was designed to help all students meet high academic standards by requiring that states create annual assessments that measure what children know in the areas of math and reading in grades three through eight. These annual state assessments are based on the state standards and they will allow all educational constituency groups to follow the performance of every school in the nation, as well as their home school. Data from these assessment tests will be disaggregated for students by poverty levels, race, ethnic group, disabilities, and limited English proficiency to make sure that all students are included. The school will provide a report card which will demonstrate to parents and community members not only how well the students are meeting the academic standards but also the progress that all of the disaggregated groups are making in relation to the academic standards. School districts have had to review the structure of the curriculum and teaching methods that they are currently using in the area of mathematics, they must implement changes in order to try and improve math scores in order to meet the goals set by AYP. This study will utilize Easton's model of political decision making in examining three similar school districts efforts to reform their math curriculum in order to meet the measurable goals of eleventh grade student performance on the mathematics portion of the Pennsylvania State System of Assessments (PSSA).

Statement of Problem

What processes are being implemented and what results are being achieved in small school districts that have not met State and Federal criteria for proficiency in mathematics for at least four years and how were the interventions developed at the district level?

Definition of Terms

1. A Nation at Risk

Published on April 26, 1983, this report sounded the alarm that the current academic achievement of American school children was inadequate and needed to improve.

2. Achievement Gap

A measure of the difference in a student result indicator (e.g., PSSA results) between two subsets of the student population. Where the PSSA is concerned, the achievement gap between the two groups of students is measured by the difference in PSSA passing rates, PSSA mean scores, or PSSA performance levels. It may be reported by race/ethnicity, socioeconomic status, gender, or other student characteristic.

3. Act 16

Also known as the Educational Empowerment Act, it was passed in March of 2000 and help struggling districts with a history of low-test performance on the PSSA through the development of new management tools and grants targeted to make needed improvements in student achievement and school operations.

4. Adequate Yearly Progress (AYP)

States must establish a definition of yearly of yearly progress that each district and school is expected to meet. States must specify annual objectives to measure progress of schools and school districts to ensure that all disaggregated groups are demonstrating progress on state assessments. States must test 95% of all disaggregated groups and set intermediate goals for progress. All students must demonstrate proficiency on state assessments by the 2013-2014 school year.

5. America 2000

This was the result of the Governor's Summit on Education held at Charlottesville, Va. It centered on six national educational goals, school choice, voluntary national testing, and partnership with America 2000 communities. Although it didn't pass – it signaled the beginning of more comprehensive packages of federal education reforms and the dissatisfaction with existing initiatives.

6. Authorities

They are members of a system who engage in daily political affairs of the political system; they must be recognized by a majority of the members of the system as having responsibility for these matters; and their actions must be seen as binding most of the time by most of the members as long as they act within the limits of their roles.

7. Class A Similar Schools

According to the Pennsylvania Interscholastic Athletic Association (PIAA), a Class A school for football must have a male student enrollment between 1-193 in grades 9, 10 and 11.

8. Curriculum

A series of planned instruction aligned with the academic standards in each subject that is coordinated and articulated and implemented in a manner designed to result in the achievement at the proficient level by all students of specific knowledge and skills and the application of this knowledge.

9. Demands

An expression of opinion that an authoritarian allocation with regard to a particular subject matter should or should not be responsible for doing.

10. Disaggregated Groups

These are the subgroups that will be measured for AYP proficiency, in Pennsylvania they include; all students, students with individual education plans, limited English proficient students, economically disadvantaged students, and students from major racial/ethnic groups.

11. Essential Variables

The two essential variables of political life are (1) the allocation of values for a society and (2) the relative frequency of compliance with them.

12. Excessive Volume Stress

This occurs when a political system is confronted with a situation in which the input of information conveying demands becomes too great for the responsible members of the system to process for possible conversion to decisions.

13. Feedback Loop

A part of Easton's political decision making model, it is the channel that information regarding the behavior of the authorities regarding their decisions returns as inputs through the intra or extra societal environments.

14. Goals 2000

President Clinton's first major education legislation, it was enacted in 1994. This program provided funds for states to develop standards and assessments, and it authorized a federal board to certify national and state standards. Voluntary national standards were drafted by groups that had been funded by Goals 2000, but there was no public formal review process or board to certify these goals. This program was discontinued by the Congress.

15. Inputs

These are the stimuli that enter into the political environment through the intra or extra society. There are two types of inputs, demands and supports.

16. Local-Source Revenue Per-Student

Includes revenue for instruction, support services, and other operating purposes obtained from local sources, including real estate property and other district-levied taxes, investment earnings, and tuition. Revenue is divided by total enrollment to determine per-student basis.

17. National Council of Teachers of Mathematics (NCTM)

Founded in 1920, NCTM is the world's largest mathematics education organization, with nearly 90,000. NCTM is a public voice of mathematics education, providing vision, leadership, and professional development to support teachers in ensuring mathematics learning of the highest quality for all students.

18. New Math

This was the name given to the mathematics reform movement in the 1960's. It was funded after the 1957 launch of Sputnik. This reform was the idea of mathematics professors who wanted to change the way in which mathematics was taught in the nation's schools. It stressed the conceptual idea of mathematics, rather than focus on the computational skills. This reform met great opposition after subsequent test scores began to decline. There was a strong "back to basics" movement which ended the interest in New Math reform.

19. No Child Left Behind Act of 2001

Latest revision of the Elementary and Secondary Schools Act (ESEA) passed by Congress in December 2001 and signed into law January 8, 2002, greatly expands the federal government's role in the operation of public schools and imposes a host of new obligations on local schools and school districts.

20. Outputs

The stage in the internal process of the political decision making process where there is a transaction between the political system and the environment.

21. Pennsylvania Performance Index

PPI measures growth across all levels, not just from Basic to Proficient. The index starts each school and disaggregated group at its own 2002 baseline and aims for 1005 proficiency by 2014.

22. Pennsylvania System of School Assessment (PSSA)

This is the tool used by the Commonwealth of Pennsylvania to assess student knowledge of the state's academic standards. Under the provisions of NCLB all eligible students must be proficient on the PSSA by the 2013 – 2014 school year.

23. Political Decision Making Model (Easton)

A complex set of processes through which certain kinds of inputs are converted to types of outputs that we call policies, procedures, and actions. These outputs are then channeled through a feedback loop and returned to the system as new inputs.

24. Reform Initiatives

For the purpose of this study it is defined as those variables that refer to the improvement of student achievement and the reform of mathematics curriculum.

25. Regime

The regime represents relatively stable expectations by developing a set of formal operating procedures and placing constraints on the political interactions of the political system.

26. Safe Harbor

Safe Harbor status allows a school or school district to achieve AYP status without meeting the standard achievement targets. These schools qualify under the NCLB “safe Harbor” provision if the school or disaggregated group reduce the percentage of below-proficient students by more than 10% or more. These schools are recognized as meeting AYP because their improvement is significant.

27. School Mathematics Curriculum

An operational plan that details what mathematics students need to know, how students are to achieve the identified goals, what teachers are to do to help students develop their mathematical knowledge, and the context in which teaching and learning occur.

28. Standard and Poors School Evaluation Services (SES)

Provides powerful decision-making tools for parents, taxpayers, school administrators, educators, and policy makers committed to improving student achievement and the management of schools. SES analyzes academic, financial, and demographic indicators and trends; provides valuable comparative benchmarks; and presents Standard & Poor’s impartial findings on the performance of schools. SES features a unique synthesis of financial and academic performance factors that promotes the sharing of “best practices” among schools.

29. State-Source Revenue Per-Student

Revenue received from the school system from the state for operating purposes. Such revenue includes state aid allocated according to a state-determined funding formula. Revenue is divided by total enrollment to determine per-student basis.

30. Support

One type of an input, this is the major variable in connecting the political system to the environment.

Research Questions

1. What processes are being implemented to reform mathematics curriculum and to improve student achievement?
 - a. What resources are being allocated?
 - b. Who participated in the process?
 - c. What training was offered to staff members?
2. How was the implementation of reform initiatives monitored?
3. What were the patterns of student achievement since the interventions were initiated?
4. How did the decision making process serve as a connection between the development of reform initiatives and their implementation in each of the school districts?
5. How did the decisions that were made get implemented?
6. To what extent did the implementation of reform initiatives result in improvement of student achievement?

Chapter III – Methodology

Introduction

The purpose of this chapter is to explain the research design and methodology of this study. The purpose of the study was to investigate the political decision-making process mathematics curriculum reform in secondary schools that have failed to achieve AYP status. To conduct this study a number of variables were selected from a variety of literature and data sources. Four similar Class A school districts in Western Pennsylvania, as defined by the PIAA classification for football, which did not have secondary schools that met AYP on the mathematics portion of the PSSA, were selected as sites for the study.

These districts were also similar in the fact that they were all Act 16 schools during from 2000-2003 due to their history of low test performance on the PSSA. The Pennsylvania Department of Education passed Act 16, also known as the Educational Empowerment Act, in March of 2000 in order to assist schools in improving student achievement and schools operations. School districts that had a history of low-test scores on the PSSA created a District Empowerment Team consisting of administrators, teachers, and parents that worked collaboratively to develop a School District Improvement Plan that would be used in guiding the district in improving student achievement and school operations. An Academic Advisory Team is created by the Pennsylvania Department of Education to work cooperatively with the School District Empowerment Team to work towards the goals of the School District Improvement Plan. During the middle of the 2003-2004 school-year, one of the schools was removed from the list of Act 16 schools (PDE, 2002).

Design

Step One: Data Collection

This research will be based on many forms of data collection such as the Standard and Poor's Schools Evaluation, performance results of the 2002-2003 math section of the 11th grade PSSA test, and the Pennsylvania Department of Education AYP list and multi-site qualitative descriptive case studies.

The Standard and Poor's School Evaluations provides information relevant to each school district on a number of academic and financial indicators; how well the students are doing on state achievement tests, student performance on college entrance exams, student attendance, classroom profiles, teacher profiles, tax information, and amount spent per pupil information. This evaluation provides the researcher with information regarding the district and its academic progress.

The multi-site case study offers a means of investigating complex social units consisting of multiple variables of potential importance in understanding the phenomenon to be studied. The multi-site case study results in a rich and holistic account of the phenomena. This researcher will be using an interview at the various sites in order to obtain information for my study. Grant McCrackin (1988) calls the interview "the most powerful method in the qualitative armory". This researcher will be interviewing district personnel who are responsible for curriculum development and implementation in each of the four districts. For each of the interviews I will be taping the conversations in order to develop an anecdotal record of the conversations with key personnel in each of the school systems. I will also have a second person in all of the interviews

for the purpose of scripting the interviews and also be able to discuss the various interviews in depth. The person that I have chosen to serve as a recorder in each of the interviews is my former Administrative Assistant who worked with me while I was the assistant superintendent at my prior position. This person and I have previously worked together for five years and we have a great deal of experience working collaboratively in the discussion and interpretation of educational dialogue and issues.

Step Two: Development of the Multi-Site Case Study

The multi-site case study is used when the researcher conducts a study using more than one case. The purpose for conducting a multi-site case study is that the more cases included in a study and the greater the variation across the cases, the more compelling an interpretation of a phenomenon. This researcher will be using a descriptive multi-site case study format. There are several aspects of a descriptive case study listed by Olsen (1982):

- Illustrate the complexities of a situation- the fact that not one but many factors contributed to the phenomena.
- Have the advantage of hindsight, yet can be relevant in the present.
- Show the influence of personalities on the issue.
- Show the influence of the passage of time on the issue- deadlines, change of personnel, funding, etc.
- Include vivid materials- policies, quotations, newspaper articles, board minutes, state reports, etc.
- Obtain information from a wide variety of sources.

- Spell out differences of opinions on the issue and suggest how these differences have influenced the result.
- Present the information in a variety of ways and from the viewpoints of members of different political divisions of labor.

The following is the manner in which this researcher will be presenting the individual cases studies:

TOPIC	DESCRIPTION
Introduction	Describing the time, place, and period of the case study in order to give the audience a background of the study.
Issue identification, purpose, and method of the study	Describing how the study originated, the background of the researcher, the issues that are central to the case study and to the research, and how the study is to be completed.
Assembling the case record	Pulling together the data that will be used in completing the case analysis. Information is edited and organized so that it contains all pertinent information. I will be using; the Standard and Poor's School Evaluation Report; results of student achievement on the mathematics section of the 11 th grade PSSA; the Pennsylvania Department of Education AYP list; and the Act 16 (Educational Empowerment Act) Schools list.
Placement of component parts	A description of the issues and details generated by the interviews with the various staff members involved in the study.
Triangulation	A description and analysis of all of the component parts of the research and what the research has done to confirm my observations, but also what has occurred to disconfirm them.
Summary	A review of the case and how it relates to the research questions that have been posed.

In the development of the multi-site case study, I will be working in collaboration with my dissertation/research advisor, Dr. Charles Gorman, in order to understand the complexities of the individual districts and how the implementation of the Act 16 Empowerment Plan has influenced the political and educational climate of the four districts used in my study. We will work together to review the development of each of the case studies and review the structure of the case study to make sure that there is a depth to the information in the studies that adequately answer the research questions that have been posed.

Step Three: Triangulation

The technology of educational and psychological testing has been particularly good at requiring measurements to be demonstrably reliable and valid (Cornbach, 1971). The process by which this researcher will validate the many sources of data is called triangulation. Stake (1994) supports the use of triangulation as a method of increasing the reliability of case studies. Because the main purpose of triangulation is to examine a single phenomenon from more than one perspective, this study will include interviews with central office staff, building –level administrators, and teachers. However, this study will also include the utilization of a variety of data sources from the Pennsylvania Department of Education. There are many types of triangulation: (1) theoretical triangulation, when different theoretical frameworks are used; (2) data triangulation, based on using various sources of data; (3) investigator triangulation, when research is conducted by several independent researchers; and (4) methodological triangulation, based on the utilization of different methods of research (Schwandt, 1997). Specifically, this researcher will be using methodological triangulation to increase confidence in

the interpretation by following direct observation, through interview, with a review of the many documents and records that I have listed at the beginning of the methodology section.

Multi-Site Case Studies

Voices of Reason

District One

This school district is located in Western Pennsylvania and is identified in the Standard and Poor's School Evaluation Services Report (2002) as a district on the "urban fringe of a large city" (Standard and Poor's, 2002). The people that were interviewed for the purposes of this study were; a central office administrator, a secondary building level administrator, and a veteran mathematics teacher with thirty years of experience and fifteen years experience as the department chairperson of the secondary mathematics department.

Pre 2000 – 2003

School District One has experienced a great deal of economic and community change within the past twenty years, the building level administrator remembers when he was a teacher in 1982,

"The bottom fell out in 1982 with the closing of the steel mill, at that time we had 162 students in our senior class and the community was made up of a large number of middle class families. Now we only have 90 students in our senior class and socio-economically we are a Title I district which indicates a high number of families living in poverty" (Interview with building level administrator, March 25, 2004).

Due to the fact that District One has had a history of low test scores and a high percentage of students in the below basic group of the PSSA it was classified as an Empowerment District under Act 16 of 2000 (PDE, 2000). The percentage of students that scored in the bottom group/below basic on the reading and math portions of the PSSA for a four year period are as follows (PDE, 2003);

% of Students Scoring in the Bottom Group/Below Basic

School Year	1998-1999	1999-2000	2000-2001	2001-2002
District One	53.9	56.1	50.7	53.0

Due to the fact that District One was declared an empowerment district, they were able to receive a large amount of funds to be used for school improvement projects. During the 2000-2001 school year District One received \$575,000 in order to improved student achievement with the district (Beaver County Times, January 29, 2002). The additional funding was received so late that the state allowed District One to carry the funds over to the 2001-2002 school year (Pittsburgh Post Gazette, August 29, 2001). District One utilized most of the money from the Act 16 funds to purchase textbooks in the first year, this included new books for all grades and new science and English books in only some of the grades (Pittsburgh Post Gazette, August 29, 2001). Prior to the purchase of the new textbooks some of the district’s old books had copyright dates dating back to 1984 (Pittsburgh Post Gazette, August 29, 2001). The funds from Act 16 were also used to hire additional staff; including a special education teacher, a high school reading specialist, high school mathematics teacher, and a consultant from the University of Pittsburgh to assist the district in curriculum reform (Pittsburgh Post Gazette, August 29, 2001). When asked about the effects of District One being placed on the Act 16 Empowerment List, the central office administrator stated,

“It put a lot of pressure on us; there was pressure on the teachers and pressure from the community. When the newspapers label your district as a low achieving district, which is not good. We know our clientele and we know that we are a poor district and we are confronting those issues. Those who make the policies don’t have the same sensitivity to the issues that we face. We understand accountability is necessary, but with the way that things are publicized in the media, there is a lot of pressure especially to hear what happens if you don’t make the mark. That is what we are faced with and we have to do the best we can to overcome it” (Interview with central office administrator, March 25, 2004).

The building level administrator agreed with the sentiments of the central office administrator but also stated that there were some original thoughts that the state was not serious in dealing with the districts that qualified for Act 16,

“The climate that I saw was one that reminded me of what a former superintendent was talking about my first year of teaching thirty one years ago, he said that the pendulum swings one way and then another and things go in a cycle, and this too shall pass, but the realization came to many people that this was not going to go away and people became very concerned. We knew that we had to improve and that we just couldn’t accept poor student achievement because we were expected to be at the bottom” (Interview with building level administrator, March 25, 2004).

From the secondary mathematics teacher and department chairperson’s frame of reference, the inclusion of the high school on the Act 16 Empowerment List was a serious warning to members of the staff about what would happen if there wasn’t improvement in student achievement, but also the impetus for reform created by Act 16 has been replaced by the mandates of the No Child Left Behind legislation. He stated,

“Certainly the fact that we were placed on the Empowerment List is not something that you want to hear. The climate was bad because the local paper would always include the fact that we were an Empowerment District in every story that it did about the district. It was kind of a black mark against the district and I don’t know if it was a fair thing to do. I don’t know if there is any magic bullet to improving student achievement. It appeared that it was like the teacher who told the students that if they misbehaved then they were going to get detention, and they never did. Act 16 went the way of NCLB, and it will certainly be interesting to see that in 2013-2014 if NCLB is replaced by something else” (Interview with secondary mathematics teacher, March 16, 2004).

As previously mentioned, the inclusion of District One brought a significant increase of available funding to assist in the improvement of student achievement, when the question was asked regarding how mathematics curriculum reform has been affected by Act 16, it is obvious that the

additional funds enabled the district to pursue curriculum reform much more vigorously. The secondary mathematics teacher stated,

“When we were first under Act 16 we had to go backwards in order to go forwards. When we were first placed on the list it released a lot of funds that weren’t available here before, and we felt that we should go with a textbook series 7-12 in order to get continuity in the curriculum, the series we chose was directly related to the standards and had a lot of open ended questions. We also became involved with the University of Pittsburgh through the Tri-State Study Council which began to work with teachers from the elementary and secondary schools in order to reform the mathematics curriculum. We began working on curriculum mapping; we have done this a few times in the last couple of years. With the help of Tri-State we look at the essential standards in each level and try to find holes in the curriculum where certain standards or concepts are not being taught” (Interview with secondary mathematics teacher, March 16, 2004).

The building level administrator observes that the inclusion of District One on the Act 16 Empowerment List has enabled the districts to make some significant improvement in programs and in personnel that has been available to implement improvements in the area of mathematics. He stated,

“I have seen two direct changes in the area of mathematics since we were included on the Act 16 Empowerment List. The first change has occurred in class size. We were able to use some of the funds available in order to add a math teacher. The second area was the increase of funds that were available to the district; we used this money to purchase textbooks and to hire a mathematics consultant” (Interview with building level administrator, March 25, 2004).

District One faces many challenges as the staff and administration work collaboratively to improve student achievement. District One has one of the largest proportions of economically disadvantaged students in the state. In addition, it is estimated that the community has a high proportion of lone-parent households with children (Standard and Poor’s, 2002). The district also faces challenges with it’s teaching staff due to the fact that it has a comparatively high

proportion of teachers with one year or less of experience, as well as one of the highest rates of teacher absenteeism in the state (Standard and Poor's, 2002).

In terms of financial support, District One local source operating revenue per student is well below the state average and the peer group average. However, the districts state-source operating revenue per student is well above the state average but still below the peer group average. The district's property tax burden through property tax is well below the state average, but comparable to the peer group average. In terms of financial support in purchasing supplies and materials for student instruction, the cost per student constitutes a higher percentage of the district's operating expenditures than both the state and the peer group average (Standard and Poor's, 2002)

When this researcher examined the area of student achievement related to performance on the mathematics portion of the eleventh grade PSSA it was noted that over 50% of students scored in the below basic range. The results of the student performance on the mathematics portion of the eleventh grade PSSA for a three-year period in District One are as follows (PDE, 2003):

Three Year History of Student Performance on the Mathematics Portion of the 11th Grade PSSA

	2001	2002	2003
Advanced	7.3%	3.4%	3.4%
Proficient	14.5%	16.1%	18.2%
Advanced and Proficient	21.8%	19.5%	21.6%
Basic	21.8%	20.7%	25.0%
Below Basic	56.4%	59.8%	53.4%

It is evident through the review of this table that the results of District One on the mathematics portion of the eleventh grade PSSA indicate that the percentage of students who have scored in the proficient and advanced range is far below the AYP of 45% set by the Pennsylvania Department of Education. These averages indicate an exceptionally below-average proportion of PSSA scores in the Advanced performance level and an exceptionally above-average proportion of PSSA scores in the Below Basic performance level (Standard and Poor's, 2002). The student achievement in each of the performance areas has remained relatively consistent throughout the past three years. It should also be noted that for each of the disaggregated groups listed on the District One report card, none of the disaggregated groups met the AYP standard for mathematics in eleventh grade for the 2002-2003 school year (PDE, 2002). However, according to the Standard and Poor's Evaluation Services Report for the 2002-2003 school year, the achievement gaps that exist among students (black/white and economically disadvantaged/non-disadvantaged) are below the state average in both categories.

In the educational return summary section of the Standard and Poor's School Evaluation Services Report (2002) for District One it stated, "Relative to other school districts in Pennsylvania, *District One* generates exceptionally below-average student results with moderately above-average spending. When compared with a composite of peer districts, the district produces average student results with lower per-student spending." Due to the continued low test scores the high school for District One has been placed on the Pennsylvania Department of Education's Warning List for failure to meet the AYP standard (PDE, 2002).

2003-2004

With the knowledge that District One did not meet the measurable objectives of AYP, the members of the administration and teaching staff were asked what demands they felt were placed upon them and by whom. The central office administrator stated,

“When you look at where NCLB and AYP demands come from, those that developed the NCLB and passed on the guidelines and regulations that govern AYP place the demands on the school districts that don’t quite measure up. Our school board is very supportive, they know and understand the challenges that we have and any time things are not quite up to par, whether it is curriculum or other issues, they will put demands on the administration to bring our district up to meet the standards” (Interview with central office administrator, March 25, 2004).

The secondary mathematics teacher stated,

“What comes with being placed on lists and ramifications? Demands were placed on us and everyone associated with the school district, as well as ourselves, to see what we could do to make things better. So we were looking at ways that we could improve” (Interview with secondary mathematics teacher, March 16, 2004).

The challenge in District One was to find a way to work collaboratively to improve student achievement. The question was asked about strategies that were utilized to improve student achievement and who had input into the development and implementation of these strategies.

The central office staff member reports,

“One of the things that was very important to us and that we looked closely at was to make certain that our math curriculum was aligned to the standards. As we have done that, we constantly are looking at the curriculum K-12 to see what needs to be done to address the standards and see that the information is disseminated to the teachers. We have to look at what we are teaching in relation to the standards. We are also in the process of putting together in hard copy an instructional model for our district. We are taking a look at all areas of instruction and accountability; these are important and go hand in hand. The things that we require of teachers are things that we expect to go in and observe in their classrooms” (Interview with central office administrator, March 25, 2004).

The building level administrator relates specific examples to the mathematics curriculum and what changes are being made to the scope and sequence within the high school. He stated,

“We are in the process of trying to develop an instructional model for the district that will have all of the components of classroom instruction that we are looking for, but that is being developed by the Committee of Nine (three teachers from each of the schools). As far as mathematics, over the past few years we have discovered that kids don’t want to take Algebra and Geometry. They would rather take the easy way and take courses like basic math, business math, or general math, all of which will be eliminated from the curriculum. Every student must now take some type of Algebra in ninth grade, either Algebra 1 or Algebra A/B which is spit into two years. This means that by the time all students reach the eleventh grade they will have some exposure to Geometry, which is necessary for the PSSA. This idea came directly from our mathematics department. We also have a mathematics consultant that we have hired through Tri-State who has been very involved with mathematics curriculum reform and has worked well with our mathematics department members” (Interview with building level administrator, March 25, 2004).

The secondary mathematics teacher agreed with the comments made by the central office and building level administrators regarding the importance of reviewing and changing the curriculum in order to improve student achievement. There is also an opinion expressed by the secondary mathematics teacher that the inputs of the mathematics department are validated by members of the administration. He commented,

“Two comments, first of all we are going to eliminate lower level mathematics courses because the basic level mathematics courses do not hit the eleventh grade standards. We are going to have a lot of people fail at first, but that is the direction that we are headed. However, we do have a group of eighth grade students who are taking Algebra 1 and will be able to go through the entire mathematics curriculum. We are not going to have lower level courses and we are going to have higher expectations for students. We will be trying to place more responsibility on the student. The second comment, our (mathematics department) voice has been pretty important with all of the decisions and changes that have been made. With change coming in the district and superintendent continually coming and going it has been even more important to have the staff be a fundamental part of curriculum reform and development” (Interview with secondary mathematics teacher, March 16, 2004).

However, this process has not been accomplished without any outside assistance. All members of the staff that were interviewed acknowledge the assistance of the Tri-State Study Council and the local Intermediate Unit for their assistance in the process of curriculum reform in mathematics. The central office administrator summarizes this opinion when he stated,

“We receive a lot of support from the Tri-State Study Council. They have been very supportive and have been working very closely with math and with curriculum. They are very helpful in the information that they share with us and their expertise in curriculum has been very important. The Intermediate Unit has also been helpful to our teachers because we can share ideas with other teachers and bring back ideas to share with our own staff” (Interview with central office administrator, March 25, 2004).

With all of the changes that have occurred in District One, the final question that was asked to the members of the administration and teaching staff dealt with the direction of the curriculum reform in the area of mathematics. The secondary mathematics teacher stated,

“I think that we are headed in the right direction by trying to raise the bar. We are examining the standards and finding out where we need to add courses. In our district because of the size of the mathematics department it is hard to add courses, but we found out that we need to make sure that our upper level kids have exposure to statistics, so we are adding a statistics course. We have become very aware of the test because of our status. To me it is not about the test, I look at it as preparing kids for going to the next step” (Interview with secondary mathematics teacher, March 16, 2004).

The building level administrator has this opinion regarding the direction of mathematics curriculum reform,

“I see higher expectations for our kids. Our kids are better prepared now for the PSSA and we are going to continue to prepare them even better. Teachers know that there are higher expectations and that accountability is here and you either fall into line or you are going to feel a lot of pressure, I think that it is my job to bring about the pressure. I see us getting better and people getting more skillful

in the use of techniques in the classroom, especially problem solving. We will be O.K., we will never be an affluent district, but we are going to have our kids prepared better than every before” (Interview with building level administrator, March 25, 2004).

The central office administrator comments,

“I see our mathematics curriculum moving to another level. We are currently in the process of eliminating some things and adding some additional things. As we begin to share and come up with better methods of teaching and better methods of utilizing resources that we have, I think that we will move to another level and it will be a very positive change. If we had the answer, I think that we would bottle and send it to every district nationwide. I believe that sharing of information among the staff and with Tri-State, the Intermediate Unit, and others skilled in mathematics; we will see the changes that we are expecting to see. I just hope that the clock doesn’t run out on us before the changes take place” (Interview with central office administrator, March 25, 2004).

The collapse of the steel industry in 1982 had a dramatic effect on the history of District One.

During the time when the steel industry was productive District One consisted of a majority of middle income families and a moderately large student body. However, since the collapse of the local steel mills District One has gone through a drastic decrease in the student population while the number of children of families living in poverty has significantly increased.

Due to the fact that District One had a history of low test scores they were placed on the Act 16 Education Empowerment List in 2000. This placement caused the district to be faced with many demands; parents demanded an improvement in student achievement and some parents began to take their children out of the district and enroll them in other school districts and the local media demanded accountability from the school district and constantly labeled the district as low achieving creating a source of embarrassment for the teachers, administrators, and members of the community. The school board understood the problems that District One faced but also

knew that student achievement had to increase or they would face the consequences from the state. There also appeared to be an opinion in the district that the state must be more accountable to the individual districts for providing resources and support to assist in improving student achievement and that the state needed to be sensitive to the individual characteristics and needs of each district, the members of the district did not use this as an excuse for poor performance but as a point of contention with the state accountability system (Excerpt from interview with central office administrator, March, 23, 2004).

With state grants that were received as a condition of Act 16 legislation, District One was able to purchase new textbooks in all subject areas, purchase supplementary classroom materials, and hire additional staff for the mathematics department. The original purpose of this new mathematics staff member was to teach classes to students that would reinforce skills necessary for the PSSA and to provide tutoring (Excerpt from interview with secondary mathematics teacher, March 16, 2004). The district also used the funds to enter into a partnership with the University of Pittsburgh through the Tri-State Study Council. Tri-State immediately began to work with the teachers at the elementary and secondary levels in order to reform the mathematics curriculum. A mathematics consultant was also hired through Tri-State to work with mathematics teachers on improving instructional techniques in the classroom and beginning the process of curriculum mapping in order to align the curriculum to the state standards.

The district continued to work to improve the mathematics curriculum; however in 2003 they were informed that they were being placed on the State's Warning List due to the fact that they

did not meet the measurable objectives of AYP. Once again there were demands placed on the district to improve student achievement by members of the community, the school board, and the administration. The members of the mathematics department placed demands on themselves to investigate strategies that they could utilize in order to improve student achievement (Excerpt from interview with secondary mathematics teacher, March 16, 2004).

District One believed that in order for cultural change to occur in the district there had to be change in the individual classrooms. Members of the administration and teaching staff met to develop an instructional handbook that would be given to all of the teachers and administrators that would contain the essential components for effective classroom instruction and assessment within the district. The administration has stated that there are higher expectations for students and teachers and that teachers are going to be help accountable for using a variety of instructional techniques in their classrooms (Excerpt from interview with secondary building level administrator, March 25, 2004). A second idea for reform was in the restructuring of the scope and sequence of the mathematics curriculum at the secondary level. Administrators and members of the mathematics department noticed that students were not enrolling in the higher level math courses and instead, enrolling in the general math courses. The curriculum within the general courses did not align to the state standards and the students were not prepared to be successful on the PSSA. Members of the administration and the mathematics department worked collaboratively to eliminate the lower level general courses and institute a course sequence consisting of Algebra 1 A/B or Algebra 1, Geometry, and Algebra 2. This sequence

enabled all students to have some exposure to the principles of Geometry by eleventh grade. This restructured mathematics scope and sequence was much more challenging, better prepared students for post-secondary life, and was more aligned to the state standards (Excerpt from interview with secondary mathematics teacher, March 16, 2004).

District One has been very fortunate in the fact that it has been able to develop such a successful partnership with the Tri-State Study Council. It is evident that by working collaboratively, the district and Tri-State have established a vision regarding curriculum reform in mathematics in order to improve student achievement. This vision is supported by the teaching staff and the administration due to the fact that they both were a part of the creation and implementation of the vision (Excerpt from interview with central office administrator, March 25, 2004). The district has also utilized the resources of the local intermediate unit as a place where teachers can share ideas and bring ideas back to share with their colleagues.

The feedback that has been received by the educators at District One is representative of the positive environment that has been created within the district. Members of the mathematics department strongly believe that their inputs are valued and that their voices are heard in reference to reform in the mathematics curriculum (Excerpt from interview with secondary mathematics teacher, March 16, 2004). They also believe that their opinions matter and are taken seriously by the administration. An example of this was in the hiring of the additional staff person for mathematics, based on a recommendation from the mathematics department the duties of this person were changed to that of classroom teacher. This enabled the secondary

mathematics department to have smaller class sizes and to be able to work individually with more students. In return, the mathematics department has developed and implemented an aggressive tutoring program to work with students who are having difficulties. The mathematics teachers realize that in order for student achievement to improve, their department must be an integral part of the culture change within the district (Excerpt from interview with secondary mathematics teacher, March 16, 2004). Finally, the feedback has been very favorable regarding the curriculum mapping that has been occurring in the district in order to align the mathematics curriculum to the state standards in order to develop a written K-12 curriculum.

District One, with the assistance of Tri-State, has developed a plan for mathematics curriculum reform within their district that they feel meets the needs of their staff and students. They have not chosen to just purchase a curriculum program, but instead to review a variety of instructional materials and collaboratively decide what meets their needs. An important part of the success of their reform efforts is allowing the voices of the teachers and the consultants to be heard as an integral part of district reform. Although the district and building level administrators are relatively new to their current leadership positions; as the instructional leaders they must listen to the input of the mathematics experts and provide the resources necessary to improve student achievement.

The Road Best Taken

District Two

This school district is located in Western Pennsylvania and is identified in the Standard and Poor's School Evaluation Services Report (2002) as a on the "urban fringe of a large city"

(Standard and Poor's, 2002). The people that were interviewed for the purposes of this case study were; a central office administrator, a high school mathematics teacher who was just appointed to an administrative position, and a veteran secondary mathematics teacher who has taught in the district for over thirty years and has experience teaching in both the high school and middle school.

Pre 2000-2003

District Two is no stranger to being placed on distressed lists by the Commonwealth of Pennsylvania. The School District Improvement Plan for District Two stated,

“The District Two has an extensive history of financial difficulty. From 1984 to 1988 and, again from 1993 to 1999 the district was declared financially distressed and placed under the direction of a state appointed Board of Control. A tumultuous global economy had a devastating effect on the domestic steel industry. The community and schools of District Two were heavily dependent on the steel sector. With the loss of tax revenue, fiscal stability found itself pitted against academic programming, since they were directly proportional to one another, the academic agenda also suffered” (www.empowerment.htm, 2001).

Due to the fact that District Two has had a history of low test scores and a high percentage of student achievement in the below basic range on the PSSA it was classified as an Empowerment District under Act 16 of 2000 (PDE, 2000). This can be demonstrated by the following table which documents the percentage of students scoring in the bottom group/below basic range on the reading and math section of the PSSA over a four year period;

% of Students Scoring in the Bottom Group/Below Basic

School Year	1998-1999	1999-2000	2000-2001	2001-2002
District Two	52.3	49.9	44.2	38.6

District Two received \$530,100 in state grants each year due to their placement on the Educational Empowerment List. These funds were used to provide professional development training, add two additional staff members (high school mathematics and reading teachers), purchase curriculum programs (Carnegie Learning Cognitive Tutor and Waterford K-2), and for extended learning opportunities for parents and staff (www.empowerment.htm, 2001).

When asked about the effect of being placed on the Act 16 Education Empowerment List, the central office administrator replied,

“It was devastating for the staff because we have had to go through a time period when the district was identified as being in financial distress, now we were identified as being placed on the Empowerment List because of academic distress. During this time the staff felt threatened with the loss of their jobs unless student performance increased. The Act 16 notification caused the whole process of being distressed to start over again, it was devastating to our staff and initially they reacted negatively. The threat of the loss of jobs for those folks who had been working extremely hard was devastating and they didn’t know where to go” (Interview with central office administrator, March 19, 2004).

The veteran teacher agrees with the sentiments of the central office administrator, she stated,

I was very angry when they told us that our school was placed on the Empowerment List. This came out after the Board of Control had come into our district and when they came in they were to make the district financially stable. They eliminated extra curricular activities, all the extra material that you had, they broke us down to bare bones, so you lost all of your extra stuff. As a result, these kids weren’t given an opportunity to learn things to improve their knowledge and then they test us and tell us that we aren’t doing a good job. How can we do a good job? I was not happy with the process and I felt betrayed by the state government. It was not my fault that the school board mismanaged the money, but now that the children have not reached the achievements that you want them to it was my fault” (Interview with secondary mathematics teacher, March 19, 2004).

District Two did receive a large amount of state grants as previously mentioned, when asked about the impact that these funds had upon the district the central office administrator discussed how the funds impacted mathematics curriculum reform, he stated,

“The biggest thing that occurred was that the school board was willing to make changes. The school district does not have a high percentage of students that attend post-secondary school, so the curriculum had courses designed for the students that were not thinking about post-secondary education, (e.g., general math and other dead end courses). We convinced the members of the school board that regardless of where the child was going they needed to have more challenging math courses. In order to ensure that students were more successful, we wanted to get away from general math and to implement a sequence including Algebra, Geometry, Algebra 2 and so on. Through Act 16 funds we were able to purchase the Cognitive Tutor program for the high school and provide training for all of our staff.” The fact that we were declared an empowered district worked to our advantage because we were able to start many of our curriculum reform initiatives under Act 16. That money provided us the front loading of everything we needed from supplies through professional development. If it were not for Act 16 money we would not have been able to have had the resources to begin many of our programs” (Interview with central office administrator, March 19, 2004).

The veteran math teacher felt that the majority of the funds from Act 16 were spent on the improvement of the reading program, she stated, “The funds from Act 16 did not have an effect on curriculum reform in the area of mathematics, it didn’t because the funds were focused on the reading program.” (Interview with veteran teacher, March 19, 2004) There has also been a great deal of discussion regarding what types of inputs that members of the mathematics department had into the selection of the Cognitive Tutor program for curriculum reform. The central office administrator discussed a process that began before the district was placed on the Empowerment List and include members from the school board, administration, teaching staff, parents, and community members, he explained,

“Even prior to when we were on the Empowerment List, we went out on monthly basis with members of the administration, community, and teaching staff to discuss curriculum reform in the district. One of the concerns was the mathematics department and that the children were not meeting the expectations of the parents. We began to discuss ideas and ways that we could improve our district. So, when we were placed on the Empowerment List, these ideas were placed in our School District Improvement Plan and validated by the community, but it was left up to the staff as to what the changes would be regarding mathematics curriculum reform. So the staff and community were very involved in curriculum reform in our district” (Interview with central office administrator, March 19, 2004).

The veteran teacher agreed that she and members of the mathematics staff had the opportunity to review programs, but the decision to purchase the Cognitive Tutor program was not made by the secondary mathematics department, she stated,

“I was given an opportunity to look at different programs and to analyze those programs and attend some workshops about the Cognitive Tutor program. The decision to purchase the Cognitive Tutor program was made by the Empowerment Team more than by the faculty. There was one senior high mathematics teacher and a special education teacher who strongly recommended the Cognitive Tutor program. We are not a department and there are no department heads, one math teacher individually pushed this program on his own” (Interview with secondary mathematics teacher, March 19, 2004).

When I questioned the building level administrator she agreed with the perception of the mathematics teacher, she said,

“I was not here when the Cognitive Tutor program was chosen, but from what I understand, the decision was made by a few administrators and teachers and not the members of the mathematics department. I believe that this was the reason that at first the Cognitive Tutor program was not accepted because there was not a great deal of input from the mathematics department and not everyone had been trained. Now everyone has been trained and it appears that people are more accepting of the Cognitive Tutor program” (Interview with building level administrator, March 19, 2004).

District Two faces many challenges as the staff and administration work collaboratively to sustain the improvement of student achievement over the past four years. District Two enrolls one of the largest proportions of economically disadvantaged students in the state. In addition, it is estimated that District Two has one of the state's highest proportions of lone parent households with children (Standard and Poor's, 2002). District Two also has a high percentage of its students qualifying for special education services; the percentage of students is exceptionally above both the state average and the district's peer group average. This may explain why the amount spent for purchased services by the district is exceptionally above the state average and the district's peer group average (Standard and Poor's, 2002). The district also faces challenges in the maintaining of the professional staff. District Two has one of the highest percentages of professional personnel turnover rates in the state, with the average well above the state average and higher than the peer group average (Standard and Poor's, 2002). District Two also has a high instance of teacher absenteeism; the rate is exceptionally higher than the state level and higher than the peer group average (Standard and Poor's, 2002). This high percentage of teacher absenteeism may have a negative impact on the educational environment due to the disruption of student instruction in the classroom.

In terms of financial support, District Two local-source operating revenue per student is well below the state average and lower than the district's peer group average (Standard and Poor's, 2002). The full market value of property in District Two is well below the state average and the peer group average, however the burden on the tax payers through local contribution is exceptionally higher than the state average and higher than the peer group average (Standard and

Poor's, 2002). District Two receives a great deal of revenue through state support. The district's state-source operating revenue per student is exceptionally above the state average and higher than the peer group average (Standard and Poor's, 2002). The amount of money that is spent on instruction per student and day to day operations per student are well above the state average and higher than the peer group average; statewide only 6% of districts spend more day to day per student and only 2.4% of districts spend more per student on instruction than District Two (Standard and Poor's, 2002).

Student performance on the mathematics section of the eleventh grade PSSA over the past three years indicate that over 55% of students tested scored in the below basic range. The results of the student performance on the mathematics section of the eleventh grade PSSA for the past three years are as follows;

Three Year History of Student Performance on the Mathematics Portion of the 11th Grade PSSA

	2001	2002	2003
Advanced	7.0%	1.8%	7.5%
Proficient	7.0%	8.9%	14.9%
Advanced and Proficient	14.0%	10.7%	22.4%
Basic	22.8%	21.4%	22.4%
Below Basic	63.2%	67.9%	55.2%

It is evident through the review of this table that District Two has not met the mandates of AYP of 45% of the students scoring in the advanced and proficient range on the mathematics section of the PSSA. These averages are exceptionally below the proportion of PSSA scores meeting or exceeding state standards, well below the proportion of PSSA scores in the Advanced performance level, and exceptionally above the proportion of PSSA scores in the Below Basic

performance level (Standard and Poor's, 2002). It should be noted that in a comparison of student performance by disaggregated groups listed on the District Two Report Card, none of the disaggregated groups met the measurable objectives of AYP for the mathematics section of the PSSA (PDE, 2002). However, according to the Standard and Poor's Evaluation Services Report for the 2002-2003 school year, the achievement gaps that exist among students (black/white and economically disadvantaged/non-disadvantaged) are below the state average in both categories.

In the education summary report section of the Standard and Poor's School Evaluation Services Report (2002) for District Two it stated, "Relative to other school districts in Pennsylvania, *District Two* generated exceptionally below-average student results with well-above average spending per student. When compared with a composite of peer districts with similar demographic characteristics, the district generates below-average student results with higher per student spending". Due to the continued low test scores and failure to meet the measurable goals of AYP, District Two has been placed on the Pennsylvania Department of Education's Warning List (PDE, 2002).

2003-2004

District Two was placed on a list of schools that had not met the measurable objectives of AYP or the goals of the Commonwealth in relation to student achievement. When asked what demands were placed on the district by the various educational constituency groups, the central office administrator replied,

"The pressures were very extensive, primarily from the community and the state. We began reforms prior to the declaration of AYP in 2000 and let those initiatives grow with the student. We are now in our fourth year and starting to see changes, but not substantial enough" (Interview with central office administrator, March 19, 2004).

The building level administrator felt demands from all of the educational constituency groups, except for parents within the district, she stated,

“I believe that the demands were placed, necessarily by any one of those groups, but in general because of the PSSA and what the scores need to be. We have discussed AYP in the district and know where our scores need to be in order to be proficient. I was hired to come in and make changes within the mathematics curriculum in order to increase student proficiency. There are obvious demands on teachers and students by the administration to improve student performance. The students definitely want to learn and they know that they need to be proficient on the PSSA. I have heard them make comments in the mathematics classroom about material that they are learning in class and how it relates to the PSSA. I have not heard any demands from parents” (Interview with building level administrator, March 19, 2004).

District Two was aware that they needed to reform their mathematics curriculum in order to raise student achievement. They were asked what strategies were used within the district to assist classroom teachers in reforming the mathematics curriculum in order to raise student achievement. The veteran mathematics teachers stated that there needs to be more time given so that mathematics teachers at the various educational levels can work together and is frustrated by the high number of special education students that are in the classroom, she stated,

“There have been no opportunities for the mathematics department to meet and the math teachers at the high school regularly complain that whatever is going on at the elementary is not preparing these kids to be mathematicians, and we were told not to complain because they were doing the best that they could. I also think that one of the things that have hindered us is that we have a large population of special education students and in most of our students courses the special education students are integrated into regular classrooms with regular children. We have not been given much information on how to bring children up to the next level. I guess I am frustrated because I can't see any way no matter what curriculum you give me, if they are unable to do it” (Interview with secondary mathematics teacher, March 19, 2004).

The central office administrator cited the use of various sources of data and a partnership with the Math/Science Collaborative as tools that are being used to help reform the mathematics curriculum, he stated,

“We currently have six district in-service days and three Act 80 days which mean that we have nine in-service days over the course of the year, so we do have the time for our teachers to receive training in areas to help improve student achievement. In areas like reading and writing we have received a great deal of assistance from the local intermediate unit; however we have found that it is difficult to find assistance in the area of mathematics. We are now a part of the Math/Science Collaborative so that should provide us with some assistance and training. We have used a great deal of data from the Cognitive Tutor program; it has a management system built in. Teachers are also looking at the results of previous PSSA assessments to see what concepts have been mastered. We have strengths, but we are not as strong as we should be” (Interview with central office administrator, March 19, 2004).

The building level administrator believes that the districts have done a number of things to help increase student performance in mathematics, she explained,

“From the moment that I stepped into this building I had the scores from the PSSA and the Terra Nova and we broke those down by standards to see what standards were met and which we were weak in. That is why the curriculum scope and sequence was changed to include a two year Algebra course (Algebra Part 1 and Algebra Part 2). The district has always been willing to make adaptations and changes to the scope and sequence. When we ask for additional resources, they get them for us. We have a Director of Testing and she will get any practice workbook that a teacher needs. We have also downloaded a great deal of information from the PDE website. The district has also made sure that we have a certified math teacher teaching math in the middle school, that was extremely important to me because we know what the high school is lacking in and this math teacher can work on teaching those students those concepts and skills” (Interview with building level administrator, March 19, 2004).

As previously mentioned by the central office administrator, District Two has had the opportunity to begin many of their initiatives due to the financial support provided by being placed on the Education Empowerment List. The result has been that there have been many

changes to the mathematics curriculum and new programs, like the Cognitive Tutor in mathematics have been added. However, these changes alone would not be sufficient to improve student performance. With the changes that have been made to the curriculum, the question was asked about what changes took place within the classroom in relation to the instructional scheme that is being used. The central office administrator believes that there have been changes in instruction, he explained,

“I believe that our teachers are teaching the concepts that are included on the PSSA within the regular classroom. They are taking time to have the students complete open ended assessments as well as written responses dealing with mathematics. We have our teachers work with the students so they understand the concepts of how they have to explain their answers. We have also had to make changes to the Cognitive Tutor program because it was designed for the students to complete a certain amount of math curriculum and many of our students do not have the background so they are unable to master all of the material” (Interview with central office administrator, March 19, 2004).

The building level administrator believes that there have been some improvements in the instructional techniques that mathematics teachers are using in the classroom, but there is still room for improvement. However, the administration has implemented some instructional guidelines that address the standards, she commented,

“Unfortunately I have not seen a great deal of change in the use of instructional techniques in the classrooms in the middle school; I have seen some changes at the high school level. There appears to be more hands-on problem solving used in the mathematics classrooms. I think that some of the teachers are just bucking the system and sticking to their own ways of teaching. There has been an impact and I think that we will see more and more as time goes on. In relation to preparing students for the PSSA and having them become more acquainted with the standards; administrators need to make sure that the teachers are identifying the standards and that each lesson has an objective. We ask the staff to write the standards and outcomes on the board every day so that the administrator can walk in and know what the teachers are addressing that day. All lessons have to be aligned to the standards and now everyone is doing it and the kids have made the connection” (Interview with building level administrator, March 19, 2004).

The secondary mathematics teacher has noticed a difference in the way that she is teaching, but also believes that some of the problems are due to issues of scheduling rather than instruction. She believes that students in District Two may not be responding to the teaching methods of the Cognitive Tutor, she explained,

“The change in the curriculum has forced me to change the way that I teach, but then I realized that the students were not responding to the “discovery method” that I was using to teach the Cognitive Tutor. I felt that the “discovery method” was not appropriate for our children, so I had to go back to the old way that I was teaching. The kids that I deal with, the information has to be repetitive, and I have had to adapt my teaching strategies. We also have a very small population of students, so when you try to schedule an honors course it creates a small class size in that course and the regular classes would be too large, so students are placed into the honors courses that don’t have the ability. I feel that I am hard pressed to find kids that are ready to go into Algebra 3 and Trigonometry and if I were as rigorous as the course demands, they would fail” (Interview with secondary mathematics teacher, March 19, 2004).

With all of the reforms that have been made to the mathematics program the question was asked regarding the feedback that has been received by the various educational constituency groups within the district, the central office administrator replied,

“We have received a lot of anecdotal information from the staff. For example, the need to lengthen the time that is spent in the Cognitive Tutor classroom is one that we have heard. There has been a lot of feedback from the special education teachers because their students are having a difficult time with the Cognitive Tutor program” (Interview with central office administrator, March 19, 2004).

The building level administrator observes that feedback regarding the changes has been positive, yet teachers still feel frustrated because students are not coming to their classes with basic skills in order to be successful, she commented,

“Students are coming to class and wanting to learn and get the information and realizing how far behind they are. When you tell them what the concepts are and how they will be tested, they want to know what they can do to get better. The department is frustrated because it seems that the teachers are jumping through

hoops and now people are saying that it is your fault that the kids aren't learning or that they don't know the material. The problem lies in math in that you have to know how to multiply, divide, add, and subtract before you can move on to the other skills in Algebra. You have to spend so much time on the basic skills that you don't have the time to make sure that you cover the standards for your course and what will be on the PSSA. What does a teacher do, stop the Algebra 3 curriculum in order to re-teach basic skills to help them pass the test or do they just plow through the curriculum? The pressure is tremendous on the teachers and when there is failure they think they will be blamed" (Interview with building level administrator, March 19, 2004).

The veteran mathematics teacher felt that the feedback from parents and students has not been positive in relation to some parts of the Cognitive Tutor program, she explained,

"Parents were not happy with the Cognitive Tutor. They did not have a problem with the computer lab component of the lesson; they had a problem with the classroom component. It was very frustrating for me because instead of teaching at the board, I had to go around to five or six groups and teach the same lesson that many times. Students had two mindsets in relation to the Cognitive Tutor lab experience; when are we going to the computer lab and I can't wait to go to the computer lab or why do we have to go to the computer lab. None of the students liked the textbook and I told them to just leave it in their locker, I supplement everything I use with the Cognitive Tutor. I guess there is one good thing with the Cognitive Tutor, it did encourage students to answer questions in complete sentences" (Interview with secondary mathematics teacher, March 19, 2004).

District Two has recently been informed at the beginning of the 2003-2004 school year by the PDE that due to the fact that student achievement improved so that fewer than half of the students scored at the below basic level on the PSSA over the past three years and that they have met the specific goals outlined in their School District Improvement Plan; they have been removed from the Education Empowerment List (www.prnewswire.com, 2003). A review of the district-wide four-year history of the PSSA averages demonstrates that there has been improvement relative to student achievement on the math and reading portions of the PSSA.

This has been a source of great pride for the district and has proven to validate that they have taken measures for lasting systematic change within the district.

Four Year Empowerment District History

	% in bottom group/below basis			
	98-99	99-00	00-01	01-02
District Two	52.3	49.9	44.2	38.6

The question was asked regarding where each person saw the future of mathematics curriculum reform in the district. The central office administrator replied,

“I think that the district has made substantial progress to where it once was. We can possibly offer one class of advanced math; however we cannot guarantee how many students we will get in a class. I believe that student achievement will continue to improve, but it is difficult to maintain consistency, one year you could be doing very well and the next year the bottom falls out simply because students in that class are not as academically gifted. We are looking at two programs; one is a behavior modification program that deals with assuring that behavior is consistently monitored in each of the classrooms, and the second is examining student performance issues. The bar is being raised by the state and we want to make sure that our students have every opportunity to meet the measurable goals established by AYP” (Interview with central office administrator, March 19, 2004).

The building level administrator listed these goals that she had for the future of mathematics curriculum reform in the district,

“We need to look at what we are actually teaching and make sure that it is correlated to the standards so that students have a better chance on the PSSA. We need to add a Probability and Statistics course into the curriculum, which is one area where we are weak in comparison to the standards. I would like to see more of the melding of teaching concepts in harmony with one another, a merger of the connections between the implementation of the standards and an improvement of teaching techniques in the classroom” (Interview with building level administrator, March 19, 2004).

Finally, the veteran mathematics teacher had this outlook for mathematics curriculum reform in the district, she stated,

“I see us teaching the test because it is all about achieving the objectives of the test in order to make these kids proficient. If you don’t want your school to be taken over by the state, then you have to teach the test” (Interview with secondary mathematics teacher, March 19, 2004).

District Two has had a history of association with and placement on state lists for financial and academic distress. However, the story of District Two is one of commitment to increasing student achievement through collaboration, cooperation, and a belief that long term academic success can only be reached through the development and implementation of consistent academic goals. The efforts of District Two have proven to be successful in the fact that they were notified during the 2003-2004 school year due to the improvement of student achievement on the PSSA over a two year period the district would be removed from the Educational Empowerment List.

The journey on the road best taken had its beginnings after the district was notified that it was going to be placed on the Education Empowerment List as a condition of the Act 16 legislation. This notification demoralized many members of the staff because District Two had just been recognized as a financially distressed district and was placed under the direction of a Board of Control in order to help improve the financial situation in the district. Many staff members were concerned that due to the consequences of Act 16 their jobs were in jeopardy and that there was an opinion in the educational community that they were not performing proficiently in their teaching responsibilities (Excerpt from interview with secondary mathematics teacher, March

19, 2004). This news could have provided an opportunity for teachers to become upset with the educational system and become complacent in the workplace. Instead, members of the community, school board, administration, and teaching staff worked collaboratively to develop educational goals and brainstormed ways that the district could improve. These ideas would become the foundation for the School District Improvement Plan that was required as a part of the Act 16 process. The development of this plan encouraged participation by all educational constituency groups, however the process for mathematics curriculum reform was left up to the members of the staff (Excerpt from interview with central office administrator, March 25, 2004).

The idea of curriculum reform had a great relationship to the perception of the school board regarding students' abilities in the district to achieve. Members of the mathematics department and the administration convinced the school board that the mathematics curriculum needed to be changed in order to provide a more rigorous and challenging experience for students (Excerpt from interview with central office administrator, March 25, 2004). This change in scope and sequence would also enable students to have a more successful transition to post-secondary life. The school board approved the changes and allowed the administration and teaching staff to develop the new rigorous curriculum. In order to accomplish this, the administration included members of the mathematics department in the process of reviewing various mathematics programs and gave the staff the opportunity to attend various professional development workshops and seminars that focused on mathematics curriculum. The decision to empower teachers in the selection of the curriculum was crucial for a successful restructuring of the mathematics program. The district had not empowered teachers to such a great extent in the

past; however there are some teachers felt that they were not given an opportunity to participate in the selection of the program, and that has been a source of consternation for their acceptance of the Cognitive Tutor program (Interview with secondary mathematics teacher, March 19, 2004). The secondary mathematics department also recommended a change in the scope and sequence of the curriculum which would eliminate all of the general mathematics courses and require students to take a mathematics sequence including Algebra 1, Geometry, and Algebra 2 in high school. The Cognitive Tutor program has been adopted as the means for providing instruction for these three courses, but as previously mentioned not all staff members believed that they had a voice in its selection, so when the program was implemented not all staff members attended the training. This was an area of concern for the district because they had a program being utilized in the district, but not all of the staff was trained. That problem has since been rectified because all staff members are currently trained in the Cognitive Tutor program (Excerpt from interview with central office administrator, March 25, 2004).

Although there have been many changes to the mathematics curriculum, District Two was informed that they were being placed on the State Warning List because they did not meet the measurable objectives of AYP on the PSSA test. The central office administrator summarized the attitude of the members of the staff when he commented, “We are now in our fourth year (of mathematics curriculum reform) and are starting to see changes, but not substantial enough” (Interview with central office administrator, March 19, 2004). There were a number of demands that were placed on the district after it was publicized that District Two had not met the objectives of AYP. The state demanded that the school district improve student achievement or

they would face further consequences, the community demanded that student achievement increase and that District Two work diligently to be removed from the list, and finally, members of the staff demanded that improvements take place within the classroom in order to raise student achievement. District Two chose not to develop strategies that focused on short-term improvement by centering attention on the PSSA, instead District Two focused on long-term strategies of improving instruction within the classroom by providing in-service programs that focused on aligning lesson instruction with state standards, incorporating test taking strategies of the PSSA as an integral part of the curriculum, and holding teachers accountable to make sure that students had the basic skills that were necessary for success (Excerpt from interview with central office administrator, March 25, 2004). This task has been difficult and has met with some resistance from the teachers, many of the staff are frustrated due to large populations of special education students in regular classrooms, implementing the classroom and laboratory portions of the Cognitive Tutor, and a perception that students will not be successful with the difficulty of the new rigorous curriculum (Excerpt from interview with secondary mathematics teacher, March 19, 2004).

In order to meet the challenges and concerns of the staff, the school board and central office administration has made it a priority to make sure that building level administrators and teachers have the resources that they need in order to help students succeed. There has been a concentrated effort in the district to provide staff members with data that they need to make decisions regarding areas of strengths and areas of improvement in the mathematics curriculum (Excerpt from interview with building level administrator, March 19, 2004). Members of the

staff have been given past results of the PSSA and Terra Nova in order to examine for patterns in student achievements that can be used to improve classroom instruction. The district has also worked diligently to develop partnerships with the local intermediate unit, the Math/Science Collaborative, and have utilized resources from the PDE in order to provide professional development training and assistance for the staff (Excerpt from interview with central office administrator, March 25, 2004).

The feedback that these changes have generated in District Two has been encouraging. Members of the mathematics department reported that students like some parts of the Cognitive Tutor program, but there are areas that need to be addressed. There is an acceptance by students, parents, and staff regarding the changes that have been made to the scope and sequence within the mathematics curriculum (Excerpt from interview with central office administrator, March 25, 2004). There has also been a discussion, lead by mathematics teachers, that a course in Probability and Statistics should be added to the course offering, this was an area of weakness that was noticed when there was a review of the alignment of the district mathematics curriculum to the standards. There has also been a great deal of dialogue among the school board, administration, and staff regarding the future direction of the mathematics program in District Two. The road best taken is evident because District Two has chosen not to focus on a “quick fix” solution, but has utilized collaboration in planning, developing, and implementing a vision of where they want student achievement to be in mathematics and a realistic plan on how it will get there.

In Need of Change

District Three

This school district is located in Western Pennsylvania and is identified in the Standard and Poor's School Evaluation Service Report (2002) as a district on the "urban fringe of a large city" (Standard and Poor's, 2002). For the purpose of this case study I was able to interview a central office administrator, a building level administrator, and a veteran secondary mathematics teacher who also served as the secondary mathematics department chairperson within District Three.

Pre 2000-2003

District Three has been faced with a multitude of problems over the past few years. The district was placed on the Commonwealth's list of financially distressed schools in 1998 and 1999 and according to a member of the Board of Control, "it appeared that the administration did not follow any of the recommendations made at the time to relieve some of the financial stress placed on the district" (Pittsburgh Post Gazette, 2001). According to the Pittsburgh Post-Gazette, the districts finances were in such disarray that no one knew, for example, how many sick days some employees had taken, and the district charge card was used to pay a hotel bar bill and for in-room movies during a school board trip to San Francisco (Pittsburgh Post Gazette, 2001). However, the school district cannot shoulder the entire blame for the financial disarray it faced. With the demise of the domestic steel industry, property values shrunk to the smallest tax base of any school in the Western Pennsylvania area (Pittsburgh Post Gazette, 2001). The loss of real estate value had qualified the district to receive special state funding, as much as \$1 million in 1994-1995, but that state subsidy was gradually reduced and then eliminated (Pittsburgh Post

Gazette, 2001). During the 1999-2000 school year the district faced severe economic hardships, twice during the school year the district was unable to make bond payments and it ended the school year with a deficit of \$202,000 (Pittsburgh Post Gazette, 2001). The district had three main financial problems facing them that they had to find answers for: the out-of balance budget, the construction fund and the money owed to their creditors (Pittsburgh Post Gazette, 2001). In relation to financial support, District Three has local-source operating revenue per student that is well below the state average and lower than their peer group average. The full market value of property in District Three is exceptionally below the state average and lower than their peer group average (Standard and Poor's, 2002). The tax burden on the property owners is exceptionally above the state average, but comparable to their peer districts (Standard and Poor's, 2002). The state-source operating revenue per student is exceptionally above the state average and is comparable to their peer districts (Standard and Poor's, 2002). Revenue from the state constitutes over 60% of the budget for District Three; this is in comparison to the state average of approximately 40% (Standard and Poor's, 2002). The district spends an amount that is exceptionally above the state average on purchased services per student, this might be due to the fact that over 20% of the total population of District Three qualifies for special education services (Standard and Poor's, 2002). The districts spending on day-to-day operations per student and for instruction per student are both well above the state average, but are lower than or comparable to their peer districts (Standard and Poor's, 2002).

However, financial problems were not the only problems that plagued the district; District Three also faced the challenges of hiring a new superintendent and new building level administrators in

the district. In 1999, a new superintendent was hired to manage all of the educational and financial challenges that were part of the environment in District Three. One of her first duties was to hire principals at the elementary, middle school, and high school levels. The middle school principal did not even remain in the district long enough for the students to start the school year. So there has been a history of administrative turnover in the district which caused concern among teachers, students and parents. This problem of stability in administration would be a concern for years to come.

District Three was also faced with severe academic concerns. There was not a copy of a written curriculum to be found in the district, so the curriculum that the teachers were using was not recently updated or aligned to the standards. Materials were needed in order to make sure that all students had copies of books and that teachers had copies of manuals to use in their classrooms. There were also problems with student attendance and tardiness, at one time almost every high school student in District Three had been tardy at least ten times. District Three was included on the list of Empowerment Districts under Act 16 due to its history of low student test scores and a high percentage of students achieving in the below basic range on the PSSA (PDE, 2000). In October 2000 as a provision of the Education Empowerment Act, a Board of Control was appointed by the state to handle all financial and educational matters of District Three.

After the district was placed on the Empowerment List in 2000, the effect on the district was experienced differently by the staff. When asked about the effect of the climate on the district when it was placed on the Empowerment List, the building-level administrator stated,

“Basically, when I got here in 2000, we were already identified as lacking in basic skills. When the Board of Control came in we began looking back to the reasons why the district ended up where we were at, and it wasn’t too hard to follow the trail back to the early 80’s, they had curriculum in place, but when you go back to about ’83-’84 curriculum development stopped. No new courses were developed after that, no changes to programs, everything just stopped. When the Board of Control came in it was a movement to systemic change within the district and it was probably the best thing that could have happened to the school district” (Interview with building level administrator, March 11, 2004).

The central office staff administrator stated,

“I think at this particular time there was a feeling that this would never come down. If the state takes over the district they will not be able to do a better job educating the students than we did. I have a background in psychology; I would say that the district was in denial, they said to themselves that this wasn’t happening. I would say that since the school district was placed on the Empowerment List, the teachers have been very focused and concerned about student achievement. I have seen a transformation over the past three years” (Interview with central office staff administrator, March 11, 2004).

However, the secondary mathematics teacher commented,

“I think the staff would have reacted better if we would have been informed differently, we walked into a meeting and it was if they were saying if you (the teachers) don’t do better the school will be closed and you will lose your jobs. They made it seem like it was the teachers fault. I think that if we worked better together and if the administration would work with us and say, we know that curriculum and discipline are problems and I will work with you, but that wasn’t the way that it happened” (Interview with secondary mathematics teacher, March 11, 2004).

The building-level principal agreed with the assessment of the secondary mathematics teacher that teachers did feel that “the finger was being pointed at them (teachers), and that they were worried about first, losing their jobs and second, the accountability for performance in their classroom.” Act 16 school district did receive some benefits financially; funds were allocated to districts for the purpose of improving student achievement within the district. District Three was

able to begin the process of reforming their secondary mathematics curriculum with the purchase and implementation of the Carnegie Learning Cognitive Tutor Program at the high school for Algebra 1, Geometry, and Algebra 2. Money was also allotted for the purchase of textbooks and other supplementary material for the mathematics classroom. The central office administrator was a supporter of the Cognitive Tutor program and also worked as a participant in its development. When asked about the inputs that teachers had into the selection of curriculum material, the math teacher stated,

“To my knowledge, the mathematics department had nothing to do with it (the selection of the Cognitive Tutor Program), the district wanted me to take a week away from my students and learn the Cognitive Tutor program but I told them I couldn’t take a week away, but that I would train in the summer. So that first year in 2000 I taught it without the training, in hindsight that was a bad move, I should have taken the training. The other teacher did take the training and help me along. I wasn’t happy we didn’t have input, but I have to admit I back the program now. I think it will work better in other districts than it will do here as far as the projects and having the students present things” (Interview with secondary mathematics teacher, March 11, 2004).

With the funds that were received from the state in accordance with Act 16 District Three was able to identify and implement some reforms to the mathematics curriculum. The adoption of the Cognitive Tutor program was only one of the mathematics curriculum reforms that were made within District Three, there was also a change in scope and sequence in the mathematics department with the elimination of basic level courses and the course offering sequence has been narrowed down so every student would take Algebra, Geometry, Algebra 2, and Trigonometry as a part of the same sequence. The building-level administrator supported this new structure,

“Everything was so disconnected and disjointed when I first got here; I used to say that teachers were in private practice, but now we started to work on connecting things. We are all moving toward the Cognitive Tutor and are in the

midst of a well planned and well directed 6-12 math curriculum” (Interview with building level principal, March 11, 2004).

When the question was asked if the reforms included the implementation of a standards based written math curriculum, the building level principal replied,

“There is no written math curriculum that is aligned with the mathematics standards. The belief in the district is that there is a written curriculum somewhere, but due to the constant turnover of administration, no one knows where the curriculum would be” (Interview with building level principal, March 11, 2004).

This lack of written curriculum and the fact that teachers do not have a curriculum that has been aligned to the state standards was an area of concern for the district. The district had consistently scored poorly on the PSSA and it was believed that the development of a standards based curriculum would help improve student achievement in the classroom and on the PSSA. The following table presents a four year history of the percentage of students who scored in the bottom group/below basic on the math and reading sections of the PSSA;

% of Students Scoring in the Bottom Group/Below Basic

School Year	1998-1999	1999-2000	2000-2001	2001-2002
District Three	69.9	72.0	71.3	66.7

District Three has numerous challenges that face the members of the administration and staff as they work collaboratively to improve student achievement. District Three enrolls the largest population of economically disadvantaged students in the state (Standard and Poor’s, 2002). The teaching staff of District Three has one of the highest percentages of teachers with less than one year of experience, this average is exceptionally above the state average and higher than the peer group average (Standard and Poor’s, 2002). In contrast, District Three has a low percentage of

teachers with 20 or more years of experience, in fact, the average is well below the state average and lower than their peer group average (Standard and Poor's, 2002). There is a substantial amount of professional turnover in District Three; the percentage rate for professional turnover is well above the state average and higher than their peer group average (Standard and Poor's, 2002).

District Three has a history of low test scores on the PSSA and a high percentage of students scoring in the below basic range. A review of the student performance on the mathematics section of the eleventh grade PSSA over a three year time period demonstrates that student performance on the PSSA is an area of concern for staff members.

Three Year History of Student Performance on the Mathematics Portion of the 11th Grade PSSA

	2001	2002	2003
Advanced	0.0%	0.0%	0.0%
Proficient	2.9%	12.1%	2.3%
Advanced and Proficient	2.9%	12.1%	2.3%
Basic	8.6%	18.2%	9.3%
Below Basic	88.6%	69.7%	88.4%

These results indicate that District Three was not able to meet the measurable goals of AYP on the mathematics section of the eleventh grade PSSA (PDE, 2003). These averages are exceptionally below-average proportion of PSSA scores meeting or exceeding state standards, exceptionally below-average proportion of PSSA scores in the Advanced performance level, and exceptionally above-average proportion of PSSA scores in the Below Basic performance level (Standard and Poor's, 2002). This pattern of performance was also indicative of student achievement for all of the disaggregated groups for District Three (PDE, 2003). In terms of

achievement gaps of students from different disaggregated groups, the achievement gaps that exist among students (black/white and economically disadvantaged/nondisadvantaged) are below the state averages in both categories (Standard and Poor's, 2002). Another challenge facing the staff and administration of District Three is related to student attendance, for the past school year the student attendance rate in District Three was exceptionally below the state average and lower than their peer group average (Standard and Poor's, 2002).

Due to the continued low test scores and failure to meet the measurable goals of AYP, District Three has been placed on the Pennsylvania Department of Education's Warning List (PDE, 2002).

2003-2004

In 2003, when the results of the mathematics section of the PSSA were made public District Three learned that their students had not met the measurable goals established by AYP. There were a number of demands placed upon the staff of District Three by many of the educational constituency groups. The secondary mathematics teacher stated,

“There were a number of demands and they were coming from everywhere. The teachers realized that we had to make changes but couldn't on our own. Parents were threatening to take their children out of the district unless we did better, and of course the administration said we had to do better” (Interview with secondary mathematics teacher, March 11, 2004).

This sentiment was fully supported by the central office administrator, who stated,

“This district has always had pressure and has been aware that achievement has not been where it is supposed to be. I think that the anxiety level of the staff was heightened and there was awareness on the part of the staff about what they had to do. There is also an expectation from the Board of Control that achievement will increase, but I place more of the demand on myself because I feel an obligation to make the superintendent successful in this district” (Interview with central office administrator, March 11, 2004).

One strategy of reform that is currently being used in District Three is the extensive use of data in order to make decisions about mathematics curriculum reform. The district and building level administration are currently utilizing data from the PSSA, the Terra Nova, and teacher made test in order to reform the mathematics curriculum. The central office administrator has been given the responsibility of working with the local Intermediate Unit in the development of the data base for CDA (Comprehensive Data Analysis) Plan for District Three, he stated,

“If you ask me what has been happening, my secretary has been gathering data and placing it on an Excel spreadsheet format that I have designed. In the middle of April I would be able to talk for an hour about what we are doing with the data. I am using the data with the staff for the next three staff development days and I am going to work with them on how to use the data. It will be the discovery process where they will work together in terms of analyzing the data and I will ask them questions which relate directly to the data” (Interview with central office administrator, March 11, 2004).

The district has also attempted to improve student achievement by changed their schedule in order to create time so that teachers can review the strategies of the PSSA and prepare students to take the test. The building-level administrator described the program this way,

“I have a 5th period which I call KIDS. At that time we present different approaches to taking the PSSA test, so if you are a kid who has math 2nd period you are taught the regular math curriculum, but if you are taking a standardized test that year, your fifth period is a review of test strategies for the test. We actually permit time, but we don’t take away from class time. We don’t have study halls and the students receive .25 credit for those 5th period classes” (Interview with building level administrator, March 11, 2004).

According to the teacher, the mathematics department or members of the teaching staff had little or no input into the development or implementation of these classes (Interview with secondary mathematics teacher, March 11, 2004).

In order to meet the many demands associated with improving student achievement the district knew that an important part of developing and sustaining curriculum reform is the presence of a well planned professional development program. When asked about professional development opportunities, all members of the administration and faculty interviewed at District Three report an increase in the quality and quantity of the professional development programs. Prior to 2003, it was reported that the district would hire an outside consultant to come to the district to make a presentation, the topic of the presentation would not be followed up in later meetings or staff development programs. It appears that in the past the staff development programs were disconnected and members of the teaching staff were reported to see “little value” in previous programs. The building-level principal explained,

“Until recently professional development was a band aid process. We had a one time expenditure of funds to have a well know person come in and give an in-service and we would never follow up on it. So our teachers have been trained in fifty different things and don’t do any of them. Staff development must be systemic and must have follow through. The teachers would laugh and say “Oh, another one of those, huh? It will last a week.” So we have to make sure that staff development is seen as very important and the only way that we will influence the instructional process is if we can make sure that the teachers know what is in it for them” (Interview with building level principal, March 11, 2004).

The secondary mathematics teacher feels that the staff development programs are sufficient, but that the way that teachers are supposed to run their classroom is unrealistic. The teacher explains,

“We get a lot of directives saying that this is what you should be doing (instructional scheme). Everyone should do this and I don’t think that this is realistic because the administrators are not in the classroom with us. You can tell the kids that they are working on Standard 2.1, but I don’t care if they know it is 2.1 or not just so they can do it. It seems like we are getting to a point where we don’t let personalities (teachers) have a place in the classroom and everyone has

to do everything the same way. We also need time to meet with mathematics teachers K-12 in order to find out what everyone is doing and where everyone is, until we have time to do that we are going to have problems” (Interview with secondary mathematics teacher, March 11, 2004).

The central office administrator believes that the district has been trying to do too much and not concentrating on the development of a data-driven curriculum,

“On the downside, I believe that the district is trying to do too much. We have a bullying program we are trying to implement; we are working with the National Center for Education and Economy (NCEE), and other things. I have difficulty determining what the district calendar is like. Case in point, there is nothing that resembles a data-driven curriculum here within the district and I want to turn that around” (Interview with central office administrator, March 11, 2004).

When the question was asked regarding the support that the staff and administration within District Three receive, they reported that they receive assistance from various sources; the local intermediate unit, the Math/Science Collaborative, and members of the NCEE, which helped to develop the New Standards Project, come in on a regular basis to work one on one with secondary math teachers. There has also been direction from the Board of Control and the Superintendent for the central office administrator interviewed to mentor the building-level principals. The central office administrator and the building-level administrators have set a goal in the 2003-2004 school year to average about “six co-evaluations of classes per week, and this is certainly a significant increase in the number of observations.” (Interview with central office administrator, March 11, 2004)

In our discussion of how the administration is monitoring the reform initiatives that have been begun within the district, it is apparent that there is a much greater focus on the structure of the lesson within the classroom. The building level administrator stresses that the most important step is to work with the teachers, he stated,

“In order for a student to want to learn there has to be some value in what is happening in the classroom. The student has to see the value. Our teachers have to turn the instructional environment into something that the students want to do. So we do a number of things, we try to start the classroom off with several types of activities, I call them starter exercises. We talk about objectives and that all lessons must have a stated objective about what we are doing through the day. We try to look at each child and how we can meet the child’s needs. There has to be input from home that is valuable to them for education. Again, it goes back to fact that it isn’t just professional development on how to teach or how to develop a lesson, it is lesson preparation, materials used, assessment techniques, and a purpose for what you are doing, setting benchmarks so that students know that they have to reach a certain level in order to go on” (Interview with building level administrator, March 11, 2004).

The mathematics teacher agreed with the fact that teachers need to follow certain instructional techniques within their classroom, but believes that problem is one where the administration is not consistent in their handling of discipline problems. She stated,

“Discipline is a problem, sometimes I throw a kid out of class and they are back within five minutes causing greater disruption, the administration tell us to call home if there is a problem, but a lot of these kids live on their own or have parents that are not supportive, so the call home is ineffective. I want to teach, please let me teach” (Interview with secondary mathematics teacher, March 11, 2004).

The building-level administrator agrees that this can be a difficult situation in which to teach and not every teacher can be successful in this environment, but that there are other districts which have more dangerous situations and that the discipline is improving within the school. When the

teacher was asked if there was a discipline committee developed to look at ways to improve the climate and some of the frustration that teachers feel, her response was, “Committee is a four letter word around here” (Interview with secondary mathematics teacher, March 11, 2004).

When asked if there was a district policy that related to classroom instruction all three educators replied that they did not know if one existed.

There have been a number of changes in District Three which have resulted in new personnel in key positions (Superintendent (hired in 2003) and Director of Curriculum (hired in 2004) in fact, the secondary principal has the most experience of any administrator and he is only beginning his fourth year of service in the district. There has also been the implementation of the Cognitive Tutor program at the high school and the subsequent elimination of basic level math courses. Although there is still not a written curriculum course sequence for mathematics, all students must follow the Algebra, Geometry, Algebra 2, and Trigonometry sequence. The school day has also been changed in order to accommodate a class period dedicated to the review of test strategies. However, it may be the lack of stability in the teaching and administrative staff that has created the greatest concern in the district in regards to the implementation of curriculum reform projects. The central office administrator reported that when reviewing curriculum reform in another subject area he was approached by teachers who asked, “Please look at the notes from what we have done in previous meetings.” They thought that because he was new that he would ignore all of the past work that has been accomplished. The mathematics teacher agreed,

“Because of the turnover in administration and teaching staff, today the rule is this and tomorrow the rule may change. We need stability in this district badly,

and I don't know how you get that" (Interview with secondary mathematics teacher, March 11, 2004).

The feedback that has been generated from the various reform initiatives in the mathematics curriculum has been mostly positive according to the building-level administrator,

"Staff will tell you that over the years they have put together curriculum and benchmarks, and it got lost and now one knows where it is. They are saying that finally we are getting something together. We are currently working on the development of a written standards based K-12 mathematics curriculum, the development of a standards based report card. In a few years, you will hear from us, no doubt" (Interview with building level principal, March 11, 2004).

The math teacher commented,

"I believe that we are going to keep running after this carrot somewhere and never get anything accomplished until we get plans on paper. I can remember the time when teachers had time in the summer to write curriculum so you came in on the first day of school and it was all ready for you to use. I would like to see departments meet K-12 and see what everybody else is doing. We are killing ourselves and getting nowhere" (Interview with secondary mathematics teacher, March 11, 2004).

In the education summary report section of the Standard and Poor's School Evaluation Services Report (2002) for District Three it stated, "Relative to other school districts in Pennsylvania, *District Three* generated exceptionally below-average student results with well-above average spending per student. When compared with a composite of peer districts with similar demographic characteristics, the district generates below-average student results with lower per student spending" (Standard and Poor's, 2004).

District Three has faced many educational and financial problems in recent history; with the district being placed on the state list of financially distressed districts in 1998 and 1999, and it

has a more recent history of educational distress. The district was placed under the direction of a Board of Control to attempt to rectify some of the financial and educational areas of concerns, but a history of a shrinking tax base and revolving administrators has kept District Three from initiating strategies for long term change within the school culture.

District Three was faced with severe economic hardship during the 1999-2000 school year, twice during that year the district was unable to make bond payments and it ended the year with a budget deficit. The district was also facing a crisis in leadership during this time, a new Superintendent was hired in 1999 and one of her first duties was to replace the building level administrators at the elementary, middle, and high schools. This meant that there would be very little district experience within the administrative team. This new administrative team was challenged by the fact that the district was not only plagued by financial problems but also faced with severe academic concerns; there were indications that curriculum had not been updated since 1984 and thus curriculum was not aligned to the state standards, teachers and students did not have enough textbooks or manuals to use in individual classrooms, and there were issues with student discipline and attendance. In 2000, due to the fact that the district had a history of low test scores on the PSSA, District Three was placed on the Education Empowerment List. In October 2003, as a part of the provisions of Act 16, a Board of Control was assigned by the state to manage the affairs of District Three. The placement of the district on the Education Empowerment List had a dramatic effect on staff members; some members of the administration stated that teachers were in a state of denial and that this would serve as a warning that the district had to improve student achievement, other administrators expressed the opinion that this

was the best thing for the district because it would initiate a climate for change within the district (Excerpt from interview with central office administrator, March 11, 2004). Some members of the teaching staff were upset with the manner in which this information was presented by the administration and they were concerned with issues of job security and accountability (Excerpt from interview with secondary mathematics teacher, March 11, 2004).

As a part of Act 16, District Three was eligible to receive grants from the state in order to improve student achievement. In the area of mathematics, these funds were used for the purchase of textbooks and supplementary materials. These funds were also used to purchase and implement the Cognitive Tutor program for Algebra, Geometry, and Algebra 2 at the high school. In discussion with the secondary mathematics teacher, it appears that the mathematics department had very little or any input in the selection of the Cognitive Tutor program, in fact not all of the staff were trained on how to use the program during 2000 in its first year of implementation within the district (Excerpt from interview with secondary mathematics teacher, March 11, 2004). There was also a concern by members of the mathematics department that there was still no written curriculum that was aligned to the state standards. Another concern of the teachers was that there was not a system of accountability within the district to make sure that the students had the basic skills necessary in mathematics in order to be successful with the Cognitive Tutor program (Excerpt from interview with secondary mathematics teacher, March 11, 2004). The fact that the district had chosen not to include the teachers in the decision making process regarding the development and implementation of mathematics curriculum was

detrimental to increasing student achievement and the predicted effect occurred and in 2003

District Three was placed on the State's Warning List for failure to meet the measurable goals of AYP.

In addition to being placed on the State's Warning List, District Three also faced an administrative change in 2003 with the hiring of a new superintendent. The new superintendent had an administrative team where the most senior member of her team had four years of administrative experience within the district. There were a number of demands placed on the new superintendent to improve student achievement so that District Three would be removed from the State's Warning List; the demands came from the Board of Control which had expectations that student achievement would improve, parents that were threatening to remove their children from the district, administration told that staff that they had to do better, and the members of the teaching staff placed pressure on themselves to improve, but voiced concerns regarding student discipline (Excerpt from interview with secondary mathematics teacher, March 11, 2004).

In order to improve student achievement, the secondary building administrator developed a program that would change the school day in order to create a fifth period class that was dedicated to teaching various instructional strategies that were a part of the PSSA (Excerpt from interview with building level administrator, March 11, 2004). This was a credited class and was listed on the students' transcripts. However, the class that was developed was done with little or no input from the mathematics department or teachers within the building and there also wasn't a

written curriculum developed for these classes, this was an attempt at a short term fix for a more cultural school problem (Excerpt from interview with secondary mathematics teacher, March 11, 2004).

A second initiative was to improve the professional development program at District Three. All educators interviewed stated that the current professional program was much improved in quality and quantity to the program in previous years. The district has established a focus of improving data collection and distribution in order to improve classroom instruction and in the establishment of consistent expectations for all classroom instruction (Excerpt from interview with central office administrator, March 11, 2004). The initial reaction to these goals were that teachers were very interested in working with data in order to improve classroom instruction, however the idea that developing consistent expectations for classroom instruction was unrealistic because it would take away from the autonomy and personality of the individual teacher within the classroom (Excerpt from interview with secondary mathematics teacher, March 11, 2004). The district has been fortunate to be able to develop partnerships with the National Center for Education and Economy, the Math/Science Collaborative, and the local intermediate unit in order to provide training and assistance to members of the teaching staff. One area of caution that was explained was that the district must be careful that it does not attempt to focus on too many issues in professional development, a prioritized list of areas needs to be addressed to ensure that staff development is effective and meaningful (Excerpt from interview with central office administrator, March 11, 2004).

The feedback from staff regarding the reform initiatives that have occurred within the mathematics curriculum in the district speak to the problems within the district itself. Members of the administration have cited the fact that they are in the process of working on a written K-12 curriculum in the area of mathematics and the development of a standards based report card for the district (Excerpt from interview with building level administrator, March 11, 2004).

However, the secondary mathematics teacher was most concerned with discipline problems that keep her from effectively teaching her students. There was also a concern that until mathematics teachers in K-12 are given an opportunity to work together and plans for reform are put on paper, any chance for change and long term success will not be accomplished (Excerpt from interview with secondary mathematics teacher, March 11, 2004). District Three will have a difficult time initiating programs that will bring about long term cultural change unless the members of the administration begin to work more collaboratively with teachers (Excerpt from interview with secondary mathematics teacher, March 11, 2004). There has also been so much administrative turnover in the district that members of the teaching staff are unaware of what rules or guidelines are associated with past or present administrators, so teachers are forced to make their own rules believing that the current administrative direction shall too pass like the previous ones (Excerpt from interview with secondary mathematics teacher, March 11, 2004). District Three is in desperate need of administrative stability, but from educational leaders who are dedicated to creating a shared vision of reform within the district.

It Takes a Village to Raise a Child

District Four

This district is located in Western Pennsylvania and is identified in the Standard and Poor's School Evaluation Services Report (2002) as on the "urban fringe of a large city" (Standard and Poor's, 2004). For the purposes of this case study, I was able to interview a retired math teacher and former mathematics department chairperson, who now is employed as a math coach for District Four; a secondary building level administrator, who has been with the district for four years; and a central office administrator who is employed by the University of Pittsburgh and was the former managing director of the Pittsburgh office of the Pennsylvania Economy League.

Pre 2000-2003

District Four has had to cope with a great deal of civic, financial, and educational turmoil in its history. In the 1990's, in an effort to improve student achievement, an elementary school was turned over to a for-profit firm to run, and charter school was open. Both of these initiatives have failed amid controversy (Pittsburgh Business Times, 2003). The teachers went on strike in 1998 and 1999 due to the fact that they had not received a pay raise in the past five years. Finally, in 2000 the district attempted to merge with other school districts in order to solve its educational and financial issues but was unable to do so (Pittsburgh Business Times, 2003).

In the past District Four has had a history of low test scores and a high percentage of students in the below basic/ bottom group of the PSSA. Due to this poor student performance, District Four

was classified as an Empowerment District as a part of Act 16 of 2000 (PDE, 2000). The percentages of students that scored in the bottom group/below basic range on the reading and math sections of the PSSA over a four period are as follows (PDE, 2002);

% of Students Scoring in the Bottom Group/Below Basic

School Year	1998-1999	1999-2000	2000-2001	2001-2002
District Four	52.8	53.8	55.0	53.0

When District Four was placed on the Education Empowerment List it turned to the Pennsylvania Economy League for support. During the fall of 2000, representative of the Pennsylvania Economy League worked with the eleven members of the Empowerment Team of District Four in order to develop and submit a School Improvement Plan. On December 20, 2000 the School Improvement Plan was submitted to the state, it was the first plan in the western part of the state to be approved and fully funded by the Pennsylvania Department of Education (Pennsylvania Economy League, 2000).

In examining the area of political decision making in curriculum reform in the area of mathematics, I began my interviews with a question regarding the impact of Act 16 upon the district. The central office administrator stated that at first the staff was “discouraged” and the feeling was that “we couldn’t do better; that the kids we have are the kids we have and wouldn’t do better.” (Interview with central office administrator, March 16, 2004)

The building level administrator commented that the effect of the placement of the school district on the Empowerment List,

“To a large degree helped us to focus, for the lack of a better word, on literacy

and math, particularly math because it was the first area that we focused on. It made us deal with the process of cooperation and made the unions and the administration sit at one table. I view it as a positive process, at first there was some denial from all parties and comments were made about how the state should look at district and the community that they were dealing with and all of the societal problems. However, we did research and discovered that districts that were very similar to ours were achieving. After you get past the initial shock and look into the process it becomes positive” (Interview with building level administrator, March 16, 2004).

The building level administrator was selected as the administrative member of the committee when the empowerment process started and was able to have input into the decisions and direction of the district in raising student achievement. The building level administrator also was a math major so he had a deep commitment to the reform of the mathematics curriculum.

The secondary mathematics teacher stated that the effect of placement on the Empowerment list was very negative,

“It created a lot of stress. Of course we (the teaching staff) knew and agreed that there were some things out of place and we were concerned. Whenever change is involved people are apprehensive. We had meetings, but people didn’t say anything. They told us don’t worry your jobs are secure, but we really had no clue” (Interview with secondary mathematics teacher, March 16, 2004).

With placement on the Education Empowerment List also came financial resources that were not readily available to the staff and administration at District Four, the district received an additional \$601,028 for the first two years that they were under the guidelines of Act 16 (Pittsburgh Post-Gazette, 2001).

The secondary mathematics teacher stated that there were many benefits to being part of the empowerment process,

“There was money from the state and we added another computer lab, we used to have two now we have three. We were also able to purchase supplies like protractors and calculators. We used to have students taking the PSSA with a four function calculator, now they are able to take the test with a graphing calculator. Programs were also purchased for the district, I am sure that this money was used to purchase the Cognitive Tutor and Connected Math programs that we use in our middle and high schools”(Interview with secondary mathematics teacher, March 16, 2004).

With these new funds that were now available from the state after District Four was placed on the empowerment list in 2000 there was a question of the involvement that each of the staff members had in the selection, review, training, and implementation of programs for mathematics curriculum reform. The district has utilized the services of the local intermediate unit, the University of Pittsburgh, and representatives from the Pennsylvania Economy League. The central office administrator stated,

“I am not an educator and I did not spend years in a school system, however I know something about organization, education reform, and how you bring people along. I had talked to a number of Superintendents and spoke with an educator that was a part of the group from Carnegie Mellon University that helped to design the Cognitive Tutor and I thought that it was a viable help for the district, I got in touch with the mathematics department chairperson and he got another teacher and we went to the Cognitive Tutor training sessions. What I remember is we went through the demonstrations, walked out in the hall and the teachers said they loved it. However, they also began to tell me why it wouldn't work in District Four due to historical, fiscal, and organizational reasons” (Interview with central office administrator, March 16, 2004).

The secondary mathematics teacher agreed with the central office administrator that members of the mathematics department always had input into the selection of curriculum materials that were to be used in the district. He stated,

“There was research done by the administration and they narrowed it down to three programs. The mathematics department was given an opportunity to review the three programs that had the most positive results with schools in an urban

setting. We choose to go with the Cognitive Tutor program. This was a result of the math department reviewing the programs and deciding for ourselves what we thought would be the most appropriate” (Interview with secondary mathematics teacher, March 16, 2004).

The building level administrator concurs and stated that the process in which mathematics curriculum reform was handled was very collaborative,

“There was an inordinate amount of collaboration and we all sat down and put everything on the table. We had some philosophical disagreements as the integrated math program and the Cognitive Tutor. We spent a great deal of time discussing curriculum reform and how could we expect an eleventh grade student to pass the PSSA if that student had not been exposed to Algebra. We spent a lot of time discussing course sequencing and looking at gaps in the mathematics curriculum. The district also used outside data sources help in the decision making, the results of the PSSA and the New Standards test data was shared with the teaching staff.” In addition to the Cognitive Tutor, the whole district is in the process of purchasing textbooks for literature and mathematics. The process involves teachers, administrators, parents, and the school board; they are not purchased in isolation” (Interview with building level administrator, March 16, 2004).

Following the 2000-2001 school year math teachers were questioned regarding the effectiveness of the Cognitive Tutor Program by the administration (1) if the program worth keeping, and (2) should the district go with the next step and implement Geometry? According to the central office administrator all of the teachers said that the program should stay and that Geometry should be implemented. District Four implemented the Cognitive Tutor program in the areas of Algebra and Geometry and have been using this program since 2000.

The staff and administration of District Four face many challenges in their attempts to work collaboratively to improve student achievement. District Four enrolls one of the highest populations of economically disadvantaged students in the state (Standard and Poor’s, 2002). In

addition, District Four has the highest dropout rate for students in the state. This rate is exceptionally above the state level and higher than the peer group average. Statewide, none of Pennsylvania's school districts report a greater drop-out rate (Standard and Poor's, 2002).

In terms of financial support, District Four local-source operating revenue per student is moderately above the state average and higher than the peer group average (Standard and Poor's, 2002). District Four state-source operating revenue per student is comparable to the state average, but lower than the peer group average (Standard and Poor's, 2002). The full market property value per student is well below the state average, but higher than the peer group average (Standard and Poor's, 2002). The burden placed on the taxpayer through property taxes is exceptionally above the state average and higher than the peer group average (Standard and Poor's, 2002). During the period examined by the Standard and Poor's Report (2002) the tax burden increased by an average of 8.2% which was counter to the state and peer group trends which demonstrated relatively little change over the same time period. The district day-to-day spending per student and the instructional spending per student are well above the state average, but comparable or below the peer group average. One limiting factor facing District Four is that they have very little financial reserves; this may limit the districts future financial abilities (Standard and Poor's, 2002).

In the examination of student achievement data related to student achievement on the mathematics section of the eleventh grade PSSA over a three year period, over 60% of students scored in the below basic range (PDE, 2003). The results of the student performance of the

mathematics section of the eleventh grade PSSA over a three year period are as follows;

Three Year History of Student Performance on the Mathematics Portion of the 11th Grade PSSA

	2001	2002	2003
Advanced	1.6%	1.6%	0.0%
Proficient	1.6%	3.3%	3.7%
Advanced and Proficient	3.2%	4.9%	3.7%
Basic	16.4%	27.9%	25.9%
Below Basic	80.3%	67.9%	70.4%

It is evident through a review of this table that student achievement on the mathematics section of the eleventh grade PSSA in District Four did not meet or exceed the 45% proficiency level set by the Pennsylvania Department of Education in order to meet AYP. These averages indicate an exceptionally below-average proportion of PSSA scores meeting or exceeding state standards, a well-below proportion of PSSA scores in the Advanced level, and an exceptionally above-average proportion of PSSA scores in the Below Basic range (Standard and Poor’s, 2002). It should be noted that none of the disaggregated groups examined met the measurable goals of AYP; however the achievement gaps that exist among the disadvantaged and nondisadvantaged students were exceptionally below the state average (Standard and Poor’s, 2002).

In the educational return summary section of the Standard and Poor’s School Evaluation Services report (2002) it states, “Relative to other school districts, *District Four* generates exceptionally below-average student results with above-average spending per student. When compared with a composite of peer districts with similar demographic characteristics, the district

produces average student results with lower per-student spending”. Due to the fact that District Four has not met the measurable goals for AYP, it has been placed on the Pennsylvania Department of Education’s Warning List (PDE, 2003).

2003-2004

The demands that were experienced by District Four after being placed on the list of schools that did not meet the measurable objectives of APY came from various constituency groups. The central office administrator stated,

“I remember looking at the results and 70% of our students were below basic, and I thought what would happen if we just improved each students score 10%, and that’s how I approached it with the staff. If we can work with each child to improve their score by 10% I think that we only had 27% below basic” (Interview with central office administrator, March 16, 2004).

The secondary mathematics teacher reported that he was aware of demands from the school board and parts of the community, but never heard from parents (Interview with secondary mathematics teacher, March 16, 2004). The building level administrator reported that he saw the demands coming from the state and that, “it wasn’t a matter of us setting the priorities, and it was a matter of the state setting the priorities” (Interview with building level administrator, March 16 2004).

In response to these demands the district began to receive assistance from the University of Pittsburgh. In 2003, the University of Pittsburgh opened the Center for Urban Education and the center began working with District Four in its Partnership for School District Improvement Plan. (Pittsburgh Post-Gazette, 2003) The former managing director of the Pittsburgh office of the

Pennsylvania Economy League was now employed by the University of Pittsburgh in the Center for Urban Education, and was selected as the leader of the intervention team that was assigned to District Four. In July 2003, an intervention team of five professionals from the Center for Urban Education began to work collaboratively with the staff and administration of District Four with a goal of raising student achievement. By working with district administrators, teachers, and regional supporters, the team will help to develop and implement appropriate systems and structures that will support and sustain increased student achievement. The general focus of the District Four intervention model involves; developing a core leadership team comprising of representatives from the school board, administration, teachers union, and University resource people, all whom will meet frequently to resolve problems impeding academic progress; moving the reform into the classroom via teams of teachers working on key areas; and improving the business, financial, and data systems in the district to five decision makers and teachers the information needed to implement reforms efforts. (News from Pitt, 2003) At this time the intervention team from the University of Pittsburgh was working to improve the financial and academic progress of the district and a new school governance structure was created in District Four. According to the central office administrator,

“The Superintendent and I split the responsibilities; I am responsible for the financial operation of the district, we have a curriculum person that works for me; and the Superintendent handles the day-to-day disruptions and the special needs population. We meet every day and coordinate, it is important to work together. This is a pilot project, but it is a continuation of work began in the summer of 2000” (Interview with the central office administrator, March 16, 2004).

In order to implement new programs and to assure that academic growth is consistent, there has to be in-service for all staff members. The secondary mathematics teacher agreed with the

importance of in-service opportunities and acknowledged that the district has been very supportive in providing in-service opportunities for mathematics teachers,

“Every one of our math teachers (in the secondary school) has Cognitive Tutor training depending on what they are certified. We have two teachers who are not certified in Geometry, while everyone else is certified in Algebra and Geometry. I have also had the opportunity to present to the staff regarding writing within the mathematics curriculum. We got to take our message to the physical education teacher, the shop teacher, and every teacher in the building. In that respect things have changed here” (Interview with secondary mathematics teacher, March 16, 2004).

It was now time for the district to examine means by which they could improve student achievement within the district. There were two ideas that have become realities; (1) the extended day program, and (2) to change the mathematics curriculum with more of a focus on academically rigorous courses. According to the building level administrator,

“The extended day program began during the 2003-2004 school year; this is the first year we have done this. Three days a week for approximately fifty minutes we have ninth, tenth, and eleventh grade students engaged in PSSA preparation. We have small groups and for example the eleventh grade students work with a math teacher and once a week they receive an open ended question, the other two days the teacher would work on the specific needs of the student or would pick a topic that is one the PSSA test. The tenth grade students are involved in working with literacy; writing, poetry, and literature. The ninth grade students are given time in the computer lab to work on the Cognitive Tutor or the Compass Learning programs. The unique thing about this program is that everyone in the district instructs the students; at 2:30 the superintendent is here, I am here, everyone teaches from 2:30 – 3:30. That is what makes it unique. I expected people to be marching in the streets in protest, but they have not. They have adjusted very well to it. We have provided an open forum for feedback and it has worked quite well for us” (Interview with building level administrator, March 16, 2004).

The central office administrator agreed,

“Everyone has their kids, I have my kids, the superintendent has his, and everyone is working together.” When we get back from the break I will sit down with every teacher who was a part of the program and ask them what was good,

bad, and what was ugly. We will talk to the teachers individually and we may talk to some anonymously, and if we have an extended day program next year it will probably be changed. We are always fine tuning and we get lots of feedback” (Interview with central office administrator, March 16, 2004).

The second major initiative was the change in the course sequence for the mathematics department. With the inclusion of the Algebra 1 and Geometry Cognitive Tutor programs, the district did not choose to implement the Algebra 2 program at this time. The math teacher explained, “It would be difficult for a student to just walk into the Algebra 2 program now, we wanted to phase it in and next year will be our third year. We are currently having meetings to decide that” (Interview with secondary mathematics teacher, March 16, 2004). The central office administrator agreed, “I thought that they had enough under their belt at the current time, they (the math department) are currently looking at the disc now. Will we do it next year? I’m not sure” (Interview with central office administrator, March 16, 2004). There has also been a movement to eliminate basic level mathematics courses and replace them with the sequence of Algebra 1, Geometry, and Algebra 2. Integrated math courses will be added to the curriculum for those students that do not have the basic skills to comprehend the skills necessary to complete the regular math sequence. It should be noted that the integrated math courses are being placed in the district course sequence for the 2004-2005 school year due to the input of the members of the mathematics department. The mathematics teacher explained,

“At first we wanted to include two integrated math courses. All of our ninth grade students take Algebra. If they do not perform well they are placed back in Algebra, we wanted to have an integrated course option that would include math and Geometry. It started, and then it was removed for this year, and will be placed again in the course sequence for next year” (Interview with secondary mathematics teacher, March 16, 2004).

District Four is also examining adding an Advanced Placement course in mathematics, the building level administrator explained that this may take a few years to implement, “We are going to be selecting a group of students who will be taking Algebra 1 during their eighth grade year, this will allow these students to complete the mathematics sequence to the AP level” (Interview with building level administrator, March 16, 2004).

The feedback from members of the various educational constituency groups is an important factor in considering the direction that District Four should take. The feedback that has been given to the staff members that I have interviewed regarding the reform of the mathematics curriculum involved the formalization of the mathematics curriculum. The central office administrator stated,

“We are largely on track; we will begin to require kids to take four years of math. We are going to start getting kids at least to the calculus and pre-calculus classes; there was one year we didn’t even offer trigonometry. We will begin to look at including courses like; Probability and Statistics, Excel Spreadsheet, and Computer Math” (Interview with central office administrator, March 16, 2004).

The secondary mathematics teacher stated,

“I am so impressed with the Cognitive Tutor program, when I see the student being so enthusiastic about this program I decided that I wasn’t quite ready to retire completely from teaching. You always have some students who don’t respond, but I’ve had more positive response with this than anything I’ve seen in 34 years. Many stay after school without prodding to do more math” (Interview with secondary mathematics teacher, March 16, 2004).

The building level principal stated,

“We looked at the K-12 curriculum; there is really no written curriculum in place. What we have is basically just Table of Contents, nothing that is aligned to the standards. We are working on that now, and when it is completed it will be the

first time in my professional career that we have a written K-12 mathematics curriculum that will meet the standards. We also need to address the how we are going to increase academic rigor within the district. I believe that all children can learn and that we can provide the proper environment to for our students to function in a global society. We have to do that, which is why we are here; we must meet the needs of our clientele” (Interview with building level administrator, March 16, 2004).

The history of District Four involves a great deal of civic, financial, and educational turmoil.

The district has chosen many paths in its attempts to improve; turning the running of an elementary school over to a for-profit organization, the opening of a charter school within the district, and attempting to merge with another school district in order to solve its financial and educational problems. These attempts have proven to be largely unsuccessful and in some cases have provided the district greater problems in public relations and in the development of mutual trust among teachers, administrators, and the community (Excerpt from interview with building level administrator, March 16, 2004). District Four has developed new strategies to improved student achievement based on collaboration with the Pennsylvania Economy League (PEL) and the University of Pittsburgh’s School of Education’s Center for Urban Education. These partnerships have provided the impetus for breaking old district norms and replacing them with new ideas that will help to improve student achievement within the district.

Following the placement of District Four on the Act 16 Education Empowerment List, the district turned to the PEL for support. The PEL became very active within the district and was an integral part of the development and implementation of the School District Improvement Plan that was required as a condition of Act 16 (Excerpt from interview with central office

administrator, March 16, 2004). District Four had a difficult task in motivating the teachers to meet the challenges identified through Act 16. The members of the staff were concerned that their jobs were in jeopardy and that due to the socio-economic and single family dynamic realities of the community there was no way that student achievement in District Four would improve. One benefit of being placed on the Empowerment List was the large amount of grant money that District Four received from the state in order to improve student achievement. The central office administration and representatives from PEL made sure that the teachers had a voice in the review and selection of new mathematics materials purchased using the grant money (Excerpt from interview with central office administrator, March 16, 2004). There were also opportunities allotted for discussion of the mathematics curriculum between teachers and administrators. This allowed the staff members to discuss course sequencing and review the gaps in the mathematics curriculum as they attempted to align the curriculum with the state standards. Through this collaboration, District Four chose to purchase the Cognitive Tutor program for Algebra 1, and there was also a decision, not supported by the mathematics teaching staff, not to use integrated mathematics in the curriculum for those students that lacked the basic skills for Algebra 1 (Excerpt from interview with secondary mathematics teacher, March 16, 2004). All mathematics teachers were trained in the Cognitive Tutor program and it went into effect in District Four. Following the 2000-2001 school year members of the PEL, administration, and teaching staff reviewed the Cognitive Tutor program and decided to continue using the program and to add the Geometry component to the mathematics curriculum (Excerpt from interview with central office administrator, March 16, 2004).

The district continued to use the Cognitive Tutor program and make revisions to the mathematics curriculum, but due to the fact that the district did not meet the measurable goals of AYP it was placed on the State's Warning List. The effect of placement on the warning list served as a message to the staff within the district that there needed to be improvement or District Four would face consequences listed in the NCLB legislation (Excerpt from interview with building level administrator, March 16, 2004). Assistance came to District Four from the University of Pittsburgh, a Center for Urban Education was opened that year and one of the first projects of the Center was working with District Four in its Partnership for School District Improvement Plan. The administrator who formerly worked with the PEL in District Four was now working at the University of Pittsburgh and was chosen to lead the Intervention Team that would be assigned to work there. This was very fortunate because it provided consistency between the reforms that were begun in 2000 under the PEL and initiatives that would begin under the Center for Urban Education in 2003 (Excerpt from interview with central office administrator, March 16, 2004). Members of the intervention team were given a great deal of power and responsibility within District Four; the leadership structure of District Four was changed so that the duties of the Superintendent included special education and handling daily disturbances, meanwhile the duties and titles of the intervention team leaders were Chief Financial Officer and the Chief Academic Officer (Excerpt from interview with central office administrator, March 16, 2004). In order to ensure that the new leadership structure was cohesive members of the central office staff and intervention team met daily to coordinate planning and work collaboratively to improve student achievement (Excerpt from interview with central office administrator, March 16, 2004). The

staff at District Four was challenged to develop strategies to improve student achievement. Two ideas that became realities were; (1) the extended day program, and (2) reform in the scope and sequence of the mathematics program.

The extended day program exemplifies the title of this chapter and the dedication that it takes a village to raise a child. All staff members; central office administrators, intervention team members, building level administrators, and teachers who volunteered stayed after school three days a week for approximately an hour a day to work with small groups of students on improving their preparation for the PSSA (Excerpt from interview with building level administrator, March 16, 2004). Each staff member had their individual group of students that they worked with on developing and reinforcing skills in the area of mathematics and reading. Members of the administration and teaching staff reported that this program has been very successful and has been well received by teachers, students, and parents (Excerpt from interview with central office administrator, March 16, 2004).

The change in the scope and sequence for the mathematics curriculum has been a collaborative process among the intervention team, district administration, and the mathematics teaching staff. It was decided that the Algebra 2 component of the Cognitive Tutor would not be implemented until it was able to be phased into the curriculum so that students would not have difficulty with the program (Excerpt from interview with secondary mathematics teacher, March 16, 2004).

There was also a movement to eliminate general math courses and replace them with a more rigorous curriculum. Many of the general mathematics courses were eliminated, however due to the fact that many students lacked basic skills, integrated math courses were placed back into the

curriculum. This was an idea that was previously suggested by the teachers and was now a reality (Excerpt from interview with secondary mathematics teacher, March 16, 2004). There are also plans to add courses such as; Advanced Placement math, Statistics and Probability, Excel Spreadsheet, and Computer math to the curriculum, but these will not be implemented for a few years.

The feedback that staff members from District Four have received has been very positive. All of the educators that were interviewed have stated that they believe that the district is on the right track for improving student achievement within the district. With the addition of the extended day program and the focus on the revision and adoption of a more rigorous mathematics curriculum the outlook for District Four appears to be brighter than it has been for many years. However, District Four has not had to meet these challenges alone; it has relied heavily upon the consistent support of the Pennsylvania Economy League and the University of Pittsburgh for resources used in the restructuring of the educational environment. The new leadership team has been able to work together to focus the energies and resources of the community, university, and district to form a structure which encourages collaboration in order to improve student achievement (Excerpt from interview with central office administrator, March 16, 2004).

Summary of Research Questions

The four school districts included in this research were all placed on the Pennsylvania Act 16 Education Empowerment Act List due to their history of low test scores. The demands that were placed on these districts came from a variety of sources; however, these demands were very

similar across the districts. All of the districts reported demands from the administrative body that was in charge of the school district whether it was the central office or a state-appointed Board of Control. These groups placed demands on the organization to improve student achievement and attempted to develop strategies for improvement without placing their district in financial jeopardy. The building level administration expected the teachers to improve, and in many cases they empowered the teachers to develop strategies to improve student achievement. However, in some school districts, building level administrators choose to implement strategies without input from staff. This top-down strategy was cause for concern among teachers in the district where this took place. In three of the school districts, parents were very concerned and also placed demands on the school districts to improve or else the parents began to search for ways to enroll their children in other school districts or in other schools.

Since all of the districts were placed on the Empowerment List, all were entitled to funds from state grants for the purpose of improving student performance. Many of the reform movements that the districts began were possible because of the large amount of funding from the state grants. These funds were used in a variety of ways in each of the districts in order to implement processes to reform the curriculum and improve student achievement. In a majority of the districts it appears that the uses of the funds were in direct relationship with the establishment of a mathematics curriculum reform plan for the district. The school districts utilized these funds for the purchase of textbooks or the adoption of the Cognitive Tutor program. The Cognitive Tutor program was adopted by a majority of the districts as a means for providing instruction for students in the areas of Algebra 1, Geometry, and Algebra 2. A fourth district chose not to

purchase the Cognitive Tutor program, but instead to purchase a new standards-based mathematics series. The selection of the Cognitive Tutor program also meant that those districts that purchased the program had to update their technology within their district, so these funds were also used to purchase additional computers and software for the districts.

A second process that was implemented was the restructuring of the mathematics curriculum in all of the districts. Lower level general mathematics courses were replaced with a sequence of Algebra 1 (in some districts a split Algebra 2 A/B was used), Geometry, and Algebra 2. This restructuring was implemented because the students in the lower level general courses were not receiving instruction in the basic skills that were a part of the academic standards. Under this new sequence students were receiving instruction that was standards based; specifically, students would now be exposed to the principles of Geometry before they took the PSSA in eleventh grade. Another commonality in the area of curriculum restructuring was the development of an accelerated track in mathematics by identifying a select group of students who would begin Algebra 1 in the eighth grade and be able to complete a higher level mathematics sequence by the time they graduated from high school.

A third process that was implemented by two of the districts was the development of partnerships with outside organizations or educational institutions that resulted in the restructuring of the mathematics program. These partnerships provided a variety of services to the districts professional development, consultation in mathematics, curriculum development, additional subject area staff, and even provided a restructuring of the administrative team in one of the districts. These partnerships have enabled the districts to utilize additional resources in the

development and implementation of improvement plans in order to improve student achievement.

Finally, some districts chose to adapt their school day in order to provide additional opportunities for students to receive standards based instruction. In two of the districts an additional period was added in order to offer assistance to students in the areas of reading or mathematics, this was an opportunity for small group instruction for students that were having difficulties in these areas to receive additional help during the school day. In another district, there was a decision not to alter the school day but to provide students with the opportunity to receive tutoring at the end of the school day. The belief is that the students have to be held accountable for their own learning and that the teachers will provide additional opportunities for those students that chose to take advantage of them.

These processes for mathematics curriculum reform in the various school districts were monitored by members of the central office and building level administration. One of the districts is in the process of developing an Instructional Model that will be used in the improvement of classroom instruction and assessment. Many of the districts are increasing their focus on the use of data from previous assessments or current practice tests in order to examine the strengths and areas of concerns and how these related to the improvement of classroom instruction. The Cognitive Tutor program has a management system that provides the teachers and administrators with various types of data regarding student performance. The administration has taken steps to ensure that the staff had the latest data reports from the various state and

national assessments that are taken by students in the district. All of the districts stated that the members of the administration have adapted their formal and informal observation process to make sure that the teachers are including references to the standards in their classroom instruction in order to reinforce the importance of understanding the relationship between the mathematic concept and the standard that concept represents. Members of the administration also stated that they are encouraging teachers, through a focus in staff development workshops and seminars, to use a variety of instructional techniques within their classrooms. According to administrators this focus has increased the use of strategies to facilitate active learners within the classroom.

The patterns of achievement within the districts are still at very low levels, even though one of the districts studied was removed from the Empowerment List due to the fact that their test scores increased over a two year period. All of these districts did not meet the measurable objectives of AYP and were placed on the State's Warning List. However, that is not to say that there have not been improvements noticed in the district. With the restructuring of the mathematics curriculum, all of the districts reported an increase in the number of students who are enrolled in higher level mathematics courses. Students who are enrolled in these higher level mathematics courses have the opportunity to compete with students from any other school districts and are better prepared for post secondary life than before. With this restructuring of curriculum, the teachers in a majority of districts reported that there have been attempts to start the process of developing a K-12 mathematics curriculum. Many of the districts reported that there has been improvement in student achievement and performance in the area of mathematics,

but it still too soon for a dramatic increase to have taken place.

The largest area of difference in the districts studied is how the decision making process served as a connection between the development and implementation of mathematics reform and implementation. All of the districts have utilized the resources from the Act 16 legislation in order to initiate change; however in only some cases were other members of the educational constituency groups included in the process. In some districts there was a effort to ensure that parents, teachers, administrators, school board, and outside agencies were included in the decision making process. These districts have developed a district wide plan that has acceptance in the school community because members of various constituency groups have had a part in the development of the plan. These types of reform initiatives offer districts a long term means for achieving improvement of student performance. While in other districts, the administrators, school board members, or Board of Control has developed the plan for reform without input from the major educational stakeholders, these plans have often met with resistance because members of the educational constituency groups did not have a voice in the development of the plan, thus they do not have a commitment to its success.

The power structures in the majority of the districts are typical of what would be found in other districts throughout the Commonwealth. There is a Superintendent who is in charge of the district and a central office staff that also is in charge of the educational and financial responsibilities within the district. The individual buildings each have an administrator who serves as the instructional leader and is responsible for marinating a climate suitable for learning.

The building level administrators are responsible for observing and evaluating the staff and making recommendations for curriculum development within their buildings. However, in some of the districts, even though this formal structure is still in place due to administrative turnover an informal structure of teacher survival is evident. In some cases there has been so much instability in the ranks of the central office and building level administration that teachers are often confused about the policies and guidelines for the current administrative team, so they create their own rules and guidelines within their classrooms. This instability occurs not only in the administrative ranks but also among teachers; many of the districts in this study have an above average amount of teacher turnover when compared to similar districts in the state. This also creates academic problems because the veteran teachers are reluctant to form academic partnerships with new staff because they believe that these new teachers will soon be leaving the district and a new person will be hired to fill that position. In one of the district there is a unique power structure in which an employee of an educational institution and members of his team serve as the leadership structure within the district. The district still maintains a superintendent, but his duties have been reduced and many have been reassigned to members of the leadership team that was brought into the district. This leadership team has worked diligently to include members of the teaching staff in the decision making process regarding mathematics curriculum reform and in order to ensure that the financial resources are available to support the reform initiatives.

Cross-Site Analysis

<u>Themes</u>	District One	District Two	District Three	District Four
Teacher Empowerment	<ul style="list-style-type: none"> Teachers have an active voice in curriculum decisions 	<ul style="list-style-type: none"> Some teachers are included in decisions involving curriculum 	<ul style="list-style-type: none"> Decisions appear to be mostly made using top-down strategy 	<ul style="list-style-type: none"> Teachers have an active voice in curriculum decisions
Student Results	<ul style="list-style-type: none"> Placed on State Warning List due to failure to meet measurable objectives of AYP 	<ul style="list-style-type: none"> Placed on State Warning List due to failure to meet measurable objectives of AYP Removed from Act 16 Education Empowerment List due to increase in student performance 	<ul style="list-style-type: none"> Placed on State Warning List due to failure to meet measurable objectives of AYP 	<ul style="list-style-type: none"> Placed on State Warning List due to failure to meet measurable objectives of AYP
Administrative Stability	<ul style="list-style-type: none"> Administrators have much experience within the district Recent change in Superintendent and Secondary principal 	<ul style="list-style-type: none"> High turnover rate of administration Assistant Superintendent is the only administrator with much experience within district 	<ul style="list-style-type: none"> High rate of turnover of administration Superintendent hired in 2003 and Director of Curriculum hired in 2004 	<ul style="list-style-type: none"> New administrative team in place, but have prior association with district through PEL Administrators have much experience within the district
Curricular Issues	<ul style="list-style-type: none"> Collaboration with Tri-State Study Council Adopted new textbook standards based textbook 	<ul style="list-style-type: none"> Purchase and implementation of Cognitive Tutor program No written curriculum Restructuring of 	<ul style="list-style-type: none"> Purchase and implementation of Cognitive Tutor program No written curriculum Restructuring 	<ul style="list-style-type: none"> Purchase and implementation of Cognitive Tutor program

	<p>series in 2000</p> <ul style="list-style-type: none"> • Working on the development of instructional model for district • No written curriculum • Restructuring of mathematics curriculum • Curriculum mapping 	<p>mathematics curriculum</p>	<p>of mathematics curriculum</p>	<ul style="list-style-type: none"> • No written curriculum • Restructuring of mathematics curriculum • Administrative structure has changed with the Chief Financial and Academic Officers not employed by district but by University of Pittsburgh
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Cross-site analyses of the school districts indicate that there are many similarities within the four themes. The administration of three of the four school districts made a conscious decision to empower teachers as a part of the curriculum reform process in mathematics. This strategy of empowerment has enabled staff within these districts to work collaboratively in the development and implementation of a shared vision for the improvement of student performance. Teacher empowerment has also enabled the implementation of new curriculum initiatives to occur with less resistance among members of the teaching staff because teachers believe that they have a voice in curriculum decisions that affect their classrooms.

The student results in the school districts studied indicate that the level of student achievement has not met the measurable objectives of AYP according to the NCLB legislation. Each of the school districts has developed a School Wide Improvement Plan which outlined a strategy for improving student achievement. However, there are other factors that influence achievement besides a single assessment result. Due to the fact that the school districts have chosen a strategy of restructuring curriculum the students will be enrolled in a more challenging and rigorous curriculum in mathematics. This will better prepare students for post-secondary life because they will have a stronger foundation in mathematics. The school districts also are identifying students who are performing well in mathematics in seventh grade that can begin an accelerated study of Algebra in eighth grade. These students will have the opportunity to experience upper level mathematics courses during high school.

In school districts that experience a high rate of administrative turnover, there is a tendency on the part of the staff to resist organizational change attempted by the new administrator. Members of the staff often believe that new administrators do not take the time to review the policies and practices of the former administration and that work previously completed is often ignored. The new administrator often brings new programs and ideas that do not correspond to the current culture of the school or the staff. In two of the school districts studied there are members of the administration who have a wealth of experience that can assist new building level administrators in the acclimation to the community, staff, and educational environment. This provides the new administrator with an opportunity to get to know the staff and review the history of curriculum reform in the district.

There are many similarities in the manner in which these school districts chose to reform their mathematics curriculum. They all have eliminated lower level mathematics courses and replaced them with a scope and sequence beginning with Algebra 1, Geometry, and Algebra 2. Students will be enrolled in either Algebra 1 or the first of a two-part Algebra class in the ninth grade. All of the school districts are also examining the opportunity to recognize students that have demonstrated ability in mathematics to be enrolled in an accelerated Algebra class in the eighth grade. The restructuring of the curriculum will allow the students to have a better understanding of the standards that are included on the PSSA and consequently student performance on the state assessment should improve. One concern that members of the teaching staff had is that students must have the basic skills necessary in order to be successful Algebra 1.

District Review

The school districts that were studied had many characteristics that were similar; however there were also many characteristics that were very different that created sources of strengths and areas of concern. The titles that were assigned provided a foreshadow of the characteristics for each of these districts.

The title of the case study for District One was the *Voices of Reason*; this name was given because the district needs to listen to the voices of the staff and the Tri-State Study Council in order to reform the mathematics curriculum. District One has utilized funds from Act 16 to develop a partnership with the Tri-State Study Council. Through Tri-State the districts has started the process of curriculum mapping and have hired a mathematics coach to work with members of the mathematics department. The mathematics coach has been very instrumental in

working collaboratively with members of the teaching staff to improve classroom instruction (Excerpt from interview with secondary mathematics teacher, March 16, 2005). The district is also fortunate to have a mathematics veteran mathematics staff that is dedicated to working collaboratively with Tri-State in improving student achievement and improving their own subject knowledge. The administration must listen to these voices and provide the necessary resources that are needed to improve student achievement. The building level administrator must find his own voice as the instructional leader and work collaboratively to raise achievement in the building. By listening to all of the other voices and focusing on student achievement through collaboration, District One will continue to strengthen the mathematics curriculum and reform initiatives will be more effective.

The title for the case study for District Two is *The Road Best Taken*. This title fit this school district because this district is the only one which has improved student performance to the point that it has been removed from the Educational Empowerment List. District Two began a process of collaborating by forming a committee consisting with educational constituency groups such as community members, school board members, teachers, administrators, and parents prior to the passage of Act 16. This committee discussed problems that were occurring within the school district and possible strategies that could be used to address the problems. Following the passage of Act 16, and the subsequent placement of District Two on the Education Empowerment List, District Two had already been working on strategies to improve the educational climate within the district. Those ideas which were developed in the committee meetings became realities using the funding from Act 16. District Two had begun initiatives for reform prior to the state

mandating reform and these reforms had the support of the community. The road best taken for the district has been a commitment to educational reform through the involvement of the community in student success.

District Three has many obstacles that face efforts for improvement of student achievement, however the reason that the case study for the district was called *In Need of Change* is because many of the obstacles that are faced by District Three have been created due to a lack of vision in creating a collaborative environment for reform. In discussion with the secondary mathematics teacher, it was stated that there was no mathematics department, committee is a four letter work around here, and that the mathematics teachers had no input into the selection of the Cognitive Tutor or the development and implementation of the PSSA preparation class (Excerpts from interview with secondary mathematics teacher, March 11, 2004). This demonstrates that there is little collaboration between administrators and mathematics teachers occurring in the district. When the Cognitive Tutor program was implemented not all of the staff members received training, this had an affect on the quality of instruction that was delivered to the students (Excerpt from interview with secondary mathematics teacher, March 11, 2004). Even the building level administrator reported that when he first arrived it was like the teachers were in private practice (Excerpt from interview with building level administrator, March 11, 2004). District Three had a high rate of administrative turnover and the teachers are not sure what the school-wide policies and practices are that should be followed. The administration must make a concerted effort to ensure that members of the mathematics staff are empowered and that they believe that their opinions count in the reform of the mathematics curriculum and also the

administration must listen to the concerns of the staff and how they effect instruction within the classroom.

In District Four it truly *Takes a Village to Raise a Child*. The staff and administration have faced many distractions in their attempts to educate the children of the district. There has been the development of a charter school within the district and one of the elementary schools was turned over to a for-profit company to run. In order to help find solutions for a history of academic and financial distress District Four formed a partnership with the Pennsylvania Economy League. The PEL was instrumental in the development and implementation of the School Wide Improvement Plan after District Four was notified that due to a history of low test scores it was being placed on the Education Empowerment List. Representatives of the PEL and the school district worked collaboratively to develop strategies to improve student achievement (Excerpt from interview with central office administrator, March 16, 2004). There were reforms made to the mathematics curriculum and the Cognitive Tutor program was brought in as an educational tool for instruction in Algebra 1. However, in 2003, District Four was informed that due to low student performance on the PSSA, they were placed on the State's Warning List. The school district developed a partnership with the University Of Pittsburgh School Of Education's Center for Urban Studies to help address the problems within the district. The Center for Urban Studies sent an Intervention Team into the district to work with the staff and administration in the development of strategies to improve student achievement (Excerpt from interview with central office administrator, March 16, 2004). The members of the Intervention Team assumed leadership roles within the district and began to work collaboratively with the staff to deal with

financial and academic problems faced by the district. The educational and civic communities have had a dramatic impact on the reform initiatives within District Four and the stakeholders within these various groups are dedicated to the improvement of student achievement within the district.

Implications for Policy and Practice

The implications for policy and practice in the area of curriculum reform in mathematics focus on five major themes; policy confusion, teacher empowerment, student results, administrative stability, and impact of curricular issues. These five themes will form the basis for this researcher's recommendation for policy and practice but also serve as a forum for questions yet to be answered.

The discussion of policy confusion is a very important piece because the impetus for improvement within the districts for this research began with the notification that the school districts studied were placed under the guidelines of the Pennsylvania Education Empowerment Act due to their history of low test scores. The school districts were given directives by the PDE as to the conditions of the Act and the steps that they must take in order to demonstrate an increase in student performance. It is ironic that this Act is called the Education Empowerment Act when in actuality it disempowered school districts. School districts were told by the PDE the steps that they should take, the structure of the School Improvement Plan, and the manner in which funds could be spent. Often, the involvement of the PDE disappeared and the School Improvement Teams had the task of developing the plans for improvement of student achievement. As was the case in two of the school districts studied, the PDE refused to accept

their Improvement Plans because they did not meet the criteria established by the state, even though these plans were approved by the School Improvement Teams that drafted them. School districts worked diligently to develop plans that met the criteria developed by the state and have had the plans approved. However with the passage of the NCLB legislation the federal government has become involved, along with the states, in holding schools accountable for improving student achievement. School districts must now focus their improvement efforts on meeting the measurable goals of AYP and policies related to Act 16 have been replaced by a focus on NCLB. The focus in the school districts of adding additional time during the school day to prepare students for the PSSA is an indication of the importance that school districts place on increasing student performance on the state assessment. School district are not focusing their resources on the improvement of classroom instruction, instead the districts are examining strategies that relate directly to the PSSA. This strategy has often replaced the long range planning and development of a vision for improvement that occurred during the development of the School Wide Improvement Plans under the Act 16 guidelines. How are school districts going to be able to restructure their practices in order to meet the new mandates of NCLB? What happened to Act 16? These are questions that have caused much confusion in the school districts that were studied.

The area of teacher empowerment is very important in the development of a collaborative and systemic plan for mathematics curriculum reform in school districts. The members of the administration must be able to empower the teachers in the many decisions that need to be made

in improving student performance in the area of mathematics. Teachers must be given the recourses for professional development that will allow them to have a voice in the direction of the curriculum within the mathematics department. This collaboration provides for the development of a shared vision what the mathematics curriculum should be and how the district intends to make it reality. The members of the teaching staff must be able to connect the reform initiatives with the actual classroom instruction in order for the change to be long term and effective. However, it cannot be expected that teachers automatically are prepared for empowerment; guidelines must be established in order that there is an understanding of what roles each member of the various educational constituency group will have in curriculum reform. In the case of District Two, there were meetings with members of various constituency groups to discuss the development of the School Wide Improvement Plan, but the decisions regarding the reform of the mathematics department were the roles of the administration and the mathematics teachers. There must also be a concerted effort on behalf of the administration to include all members of the staff in the empowerment process, those members that choose not to participate as part of the reform movement cannot place blame on the administration. In addition to professional development for teachers, building level administration must be provided with training on how to empower staff members in order to improve student achievement. It is imperative for the members of the administration to understand what shared decision making involves and where it might lead in the future.

The school districts that were studied were very similar in the fact they all had student results that initially placed them on the Education Empowerment List and then on the State's Warning List. However, can a singular focus on student results be detrimental for a district? Change will not occur in student achievement in a short period of time. A district has three options when it studies the idea of change; do nothing and hope for change as part of the environment, initiate strategies that will result in short term change, or create an environment for systemic change that will result in long term change within the district. Many of the districts studied began with the development and implementation of a School Wide Improvement Plan and were given additional state grants in order to improve student achievement; all of these districts did not meet the mandates of AYP. Does this mean that none of the districts have created an environment where change has affected student results? How long will it take districts to improve? It is the opinion of this researcher that the districts which have focused on long term systemic change which includes the development of a vision in collaboration with members of various educational constituency groups will observe student results that indicates an improvement in student achievement. It is also important the district identify the results they are looking for as far as benchmarks for an improvement in student achievement. The school districts decided that a means of improving student results was to restructure the mathematics curriculum; some have purchased textbooks while others have chosen to purchase the Cognitive Tutor program. The district must state what results that they are looking for as a measure of success, certainly the fact that more students are taking Algebra than general lower level mathematics courses is an indication that student achievement is increasing and the fact that districts are adding courses that

address the standard of Probability and Statistics within the curriculum will improve student achievement and have a positive impact on student results. Another issue related to student results is that these districts also have a history of lower than average student attendance when compared with other schools in the state; improvement in student attendance is usually associated with an increase in student achievement. It is very important for the district to decide what criterion they will use for student results in the establishment of benchmarks for success for improving student achievement.

In many of the school districts studies there was a very high rate of administrative turnover reported. What are the effects of a lack of administrative stability in the district? In discussions with teachers and new administrators it is reported that teachers often believe that the lack of administrative stability creates an environment where each administrator coming in creates new programs and directives without reflection or consideration of the academic initiatives that were started under the former administration. Teachers believe that the work completed under the direction of the former administrator is not valued and all of the time, effort, and resources spent were worthless. This created an environment in some of the districts where teachers were reluctant to move ahead with new initiative unless the new administration promised to review work that had already been completed. Constant change in administration also serves as a deterrent for the development of a shared school culture. New administrators bring with them new programs, personalities, priorities, and often the school environment takes a while to adjust to the new leadership style. Teachers often choose to “survive” by isolation within their own classroom and the development policies and practices within their classroom that are void of

administrative interpretation, due to the fact that the administration stability is so inconsistent. Districts have a duty to incoming administrators to make sure that they understand what their policies and practices have been during the tenure of the former administrator and new administrators have the responsibility to work collaboratively with members of the staff in order to observe what has occurred in the district before change is initiated.

In the school districts studied one commonality was the lack of a written standard based K-12 mathematics curriculum. It is difficult to believe that in these districts there can be any continuity of curriculum among the various grade levels without the presence of a written K-12 curriculum. Districts must work collaboratively in order to develop a timeline for the timely review and update of standards based curriculum in all areas. This updated should be coordinated with the development of the district budget to ensure that all resources are available to assist teachers in the improvement of student achievement. This standards based written curriculum should be developed with input from teachers and support personnel at the various grade levels so that there is connectivity within the curriculum. The educational systems should take more accountability for ensuring that the curriculum within the district is current and that resources (i.e., staff development, hardware, software, books, and supplementary materials) are available for the staff. A second area of concern was that in some districts the Cognitive Tutor program was replacing the idea of a written curriculum; it is the opinion of this researcher that the Cognitive Tutor program is only an educational tool that provides students and teachers with a means of instruction in mathematics. The Cognitive Tutor has a curriculum that is standards

based that is part of the program however this does not replace a written curriculum that is developed by the district that encompasses the Cognitive Tutor, districts should still write curriculum that represents their individual needs and focuses on strategies that improve student achievement within their district. As one district discovered, the Cognitive Tutor program had to be adjusted because the students enrolling in the Algebra 1 course did not have the basic skills in order to be successful. Initially, mathematics teachers had to provide instruction in basic skills in order for students to experience any success with the Cognitive Tutor. This demonstrates the importance of the development of the written standards based K-12 curriculum that allows teachers to have accountability for instruction of basic skills and student performance.

Personal Reflection

The opportunity to utilize the multi-site case study for my methodology provided an opportunity to be able to have an in-depth view of the major components of the individual school districts through the use of person interview and the collection of a variety of sources of data; such as assessment results, newspaper articles, and a information from a number of electronic sources.

Utilizing the interview process was a very strong tool that was used to learn about the practices of the individual districts in relation to the mathematics curriculum reform. This researcher was very fortunate in the fact that I was able to use my former administrative assistant as a documenter during the interview process. This person has had a great deal of experience in public education was able to serve as a documenter but also comprehend the meaning of the answers to the interview questions in context. Following each interview, we would discuss the

questions and the feedback to ensure that what we heard through the course of the discussion was related to the documentation. We also discussed characteristics of each participant in relation to body posturing, voice intonation, eye contact and level of comfort. These insights provided by the documenter and our consequent discussions generated a greater depth to the interview experience. We often discovered that what appeared on the surface to be a simple answer had greater depth and importance due to the conviction, or lack thereof, of the person answering. Including the documenter in the interview process also allowed for a sounding board for further questions, interpretation of interview data, and the development of follow-up questions. The documenter provided complete transcripts of all interviews which were sent to all participants for review and comment before they became a part of the written record. The documenter proved to be an integral part of the interview process because it helped to ensure a factual account of the political decision making process during the reform of the mathematics curriculum through the perspective of each participant.

The services of my research advisor were also invaluable in the preparation of the case studies. Through our weekly discussions valuable insight was provided and an opportunity for validation of information was discussed through the examination of data sources and the personal interviews. Through his relationship with the University of Pittsburgh and the Tri-State Study Council, my research advisor had the opportunity to work with all of the districts. Using his insight provided this researcher with a stronger understanding of each of the districts and he recommended various references and pieces of scholarly research that were used to gain an

understanding of the political, financial, and educational issues these districts faced. A second important benefit of our discussions was the opportunity to validate and clarify opinions that this researcher had that were generated regarding the mathematics curriculum reform process. This clarification served as a bridge between the political climate in the district at a particular time and the decisions that were made in reference to mathematics curriculum reform. The opportunity that this researcher had to share my opinions and discuss the educational climate of the districts with an educator who was a part of shaping curriculum reform was invaluable.

This researcher has learned a great deal utilizing the multi-site case study analysis as the methodology for this study. The importance of the influence of time issues became apparent as this researcher began to document the various initiatives that were related to mathematics curriculum reform. It was important to be able to document issues that surfaced in each of the school districts during the enactment of the Act 16 legislation and to be able to describe how each of the school districts reacted to their placement on the Education Empowerment List. This research encompassed the school districts notification that they were placed on the Education Empowerment List, through the development of the School Wide Improvement Plans, and included placement on the State's Warning list. It was imperative to ensure that the direction of the school districts correlated to the time frame in which the issues occurred. These time issues; passage of legislation, assessment results, staff development initiatives, change of personnel, and

the changing political and educational climates within the districts provided a necessary background of information that helped to demonstrate growth, decay, or stagnation in the district. By utilizing various data sources and placing those into a chronological time frame the multi-site case study became a road map for mathematics curriculum reform in the districts.

A second area of importance in the use of a variety of sources and the precision the researcher must use in assembling the case record. There are many sources of data that are available, the researcher must be able to decide the value of each piece of data and prioritize its use in the study. The use of the interview was the most important tool that was used in developing the case record; however the interview and data had to be correlated in such a way that it complemented each other and related directly to the stated research questions. It was imperative to insure that the data was accurate and related to the topic that was studied. Once a variety of data sources were used and the accuracy of the data confirmed, triangulation took place. This allowed the researcher to utilize all of the component parts of the research for the individual districts in order to confirm or disconfirm what was occurring.

The multi-site case study was a vehicle through which this researcher was able to gain an introspective examination of the individual school districts by examining the political decision making process through the history, reform movements, and implications for reform. These variables were then compared and contrasted to scrutinize areas of similarity and differences and how these areas related to implications of policy and practice within the districts. This examination often asked more questions than provided answers as districts continue to improve student achievement.

Summary

There have been dramatic reform efforts that have taken place in the school districts that were studied. Each school district, although there are similarities, has chosen its own direction in meeting the mandates of the Act 16 legislation. The school districts have spent the state grants that were made available to them in various ways that they saw as improving the educational climate within their district. However, as the chart below indicated, there is still much work to be done in order for the school districts to meet the measurable objectives of AYP.

Summary of Student Performance on the Mathematics Portion of the 11th Grade PSSA (2003)

	District One	District Two	District Three	District Four
Advanced	3.4%	7.5%	0.0%	0.0%
Proficient	18.2%	14.9%	2.3%	3.7%
Advanced and Proficient	21.6%	22.4%	2.3%	3.7%
Basic	25.5%	22.4%	9.3%	25.9%
Below Basic	59.8%	55.2%	88.4%	70.4%

In Michael Fullan's article, *Changing Forces: Probing the Depths of Educational Reform* (1994), he states that there are eight basic lessons of the new paradigm of change and they are;

- You Can't Mandate What Matters
- Change is a Journey not a Blueprint
- Problems are our Friends
- Vision and Strategic Planning Come Later
- Individualism and Collectivism Must Have Equal Power
- Neither Centralization or Decentralization Works
- Connection With the Wider Environment is Critical for Success, and
- Every Person is a Change Agent

In this article Fullan (1994) describes the idea of the changing forces as:

“There are no comfortable positions in contending with the forces of change because one must always fight against over-control on one hand, and chaos on the other. There is a pattern in the eight basic lessons and it is the ability one has to work with polar opposites: simultaneously pushing for change while allowing self-learning to unfold; being prepared for a journey of uncertainty; seeing problems as sources of creative resolution; having a vision, but not being blinded by it, valuing the individual and the group; incorporating centralizing and decentralizing forces; being internally cohesive, but externally oriented; valuing personal change as an agent on the route to systemic change” (Fullan, 1994).

In the school districts that were studied using the multi-site case study, the goal of reaching the measurable objective of meeting AYP can be attained by understanding that the political decision making process is dependent on the understanding that there is complexity in integrating the individual and educational constituency groups within the educational environment. The school districts must struggle between the demands placed on them by the state and federal accountability systems and the realities of the local economies and the socio-economic composition of their communities. However, the success of the organization in attaining the goals that have been set in the School District Improvement Plans depends on the ability of individuals and the educational constituency groups to balance and embrace the various processes for educational change. There can be no set timeline for an increase in student achievement in these school districts and it may be many years before there is any significant improvement in student achievement is noticed, however the process of improving student achievement can contain many benefits for the school district that chooses to look at change as a journey and not a destination.

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