

Development of a Multivariate / Multi-Level Model Examining the Impact of Middle Grade Structures, Organizations, and Practices on Student Outcomes

Steven B. Mertens, Ph.D.
CPRD, University of Illinois
510 Devonshire Drive
Champaign, IL 61820
(217) 333-3231
mertens@uiuc.edu

Nancy Flowers
CPRD, University of Illinois
510 Devonshire Drive
Champaign, IL 61820
(217) 333-3231
nflowers@uiuc.edu

Matthew Hesson-McInnis, Ph.D.
Psychology Department
Illinois State University
Normal, IL 61790
(309) 439-7266
mshesso@ilstu.edu

Carianne Bishop
CPRD, University of Illinois
510 Devonshire Drive
Champaign, IL 61820
(217) 333-3231
chbishop@uiuc.edu

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Abstract

This paper will present a theoretical-conceptual model for middle-grades school improvement developed by researchers at the Center for Prevention Research and Development (CPRD) at the University of Illinois. Currently there are several sets of recommendations for what we “think” or “believe” are the critical components/elements/features that every middle school should implement in order to provide the most academically excellent, developmentally appropriate, and socially equitable education for all of our nation’s young adolescents. While there have been many studies, both quantitative and qualitative in nature, that have examined varying aspects of these components of middle-grades education (e.g., teaming, advisory, curriculum, student well-being, parent/family involvement) over the past several decades, there are only a handful of reliable studies that have examined the impact or interrelationships of more than one of these components on student learning and achievement. The research leading to the development of this theoretical-conceptual model is based primarily on quantitative survey data collected from hundreds of middle-grade schools in Arkansas, Louisiana, Michigan, and Mississippi from 1995 to 2003. This paper will describe the development of the model, as well as provide a discussion of the components of the model and how we believe the components are interrelated, based on the extant research literature and CPRD’s prior research.

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Introduction

The debate as to the most appropriate way to educate early adolescents has been around since the early 20th century. In 1989, the discussion was reinvigorated when the Carnegie Council on Adolescent Development published *Turning Points: Preparing American Youth for the 21st Century*, which included eight recommendations for improving the education of young adolescents (Carnegie Council on Adolescent Development, 1989). The theoretical underpinning of *Turning Points* and its follow-up report, *Turning Points 2000* (Jackson & Davis, 2000), is grounded in a developmental-ecological approach that posits that student educational attainment and well-being is a complex interaction between the students and their settings including families, peers, schools, and communities (Bronfenbrenner, 1979; Eccles & Roeser, 2003). These interactions are particularly salient during early adolescence as they experience multiple and continuous physical, social, emotional, and environmental changes as they move toward adulthood (CCAD, 1989).

National organizations and associations have also taken up the call for improved middle grades education by issuing sets of recommendations specific to middle grade schools and young adolescents. These sets of recommendations define a vision for middle grades education that guides the educational experiences of young adolescents and typically incorporates practices such as interdisciplinary teaming, advisory programs, exploratory curriculum, integrated curriculum, hands-on learning, and cooperative learning. The National Middle School Association's position statement, *This We Believe*, was first published in 1982 and contained a

list of the essential elements of a “true” middle school. NMSA updated and reissued this statement in 1995 and again in 2003 (NMSA, 1995; 2003). By 1999, the National Forum to Accelerate Middle-Grades Reform, an alliance of educators, researchers, national associations, and officers of professional organizations and foundations, developed a vision statement calling for all middle schools to be academically excellent, developmentally appropriate, and socially equitable (National Forum to Accelerate Middle-Grades Reform, 1998). Along the way, a myriad of middle grades reform models, initiatives, and other projects have added more specific recommendations, principles, or design elements in an effort to improve middle grades education.

Questions about the effectiveness of the middle grades concept/philosophy on student learning and achievement have been posed over the years by policymakers, school systems, and researchers. The National Middle School Association’s *A 21st Century Research Agenda* (NMSA, 1997) posited, “Does it work and how do you know?” (p. 5) or later in the same publication, “Which middle level schooling practices contribute to what types of outcomes?” (p. 7). Often the question is reframed around grade configurations; is one configuration more likely than another to produce better outcomes. The author of a recent middle grades publication summarized the issue in asking, “Are middle schools producing better outcomes for young adolescents than other school types?” (Hough, 2003, p. 8).

Since most school reform efforts are guided by targeted practices (e.g., new reading program) or deeper theory-based principles of whole school reform that examine the impact of major structural, organizational, or instructional practices (McLaughlin & Merta, 2002), the research supporting the practices and theory has focused on one or two elements of middle grades reform. For example, studies have examined single elements such as small communities

for learning, interdisciplinary teaming, personalized learning, goal structures, school support and connectedness, authentic assessment, and heterogeneous grouping (Battistich, Schaps, & Wilson, 2004; Felner, Jackson, Kasak, Mulhall, Brand, & Flowers, 1997; Lee, Smith, Perry, & Smylie, 1999; Newmann & Wehlage, 1995; Reddy, Rhodes, & Mulhall, 2003; Roeser, Eccles, & Sameroff, 1998). Unfortunately, research that focuses on the impact of single components of middle school restructuring (e.g., interdisciplinary teaming, teacher-led advisory) rather than the interrelated nature of comprehensive reform falls short of meeting the needs of middle grades policy makers, administrators, and practitioners. Rather, research needs to examine the impact of full-scale middle school restructuring on student outcomes. Large-scale and longitudinal research with the ability to generalize research findings is required to examine the long-term effects.

The most critical issue facing middle grades education today, therefore, is the paucity of reliable, valid, generalizable research studies that have demonstrated, quantitatively or qualitatively, the link between the components of the middle school philosophy and any type of teaching or learning outcome. With one or two notable exceptions (e.g., Lee & Smith, 1993), multivariate analyses of middle grades education simply do not exist. Further, very few studies have attempted to link middle grades programs and practices with student achievement outcomes (Felner, Jackson, Kasak, Mulhall, Brand, & Flowers, 1997; Flowers, Mertens, & Mulhall, 1999, 2000; Lee & Smith, 1993, 1999; Mertens & Flowers, 2006; Mertens, Flowers, & Mulhall, 1998). Even fewer studies have examined the combined effects of multiple middle grades components on student outcomes (Lee, Smith, Perry, & Smylie, 1999).

Research and Resources in Support of This We Believe (Anfara, Andrews, Hough, Mertens, Mizelle, & White, 2003), the research-based companion volume to the most recent

version of *This We Believe* (NMSA, 2003), contained six recommendations for the direction of future research:

- More large-scale, longitudinal studies;
- Studies combining quantitative and qualitative methodologies;
- Studies that examine more than one reform recommendation, practice, or design element;
- More studies that replicate previous methods and designs;
- Need to design and conduct more experimental studies; and
- Need to create a national database.

Educational researchers need to heed these recommendations and develop more unified and focused efforts on the research that needs to be conducted to answer the critics, but more importantly, to establish a body of research that empirically tests the “middle school philosophy” in a manner that we can ultimately say, “This we believe,” and “Here’s the research to support it.” Therefore, we believe that the research to fill this significant gap in our knowledge about the impact of middle grades restructuring on student outcomes is both highly sought after and necessary if our middle grades students are to receive the education they need to be successful.

The purpose for developing a multivariate/multi-level model designed to examine and empirically test the impact of middle grades structures, organizations, and practices on student outcomes is to address how the components of the “middle school concept” (e.g., interdisciplinary teaming, school contextual factors, team and classroom practices, positive school climate) are interrelated; and to assess their individual and combined impact on a variety of student outcomes including learning and achievement.

Data Sources

The schools contained in our study sample participated in statewide or regional middle grades initiatives funded by private foundations. In Michigan, the W. K. Kellogg Foundation funded the statewide Middle Start Initiative from 1994 to 2003. In 1998 the Foundation for the Mid South launched a similar initiative—Mid South Middle Start—in the states of Arkansas, Louisiana, and Mississippi. This initiative was funded through 2005. Although there were some regional variations, the projects were nearly identical in scope and implementation.

Self-Study data were collected in 1999, 2001, and 2003 from students, teachers, and principals in more than 360 middle grades schools in Arkansas, Louisiana, Michigan, and Mississippi. Data were collected from 235 schools in 2003 (Table 1). The schools are located in diverse geographical areas (i.e., urban, rural, suburban), contain students in grades 5 through 8, and have an average of 55% of the student population receiving free or reduced-priced lunch. All schools in the sample participated in the Self-Study data collection, with a large number of schools being involved in multiple data collection in all three focal years (1999, 2001, and 2003).

Measures

In 1990-91, the Center for Prevention Research and Development (CPRD) at the University of Illinois, Urbana-Champaign, developed a School Improvement Self-Study process for middle-grade schools. The Self-Study consisted of quantitative survey measures for teachers, students, and principals. The constructs and indicators were based on the recommendations of the Carnegie Corporation's seminal work, *Turning Points: Preparing American Youth for the 21st Century* (Carnegie Council on Adolescent Development, 1989). *Turning Points* contained a set of recommendations to improve middle grade schools, particularly schools containing large

percentages of at-risk students. These recommendations included creating small, safe, personalized learning communities, teacher advocates for every student, relevant curriculum and appropriate instructional strategies, teachers prepared to teach this age group, and family and community involvement. Utilizing these recommendations and the extant research literature on middle schools and young adolescent developmental needs, CPRD developed the Self-Study as a set of quantitative measures to assist schools in measuring the level of implementation of the *Turning Points* recommendations.

The teacher measures are comprised of numerous constructs including attitudes toward middle-grades practices, interdisciplinary team practices, quality of team interactions, decision making, classroom instructional practices, and school and work climate. The student measures are comprised of similar constructs including classroom instructional practices, school climate, parent/family involvement, self-esteem, academic efficacy, and behavior problems. Attitudinal constructs are comprised of a 5-point Likert scale, whereas constructs measuring practices are assessed on a frequency metric (e.g., from never to daily). Most of these constructs have remained consistent over time and several have been validated in prior and current work (Flowers, Hesson-McInnis, Bishop, & Mertens, 2007; Mertens & Flowers, 2003; Mertens, Flowers, Hesson-McInnis, & Bishop, 2006).

Theoretical-Conceptual Model

As discussed earlier, from 1995 through 2003, CPRD was involved in the large-scale collection of longitudinal quantitative data from hundreds of middle grade schools in several states. The survey data collection consisted of comprehensive teacher and student measures and constructs to assess varying levels of middle-grades practices, programs, and levels of

implementation. The constructs on these measures were developed based on several national recommendations or visions of what highly effective middle schools should look like. Two of the most important documents that were reviewed were *Turning Points: Preparing American Youth for the 21st Century* (CCAD, 1989) and *This We Believe* (NMSA, 1982, 1995). These publications contain specific recommendations as to how young adolescents should be educated. The constructs contained in the CPRD Self-Study measures represent our effort to “operationalize” these conceptual recommendations.

As our data repository grew over time and the development and refinement of this large-scale data collection process became more streamlined, we began conducting various analyses of the datasets. Based on needs of the project funders, these initial analyses were primarily descriptive in nature (e.g., Mertens & Flowers, 1998; Mertens, Flowers, Hartley, & Mulhall, 1999; Mertens, Flowers, & Mulhall, 1998). Over time we recognized the need for more sophisticated techniques and methods in analyzing these data. As a first step toward this goal, it was necessary to construct a theoretical-conceptual model to depict the potential relationships between various constructs (Figure 1).

In beginning to conceptualize what such a model might look like, it was necessary to review the current literature on middle grades education research. In addition to *Turning Points* and *This We Believe*, we examined the revised recommendations in *Turning Points 2000* (Jackson & Davis, 2000), the criteria established by the National Forum to Accelerate Middle Grades Education focusing specifically on academic excellence, developmental responsiveness, and social equity. In addition, we reviewed the extant middle grades educational research literature, specifically those studies that utilized constructs similar to those developed for the Self-Study (e.g., Lee & Smith, 1993; Roeser, Eccles, & Sameroff, 1998). The theoretical-

conceptual model presented here represents our view of how we believe these recommendations inter-relate to one another—both in having a direct effect on other constructs, as well as being effected by other constructs.

Interdisciplinary Teaming Structures and Organization

Our prior research has suggested a strong association between the levels of interdisciplinary teaming and common planning time and increased levels of team and classroom practices and higher student achievement. We believe that this component of the model is critical in predicting all other components of the model, including student outcomes. For this reason, *interdisciplinary teaming structures and organization* has been placed on the left side of the model (Figure 1).

The aspects of teaming structures and organization that we considered important to include in this model were: team size, length of time teaming, common planning time frequency, and common planning time length. The variables were derived from three sources, the teacher survey, the principal survey, and a school information form that is used to collect descriptive data about the school (e.g., enrollment, team configurations). The *teaming structures and organization* variables are item-level variables. Team size and length of time teaming are interval level variables and common planning time frequency and length are ordinal, categorical variables. These variables were examined in an effort to create a single construct—level of teaming implementation—that could be used in the testing of the model. A sophisticated coding scheme was developed and employed by CPRD researchers to examine all of the *teaming structures and organization* variables across all 235 schools and create a new composite measure

reflecting the level of implementation of teaming and common planning time at the school, grade, and team level (see Bishop, Mertens, Flowers, & Hesson-McInnis, 2007).

The subsequent components of our model—described and discussed below—are comprised of interval level data that have been factor analyzed to validate the constructs. The model components presented are based on confirmatory factor analyses of the constructs and will be reported as both lower-order and higher-order factors.

Quality of Team Interactions

These constructs assess the level of agreement shared between teachers with regard to the “quality” of their interdisciplinary team interactions. The individual questions range from climate issues (e.g., “teachers on my team respect each other’s opinions and ideas”) to interactions with students and parents (e.g., “teachers on my team work to motivate students”). These questions are intended to assess the level of collaborative agreement among teachers on the same team. Empirically, *quality of team interactions* consists of one higher-order factor—*quality of team interactions*—and two lower-order factors: student needs and high expectations and team cohesion and readiness for teaming (Figure 1). These constructs have been demonstrated to be both reliable and valid measures (Flowers, Hesson-McInnis, Bishop, & Mertens, 2007).

School Contextual Factors

This component of our model consists of a broad grouping of constructs that were designed to measure varying aspects of the school context and climate as assessed by teachers. Collectively *school contextual factors* consists of one higher-order factor and six lower-order

factors: team decision making, teacher decision making, classroom climate focusing on achievement, classroom climate focusing on disruptive behaviors, work climate, and teacher efficacy and positive interactions with students.

The two decision making constructs are designed to measure decision making at the team level and at the individual teacher level. The 14-item team decision making measure assesses how much decision-making authority the interdisciplinary team has regarding instruction, assessment, and activities. Teachers engaged in teaming respond to the team decision making questions using a five-point frequency metric ranging from very little (1) to very much (5). On the other hand, the 6-item teacher decision making construct asks teachers about whether they feel they participate in making decisions at their school and whether they have autonomy to make decision in their own classrooms. The teacher decision making construct uses a five-point metric from strongly disagree (1) to strongly agree (5).

The teacher efficacy measure (4 items) asks about teachers' feelings about their ability to work with all students to find teaching methods that will be effective for each individual. Teachers respond to the teacher efficacy questions using a five-point metric ranging from strongly disagree (1) to strongly agree (5). The work climate measure (8 items) is intended to assess teachers' commitment to the school via hard work, positive attitude, and group spirit, as well as teachers' feelings that they are recognized for their contributions and supported by the administration. Teachers respond to the work climate questions using a five-point frequency metric ranging from never (1) to always (5).

Classroom climate is measured with 18 items and is designed to assess teachers' views about their classroom environment. It includes such concepts as whether students respect each other and are sensitive to diverse cultures, are academically motivated, and work together

constructively. It also asks about whether students initiate positive interactions with the teacher. Finally, classroom climate further includes teachers' feelings of whether students are disruptive, inattentive, and restless in class. For the classroom climate measure, teachers respond using a five-point metric ranging from strongly disagree (1) to strongly agree (5).

All six of these *school contextual factors* constructs have been demonstrated to be both reliable and valid measures (Flowers, Hesson-McInnis, Bishop, & Mertens, 2007).

Interdisciplinary Team Practices

These questions are designed to be answered by middle-grades teachers that are engaged in interdisciplinary teaming in their school. Interdisciplinary teaming is broadly defined as a group of teachers that coordinate the teaching of core subject areas (e.g., English, mathematics, science, social studies) within the same group of students over the course of the school year. Teachers engaged in teaming typically have common planning periods, in addition to their individual planning periods, to facilitate the coordination of team practices and activities. Teaming enables middle-grade schools with large student populations to create smaller, more personalized learning communities.

Interdisciplinary team practices are represented in the model as one higher-order factor and five lower-order factors including: planning and coordination of team activities, curriculum integration, coordination of student assignments, parent contact, and involvement of other school resource staff (e.g., technology, arts). Core academic teachers respond to the 27 items using a seven-point frequency metric ranging from never (1) to daily (7). The validity and reliability of these constructs were previously presented (Mertens, Flowers, Hesson-McInnis, & Bishop, 2006).

Classroom Instructional Practices

The classroom practices questions are designed to measure how frequently teachers are engaged in different types of practices or strategies within their classrooms. These practices include small group instruction, critical thinking practices, authentic instruction and assessment, literacy and mathematical skill practices, computer usage, community-based learning, citizenship and social responsibility, and heterogeneous ability grouping practices. Similar to team practices, teachers responding to the 56 items answer using a seven-point frequency metric ranging from never (1) to daily (7). Only the responses of core academic teachers (i.e., language arts, math, science, and social studies) are included in this analysis of team and classroom practices. These constructs can be represented with one higher-order factor and seven lower-order factors. The validity and reliability of these constructs were previously presented (Mertens, Flowers, Hesson-McInnis, & Bishop, 2006).

Student Outcomes: Experiences and Socio-Emotional

In considering the types of student outcomes to include in our model we ultimately decided on two types. The first type of student outcomes we included were those that are assessed through our measures. The student survey contains six constructs that assess student experiences and socio-emotional attributes. Given their placement in the model, these could be considered to be intermediate outcomes. Within the model, these student outcomes are represented by one higher-order factor and six lower-order factors. The second type of outcome was student achievement as measured by standardized student achievement tests (see next section).

The Self-Study student outcomes are measured with multiple self-reported constructs including school climate, sense of belonging, academic efficacy, self-esteem, and delinquency. School climate (19 items) queries students about whether teachers are encouraging and supportive, expectations of classroom behavior and performance are clearly defined and upheld by teachers, and whether teachers place priority on engaging students in the learning process. School climate further asks whether students interact negatively toward each other and whether discipline is harsh. The student school climate measure uses a five-point frequency metric ranging from never (1) to always (5).

Another outcome that is important to measure among students is their sense or feelings of belonging at their school. For young adolescents, it is important that they feel connected to their school and that they are accepted in the school community by both teachers and their fellow students. The seven-item belonging scale, therefore, asks students about whether they are accepted by others at school, whether they can be themselves at school, and whether they are included in activities at school. As with the school climate measure, students also answer the belonging measure on a five-point frequency metric ranging from never (1) to always (5).

Academic efficacy is another outcome measured by the Self-Study. It is designed to assess students' attitudes toward their schoolwork in terms of whether they are willing to work hard in order to be academically successful. The five-item academic efficacy scale uses a four-point metric ranging from strongly disagree (1) to strongly agree (5). Self-esteem, another outcome measured, is answered using the same five-point agree-disagree metric as academic efficacy. The self-esteem measure (8 items) delves into whether students have positive feelings about themselves in general (e.g., I like being just the way I am, I am happy with myself as a person, I feel good about how well I get along with other kids).

Delinquency (8 items) is the final student outcome measured by the Self-Study and is designed to assess the level of problem behaviors that students are exhibiting. Thus, it asks questions such as how often the student has engaged in negative behaviors like breaking rules at school, getting into fights with other students, and acting mean toward others. The delinquency measure is answered on a five-point frequency metric from never (1) to more than 12 times (5).

Student Outcomes: Achievement

Student achievement is included in the model as the terminal outcome. Individual student achievement data for the 2003 school year was obtained from the state departments of education for schools contained in our study sample: Arkansas, Louisiana, Michigan, and Mississippi.

It is important to note that there are some inherent limitations in our use of the individual student achievement data. First, the lowest unit of analysis for our model will be the grade level. Since most of our student achievement data pre-dates the *No Child Left Behind Act* (2002), the states in our sample were not administering the same subject/content area tests across all grade levels from third to eighth grade. For example, the Michigan state assessment from 1993 to 2001 tested fourth and seventh grade students in literacy and fifth and eighth grade students in mathematics. This unfortunately was not the same test administration pattern followed by Arkansas, Louisiana, or Mississippi. Second, the student Self-Study surveys are anonymous meaning that it is not possible for us to link individual student Self-Study surveys with individual student achievement data. At best, it will be possible to examine student achievement data at the grade level.

Relationships between the Components of the Model

The graphical depiction of our causal, theoretical-conceptual model is presented in Figure

1. With regard to the linear order of the variables and constructs in our model, we believe that *interdisciplinary teaming structures and organization*, the only exogenous component, has a direct and positive impact on four endogenous constructs: *quality of team interactions*, *school contextual factors*, *interdisciplinary team practices*, and *classroom instructional practices*. In addition, we are proposing, conceptually, that there is an interactive or two-way relationship between the *quality of team interactions* and *school contextual factors*.

The next set of constructs in our model is the *interdisciplinary team practices* and the *classroom instructional practices*. Given the interrelated nature of these types of practices and our prior correlational analyses of the variables within these two sets of practices, we are proposing a two-way relationship between the two constructs (Flowers, Mertens, & Mulhall, 2000). Figure 1 indicates that *team* and *classroom practices* are impacted by *teaming structures and organization*, *quality of team interactions*, and *school contextual factors* and they, in turn, have a direct effect on the *student outcomes: experiences and socio-emotional* constructs and an indirect effect on the *student outcomes: achievement* construct.

The development and refinement of our theoretical-conceptual model of middle school improvement has been influenced by a number of factors. First, we believe our model reflects the myriad of recommendations that have been presented by middle school advocates over the past quarter century. Middle school advocates, practitioners, and researchers familiar with the recommendations and tenets of *Turning Points* (CCAD, 1989), *This We Believe* (NMSA, 1982, 1995, & 2003), or the vision statement of the National Forum to Accelerate Middle Grades

Education (National Forum, n.d.), will readily see those recommendations or criteria contained in our model.

Second, we have been engaged in the collection and analyses of these data for over a decade and over the course of that time we have become very familiar with these constructs both within particular projects and across different types of indicators such as socio-economic status, school location, grade configuration, etc. Our prior analyses have provided us the opportunity to explore the relationships between two or three variables or constructs in the data. Our familiarity with the data and prior analyses has influenced the development of this multivariate model.

Third and perhaps most importantly, was our desire to develop a model that could be empirically tested so as to observe how the various constructs interact, relate, or predict one another. Earlier, we discussed how the recommendations for middle school education have impacted the development of our data collection instruments and subsequently, how these should be represented in our theoretical-conceptual model. What has not been presented or discussed in the national middle school recommendations is how the various components (e.g., teaming, developmentally appropriate practices, school climate) interact with one another and at what level to predict student outcomes. We hope that our model, and its subsequent testing, is a first step in the process to begin answering these critical questions.

Conclusions

Empirical testing of the theoretical-conceptual model described in this paper has the potential to contribute in a variety of ways to the existing research literature and inform middle grades educational practice and policy. First, the study sample for this research is both large-scale and longitudinal in nature, therefore expanding on the breadth and scope of the current

body of research. Second, our theoretical-conceptual model will allow us not only to examine multiple middle grades recommendations and practices (e.g., effect of teaming structure/organization on interdisciplinary team and classroom instructional practices and their combined effect on student outcomes) but also to assess their interrelated nature. Third, the research design is highly quasi-experimental with large-scale, representative, statewide samples. Lastly, although the data for this project are not national in scope, they are representative of four states with schools containing widely varying levels of socioeconomic status. The large-scale, representative nature of these data can provide for state and district-level generalizability which potentially have significant policy implications.

We believe that the development and testing of this theoretical-conceptual model will be a significant contribution to our understanding of the factors that influence student learning in middle grade schools. While the results of the empirical testing of our model will, in all likelihood, vary from our theoretical-conceptual perspective, we believe the results will help us refine our model and provide insight into the interrelationships of these middle-grade constructs that have, for the most part, been untested. The research findings generated from the testing of our model will provide middle grades education researchers with results from a multivariate model developed specifically to test the relationships of components of the “middle school concept” and their combined effect on student learning and achievement. We believe these results will be beneficial to several audiences, including researchers, practitioners, and policymakers.

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Table 1.
2003 Self-Study Research Sample

| | Arkansas | Louisiana | Michigan | Mississippi | Totals |
|----------|----------|-----------|----------|-------------|---------|
| Schools | 40 | 39 | 117 | 39 | 235 |
| Teachers | 1,055 | 1,169 | 2,868 | 1,118 | 6,120 |
| Students | 16,165 | 15,225 | 51,210 | 18,105 | 100,705 |

Figure 1. Theoretical-Conceptual Model for Middle Grades School Improvement

