

**IOWA TAPP Overview**

**Executive Summary**

**Introduction**

The first research question would be characterized as a Stage 2 educational intervention research question, “Can scientifically based mathematical intervention strategies delivered by the IPDM and supported by technology demonstrate better achievement as measured by the Iowa Test of Basic Skills (ITBS) at the classroom level when compared with appropriate, randomly selected comparison groups?” Classrooms were the units of analysis for these efforts. The second research question at this stage, “Did the intervention strategies work in closing the achievement gap between the proficient and non-proficient at the experimental school?” The third research question would be characterized as a Stage 1 educational intervention research question, “Can we demonstrate the overall impact of the Iowa Professional Development Model, use of technology, and technology integration on student mathematics achievement over a three year period as measured by the appropriate sections of the (ITBS)?” Linked to this question is the issue of frequency of access to professional development activities (educational interventions) and whether it is a predictor of the frequency with which the classroom teacher will implement these strategies. The target behavior is a measure of student achievement in reading and mathematics as expressed as national standard scores from the ITBS.

The following report is organized into four major sections reflecting the scaling up of four initiatives in the following areas: 1) elementary school mathematics; 2) elementary school reading; 3) middle school mathematics; and 4) middle school reading. The elementary school initiatives focused on fourth grade math or reading achievement and the middle school initiatives focused on eighth grade math or reading achievement.

There were two elementary math consortia, three elementary reading consortia, three middle school math consortia, and three middle school reading consortia. The number of participating schools varied across consortia. Each consortium was established and organized during the first year of the three-year funding cycle. During the first year, students’ achievement was measured in the spring (2003-2004 academic year). Achievement was assessed during the spring for each of the remaining two years of the funding cycle (2004-2005 and 2005-2006 academic years).

**Organizational Structure**

The key to scaling up initiatives is the planning and organizational efforts that begin prior to the funding cycle. Approximately six months prior to the start of the fall semester of the first funding year, most of the planning and organizational efforts were 95% complete. Also, when signing on to a consortium initiative, all participating schools had to: 1) agree to receive common professional development from the professional team located in the Area Educational Agency; 2) agree to implement consortium educational interventions and activities; and 3) encourage individual teachers to report out monthly on the implementation rate of consortium educational interventions, report on professional development activities, and the use of technology to support professional development within consortiums. Once schools joined a consortium, they could not change course in the middle of the three-year cycle by using the ESEPT/E2T2 money to support other initiatives. The only option was for a school to discontinue participation in which case that schools funding went back to the consortium for redistribution to continuing participants.

**Methodology**

In the detailed data summaries that are provided for each consortium, the focus is on improvement in student math and reading achievement at either the fourth or eighth grades. In all cases, these analyses are longitudinal in that only students for whom a pretest score and a posttest score are available are included in the analyses. This insures that participating children were in the classroom to receive the impact of the teacher implemented educational interventions that the teacher received through the professional development system. Thus, the focus was on change in student achievement in reading and or math during the fourth or eighth grades for two consecutive academic years 2004-2005 and 2005-2006 (years two and three of the funding cycle). This provided the opportunity for a replication of initial results which may strengthen confidence in initial findings when the design is quasi-experimental.

Individual consortium data collection and analyses were developed as quasi-experimental designs. The independent variable was teacher implementation of educational intervention strategies and activities. The dependent variable was either total math score or total reading score from the Iowa Test of Basic Skills (ITBS), a commercial standardized norm-referenced achievement test. Data were analyzed at two levels, the school level where consortium buildings were compared to a state-wide comparison group and the student level where growth in achievement was compared for proficient and non-proficient students from the participating consortium schools. Since the state-wide comparison group of schools was made up of schools that did not participate in the ESEPT/E2T2 project, the comparison group was not only selected in order to be representative of the state as a whole, but also served as a no-treatment control for the consortium specific educational interventions and activities. Thus, throughout the following document we use the terms control group or comparison group interchangeably.

The systematic approach to change taken by the ESEPT/E2T2 project contains several interrelated elements: 1) professional development, 2) technology integration, 3) teacher implementation, and 4) change in student achievement. This involves the combining of student and teacher data in order to determine the paths of impact within the model. Consequently a single pilot study is included at the end of this report that tests for the goodness of fit of the model we refer to as the Iowa Professional Development Model (IPDM).

**Results**

**School Level of Analysis**

At the school level of analysis there were mixed findings. In some cases, by the second or third year, experimental schools were performing at a level similar to the state-wide comparison group. In other cases, differences were still rather large. This simply reflects the fact that when experimental schools identify the subject area (math or reading) that was in greatest need of improvement, it will take two or three years for noticeable change to occur in student achievement scores. Further, in some cases the second year progress may not be replicated during the third with a new set of students in the same schools. Also, affecting the replicability of data is the introduction of new participating schools during the third year of the funding cycle.

**Student Level of Analysis**

This is where the data are most impressive. When the progress of students identified as non-proficient at the beginning of the school year are compared with proficient students (from the same schools and grades), data consistently demonstrate a “closing of the gap” between the two groups of students. This is a rather consistent finding across consortia. Further it is a highly replicable finding within a consortium during the second and third years of the funding cycle. In other words, growth or change in student achievement is occurring for the non-proficient reader or math student in an impressive manner that may be missed by only an analysis of school level Performance.

As will become evident by reading further, neither the rate of improvement nor the effect of the educational interventions were the same across elementary school math, elementary school reading, middle school math and middle school reading initiatives. For example the average effect size (Cohen d) estimating the impact of the educational interventions on non-proficient students’ progress during the academic year was: 1) elementary math, d = .71 (large impact); 2) elementary reading, d = .77 (large impact); 3) middle math, d = .76 (large impact); and 4) middle reading, d = .25, (small impact). Generally speaking, the math initiatives were more effective in promoting non-proficient student progress than was the case for the reading initiatives. However, the beginning reading initiatives at the elementary level seem to be much more effective than middle school initiatives in this regard.

**System Analysis**

Last but certainly not least is the question of the effectiveness of the Iowa Professional Development Model (IPDM) that integrates teacher training on educational interventions with a technology to deliver and support student change at the classroom level. Is this an effective system that can link professional development activities to teacher implementation of educational interventions that facilitate change in student achievement?

A single consortium was evaluated in order to test the model. A Structural Equation Modeling (SEM) approach was taken to addressing the systems question. The data must be considered pilot data at this time and requires replication within the consortium as well as across consortia. Regardless, the path analysis model does provide a good fit for the data and does suggest that the integration of technology and teacher training can be successfully implemented if the effort is systematic.

**Methodology**

The goal of incremental change is to “improve efficiency and effectiveness in existing structures of schooling, including teaching” (Cuban, 1996, p.76). The underlying assumption of incremental change is that the existing structures do not need to be dramatically changed, while fundamental change assumes that the structures and process need to be completely “overhauled” (p.76). Although changes may start out as fundamental, they commonly become incremental changes. Changes and reform are not the same, according to Cuban, who asserted that the tendency to equate the two had created confusion.

This study is primarily a feasibility study that empirically tested the scaling-up of implementation, however, it will also involve elements of replication. During the second year of requested funding, replication and scaling-up of first year impact studies involving middle school reading and mathematics interventions were conducted. In the third year, full implementation of the dissemination of best practices to all schools needing and desiring this information.

The impetus for addressing this problem are the need to address the NCLB requirements within the context of the federal government’s educational entitlement programs, the need to discuss the problem of evaluating the effectiveness of technology in meeting the NCLB requirements and elements of the Iowa Professional Development Model, and to develop and evaluate a communication plan related to the dissemination of effective strategies and best practices to other schools both within and outside the State of Iowa. Iowa receives approximately $114 million a year through these programs. This total reflects, on average, 4% of the state’s educational budget. Thus, maintaining this source of funding and effectively using these resources is a high priority of the Iowa Department of Education.

The professional development model scaled-up is the Iowa Professional Development Model (IPDM). The development of credible data about best practices and their impact on student achievement has traditionally been called program evaluation. However, our two-factor research design model was developed by integrating recent advances in research design elements with classical experimental logic to produce credible data for driving educational decisions and policy. This model provides credible accountability and impact data that can drive decision making and policy at all educational levels and demonstrates both internal (Cook & Campbell, 1979; Levin & O’Donnell, 1999; Slavin, 1999; Stanley & Campbell, 1966) and external validity (Boruch,1997; Mosteller & Boruch, 2002; Shadish, Cook & Campbell, 2002).

In our two-factor research design model, we first focus on producing credible data at the classroom level. Here the focus is on the development of data collection procedures that guards against sources of internal validity that threaten the assumption that professional development activities and implementation, positively impacts student progress in mathematics, reading, and science. The second factor in the design model focuses on developing data collection procedures using randomized clinical trials that provide the basis for generalized causal inference. This last factor addresses the scaling-up issue within the limited implementation of the IPDM, the generalizability of credible classroom practices, and the use of this data at successively higher administrative levels within the hierarchical education structure [Local Education Agency (LEA), Area Education Agency (AEA), Iowa Department of Education (IDE).

**Recommendations**

Implications for Research and Practice within E2T2

In the E2T2 process it was felt that it was not necessary to have the “right” theory, but to have one that provided a roadmap for the program, highlights its essential components, and explains how the program is expected to achieve the desired outcomes. National Staff Development Council (NSDC) noted that “the problem is not that we don’t know what effective staff development is; it is that we don’t act on what we know.” (NSCD, 2002, p. 11) To act requires courage, commitment, and systemic support to implement the type of staff development that we know will make a difference for both educators and students. Guskey and Sparks (1996) proposed a student achievement model that depicts the complex relationship of multiple factors that influence student academic success. The model acknowledges that staff development, along with other systemic factors such as the quality of staff development, administrator support, school culture, teacher knowledge and practices, parent involvement, and parent knowledge and skills work together to impact student achievement.

Change theory underlying the design of the E2T2 process was based on the following assumptions: First, is the belief that schools are not businesses while recognizing that some change theories have focused on a business-mass production model. That is if you do “x” you will get “y”. According to Cuban, “The profound difference between businesses and schools in purposes, in deliberative decision making, and in accountability for outcomes mean that the core assumption of business inspired reformers is deeply flawed” (Cuban, 2005, p.157). The sheer complexity of the task of transforming schools, particularly classroom practices, in dramatically different settings has been lost in the rush to extract strong student performance on tests through consistency of teaching. Second, practitioners bring to their classrooms strong moral and service-oriented values inherent to teaching. These overlap with but nevertheless differ from the technical values of policy makers, corporate leaders, researchers, and administrators. Experienced and thoughtful practitioners accumulate detailed knowledge about students, broaden their repertoire of teaching skills, and gain deeper understanding of the content they teach; forms of expertise that few researchers, policymakers, or CEOs lacking classroom experience can fathom. From these teacher values and types of expertise emerge standards for judging success and failure that diverge considerably from those described above. (Cuban, 2005, p. 34-35). Third, teachers facing change need a certain amount of what Cuban called adaptiveness: whether and how they can put their personal signature on the mandated policy and make it work for their students. To most policymakers, business leaders, administrators, and researchers, however, teachers’ alterations of their design and variations in practice are signs of failed policies. (Cuban, 2005,p. 35) Fourth, there is the belief that while school buildings and districts should determine the focus of the reform, individual teachers working in professional learning communities with grade alike or content alike individuals connected by technology. In a learning community, members commit to ongoing learning and participate in learning experiences with a deliberate intent to transform teaching and learning at their school or within their district (NSDC, 2001; DuFour & Eaker, 1998).

Professional Development

It has also been found that learning communities of teachers are effective in promoting teacher professional development (Newmann & Wehlage, 1995; Bruce & Calhourn, 1996; McLaughlin & Talbert, 2001; Bryk & Schneiger, 2002). Overall, theory suggest that building community is an effective strategy for enhancing educational outcomes for those involved. As Joyce and Showers (1995) observed, that the school building is an organizational unit most capable of facilitating student growth. However, in the E2T2 process our focus was not only on the building but also on creating professional learning communities of like subject/grade teachers beyond the building and district walls. It was felt that teachers learn from each other in the process of planning instruction, developing the materials to support it, watching each other work with students, developing collaborative communities and thinking together about the impact of their behavior on the learning of their students, particularly if the students were involved in the same subject /grade. The collaborative work of peer-coaching study teams was much broader than observations and conferences. According to Joyce and Showers, designing the workplace so that teachers can work together to implement changes (through peer coaching) is still the key to transferring the content of training into the repertoire of the classroom and school, whether the content is teaching and curriculum or processes for collegial action. (Joyce & Showers, 1995) This helps create for teachers an environment that facilitates reflection on practice and the conscious development of skills through personal inquiry. Effective staff development requires cooperative relationships that break down the isolation and increase the collective strength of the community of educators. This also addresses the issue that significant levels of innovation demand changes in the very culture of educators. The creation of a culture of educator-learners connected via technology is necessary if significant improvement is to be sustained and future innovations are to be permitted without monstrous effort.

In addition, faculties are not, for the most part, very well organized to study themselves and make decisions for collective action, nor does the structure of the school provide much time for collegial study and decision making. This recognition of the need for community building within a teacher education continuum is consistent with the argument developed by Renshaw (2002) who saw community building as an ongoing, evolving process that occurred over a long period of time and as having a profound impact on not just learning but on the quality of learning that could take place. Renshaw (2002) saw building a learning community as a way of networking social capital. The success of one member of the community is dependent on the success of other members. Promoting self-learning, and promoting the learning of others, becomes networked throughout the community. The result is that the community as a whole benefits, and individuals also benefit at an enhanced rate through mutual support. Consequently, membership in a learning community provides access to a variety of social capital (Renshaw, 2002). Such capital includes knowledge, skill and ‘know-how’. A purposeful dissemination and sharing of such capital can be a useful community-building tool with individuals recognizing their increased capital and actively enhancing the community learning process. The cycle of capital enhancement can be powerful in the social learning process, particularly when such processes are acknowledged as being complex and treated with the respect generally accorded such intricate social structures when they promote change.

Crowther (2001), like Renshaw (2002) conceptualized professional development (PD) as a change agent. Community building becomes a process that provides a supportive climate that is not only receptive to change and change initiative, but actively promotes an expectation of change as a consequence of teacher learning. The object is to design training so that people learn to become more effective learners. In this collaborative environment supported by technology, it was observed that continued technical assistance, whether provided by an outside PD or content expert or by peer experts, resulted in much greater classroom implementation than was achieved by teachers who shared in the initial training but did not have the long-term support of coaching or collaboration.

The Logic of Change

According to Cuban (2005), the overall causal chain of logic for current reform efforts included in NCLB is: 1) state-mandated curriculum standards will be implemented, 2) will steer teaching practices, which in turn will, 3) shape what students learn, as measured by the state tests, and 4) then will lead to success in college and the market place. The first two causal links require evidence that state policy has, indeed, been implemented and has guided classroom practices. The third causal link is the assumption that changed instructional practice will result in higher student achievement, and the fourth is that higher test scores predict future success in college and in the workplace.

The current program of research (ESETP) initiated in 2003 chose to focus only on the first three logical links identified by Cuban as the “NCLB logical sequence”. In our words, a systematic approach to large-scale change requires developing the capacities of teachers and administrators to use pedagogical practices with fidelity while adapting these practices to meet the demands of differentiated instruction. This means first benchmarking building strengths and weaknesses in terms of student achievement. The second step involves developing appropriate educational interventions at the building level based on findings from the benchmarking process. The third step is the determination of the effectiveness of the educational interventions by evaluating gains in student achievement in reading and mathematics at the building level.

Technology Integration Model

In a rural state trying to develop state-wide initiatives in reading and mathematics, time, geographical distance, and money are critical to the success of systematic change. This is where the use of technology in support of professional development becomes a critical systems element in promoting student achievement.

In Iowa, the intermediate education agency (Area Educational Agency) has the responsibility for providing professional development for state-wide initiatives. Thus, the Area Education Agency (AEA) provides professional development at the beginning of the school year and continued support throughout the year. While the initial professional development provided at the beginning of the school year is face-to-face, real time support is provided to the local schools via IP conferencing, web-sites, and electronic communication. Thus, the link between the initiators of professional development and the participating teachers is a technology infrastructure. The second technology component is the use of the aforementioned equipment by teachers to communicate among participating schools. Thus, the team building process is not only within a building but also among buildings within an AEA initiative.

This project recognizes that high quality staff development is a multi-step process to: 1) develop educators’ knowledge, attitudes, skills, aspirations, and behaviors, 2) apply what was learned in the staff development training experiences(s) to enhance classroom practice, and 3) anticipate increased student achievement and make plans to evaluate for program impact.

Staff development programs focusing only on developing teachers’ knowledge and skills are shortsighted because they rely on the following faulty assumption: “What is learned is used”. Exposure to new information does not automatically result in consistent and accurate implementation of the new learning or in changes in attitudes, skill, and behaviors. When staff development programs assume learning will be used, without appropriate practice of the behavior or strategy, the potential for the behavior or strategy and the potential for impact on student achievement is diminished.