

IMPLEMENTING MASTERY LEARNING AT DPCHS

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This qualitative case study is about implementing a mastery learning program for algebra I. The study takes place at a small suburban high school near Indianapolis. This school decided to implement a mastery learning program to improve student performance on the upcoming End of Course Assessments. Beginning in the spring of 2008 DPCHS began creating a program titled Algebra that Works, this program required students to demonstrate mastery on essential indicators as they progressed through the course. This study provides background on the components of implementation and mastery learning. Additionally, this study illustrates how changes in classroom processes can create resistance from community stakeholders. It also provides information on how the faculty created ATW and how they worked through the challenges related to implementation.

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### Abbreviations

ATW – Algebra that Works

DPCHS – DePaul Community High School

DPCMS – DePaul Community Middle School

ECA – End of Course Assessment

ISTEP+/GQE – Indiana Statewide Testing of Educational Progress/Graduation  
Qualifying Exam

IDOE – Indiana Department of Education

NCTM – National Council of Teachers of Mathematics

## **Chapter I Overview**

Throughout the history of public education in the United States, teachers and administrators have often implemented strategies to improve learning for students. These strategies have ranged from one room schools, to new instructional practices, such as thematic units, or the optimum number of classes for high school students. This case study is about the implementation of a mastery learning program at a single high school. Implementation occurred in order to improve test performance on Indiana's Algebra I graduation qualifying exam. This case study examined the factors that fostered or hindered the implementation of this mastery learning program and the program results, specifically those students who graduated in 2012.

### **Introduction**

During the mid-2000s students in Indiana participated in a pilot Algebra I assessment. The students at DePaul Community High School (DPCHS) produced passing rates of 28.9% 2004-05, 19.2% in 2005-2006, 18.1% in 2006-2007, and 16.5% in 2007-08. During the 2007-08 school year the Indiana Department of Education (IDOE) decided to replace the current ISTEP Graduation Qualifying Exam (GQE) with this Algebra I assessment. DPCHS's weak performance on this assessment made it clear instructional methodology and curriculum needed to improve.

As indicated above, students were unprepared for this assessment. A prevailing belief among staff members at DPCHS was students did not take the piloted assessment seriously. Regardless of this perception, we determined that the implementation of a mastery learning program gave our students the best opportunity for success on this assessment. We reached this conclusion after researching a variety of alternatives, including remediation programs offered by *Plato* and *NovaNet*. These programs did not solve the issue we were having with curriculum.

As we continued our research we began to find that schools which had implemented a mastery type system enjoyed a great deal of success on standardized assessments. Mastery learning became attractive to DPCHS because of the guarantees it seemed to provide. This system requires a clearly defined curriculum utilized by all staff members and students must demonstrate proficiency on each standard as they progress through the course. The latter statement is what convinced us that mastery learning was the best fit for our school. This case study reviewed the implementation of a mastery learning program at DPCHS; specifically, researching the factors that fostered the success or hindrance of implementation. Additionally, this case study provided information on whether or not the implementation of this program improved student performance from the perspective of the stakeholders involved with implementation. The data needed came from documents, presentations, interviews with those staff members responsible for design and implementation, from interviews with parents and students.

### **Problem statement**

The DPCHS staff determined that mastery learning was the best option for us to improve our ECA performance, we did not know how implementation of a new program happened at the local level. When a new program or procedure is implemented the following obstacles can occur: skepticism from staff, students and community stakeholders, a shortage of resources, and a school culture resistant to change (Cuban, 1990; M.G. Fullan, 1989; M.G. Fullan, 2001, 2007; M. G. Fullan, & Hargreaves, A., 1991; D. Tyack, Cuban, L., 1995). The implementation of any educational program is reliant upon teachers. If skepticism permeates the staff then implementation becomes difficult. For teachers at DPCHS mastery learning as a strategy was drastically different and required an intensive assessment of current instructional practices.

Fortunately the Algebra I teachers were willing to change their process and they created a mastery learning program. They were responsible for the development and implementation of this program. It is important to know the process of implementation and how it works. Deficient knowledge in this area can alter the success of programs. This study seeks to examine how implementation occurred at DPCHS by answering the following questions:

1. Why was it necessary to implement a mastery learning program?
2. How did the implementation of a mastery learning program change the classroom processes of the teachers?
3. What were the factors that fostered and hindered the implementation?
4. How was the implementation of this program perceived by community stakeholders?
5. How did the implementation of this program impact students performance on the Indiana End of Course assessments from 2009-2010?

### **Setting**

DePaul Community High School (DPCHS) is a small suburban/rural school approximately 15 miles west of Indianapolis, IN. DPCHS features a student population of approximately 830; 98% of the student population is Caucasian and the free/reduced lunch population makes up 30% of our student body. When students graduate from DPCHS, 70-80 percent of the graduates indicate they are planning to attend a post-secondary institution.

### **Background Information**

With the new ECA imminent, DPCHS could no longer accept poor test performances as in the past. During the beginning phases of our decision on the appropriate strategy we had trouble focusing our conversations on the root cause of the poor student performance. We could not determine if the problems were instructional practices and curriculum, or if our belief about

the students not taking the test seriously was the cause of our school's poor performance. All staff members did agree that we could not continue with our current practices, since it had demonstrated that a majority of our students did not have the base knowledge and skills to pass this assessment. Once we determined mastery learning was the best fit for our needs we believed we expected: student performance to improve on the ECA, a standards driven curriculum, improved instruction from the Algebra I teachers, and stronger math students.

This case study was informed by literature on program implementation and mastery learning as a strategy. These two areas are relevant to this study in the following ways: literature regarding program implementation indicates that there are certain steps schools should take when introducing a new program. Program implementation literature also indicates that the level of fidelity by the participants, coupled with adequate resources and inclusive problem solving techniques is critical to the success of the program. Mastery learning as a strategy, some research indicates it is an effective method to ensure student learning, which will require a focused curriculum and additional time to ensure learning has occurred. These two concepts will be discussed briefly. A detailed literature review will follow in chapter 2.

Program implementation studies began in the early 1970s by researchers such as Sarason and Gross (Gross, 1971; Sarason, 1971). These early studies focused on what schools were doing wrong when they implemented new programs. They did not offer solutions to assist the process of implementation. In the late 1970s research around program implementation changed, as researchers began to provide solutions or ways educators could successfully implement new programs. Fullan and Pomfret (1977), Hall and Loucks (1977) were some of the early pioneers in providing this information to educators. From the late 1970s through today literature on program implementation often uses case study scenarios describing the process of

implementation or it provides a theoretical framework on how educators can implement change (M.G. Fullan, 1985; M.G. Fullan, 1989; M.G. Fullan, 1994, 2001, 2007; M. G. Fullan, & Hargreaves, A., 1991).

The literature on mastery learning covers a greater span of time and as a strategy has shown positive student growth. The modern founders of the strategy are John Carroll and Benjamin Bloom (Bloom, 1968, 1973; Carroll, 1963, 1989). The work of these two researchers provided the foundation that all students can improve their learning. As a strategy mastery learning is defined as a method “which establishes a level of performance that all students must “master” before moving on to the next unit” (Motamedi & Sumrall, 2000, p.32). Students must demonstrate mastery by achieving a certain percentage, usually 80% on the content being studied. As a strategy mastery learning requires the curriculum to be narrow in scope, to be specific and focused feedback to be given to students. When these items are met the performance of students on teacher created assessments or standardized assessments improves (Bloom, 1984; Guskey, 1986; Kulik, 1990; Mevarech, 1985, 1991).

Since the late 1960s, researchers (Bloom, 1968) have found mastery learning requires additional time to guarantee student learning and it also requires that the curriculum be reduced in scope.. The need for extra time often produces conflict with the traditional models of school (Cuban, 1990, 1992; D. Tyack, . Tobin, W, 1994; D. Tyack, Cuban, L., 1995). This problem has caused mastery learning to become one of the cyclical strategies educators have seen introduced and re-introduced often because the work of such researchers like Arlin (1982, 1984) and Slavin (1987) is overlooked. Arlin and Slavin indicated that mastery learning does not produce improved student learning because of the additional time needed for students to demonstrate mastery and the reduced scope of the curriculum could have long term consequences for students



as they progress forward with new content. Additionally, it does not allow teachers to reach high levels of conceptual thinking.

### **Significance**

This case study is significant “because of the sheer complexity of the reform tasks being proposed” (Little, 1993, p.139). It will make contributions in the fields of program implementation, curriculum writing, and mastery learning. It demonstrated the steps taken during implementation and what the learning outcomes were for students based upon the perspectives of the stakeholders. Other schools will find this study of use when they are considering the implementation of new curricular programs, specifically mastery learning. The setting is different, which includes demographics and culture; however, the findings will contribute to educators’ understanding of the steps necessary for program implementation. The study will help teachers understand the amount of work necessary to align curriculum and change practices. In addition the study will help administrators see the steps taken to support teachers in new endeavors; including creation, implementation, and delivery of a new program and how they must handle problems as they arise. The research will view the activities of teachers, administrators, and board members from the spring of 2008 through the end of the 2010 school year providing a detailed account of how this mastery learning program was implemented.

Determining if programs should or should not be implemented within an organization is often determined by the leader or leadership team of the organization. This study benefits educational leaders as they consider implementing a mastery learning program. Leaders will see the processes of DPCHS and the steps taken from inception through completion. Additionally, they will see if the intended outcome matched the actual outcome. As leaders consider the

implementation of a program they must understand how the implementation process works and who is doing the actual implementation. In school organizations, leaders at the building and district levels are reliant upon teachers for implementation. Principals, assistant superintendents, and superintendents, will find that it is “not easy to change well entrenched methods which are tradition based” (Waugh & Paunch, 1987, p.243). Traditions are just one element of issues regarding the implementation curricular programs. Other issues, such as resources, commitment from staff members, and a well-designed approach also impact implementation. This study will focus on what our school did to overcome the challenges created by traditional educational methods in order to implement a mastery learning program.

### **Methodology**

To understand the work of teachers and administrators during the implementation of this mastery learning program a qualitative case study design was used. Qualitative research is designed to gain a rich understanding of an organization or an event. This case studies qualitative approach is designed to explain the situation and scenario in which the event the occurred (Yin, 2009). The detail provided this type case study includes looking for insight provided by the experiences of the participants involved (Marshall and Rossman 2010). The analysis of qualitative data helps provide a greater depth of understanding from the participants’ perspectives. In order to gather this information I will be interviewing the teachers who developed and implemented the program, and the administrators and board members who were present during implementation and the parents and students who participated in this study. Also, all documents associated with this program will be analyzed.

**Definitions**

**Algebra I End of Course Assessment (ECA).** This is a criterion referenced assessment to determine the progress of Indiana students' completion of Algebra I. The ECA is administered at the end of the year. For example, schools on the trimester system give the exam at the end of the second and third trimester and schools on the semester system give the exam at the end of the second semester.

**Algebra that Works (ATW).** This is the name of the mastery learning program which was implemented at DPCHS. A more detailed description regarding ATW is provided in chapter four.

**Implementation.** For the purposes of this study implementation is being viewed as the process teachers undertook to design and produce a new learning program.

**Mastery learning as a strategy.** Bloom (1968) defined mastery learning as “most students can attain a high level of learning capability if instruction is approached sensitively and systematically, if students are helped when and where they have learning difficulties, if they are given sufficient time to achieve mastery, and if there is some clear criterion of what constitutes mastery”( p.4).

## **Chapter II Literature Review**

### **Overview**

The literature used for this study concentrates on two areas, implementation studies and mastery learning. The implementation literature provides a framework educators have utilized over the last several years when new programs were tried in schools. The literature for mastery learning is presented in a historical fashion. These two bodies of literature are important to this study in the following ways: 1. implementation literature provides insight and themes other innovators have encountered as they have implemented new programs and may exist in this implementation experience, 2. the literature on mastery learning provides a working definition, how curriculum should be written and the types of results educators found with mastery learning, including the benefits and issues of mastery learning. The mastery learning literature also informs the understanding of the nature of mastery learning in this study.

### **Implementation studies**

Implementing any type of change in a school setting is extraordinarily challenging. Tyack and Cuban identified a concept called the “grammar of schooling” (Tyack & Cuban, 1995, p. 85). They believed that over time schools have begun to operate in a similar fashion, creating a culture which is based on tradition. Waugh wrote that it is “not easy to change well entrenched methods which are tradition based” (Waugh, 1987, p. 243). These methods include the day to day operation of schools, the length of the school day, how students are placed into grades, and many other items. Elmore stated “innovations that require large changes in the core educational practice seldom penetrate more than a small fraction of U.S. schools and classrooms and seldom last for very long when they do” (Elmore, 1996, p.1-2). It is evident that organizations, not just schools, do not change easily. Knapp indicated that schools will “seek to maintain equilibrium”

(Knapp, 1997, p. 249). Given that systems do not go through change easily, research from the early 1970s, when implementation studies began, indicated what schools were doing wrong during the implementation process and did not offer suggestions for improvement.

Early research studying how the implementation of initiatives occurred in schools focused on what did not work. Sarason and Gross pointed out the mistakes educational leaders and teachers made during implementation (Gross, 1971; Sarason, 1971). Sarason believed one of the barriers educators encountered was they wanted to find a finite solution to educational problems. Sarason commented that educators “must provide a basis that controls against the tendency to think as if a universe of alternatives did not exist” (Sarason, 1971, p. 223). Sarason indicates that educators look for just one solution to a problem and when multiple options are presented educators have a difficult time making a choice. Multiple solutions to a problem are often the cause for inaction within a school organization.

Gross in contrast to Sarason, believed that finding finite solutions did not create problems during implementation. Gross believed when implementation occurred, it is natural to assume problems were going to occur. As the problems arose he indicated it was paramount for leaders to find solutions quickly. Gross stated that most innovations failed because, “the failure of the administration to recognize or to resolve problems which it exposed teachers when it requested them to implement the innovation” (Gross, 1971, p. 190). The quick action of the administration demonstrated to teachers a level of commitment to the innovation. With the absence of this behavior, which Gross indicated happened frequently; the innovation lost momentum and often stopped.

By the late 1970s the literature had shifted from what did not work to what did work and how educators could use these findings to change their schools. Two major themes derived from

this research are fidelity and the internal forces, which includes the necessary resources to solve problems acting upon implementation. Fullan and Pomfret (1977), Hall and Loucks (1977) led these early studies. Their research indicated that fidelity and internal factors such as teachers, administrators, district level administrators, and school boards determined the fate of implementation.

### **Fidelity**

Fidelity is the term used to describe the level of use and commitment by individuals when they are implementing an innovation. Fullan and Pomfret (1977) indicate that when the teacher has consistently used the innovation as it has been designed, a visible change will occur in teacher performance. The change in teacher performance then produces change in the organization. For example, if a school implements a writing program, how writing is taught and evaluated should be seen. This change may force administrators to find additional time to assist teachers with their grading. Hall and Loucks (1977) wrote specifically on levels of fidelity which could be seen during the implementation process. They determined there were eight levels of fidelity. The created system of measurement during the implementation was called, “levels of use” (p. 265). These levels begin with “non-use” (p. 266) which is considered a zero level and progressively move through the following:

- I. orientation – recent acquisition of program information and the individual is considering their options of use
- II. preparation – the individual is ready to use the program
- III. mechanical use – the individual is concerned with daily operation of the program and adjusting the program to user needs
- IVA. routine – the use of the program is stable

- IVB. refinement – the individual continues to adjust the program to best fit the end user
- V. integration – the individual combines their efforts with colleagues to maximize the impact on the end user
- VI. renewal – the individual studies the impact of the program making plans for continued use and necessary adjustments (266-267).

In order to determine the level of implementation, Hall and Loucks state, “it is essential to have first-hand documentation that the innovative process or product is in fact, being used and at what level” (p. 274). The authors indicate the levels of use were determined by direct observation. The goal was to get the teacher reaching the level of renewal, as when a teacher reaches this zenith, the innovation becomes part of their normal operating procedures. The higher a teacher reached on this scale the greater the level of fidelity seen during implementation. Teachers on both ends of the scale have a tremendous impact on implementation. Dyson (2002) stated that as teachers implement innovations a “conceptual shift in the way a teacher presents instruction” (Dyson, p. 71, 2002) will be seen. Researchers soon determined that high levels of fidelity change teacher behavior.

As researchers began to understand the importance of fidelity it became important to find ways to measure this concept. The level of use scale developed by Hall and Loucks (1977) was one of the earliest attempts to measure fidelity. Even understanding the importance of fidelity it is still difficult to measure. Fullan and Pomfret (1977) suggest using student performance as an indicator. According to Hall and Loucks, and Knapp (1997) measuring teacher consistency during implementation gives significant feedback to administrators. According to Knapp, the lack of consistency in implementation of a new process among teachers severely hampers the

implementation of curriculum reform (Knapp, 1997). Hall and Loucks believed fidelity is measured by placing teachers on a scale and then looking at their levels of use. This process of measurement allows administrators to check consistency of implementation by looking for a change in behavior. Lloyd (1998) believes that teachers are more comfortable implementing curricular changes if it enhances their current beliefs and it demonstrates positive results in student achievement. The literature indicates if administrators use a combination of student performance, levels of use, and consistency among teachers, administrators will get a sense of fidelity toward implementation.

Even when there has been a high level of fidelity during implementation, it is still exceptionally difficult to determine the exact cause of success. Fullan (1985) stated “even if we possessed complete knowledge about what caused improvement it would still be very difficult to transfer that knowledge to other situations because knowing something is critical in one context and implementing it in another are two different things” (p.398,). The variety of environments, which include culture, often determines the success or failure of an innovation resulting in school officials determining that, “implementation does not equal delivery” (Hord & Huling-Austin, 1986, p.86). O’Donnell stated that “the foundation for which fidelity of implementation is measured, curriculum-in-use appears to be viewed as that which is implemented by the teachers and not necessarily identical to the written curriculum” (O’Donnell, 2008, p.44). There are scenarios when a teacher will state he/she has implemented an innovation but at the end of the trial or school year the results state otherwise. When researchers move beyond environment and culture and focus upon delivery, they find that implementation is impacted by the teacher’s interpretation of what is to happen. The variety of thoughts teachers have about implementation is a direct result of the autonomy they have in their classroom (Lortie, 1975). Autonomy impacts



the end user, the student. When students see a lack of consistency among teachers, their confusion about how to utilize the innovation multiplies. Finding the correct balance between high levels of fidelity and teacher autonomy are critical to a successful implementation.

The research around fidelity informs this study by improving the understanding regarding the levels of use of mastery learning. Hall and Loucks' (1977) explanation and attempt to measure the fidelity of teachers during the implementation process were insightful in understanding how the teachers implemented ATW at DPCHS. Additionally, the understanding provided by Sarason (1971) gives a clear picture of why schools struggle with change. The struggle is because most if not all educators prefer to have a single answer to a problem. The fact that in nearly all situations there are multiple answers makes any type of change challenging. The research done specifically around fidelity is important; however, it is an incredibly challenging concept to measure. Authors such as O'Donnell (2008), and Penuel (2007), wrote extensively about strategies needed for successful implementation. Implementation studies are not common and the lack of current literature makes it challenging. The current authors have utilized the work of Fullan and Pomfret (1977), and Hall and Louks (1977) extensively. The early literature on implementation studies has provided an exceptional foundation for current studies. Additional studies on fidelity and the important role it has in implementation, from a practical sense, will help schools as they continue to implement new curriculum.

### **Internal factors**

Internal factors influence the implementation of any new program. Internal factors consist of the people involved with the implementation and the resources necessary to solve problems as they arise. In the following paragraphs each group will be discussed in detail.

**Teachers**

Teachers have the greatest influence on the implementation process. They are working daily with students and making adjustments to the innovation, often on the move, in order to see it work. Leithwood (1980) indicates that regardless of how sound the innovation appears, from the teacher's perspective the innovation is incomplete. It is incomplete from the standpoint of how the end users, students, interact with it and until teachers can interact with students the innovation will remain incomplete. Teachers then develop a sense of autonomy as they adjust implementation strategies to assist students. Autonomy by itself can produce great innovations; however during implementation of a known strategy, it can be problematic. Individual autonomy among teachers implementing the same innovation can produce inconsistency and this then causes confusion for students (Leithwood, 1980; Schlechty, 2001). The more consistent teachers are during implementation the more likely the innovation will succeed (Leithwood, 1980; Schlechty, 2001, Fullan 1985). Regardless of the levels of consistency or the autonomy given to teachers, Fullan and Hargreaves (1991) state "that the heavy burden of responsibility for change and improvement rests on the shoulders of teachers" (Fullan & Hargreaves, 1991, p.13). Teachers do have significant power during the implementation of a curricular innovation; yet it does not reduce the influence of the principal.

**Principals**

As the instructional leader, it becomes paramount for the principal to become a problem solver with teachers during implementation. According to Hargreaves and Fullan (1998), shared problem solving results in joint ownership of the implementation. Shared ownership increases the likelihood of success. When ownership is shared, the principal can then provide consistent feedback regarding teacher and student performance. Fullan (2007) countered by indicating

many principals have difficulty stepping into the role of instructional leader. He stated, “all major research on innovation and school effectiveness shows that the principal strongly influences the likelihood of change, but it also indicates that most principals do not play instructional or change leadership roles” (p.95). Fullan and Leithwood indicate that it is the principals’ ability to support teachers throughout the process both materially and emotionally that gives an innovation the greatest chance for success (Fullan 2001, 2007 & Leithwood 1976).

What principals do provide during implementation, even if they are reluctant to be the instructional leader is intimate knowledge of the school. Leithwood (1976) indicates that a leader’s intimate knowledge of a school impacts implementation. Leithwood states that “the planning of effective change” . . . in which principals have an “intimate knowledge of the school organization” (p.220) creates a sense of legitimacy for the program. As a result principals provide the school’s vision for teachers to follow. According to Schlechty (2001), principals can make sure the innovation is aligned to the school’s vision prior to beginning the implementation process.

### **Central Office Administration**

According to Fullan (2007), the principal’s role in successful innovation implementation is essential; however, over time research from the late 1970s forward demonstrates that a strong central office presence is also critical for successful implementation. Hargreaves and Fullan state “active involvement of the district level administrator provides a signal to teachers . . . the effort should be taken seriously” (Hargreaves & Fullan, 1998 p.53). The actions of district level administrators establishing specific, realistic and obtainable goals are extremely important. Elmore stated that, “backward mapping” (Elmore, 1979, p.604) establishes goals at the district level which then allows principals to focus the resources necessary for teachers to be successful.

For example, if a district desired to increase the literacy levels of students, the district's commitment to hiring literacy coaches would demonstrate the appropriate support for this goal. This action allows teachers and principals to focus on the strategies necessary to increase student performance. All three components, teachers, principals and district officials are committed to the innovation, through resources, time and patience there is a greater likelihood of success.

District level administrators face similar challenges as school administrators; however, the challenges faced by these leaders are often viewed from a much larger perspective. For example, according to Fullan (2007), district leaders must monitor the progress of both teachers and school officials regarding program implementation. Additionally, the type of change initiated by the district leader is proportional to the amount of change desired by the governing body (school board) and community stakeholders. Fullan and Elmore emphasized that the role of district leaders during implementation is extremely important (Fullan 2007 and Elmore 2004, 2006). Fullan states "that administrators at the school and district level are responsible for creating and nurturing, and propelling the conditions necessary to support, sustained individual and collective engagement in improvement" (p.231).

### **School Board**

One internal factor of implementation that is often overlooked is the local school board. According to Fullan (2001), the board is often forgotten as the essential component of educational change. The board is overlooked because they do not have daily interaction with the implementation. The lack of direct involvement from the board can create gaps in communication between it and those responsible for implementation. When challenging decisions need to be made the gaps in communication can hamper the implementation process. The other issue impacting boards is that they have been elected by the public. Their election can

and often does bring politics into the decision making. Ultimately, boards may make decisions based on politics. In successful cases of school improvement according to Hargreaves and Fullan (1998), boards must be committed to the long term success of the innovation and put aside the need for quick changes if early results are less than favorable. When boards are faced with the continuation of a program due to poor early results, which is known as “the implementation dip” (Busik, 1992 p.3), they are more likely to abandon the innovation because of the poor perception. According to Busik, the expectation of instant success is one of the greatest reasons why innovations do not last. The literature indicates it is more likely for student performance to decrease during the implementation of any new program, a fact which makes most boards uncomfortable.

The implementation dip and increased use of resources encourages most boards to remain static. The risk of failure with associated expenditures stops school boards from attempting any program innovation. In fact, most boards do not engage in innovations because of the turmoil caused by challenging the status quo. The desire to remain neutral is the direct result of board members’ own experience with school. All stakeholders, which include board members, often believe what worked during their time in school will continue to work. This thinking does not encourage district leaders, principals, and teachers to take a risk to try a new idea. Hargreaves and Fullan (1998) state “what worked in 1965 is unlikely to be suitable for 1995 or 2005” (p.124). The incorporation of politics and the nostalgia stakeholders have toward education results in schools remaining largely unchanged. Hargreaves and Fullan indicate that the political nature of school boards coupled with the opinions of constituents seems to make supporting curricular innovation exceptionally difficult, particularly if quick positive results do not occur.

**Resources to solve problems**

During the implementation of any innovation, problems occur. The problems that can occur during implementation are lack of commitment from the individual, lack of resources, no professional development, etc. These issues call for shared decision making and the use of additional resources. Fullan and Pomfret (1977) state, “successful innovations will have resource support, feedback mechanisms and shared decision making”. Principals must be able to find resources, which can exist as materials or funding, to solve problems. Fullan indicates that the problems occur because of poor planning related to insufficient resources. Fullan (1985) stated, there is “a serious underestimation of resources necessary for the problem to be solved” (p.397). Hord and Huling-Austin (1986) indicate if principals can acquire the needed materials the teachers can spend more time developing their skills. “Success or failure of implementation is determined by the frequency and effectiveness of one-to-one follow up interactions with teachers that focus on their problems and concerns about changing their practices” (p. 108). One of the critical resources necessary for successful implementation is teacher training. This resource is dependent upon the time spent planning and the commitment level of building and district administration. The higher the commitment from the building and district administration there is a significant increase in training for teachers in order to make implementation successful.

One area that the literature does not indicate as a problem is the evaluation of teachers. This gap in the literature creates a problem in the role of fidelity. It is illogical to assume that teacher evaluation does not play a part in the implementation of curricular programs. For example, those teachers who are concerned their job is in jeopardy or they believe that their administrator is looking to make a change may have a higher degree of fidelity than those who

do not see their employment as tenuous. The literature does not provide any reference to the role of evaluation on the implementation of curriculum.

The literature on implementation impacts this study in the following ways: fidelity is an essential component for success; at each level of the implementation (teacher, principal, district level administration, and school boards) there are specific behaviors which must occur; and acceptance from the outset that the innovation may cause results to dip before they improve. There is a significant weakness in the literature regarding the nature and effect of the implementation gap and the how teacher evaluation can impact success... The lack of information on how these issues hampers implementation is troublesome. It needs to be explored further.

### **Mastery Learning**

The concept of mastery is rooted in the work of early 20<sup>th</sup> century educational reformers and thinkers. People such as Maria Montessori and John Dewey both wrote about the importance of students truly knowing, exploring, and understanding educational concepts. Dewey (1938) believed that if a child understands the content beyond a predetermined level, the depth of knowledge is far greater than if a child is simply exposed to concepts and then moves forward to the next one. This literature review will provide a historical overview of mastery learning. It will begin with ideas from the early 1920s and conclude with present day studies, examining research on the impact of mastery learning. The roots of mastery learning are important because, during the research phase of ATW, it was clear to us that this strategy had been forgotten in educational circles for some reason. We concluded mastery learning may be the right concept for our students but we could not understand why it was not a more pervasive practice throughout the United States.

### **Historical Development of Mastery Learning**

Carlton Washburne was the superintendent of schools in Winnetka, Illinois and during his tenure he developed a program which challenged the notion of time and student learning (Washburne, 1922). He believed all children learned at different rates and indicated that if all children were to learn at their own pace or at a rate which was predetermined by intellectual ability, schools could not be run using a factory model which was and is based on efficiency not learning. Washburne wanted to reverse the plan of measuring school effectiveness based on efficiency; rather, he believed schools should be measured on how well students learned.

The Winnetka Plan was focused on three elements: curriculum – which had specific learning goals for each unit, tests – which required alignment to the learning goals, and corrective activities – which were easily understood and helped the students overcome their weaknesses. This approach required time to vary in order to ensure students learned the appropriate content. Washburne wanted to focus on the learning of students and developed his system around learning not time. Students moved through the Winnetka school system only after they had met all the learning requirements for their level or course.

Washburne's work influenced other educators to try his approach to school. Helen Parkhurst, who created the Dalton School, used the flipped model as created by Washburne. At the Dalton School student growth was measured by how much they learned and the time it took to accomplish this task varied (Parkhurst, 2007). Both Washburne and Parkhurst discovered that the record keeping of individual students and the additional time needed to help students far exceeded what was found in traditional schools. Additionally, when the programs were studied the learning gains were marginal compared to the additional effort required to have students work through this system. The Dalton School has moved from Massachusetts and is now located



in Manhattan, New York, but the principles of Parkhurst's vision still remain. The Winnetka plan was abandoned after Washburne's death; however the work of Parkhurst and Washburne inspired others to probe the concept of learning vs. efficiency later in the 20<sup>th</sup> century.

John Carroll wrote about "a model for school learning" (Carroll, 1963, p.723). This was focused on what Carroll determined to be the five variables in learning: opportunity to learn, perseverance, quality of instruction and the ability to understand instruction. Carroll was not attempting to create a new model of school; rather he was confirming the differences in individual students and how this difference impacts the child's ability to learn and the time it takes to learn.

Twenty five years after this article Carroll reviewed his work (Carroll, 1963, 1989). In this article Carroll discussed time as being one of the most perplexing issues for and against the system he had developed which others had labeled as mastery learning. Carroll reiterated his belief that each student requires a different amount of time to learn and the practice of mastery learning increases the amount of time needed for instruction and learning. Carroll stated "educational psychology as a science still has no adequate procedures for estimating how long a given unit of instruction will take to be learned by students with different aptitudes" (Carroll, 1989, p.27). Learning and instruction cannot be packaged so all children are served in the same fashion. Carroll stated that even if time varies for the students, what must remain constant is the "clear specification of the task to be learned" (p.28). Carroll's premises of having set learning standards and the allowance of additional time for student learning served as a foundation for other researchers.

Throughout the literature Carroll's work is consistently referenced as the corner stone of mastery learning. It is the work of Carroll which laid the foundation for the work of Benjamin

Bloom. Bloom is best known for creating the taxonomy all educators use; however, many educators are unaware of Bloom's work on mastery learning. Bloom expanded the work of Carroll and created a system called "Learning for Mastery" (Bloom, 1968). Bloom expanded on the concepts of Carroll by creating his own categories which are: aptitude, quality of instruction, ability to understand instruction and perseverance. In his 1968 study Bloom reports results from 1965, 1966, and 1967. The 1965 results were used as a benchmark and then mastery learning strategies were used during the 1966 and 1967 school years. A final exam was administered to a group of students in 1965 with only 20 percent of the students earning an A. In 1966 the final exam was administered to another group and 80 percent of these students earned an A. "The difference in the mean performance of the two groups represents about two standard deviations on the 1965 achievement test and is highly significant"(p 10.)

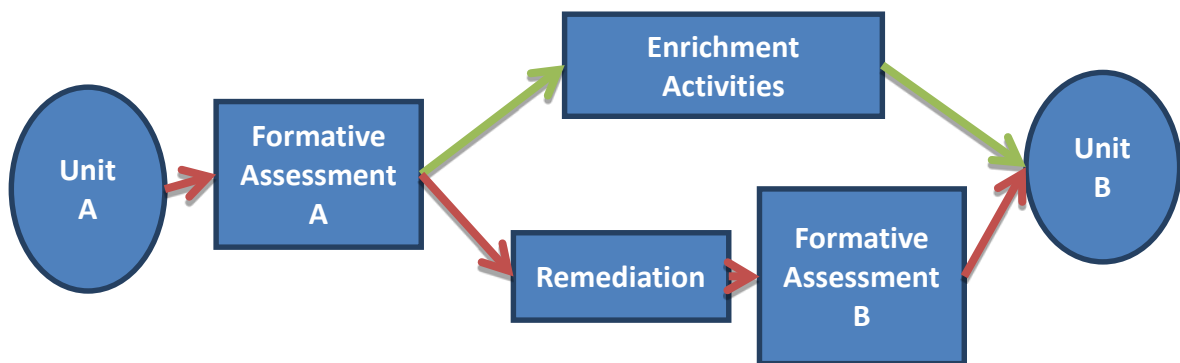
Bloom's work in 1968 led to his writing and publication of *Human Characteristics and School Learning* in 1976. In this book Bloom goes into greater detail regarding learning for mastery. It is clear this text had a significant impact upon the landscape of education from the late 1970s forward. Harvey (1977) stated that Bloom's book was significant because he believed this book "can change the ways in which we have traditionally viewed teaching and learning in school" (p. 189). Bloom's book challenges the traditional distribution of students along the bell curve. He believed, given the right amount of time, effort, and instruction, that 95% of students will master material they were being asked to learn. The 5% which did not reach mastery were those children with severe intellectual disabilities. Bloom's book challenged the long held belief that talent was born and not made. He stated, "modern societies no longer can content themselves with the selection of talent; they must find the means for developing talent" (p.17).

Bloom’s research indicates if students are required to master content then upon completion of their education children can perform at a significantly higher level.

Bloom (1976) was able to divide learning into three categories which are interdependent: students having prerequisite knowledge, motivation, and proper instruction. Bloom believed that if these three areas were met consistently then all students could learn. Bloom stated, “there is almost no point in the individual’s history when his learning characteristics cannot be altered either positively or negatively” (p. 137). Based on this work, Bloom and those who believed in this theory began to develop curriculum and instruction of the highest quality that was best suited for the individual student.

The ideal situation for instruction in Bloom’s theory is individual tutoring. Bloom’s vision of mastery learning hinges on individual tutoring which is not practical for schools. Mastery learning must operate within a culture of education that is time based and as a result educators took Bloom’s work and created a system of mastery learning based on grouping students. The grouping and regrouping of students allow mastery learning to function in the current school setting. The diagram below demonstrates how teachers can incorporate group based mastery within their classrooms.

Figure 1, the work flow for Thomas Guskey’s view of mastery learning (2007)



(Guskey, 2007, p.14)

This chart demonstrates a typical instructional unit and theoretically this chart can be applied to any content area. Guskey indicated the length of time necessary was determined by the instructor and there was not a set amount required (Unit A) (Guskey, 2007). The instructor presents the content to the students and after a period of time, as determined by the instructor, an assessment is given to the class. When the assessment is graded the class is divided into two groups. Group A met mastery and will do enrichment activities, while students in Group B, who did not meet mastery, will complete remediation activities, and then reassess. Following the second assessments the class re-groups and the next instructional unit begins (Unit B). Over time as educators implemented this model essential components of its successful use were developed. These parts according to Guskey (2001), “are (1) the feedback, corrective, and enrichment process, and (2) congruence among instructional components or alignment” (p.13). Guskey confirms that feedback on student performance and work, not a letter grade, coupled with well written and aligned curriculum is essential to students moving toward mastery.

Fiel (1975) confirmed the importance of feedback to students. Fiel wrote “teachers interested in having students be successful in cognitive activities should identify learning errors and provide some sort of remedial activity” (p.225). Educators who implemented a mastery learning process in their classroom soon learned that students required “regular and specific information on their learning process” (Guskey, 2001, p.13). Simply assigning work, grading the work and then returning it to students does not provide enough information for them. The feedback students need in this process includes three factors: reinforcement of the important learning concepts, identification of those items or concepts on which they performed well, and determination of those items or concepts in which they needed to improve. Guskey (2001) stated “feedback, corrective, and enrichment procedures are crucial to the mastery learning process for

it is through these procedures that mastery learning “individualizes instruction” (p.14). The importance of feedback cannot be overestimated. Feedback gets beyond finite answers for questions. It provides information to students so they can find strengths and weaknesses in their knowledge and determine what they can do to improve both areas.

Bloom and Guskey indicated that mastery learning requires alignment of the curriculum and instructional processes (Bloom, 1968, 1976 & Guskey, 2001, 2007). For example, if multiple teachers are teaching Algebra I, the terminology, assignments and assessments used by each educator need to be identical. Additionally the work assigned to students needs to be aligned to the skills they are expected to acquire by the end of the unit. Using each element described here becomes essential to an effective mastery learning program. The elements described through this literature impacted the implementation of the program at our school in the following ways: 1.) the curriculum was rewritten and narrowed in scope, 2.) the assignments and terminology were the same for each teacher, 3.) students received feedback quickly regarding their current knowledge, 4.) assessments were aligned to specific content standards, and 5.) students had multiple opportunities to test on each standard.

In 2014 the National Council of Teachers of Mathematics (NCTM) released a position statement regarding the curricular development for math instruction. NCTM believes that when curriculum is narrowed in scope, the student may learn the proper procedures for the concept; however, they lack the ability to connect the concept to the real world. Additionally, the narrowed curriculum does help students perform on heavily weighted assessments; however, the NCTM does not believe that these assessments help students understand the relationship between what they have learned and how it will help them solve abstract problems. The NCTM does not specifically state they are not in favor of mastery learning as an instructional strategy. It is

implied by their position that they want to see a broader curriculum which aids students in solving real world problems.

There are two gaps in the literature regarding mastery learning. First the literature is old, and the data presented from this literature occurs before standardized testing was the norm. Second there appears to be a renewed interest in mastery learning. The gap is that the research and interest stops in the early to mid-1990s and then it reappears in the mid-2010s. In December of 2013 the Association for Supervision and Curriculum Development (ASCD) dedicated their entire journal *Educational Leadership* to the practice of mastery learning. Authors such as Pink (2009), Schwan and McGarvey (2012) discuss how mastery learning is essential to guaranteeing that learning and growth occur. In Indiana one of the models for teacher evaluation specifically assesses teachers on whether students have mastered the content that has been taught. There is no current literature regarding the use of mastery learning and as a result many of the errors which were discovered between the late 1960s and mid 1990s may be repeated.

### **Outcomes and Impact of Mastery Learning**

Between the release of Bloom's book in 1976 and the early 1990s studies were conducted to determine the viability and feasibility of mastery learning. It is important to note that both detractors and supporters of mastery learning agree on the following: all students can learn; however, they all learn at different rates. Studies also viewed mastery learning as two types, individual or group based. It was evident Bloom believed the best type of mastery learning occurred through individual tutoring (Bloom, 1984). Bloom pointed to the work of two doctorate students, Anania and Burke. Based on their work Bloom stated "it was typically found that the average student under tutoring was two standard deviations above the average control class" (p.4). These results occurred under an individual based tutoring system, not group based

mastery learning. These findings demonstrated that “about 90% of the tutored students and 70% of the mastery learning students attained the level of summative achievement reached by only the highest 20% of students under conventional instructional conditions” (p.4). The positive results of students under an individual tutoring system are not surprising; however, individual tutoring is not practical for public schools. The remaining portion of this review will focus on group based mastery learning.

Group based mastery learning requires teachers to be more than the sole provider of information. These teachers must become learning facilitators. Traditionally teachers present one lesson for all students regardless of the students’ content knowledge. Group based mastery learning in its purest form requires teachers to provide multiple lessons for a wide variety of groups. Studies by Mabee (1979), Reiser (1982), and Ross (1981) demonstrated that those students who had a lower cognitive entry level often lacked the proper motivation to guide themselves, creating a situation in which teachers needed to facilitate multiple learning activities at once. This issue of varying student abilities and motivation created obstacles for many instructors. The difficult nature of designing multiple learning activities for students, coupled with challenges of facilitating student learning when all could have been at different points in the curriculum demonstrated the need for further research.

Guskey and Gates (1986) reported on group based mastery learning by researching 25 elementary and secondary classrooms. The results of this work showed, “in no study did students under control conditions perform better than those under mastery conditions” (p. 75). When the performance of the students in this study was averaged between the elementary, junior high and high school students, the results show that this combined group of students performed .84 standard deviations higher.

Kulik et al. (1990) gave the most comprehensive report on mastery learning. In this study they looked at 108 different elementary, secondary (including junior high) and post-secondary classrooms using mastery learning. In this study the authors reported that all but seven classrooms saw gains on standardized tests. They went on to specifically report that “the average effect of mastery learning programs was to raise student achievement scores by 0.52 standard deviations” (p.271). The studies by Guskey and Gates and Kulik demonstrated that group based mastery learning improved student performance.

Some of the greatest skeptics of the effects of mastery learning were Robert Slavin and Marshall Arlin. Slavin and Arlin questioned the results of Bloom (1976, 1984), Guskey (1986), and Kulik (1990). Arlin also believed the extra time necessary for students in the mastery learning model was counterproductive to the traditional methods of instruction. Arlin noted that even the earlier users of mastery learning, such as Washburne, stated that the additional time needed was an issue from the inception of this practice. The use of additional time and the narrowed curriculum were two factors Slavin and Arlin indicated caused the positive results of mastery learning to be inaccurate.

Slavin (1987b) stated mastery learning results were “moderately positive on instructor made exams and nil on standardized achievement exams” (p. 202,). Although, Mevarech (1985) and Kulik (1990), indicated students produced higher computation and comprehension results on standardized assessments, when mastery learning methods were used. In an era before high stakes standardized testing, Slavin (1987a) believed students were more apt to master content of the teachers’ choosing. Slavin stated, “when curriculum is held constant, it seems likely that the mastery learning procedures hold teachers more narrowly to the mastery objectives . . .” (p. 301,). Slavin stated that students who were subject to mastery learning may miss out on content



which may be important and more interesting to them because it was not covered on the assessment. Anderson (1987) reported that when teachers focus on specific set of objectives, which have been determined by the teacher, student performance improved significantly. Slavin believes that the data are flawed because the teacher determines the standards to be learned. Additionally, Slavin indicated that when the two groups of students were compared side by side on standardized tests, mastery vs. non-mastery, the mastery learning students did not significantly outperform non-mastery students.

Slavin questioned the results of mastery learning specifically because student performance was measured on teacher created assessments creating inflated results. Throughout his research he could not find any studies which duplicated the success Bloom, Guskey, and Kulik found. When students were given a standardized assessment those students who participated in a mastery learning system did not out-perform those students who did not participate. Slavin indicated that we should expect students to increase performance on teacher created assessments. As a result, Slavin indicated the additional time spent to help students master content did not significantly alter student performance on standardized assessments. Thus, he believed that mastery learning was not a valid practice.

The lack of significant performance differences and the additional time needed led Arlin (1982) to examine the time differences in mastery learning from a teacher's perspective. Arlin found teachers often struggled with how to use time effectively especially when they allocated time for struggling and advanced learners. Often teachers did not have enough time during the school day to support students who needed additional time to demonstrate mastery. Also, Arlin found that enrichment activities provided for faster learners did not sustain or enrich them as Bloom and Guskey had described. Arlin (1984) reported the gap between fast learners and slow

learners remained stable over time. This finding was opposite that of the proponents of mastery learning, such as Bloom and Guskey, who stated this gap closed or narrowed over time. In this same study Arlin found that, teachers continued to hold back the faster students because they needed to reallocate time to help students who had not mastered the content. Arlin described this concept as the Robin Hood approach. In terms of mastery learning it clearly demonstrates, time allocated for faster students is given to slower students to help close their achievement gaps. “A time-achievement trade off does exist under mastery learning conditions. Increased achievement appears to require the continual provision of remedial time for slower learner’s” (Arlin, 1984, p.75). Arlin’s work revealed individual differences in learning remained stable; in fact they increased with each year of schooling. It is clear his opinion of mastery learning was that it did not create a significant enough gain in student performance and it did not close the achievement gap to warrant further use.

In the end the decision to use mastery learning as a classroom strategy or philosophy is dependent upon results. The research done by Bloom, Guskey, and Kulik demonstrate mastery learning is effective; however, the work of Arlin and Slavin do not. Arlin and Slavin do not see mastery learning as a viable methodology for teachers. Arlin and Slavin were able to demonstrate through their research that if there were positive gains in learning they were negligible and the additional time required to meet mastery did not demonstrate enough gain to be economically practical. In order for this strategy to be effective, instructors must be willing to alter curriculum, focus on student improvement and growth, and provide feedback to students specific to their strengths and weaknesses. And understand there will be differences in student achievement.

This literature has helped this study answer this question: will mastery learning improve student performance on standardized testing? With the introduction of *No Child Left Behind* in 2001 teachers are being held accountable for student performance on standardized tests. With increased accountability for teachers and schools, mastery learning requires a streamlined curriculum with continuous feedback, insuring that learning has occurred. A majority of the research conducted on mastery learning was conducted prior to high stakes standardized testing; however, Arlin and Slavin were able to utilize standardized testing in their studies. Some of the research indicates a focused curriculum along with students receiving corrective feedback and having multiple opportunities to demonstrate content knowledge has shown students performing well on standardized testing. The work of Arlin and Slavins indicate that if there are gains in student learning they are minimal and the price in terms of time and resources does not merit the use of mastery learning.

In the educational environment of today, school leaders are looking for ways to guarantee student learning specifically since schools are now being held accountable for student performance. Leaders will look for strategies that accomplish this task, which explains the renewed interest in mastery learning. The desire to ensure students learned the material impacted the decision to use mastery learning as strategy at DPCHS, in spite of some research (Arlin 1984 and Slavin, 1987) that argues against this impact. We needed to do something different and to an extent radical. We had to ensure the learning of our students occurred and we felt the only way to accomplish this goal was through mastery learning.

### **Chapter III Methodology**

#### **Case Studies as a Methodology**

I conducted a case study which will examine the experiences of teachers, administrators, board members, students and parents during the implementation of a mastery learning program. According to Baxter and Jack (2008) the “philosophical underpinnings” (p. 545) of case studies are rooted in constructionism.

A constructionist epistemology indicates that humans create meaning when they are interacting with their environment (Crotty, 1998). Constructionism demonstrates “that there is no true or valid interpretations” (Crotty, 1998, p.47), of social phenomenon. Each individual constructs his or her own meaning of situations. When case studies are used as a methodology, the researcher must begin by asking how and why questions. These questions help the researcher understand the experience of the subjects being studied and how they were able to create their current reality.

“The case study is preferred in examining contemporary events, but when the relevant behaviors cannot be manipulated” (Yin, 2009, p.11). Case studies allow the researcher to understand the phenomenon within the context of it occurring and this can be done by direct observation or through interviews of the participants. This case study is what Stake (1995) refers as an intrinsic case study. Baxter and Jack (2008) indicate that an intrinsic case study is appropriate when the researcher has a sincere interest in the case and is not interested in understanding “some abstract construct or generic phenomenon” (Baxter and Jack, 2008, p.548). As the primary researcher for this work I am truly interested in how classroom processes changed and finding the factors that impacted the implementation of mastery learning at our school.

**Research design**

According to Rowley (2002), there are five components to using case studies as a methodology they are: research questions, propositions, units of analysis, the logic linking the data to the propositions, and the criteria for interpreting the findings (Rowley, 2002, p.19). Each one of these items will be discussed in the paragraphs that follow.

**Research Questions**

According to Yin (2009), Merriam (1988), and Yowley (2002), the essential part of a case study is having clear research questions. Specifically in case studies the questions need to center on how and why questions. The questions that I will look to answer are:

1. Why was it necessary to implement a mastery learning program?
2. How did the implementation of a mastery learning program change the classroom processes of the teachers?
3. What were the factors that fostered and hindered the implementation?
4. How was the implementation of this program perceived by community stakeholders?
5. How did the implementation of this program impact students performance on the Indiana End of Course assessments from 2009-2010.

**Propositions**

“The researcher has to make a speculation on the basis of literature and any other earlier evidence as to what they expect the findings of the research to be” (Yowley, 2002, p.19). The literature indicates that the implementation of any curricular program will be difficult. The challenges will included but not limited to the following: fidelity levels of teachers to implement what had been designed the commitment level of administrators throughout the district, the lack

of resources, the external pressure supplied by the school community, and the lack of increased student performance.

The decision to use mastery learning as an instructional methodology required the teachers to rewrite the curriculum for Algebra I. The curriculum was narrowed in scope and sequence. The reduction of the curriculum was done to increase the amount of time the teachers spent on the learning indicators. The literature also indicates that results of using mastery are mixed. Some researchers have found tremendous gains by students while others have found the gains to be minimal and not worth the additional expense of utilizing this type of methodology. To an extent some of the literature indicates some students will perform better on assessments when teachers select the standards to be learned. The implementation of ATW was done to improve test performance and it may have resulted in students from DPCHS being prepared very well for the ECA and not having the content knowledge necessary for later classes due to the narrowed curriculum

### **Units of Analysis**

The units of analysis are used to determine exactly what the case is. Units can vary from individuals to organizations. In this case study the main unit of analysis are people. They are grouped into the following categories, teachers, administrators, school board members, parents, and students. Each unit will be able to provide insight into answering the research questions listed. Additionally, document reviews were done creating a second unit of analysis. The documents also provided insight into the research questions.

### **Logic linking the data to the Propositions**

This case study is descriptive in nature. The questions are designed to determine the experiences of each unit during the implementation of a mastery learning program. This

descriptive approach produced a pattern of data that will explain the factors that fostered and hindered implementation, how classroom processes changed, and how the program was perceived by community stakeholders.

### **Criteria for interpreting findings**

In this case study the researcher is working to find out how a mastery learning program was implemented, how it changed classroom processes, how it was perceived by the community and why it was necessary. Yin (2009) refers to this type of case study as “explanation building” (p.141). Yin indicates that in order to explain a phenomenon the researcher must stipulate that there are causal links to how or why something occurred. This case study is a retrospective and dependent upon the participant’s recall of events that happened seven years ago. Thus no causal connections were made.

### **Setting, Situation, and Focus of Implementation**

#### **Setting**

This proposed study is an implementation study that will focus on the implementation of mastery learning at DePaul Community High School (DPCHS). The town of DePaul has approximately 9,000 residents and the school enrolls approximately 830 students. The student body is 98% Caucasian and 30% of all students qualify for free and reduced lunches. DPCHS has been and continues to be a successful school. Using the data from the Indiana Department of Education, since 2008-09 the annual averages indicate the SAT composite score in reading and math is over 1000 and 75% of the graduates will be enrolling in a post-secondary institution

#### **Situation**

If the metrics of graduation, attendance and post-secondary attendance rates are utilized then DPCHS appears to be high a high performing school. In 2013-14 DPCHS had a graduation

rate of over 94%, an attendance rate of over 97%, and over 73% of the students enrolled in some type of post-secondary institution. In the years when the ECA was piloted, 2006, 2007, and 2008 the results were the exact opposite of this perception. The performance of DPCHS on these piloted assessments indicated that our students were inadequately prepared (See chapter I). When the Indiana Department of Education (IDOE) indicated that the ECA would be replacing ISTEP, waiting to see what happened on the first round of assessments then making adjustments seemed backward. As the principal, the data indicated our curriculum and instructional methods did not prepare our students. Teachers perceived that our performance could be linked to the perception that this piloted assessment had no value to the students. Unlike the ISTEP/GQE which students needed to pass in order to graduate, the piloted ECA had no high stakes impact on students. Regardless of this perception, the data indicated that our students were unprepared. The teachers did agree that we could not move into the next year without addressing our curriculum and instructional methodology.

Our initial conversations of change focused on trying to find a remedial program to assist our students. We felt that those students who had skill deficits could benefit from a program designed to help their weak areas; however, when we began to analyze the data from the piloted assessments, we realized that the weaknesses of our students were far greater than we first imagined. The variety of needs indicated that a simple remediation program did not address the needs of all students. We determined then the curriculum and instructional practices needed to change. Through our research we found a school in Louisville, GA., which utilized a mastery learning program to help their students. In Georgia, all students were required to take an end of course assessment for Algebra I. This program was appealing to us for one reason; students at the school had a superior performance on the Georgia ECA for Algebra I (Lile, 2008).



**What was implemented?**

In chapter 4 a detailed description of what was implemented based on the data from the various stake holders will be included. We did base our mastery learning project on the experience of Jefferson County High School in Louisville, GA. This school had implemented a mastery learning program for their Algebra I courses. We took the information done prior to and after our visit back and began the process of determining what we needed for our school. Collectively we agreed mastery learning as a strategy had potential for our school.

**Data Collection**

As mentioned before, this study uses qualitative methods in order to identify and elaborate on the experience of the participants. Thus, most of the data will be collected from interviews conducted with the teachers, administrators and board members who were predominantly responsible for the implementation of ATW. Also, documents which were used during the implementation process, which includes letters to parents, memorandum and presentations, will be analyzed.

In this case study, the units of analysis will be people and a review of pertinent documents. Their experience during the process provides richness to the data that cannot be seen through student performance on the ECA. As the interviews are conducted and data are collected they will be transcribed, organized, and coded. Interviews will be categorized by the position the person held during implementation. The codes used developed from the answers given by the participants. The coding was done by using data bins with the following categories: implementation processes, hindrances' during implementation, reasons for change and the individuals experience. Once the data is placed into the appropriate bins then specific factual

statements can be used to represent the data in each bin and to identify sub-themes within the larger categories. The study of the themes will require the use of triangulation. I will triangulate the data by looking for “areas of agreement as well as areas of divergence”(Gain, 2011). The data will be triangulated between the answers to the questions, the documents being reviewed and the member checking which will occur when transcripts are sent to the participants following their interview. Participants will be able to view the transcription of their interview and provide an opportunity to clarify concepts or ideas that were produced. Each participant must feel that I have captured their thoughts correctly so they are represented accurately.

The analysis of the documents is also an important element of this study. The documents used in this study will assist in providing background and context. Additionally the documents are exact and provide a great deal of coverage during the implementation process. A concern when using documents is biased selectivity. In this study, all documents created during implementation will be used. The analysis of the documents will be done by creating a data matrix.

**Participant Selection.** The following participants will be selected for this study:

1. The teachers and counselor involved in the implementation. These include the one teacher remaining in the school that developed and implemented the mastery learning program. The second teacher resign in July 2015. Also, a third teacher has been located and a fourth teacher who came in during implementation will be interviewed. These teachers no longer work in the building. The retired department head and the counselor who assisted with implementation will also be interviewed.

2. The former assistant principal who is now working as the technology director for the district.
3. The former director of curriculum who is now working as the lower elementary school principal.
4. The former superintendent
5. Three to four former school board members
6. Former students and parents

There was 60 minute interview conducted with each participant. The interview with each participant allowed them to reflect on the experiences they encountered during the implementation of this program. Each participant was asked what their experience was during implementation and the factors that fostered or hindered the success of the program. As their experiences are documented themes revealed their lived experience during this implementation. Each participant received a transcript of the interview. They had the opportunity to review the transcript.

Also, documents, presentations and the results from the ECA test will be used. These items determined the factors which fostered and hindered implementation. The documents used during implementation helped provide clear insight into the direction of the project. Also, they indicated how problems were addressed and the adjustments made. And finally the presentations made to the public demonstrated the message being delivered to the community stakeholders. The ECA results were reviewed. This information, coming from the Indiana Department of Education website, will show the results of the students after the first and second year of implementation.

### **Data Analysis**

Interpreting the process used by the participants was essential to this study. Marshall and Rossman (2010) indicate that the analysis of information is essential for all qualitative studies. The analysis allows the researcher to make coherent connections with information collected. Interviews will be the main source of data collection. Documents were also used; however, they did not provide the majority of the data used in this case study.

The interviews were the main data source and they were what was used to develop themes. These themes developed by the reading and rereading of the interview transcripts. As I made sense of the data that was collected, the data was focused on the research questions (Merriam, 2009). After each interview I compared the findings from the earlier interviews. I then put the data into clusters, patterns and themes (Marshall & Rossman, 2010). These themes evolved from the words of the teachers, administrators, board members, parents and students as they described their experiences during the implementation of ATW.

The initial themes and categories developed from the reading and rereading of the transcripts captured some recurring patterns across the data (Merriam, 2009). Merriam suggests five criteria when the categories are developed. These categories must be responsive to the research questions, exhaustive, sensitizing, and conceptually congruent. Once the themes are identified I looked for data that confirmed these themes. Following the interpretation of the data and the creation of themes I began the process of member checking. Member checking requires that once the data has been interpreted they must be taken back to the participant for confirmation (Marshall & Rossman, 2010).

### **Ethical Considerations**

Throughout the process it is necessary to treat each respondent with dignity and respect. Each respondent will be given a consent form and be assured that the responses they give will be held in confidence. Given my positionality (principal of the school) in this study, I will need to

assure that these interviews will in no way impact the evaluation process for each teacher. As part of the consent form, each participant will have the opportunity not to participate in this study. Since this study is specifically looking at time between the spring of 2008 and the spring of 2010 it is important to note that a significant amount of the time has passed since then. It may be difficult for the participants to recall specifics regarding the implementation. The passage of time often allows participants to forget key events which can gloss over what really took place (Coburn 2012). As a result during the interview I will work to probe the memory of each participant in a respectful and dignified way. Making sure that the information provided by the participant is collected in confidence and the subjects' ability to not participate will help remove some concern.

### **Interpersonal Consideration**

Weiss described a scenario in which the researcher who is intimately involved with the project must be aware of the "unshakeable assumption" (Weiss, 1995, p107). This author is referring to the concept that the researcher already knows all the answers. It is important to understand that I do have some answers to this study; however, I cannot project my answers from the perspective of the principal onto the perspective of the teachers, other administrators, board members, parents, or students directly involved with implementation. In addition to having some answers I do have a personal relationship with each participant.

I have worked closely with the remaining teacher for the past several years and it is legitimate to think that this relationship could influence the data collected and compromise our current relationship. There will be an assumed risk taken on by both the teachers and myself. Risk is an inherent part of qualitative interviews. Participants are exposing their thoughts and feelings and for many subjects this behavior is challenging. It is essential that the teacher is

assured their participation will not impact performance evaluations here at DPCHS. Weiss indicates that after some interviews the participants may wish to have all or part of the interview erased or not used. In order to preserve the relationships that I have and to respect the confidentiality of each person I will do so if asked. The relationship and confidentiality are far more important than the results of this study.

### **Trustworthiness of data**

Qualitative research is challenging. It is challenging because the researcher is dependent upon human beings to describe their experiences in relationship to a specific scenario, or it is dependent on the researcher's interpretation of documents. The use of qualitative research is an excellent method for trying to find patterns of meaning that people use to make sense of their experience, or the interpretation of documents. Lincoln and Guba (1985) have created a definitive guideline for qualitative researchers. Their four components, credibility, transferability, dependability, and confirmability will be addressed specifically regarding this study in the following paragraphs.

### **Credibility**

The methods being used during this study have long been established as valid ways of collecting data. The primary method for data collection will be in-depth interviewing. The use of this process allows the researcher to "capture the deep meaning of experience in the participants' own words" (Marshall, 2010, p.93). This study hinges on finding out how the individual teachers, administrators, board members, parents, and students experienced the implementation of ATW.

Furthermore, I have a unique perspective of the organization. I have worked as either the assistant principal or principal in this building for the past 14 years. As a result I have been able

to develop a unique understanding of the culture present within this school. Also, I have developed a trusting relationship with the teachers directly involved with the implementation of this program which allows them to be honest regarding their experience. I have established prolonged engagement with the people involved during the implementation process. Prolonged engagement provides a level of trust from the beginning of the research that takes many researchers years to establish.

### **Transferability**

This case study captured the rich description of what transpired between the spring of 2008 and spring of 2010 at one high school. Guba (1981) indicated that “thick descriptive data that will permit comparison of this context to other possible contexts to which transfer might be contemplated,” (p.86,) is an important concept of qualitative studies. The demographics of DPCHS are not as important to this study as the process the teachers and administrators went through during implementation of ATW. This case study focused on finding items that fostered or hindered that process of implementation. As a result of the in-depth interviews and the document reviews that were conducted, the answers produced may be valuable to other organizations.

### **Dependability**

Guba and Shenton indicate that qualitative studies should be able to be repeated (Guba, 1981; Shenton, 2004). Additionally it will be possible for an external audit to occur. The data that are “collected and analyzed and interpretations made” (Guba, 1981, p.87), will be easily accessible to all those interested in reviewing the collected information. Finally, a journal was kept during the data collection process. This journal will give insight into my thoughts during the interviews and how they may have influenced my analysis of the data.

**Confirmability**

When claims are made during the research process there must be multiple sources confirming that statement. Guba indicates that the use of triangulation and reflective practice, such as keeping a journal, are two practices which can help researchers accomplish this task (Guba, 1981). Shenton suggests that it is important to admit any Shenton suggests that it is important to admit any predisposition you may have as a researcher (2004). My predisposition is that as a learner I needed more time to truly comprehend the content presented to me. As a result the mastery learning as a strategy is something I can easily relate to my learning style. Additionally, as the principal I wanted to see a successful implementation; a poor performance was not acceptable to me. I will need to take steps during my reflective practice to ensure my predisposition is accounted for during data analysis.

**Limitations**

All studies have limits. The limitations of this study are listed below:

1. The study is specific to one school with specific demographics and culture.  
The desire of this study is not to provide schools with a step by step approach to mastery learning implementation; rather it is designed for the reader to determine if the steps we took could be utilized in their environment.
2. There could be bias in this study. I was the building principal during the implementation of this program. There will most likely be biased reporting as my own experiences may cloud my view of what really happened. This problem will be addressed through member checking. The sharing of information with the participants is essential to validate the data collected.



3. This study focuses mainly on the work of the following people, the teachers responsible for implementation, the guidance counselor who was involved with the initial development, building and district administration, school board members, parents and former students. The members of each group are important to this study because they provide additional perspectives on the implementation process. The depth of knowledge provided by the main participants provided a strong base of data. The size of this study is an issue that impacts the generalizability of the findings
4. The focus of this study is on the implementation of mastery learning during a two school year period which focuses on the graduating class of 2012. The data collected provide information specifically to implementation. What happens in later years is important regarding the sustainability of implementation; however, it will not be included in this study.
5. The data will be limited to how articulate the subjects are in communicating their memories of the implementation process. The questions used allowed the participants to recall exactly what they did during that school year.
6. This study is retrospective. I am asking the participants to re-construct events and experiences that occurred over seven years ago. When participants are asked to recall events and experiences from several years past their memory may not be reliable. Interviews of each participant will assist them in remembering the events. Also, of necessity, participants' perceptions will be filtered due to their experiences since this time. Coburn stated that "retrospective data are often very general and can be smoothed by the passage

of time . . . limits insight” (Coburn, 2012, p. 140). The participants may end up co-constructing the stories of what happened during implementation.

Conclusions drawn in the study will acknowledge this limitation.

Despite the limitations of this study readers may find the information helpful. If readers are considering implementing a mastery learning program, they can see the steps taken at DPCHS, the lived experiences of the teachers, administrators, board members, parents and students base this information upon their knowledge of their school determine if what we did may be helpful to them.

## **Chapter IV Presentation of Findings**

### **Overview**

This study used a case study design to explain how, why and what the experience was like for those involved with the implementation of Algebra that Works (ATW) at DePaul Community High School (DPCHS). The participants for this case study included three administrators, the former assistant principal, the former director of learning services, the former superintendent, five teachers only one of whom still works at DePaul, one counselor, three former board members, two parents with their two children, and one parent whose children did not participate. The administrators, teachers, counselor, and board members were all contacted directly by me and agreed to participate in one semi-structured interview. The parents and students were selected randomly. Using the results from the ECA tests, students were assigned a number. The numbers were then placed into a large bowl and drawn randomly. The participants were contacted first by mail and then a follow up contact was made by phone to schedule an interview. They also agreed to participate in a semi-structured interview. The participants

selected the location for the interview in order to accommodate their schedules and to make them feel most comfortable. The qualitative data were organized and analyzed around the themes which developed during the interviews, the creation of transcripts, the re-reading and coding of the transcripts, and the review of all relevant documents.

**Participants**

Chapter four will begin with a description of all the participants in this study.

Participants were given pseudonyms to protect their identities. Their roles during the implementation and their experience are presented in this table.

<b>Name</b>	<b>Role</b>	<b>Experience</b>
<b>Jeff Unser</b>	<b>Superintendent</b>	Jeff had worked as an assistant superintendent in charge of curriculum at two districts in Indiana, he had also worked as a teacher, assistant principal and principal at multiple districts around Indiana. Jeff is now working as a director of student services at a school district in central Indiana.
<b>Cam Boyle</b>	<b>Assistant Principal</b>	Cam is a long time educator and has served as a teacher, department head, librarian, assistant principal, and the director of special projects all at DPCSC. At the time of implementation Cam had been assistant principal for two years.
<b>Shannon Thompson</b>	<b>Director of Learning Services</b>	She had been in this position for two years prior to the implementation of ATW. She had been a secondary math teacher at three different

		high schools in the years prior, one in Kentucky and two in Indiana. Shannon now works as the lower elementary principal in DPCSC.
<b>Brian Donohue</b>	<b>Board President (year two)</b>	Brian had been a board member for nine and one half years. Brian is a local businessman. He served in multiple capacities on the board and during the two year implementation of ATW, Brian was the board president during the second year.
<b>Walt Jones</b>	<b>Board President (year one)</b>	Walt had served on the DPCSC board for 16.5 years and during the implementation of ATW he was the board president during the first year. Walt has extensive experience in education having worked as a teacher in the late 1980s at a small Indianapolis school district and now is the head of a charter school in Indianapolis.
<b>Janey Hulman</b>	<b>Board member</b>	Janey began her one term on the board at the same time ATW was introduced and implemented. At the time of implementation Janey was one of the few board members with a child in DPCHS.
<b>Kim Carpenter</b>	<b>Teacher</b>	Kim worked as a math teacher at DPCHS during the time of implementation. She was entering her third year of teaching at the time of implementation. Prior to beginning her work at DPCHS she had worked at Indiana University Purdue

		University Indianapolis and Ivy Tech as a basic algebra instructor. Kim recently resigned from DPCHS and is now working in the private sector.
<b>Clare Foyt</b>	<b>Teacher</b>	Clare is entering her ninth year as math instructor at DPCHS. She was entering her third year of teaching when implementation occurred. Clare was one of two teachers that traveled to Louisville, Georgia to see ATW first hand. She continues to work as teacher and is now the math department head for DPCHS.
<b>Mindy Harvester</b>	<b>Teacher</b>	Mindy is a recent PhD graduate in psychology from a Big Ten university. At the time of implementation, she was a new teacher. She was hired in January of 2008. Mindy did not travel to Georgia; however, she was very involved with the development of the curriculum and logistics for ATW. Mindy left DPCHS in the spring of 2009 to pursue her graduate studies.
<b>Megan Crest</b>	<b>Teacher and Department Head</b>	Megan had the most teaching experience of all the teachers involved with this implementation. She had worked at DPCHS for 31 of the 35 years she was an educator. Megan had served as department head for 22 years and was serving in that capacity during the time of implementation. She retired following the 2009-10 school year and has kept active in

		education by tutoring students.
<b>Lucy Schultz</b>	<b>Teacher</b>	Lucy joined the DPCHS math department in the summer of 2009. She replaced Mindy and was assigned to teach the same subjects. Lucy left DPCHS in the spring of 2013 to be with her young family as they moved to the Chicago area.
<b>Aimee Riley</b>	<b>Counselor</b>	Aimee has worked at DPCHS since the fall of 1995 as a guidance counselor. Prior to this she had worked as an English and French teacher on the western side of Indiana. Aimee has been the go to person for students who have emotional issues DPCHS. She traveled to Georgia with the team to investigate the ATW program to provide the guidance perspective.
<b>Mark Smith</b>	<b>Parent</b>	Mark is the parent of four boys. Three of them graduated from DPCHS and one is still a student. Mark owns his own painting company.
<b>Andy Smith</b>	<b>Student</b>	Andy is 2012 graduate of DPCHS and is now attending a major university in Indianapolis and working part-time.
<b>Jennifer Fagley</b>	<b>Parent</b>	Jennifer is the parent of two DPCHS graduates. She works as an administrator of a local church
<b>Julia Fagley</b>	<b>Student</b>	Julia is 2012 graduate of DPCHS and she is attending a small university in northeastern Indiana. Julia plans on graduating in December of 2015 and

		finding employment in the golf industry.
<b>Diana Green</b>	<b>Parent</b>	Diana has had two children graduate from DPCHS, her eldest child, Jacob, graduated in 2012. Jacob was not a participant in this study. Diana is a former English teacher who left education to raise her family. She has worked as a substitute teacher at DPCHS for several years.
(Table 1: Participants description)		

**Research Question #1**

**Why was it necessary to implement a mastery learning program?**

The administrators, board members, counselor, teachers, students and parents were asked to articulate their experiences during the implementation of ATW. Additionally documents from implementation were reviewed providing additional insight into this study. For this question the participants and the documents provided information that resulted in two reasons for implementation: to meeting state mandate, and to ensure that learning occurred. The administrators, board members, counselor and teachers explained how the poor performance on previous tests created serious concerns regarding DPCHS students’ readiness for algebra becoming a graduation requirement. According to the administration and teachers there had to be some way to ensure that students were learning, which could be done through mastery learning.

**A Fear of Students: Not meeting State Mandates?**

In the fall of 2007, the Indiana Department of Education announced a shift in the Graduation Qualifying Exam (GQE) from the current form, which was the ISTEP+ (Indiana Statewide Testing for Educational Progress-Plus) test and beginning with the class of 2012

students were required to take subject specific tests for algebra I and English 10 ECA (End of Course Assessment). The administration and teachers at DPCHS were not concerned with performance on the English 10 ECA. During the years that the ECA was piloted, there were no piloted assessments for English 10. The administration and teachers had no indication that the scores on the English 10 ECA were going to be significantly different from the previous ISTEP/GQE.

In addition to the new exams being administered to students, the IDOE was introducing new accountability measurements for schools. Schools were being placed into categories, and DPCHS had been placed into the “Academic Watch” category which is the equivalent of earning a D under the guidelines used by schools in 2015. The administration and the teachers were extraordinarily concerned about the school’s performance on the algebra I test. The ECA test had been piloted by all schools in the state of Indiana. The chart below is a reproduction from a presentation that was made to the school board in the spring of 2008. It demonstrates the performance of DPCHS compared to the five other schools in the county, DPCHS is in bold:

School Corp.	Spring 2005		Spring 2006		Spring 2007	
	# of students tested	% pass	# of students tested	% pass	# of students tested	% pass
Armstrong	475	36.2	550	39.3		
Bravo	642	27.9	707	24.0		
<b>DePaul</b>	<b>159</b>	<b>28.9</b>	<b>213</b>	<b>19.2</b>	<b>232</b>	<b>18.1</b>
Cortez	115	31.3	116	13.8		
DE Gama	135	32.3	159	45.9		
Edison	284	47.5	295	45.8		
State of Indiana	68,705	24.2	72,384	24.0	78,429	29.0

(Table 2: ECA Results of County Schools)

In comparison to these schools, DPCHS was one of the lowest performing schools in the county.

This chart does not include the spring of 2008 results, because the presentation using this



information occurred before students had taken the piloted test. The students at DPCHS passed this 2008 exam at 16.5% rate.

Additionally, in 2008, the state allowed students who were enrolled in algebra I at the middle school level to take the ECA. If the students passed this test during that spring they were able to complete one of the two required tests needed for graduation. At DePaul Community Middle School, students who took algebra I in eighth grade were considered to be high ability students. The passing rate for DPCMS during the spring of 2008 was 56%.

The teachers and administrators at DPCHS was very concerned with the students' performance. Clare called these results "abysmal" while Megan considered these results "horrendous." When Brian learned of the results he also considered them quite poor indicating that they were in fact "putrid."

Clare pointed out that she and other members of the math department believed that many students "weren't taking the test seriously," which she and others believed to be a major factor in the poor performance. Director of Learning Services Shannon and Board President Walt also agreed with Clare's assessment of the situation; however, they did not believe that this excuse was a good explanation for the poor performance. Shannon stated that this behavior did not provide a "16% pass rate explanation." Walt concurred that the students' attitude toward the piloted test was a contributing factor but he felt "confident that more than 20% of our students were passing but I also knew it wasn't 90%."

The educators, administration and board members all believed that this performance data provided a foundation for change. Assistant Principal Cam stated, "the data said something was necessary." Superintendent Jeff indicated that "based on the data that was presented something had to be done." Brian stated if we didn't change our process we should expect the same results

and that was unacceptable. The teachers responsible for algebra I and the department head all knew that something different had to be done.

### **Ensuring learning**

Based on analysis of the documents reviewed for this case study finding a solution the administration at DPCHS attempted to find ways to ensure learning occurred. During the fall of 2007, meetings were held with teachers Kim, Clare, Megan, and Director of Learning Services Shannon. At these meetings several remediation ideas were considered, for example, using the current system that had been created for students or moving in a different direction. Prior to the fall of 2008 DPCHS created a system of classes called lab classes. The administration considered enrolling students in a regular algebra I class with an additional semester of remediation or test prep. Prior to the fall of 2008, these classes were designed for geometry and algebra II. The lab classes were designed to help students pass the ISTEP, which was given in the fall. Students entering the fall enrolled essentially in a test prep class and when the test was given students then began regular math instruction. This was not done for algebra I because the ISTEP/GQE was not given until the fall of students' 10<sup>th</sup> grade year. The teachers and administration also considered creating a class for students to use a self-paced and self-guided remediation program such as *Plato* or *Nova Net*. These two pieces of software are expensive and it did not provide the assurances that students had truly learned the content.

When mastery learning was researched and the program in Louisville, Georgia was discovered, the administration had found a program to ensure learning, at least from their perception, according to documents and interviews. The standardized test results from Jefferson County High School indicated that their students consistently performed at a high level on the Georgia state exams (Lile, 2008). This performance was intriguing because Slavin (1987) had

indicated that on standardized tests his data showed students in a mastery program had not significantly outperformed those students in a non-mastery program. In February 2008, the principal read an article regarding the success of Jefferson County High School. He spent time working with Counselor Aimee, who contacted the school initially to find out what the processes were. In consultation with Aimee, the principal presented the idea to Kim, Clare, Mindy, and Megan. The teachers recalled in their interview being presented the concept and Clare remembered being “intrigued” particularly when she saw the results and found out the socio-economic status of the school in Georgia (Lile, 2008). Eighty percent of the students attending Jefferson County participated in the free/reduced lunch program. This was significantly higher than DPCHS, where the free/reduced rate hovered around 30%.

Regardless of the socio-economic factors, Kim knew that we could not “expect different results if you continue in the same way.” Megan recalled “when you look at it initially from a teacher standpoint, it was what everybody should be doing.” Several conversations occurred with the teachers following the trip to Georgia and these discussions revealed that all of them felt that a mastery learning program ensured learning.

### **Research Question #2**

#### **How did classroom processes change?**

The analysis of the interviews and the review of the documents revealed that classroom processes changed significantly especially around curriculum development, the use of homework and how testing occurred.

#### **Developing curriculum without a book? You must be out of your mind!**

Superintendent Jeff, Assistant Principal Cam, Department Head Megan, and Director of Learning Services Shannon, had more experience in developing curriculum than the three

teachers implementing ATW. The process for writing new curriculum according to Cam, Megan, and Shannon had been coupled with textbook adoption. The writing of the curriculum for ATW was not linked to textbook adoption, but instead occurred during the middle of an adoption cycle and it was not based on the text. It was based on the standards provided by the state of Indiana.

In April of 2008, a meeting was held with the principal, Shannon, Megan, Kim, Clare, and Mindy. Based on the document review and interviews the principal instructed the teachers to come without the textbook for algebra I. Director of Learning Services Shannon recalled that she and the teachers “put out the standards, sorted them and said we are going to create our course based on what we feel is best mathematically and logically as opposed to historically.” Shannon is referencing her experience in writing curriculum based on the sequence of a textbook. Shannon, Clare, Kim, and Megan recalled having powerful conversations regarding which standards were the heavy duty ones and how the standards and indicators were grouped together. These conversations according to Shannon were always respectful because of the respect that Kim, Clare, and Mindy had for Megan, who was teaching the advanced math courses and likewise the respect Megan showed to the other teachers as they were in the depths of teaching algebra. As a result of their April 2008 meeting the group came up with a curriculum. The standards were grouped into modules and then each module was broken down into units. They are listed below:

Module 1 Linear Equations and Inequalities <ul style="list-style-type: none"><li>• Unit 1 – Solving</li><li>• Unit 2 – Graphing</li></ul>
Module 2 Systems, Functions, and Relations <ul style="list-style-type: none"><li>• Unit 1 – Systems of Equations</li><li>• Unit 2 – Functions and Relations</li></ul>
Module 3 Exponents, Radicals, Polynomials, and Monomials

<ul style="list-style-type: none"> <li>• Unit 1 – Monomials and Polynomials</li> <li>• Unit 2 – Radicals and Exponents</li> </ul>
Module 4 Quadratics and Factoring <ul style="list-style-type: none"> <li>• Unit 1 – Factoring and Solving</li> <li>• Unit 2 – Graphing</li> </ul>
(Table 3: Curriculum organization for ATW)

Shannon indicated that there were very strong conversations about the content but the group could and did reach consensus easily. She also recalled that the teachers did not have any special projects or beliefs that slowed the process; the respect between them facilitated the writing of the curriculum.

The content did not change; however, the fact that the teachers were not following the sequence of a textbook was extremely different for both them and the students. It was different in the fact that the teachers had never taught without a text and students had never been in a math class where the text was not the center of information. In revising the curriculum, the teachers created a system in which each module was divided into smaller parts. For example the first unit of Module 1 was on problem solving, and the students and teachers knew they were going to be working on indicator 1 “Solve linear equations” for three days. During the interviews, Students indicated that they liked this type of organization. Andy stated the “entire program was organized by 1.1, then 1.2, 1.3 etc. If we were in 1.3 I was able to go back and look through my notes for that day.” Julia recalled a similar experience with algebra and stated “we went through the section specifically. We went through 1.1 for like two days.” In the past, teachers worked through chapter 1, then moved to chapter 2. The decisions to move to a module based curriculum was a significant change for them and the students.

**Homework: A simple change that created major waves.**

During the interview with student Andy and parent Mark. Andy spent time explaining how different ATW was from anything he had ever seen in terms of classroom instruction. Andy, is an exceptionally organized individual, and he first commented on how organized the content was. He indicated that he knew exactly what was expected each day he was in class and how much he liked that. Andy then commented on how different homework was compared to what it was like in eighth grade. Julia was similar in that one of the first things she discussed was the difference of how homework was done in eighth grade. During their experience as eighth grade math students, Andy and Julia recalled that homework was rarely graded for accuracy; it was usually graded for completion. Having the correct answer was not important; having something written down was. The completion of work allowed students to earn a maximum number of points. Andy and Julia indicated that in the past the teachers had graded work on a total points system and had utilized a completion process for homework grades. The teachers at DPCHS, prior to the implementation of ATW, did the same thing. Homework was graded for completion, not for accuracy. Often teachers would have 10-15 homework assignments per chapter. These assignments typically ranged from five to 15 points, with the test being worth 100 points. As the teachers were developing ATW, they realized that students could pass algebra or for that matter any math class without passing a single test. They determined that if a student received 100 points for homework during chapter two, which was graded on completion not correct answers, and then received 50 out of 100 points on the chapter two test the student had earned a total of 150 points which produced a letter grade of C. They recognized that the students were not learning the material, so the teachers changed this process.

When the teachers began ATW student homework was graded predominantly on the basis of accuracy. Occasionally homework was graded for completion, but in order to achieve

all the points every problem had to be complete. Often it was worth only four points and the end of the semester the point value was minimal. Homework went from being between 50-60% of a student's overall grade to between 15-17%. Mindy and Lucy both commented on how different it was to grade homework for correction. The switch from completion to correction required additional time from the teachers to ensure the students were learning the material.

In the past the teachers assigned only the even numbered problems for homework, as the answers to the odd numbered problems were in the back of the book. The document review revealed that the past practice had been that the teachers did not want the students to cheat on the homework. The teachers realized that if the students did not do the work it was going to show when they took the tests at the end of the module. In order to encourage students to do the work, the teachers provided the answers for the homework. Teacher Lucy, who started in year two of implementation recalled that she thought this practice was unusual but quickly understood why it was done. Lucy stated, "we didn't want the students practicing the material wrong; they need to know they were getting the right answers." Lucy indicated that once she saw how this worked then she began utilizing this practice in all of her classes.

Kim, Clare, Mindy, and Lucy also generated a new practice called the "homework quiz." The idea was, that students took a quiz over the homework that they had done the night before. Every day class began with the teachers reviewing the homework, answering questions, and then presenting the lesson. The teachers wanted to make sure students were understanding the concept so they gave the students a quiz over the homework they just did. This gave the students an opportunity to correct mistakes they had done on the homework and regain some lost points.

The reduction of point value for homework was an area that caused a great deal of resistance from the students and parents. The change was simple in the minds of Kim, Clare, and

Mindy. These teachers wanted to make sure the students knew the material, and the process in place prior to ATW did not provide the results they wanted. The teachers wanted the students to be able to perform on the test, when it mattered most. Homework was important for practice and in their opinion it should be viewed as such.

### **How many times do I have to take this test?**

According to the syllabus and the interviews with the teachers, how tests were given to the students was extremely different. Prior to the implementation of ATW, tests were given at the end of each chapter and there was no opportunity to retest and demonstrate proficiency. ATW gave students multiple opportunities to test and retest.

With ATW, the teachers created a system where tests, (the teachers referred to the tests as indicator quizzes), were given every three weeks. Table 3 represents the four modules of ATW. Each module is six weeks in length. For example, Unit 1 Solving, was three weeks in length and at the completion students took indicator quizzes. These assessments were typically five questions and worth 50 points. Students could miss one question and still demonstrate mastery. If the students did not achieve mastery with the initial test they had other opportunities to retest.

As the teachers moved forward into the next unit, for example, Unit 2 Graphing, students had the opportunity to receive remediation and retest. Students had the opportunity to retest twice. The teachers designed ATW so that students took these retests during morning tutoring. This practice allowed the teachers to move forward with the course without giving up class time for remediation. The remediation process lasted two days. Students had to work with a tutor to go over the test on day one, review their mistakes and receive additional instruction. Then the students were to return on day two to re-take the indicator test. Each indicator test was worth 50 points. If students earned 40/50 on the test this indicated that they had demonstrated mastery for



that indicator. The document review revealed that shortly after the first round of the tests and after the parent meeting in September 2008, Clare, Kim and Mindy realized that students' grades were being reduced for achieving mastery, so once a student demonstrated mastery the students were awarded a score of 50/50. This was a significant revelation to the teachers because of the grading scale DPCHS used at the time. When the students earned 40/50 on an indicator, they demonstrated mastery of 80%. Eighty percent on the grading scale was equivalent to earning a C. The three teachers realized that unless a student earned all 50 points most students were going to end up with a C in the class even though they had demonstrated mastery. If a student did not achieve mastery on their third attempt, then Clare, Kim and Mindy took time to review the tests to see if the mistakes made were computational or if the student did not understand the concept. The teachers used the following format for having students monitor their own progress:

	<b>Indicator</b>		<b>Test 1 (A)</b>	<b>Tutoring Date and Initials</b>	<b>Test 2 (B)</b>	<b>Tutoring Date and Initials</b>	<b>Test 3 (C)</b>
	1	A.1.2.1 Solve linear equations					
(Table 4: An example of the tracking sheet used by students)							

According to the syllabus, students were not permitted to take the test until all homework was completed. On the date of the first test, following the completion of the unit, the students who had not completed their assignments were notified that they were not permitted to take the test. These students were told what assignments were missing and given the opportunity to complete the missing work. Once all of the homework was complete students had to attend morning tutoring in order to take their test. If they never completed their work then the students did not progress forward with the class; they repeated the module.

**Research Question # 3**

**What were the factors that fostered or hindered implementation?**

The factors found in the data that fostered success are: logistics which included the trimester schedule, morning tutoring, and scheduling; and support. The factors that hindered success are: parental fear of change; traditional grading practices; and student lack of preparation.

**What can logistics do for you?**

ATW is a relatively simple concept. Students must complete four modules, which represent the content of algebra I. Each module is divided into two smaller units. At the end of each unit, students take a test for each indicator and must earn 80% on each one in order to move forward. According to Kim and Clare the development of the logistics necessary to ensure students reach this benchmark were extremely challenging. The teachers had to determine how the students moved at the six week mark if the modules were or were not mastered, which teachers were going to teach which module, and how tutoring was going to be structured. They had to coordinate these efforts with the guidance department because of the impact on the students' schedules. The administration had to find ways to get students tutoring before school.

**The trimester made a difference.**

When the teachers visited the school in Georgia, they noticed that the students had a long time to finish algebra. During her interview Counselor Aimee even wondered how students were able to take advanced math classes. Jefferson County High School operated on the four block in which semesters were completed every nine weeks. Essentially, Jefferson County students could complete two years of high school in one year. For example, a student could take algebra I in the

fall and move directly into geometry after winter break. DPCHS was similar to Jefferson County in that they did not have a traditional schedule. DPCHS operated on the trimester, allowing students to complete, one and a half years of high school in one calendar year. The trimester system at DPCHS allowed those students who needed additional time to finish algebra I the opportunity to do so without a tremendous burden on the students' path toward graduation. Students in ATW could retake modules four times before they were required to take the ECA. With the trimester students had increased flexibility to retake parts of algebra I if necessary.

### **I have to come in before school to get help?**

Additional help was available to the students if they needed assistance. In reviewing the material from the visit to Jefferson County, the teachers learned that students had the ability to attend a tutoring program that ran after school. Students who needed additional help had to stay after school and then these students were provided transportation home. The teachers from Jefferson County indicated that having some type of tutoring was essential to making this type of program successful.

During the development of ATW, DPCHS teachers and administrators devised a way to take advantage of the late start time for students. DPCHS begins the school day at 8:45 AM. Instead of having tutoring after school the teachers and administrators determined that having tutoring in the morning was the best approach. The DPCHS administration worked with the transportation department to allow high school students to ride the elementary bus in order to get to school early. The elementary schools in DePaul start between 7:20 and 7:30. This arrangement was done to remove the burden of parents or guardians having to transport their student to school.

The syllabus indicated that at the inception of the program, the tutoring was staffed by the three teachers responsible for teaching algebra I and a few older students and it was available Tuesday through Thursday from 7:30-8:30. However, this changed early on during implementation. In the review of the notes from the principal, the teachers indicated that three days a week was not meeting the demand of the students. The teachers could not handle the volume of students attending the tutoring. The administration received permission from the central office to expand tutoring to five days in order to meet the increased volume. Megan recalled that she and the other two teachers began coming in to help because of the volume of students. Tutoring was an essential component to the success of ATW. Based on the information the teachers and administration received from Jefferson County students needed additional time to ask questions regarding material, and retake tests. The structure of tutoring allowed both to occur. As mentioned earlier, students had to retake their tests outside of class time. These retakes were done during morning tutoring. Kim recalled that some students did have a difficult time accepting that they were going to have come in to tutoring in order to move through the class. Jennifer Fagley indicated that she thought the tutoring provided a “really good opportunity to go in and have someone one on one tell you this is how you do it if you don’t get it in class.” Not all parents felt the same as Jennifer. An e-mail received from Kathy Britain, who is not a participant in this study, indicated that she did not believe that students should have to attend tutoring. She felt that if that many students were not understanding the material then the teachers “needed to back the pace down a bit.” The teachers had designed ATW to move forward at a pre-determined rate. The rate was set during the revision of the curriculum which allowed algebra I to be completed in two trimesters. The tutoring allowed the teachers to provide the extra help parent Kathy Britain wanted it just did not occur during class time.

**Building the schedule to benefit the students and teachers.**

In a trimester schedule students typically take courses which are one or two trimesters in length. All math classes, with the exception of calculus, which was three trimesters, were scheduled for two trimesters. The mastery component with ATW created a different scenario. Students could have up to six trimesters to complete algebra I. For example, if a student did not complete module four in the third trimester they had to have algebra I B added back into their schedule the next fall.

During the development of the program, the principal felt strongly that the teachers must have a common planning period. He based this decision on his experience in working with a team of teachers during his classroom experience at Walnut Grove High School, which was located south of Indianapolis. Based on the review of the principals' notes he and two other teachers were working with at risk students and the three of them had a common planning period. The principals' notes revealed how important this common planning time was during this experience and he believed that the teachers at DPCHS could benefit from this type of schedule too.

When the schedule was being built at DPCHS there are certain classes that drove the schedule. At DPCHS, band had to be first period and there was a large number of ninth grade students in the band. According to the document review, it was determined that the best place to schedule the algebra I classes was during second and fourth period and the teachers had third period as their planning period. The school day at DPCHS was five periods in length. Clare discussed that having the common prep was essential to the success of the program. She felt it was a time when the teachers "got to vent our frustrations with things but I mean it was always constructive because we always came out with how can we fix things." Mindy and Lucy also

recalled that having the other teachers as a resource was extremely helpful during implementation.

Having the algebra I classes specifically taught during periods two and four was also different. In the past Aimee recalled that classes were put into the master schedule when it was best for the students. If for example, having algebra I during period three resolved certain scheduling conflicts for a group of students then a section or maybe two sections of algebra I were created for this time frame. ATW required the guidance department to build students schedules around a specific class. Megan recalled getting some push back from guidance regarding the locking in of algebra I during period two and four. Having the class during the same period was important for ATW success because of the students moving every six weeks.

According to the documents reviewed for this work, students completed modules every six weeks. For example, if a student demonstrated mastery on module one then they moved on to module two. Following the completion of each module the teachers worked together to determine who was going to teach which module. Kim, recalled this being particularly challenging for both them and the students. From a teaching standpoint teachers may have taught module one during the second six weeks and then moved directly to module three at the beginning of the second trimester. Aimee indicated that the students had to get used to perhaps having a different teacher every six weeks. If a student did not master the content with one teacher they were reassigned to a different teacher during the next six weeks. Kim, Clare, Mindy, and Lucy worked with each other to make sure no one taught the same module more than twice in a row.

Megan recalled that the guidance department was committed to making the schedule work so the algebra teachers could easily swap students within the same period. According to

the interviews the teachers worked well with each other and with the guidance department to make sure that students were being placed appropriately in classes and the changes were reflected in the students' schedules. Had the algebra I classes been spread throughout the day, students could not have moved backwards easily without having their schedule redesigned. Aimee stated that she was worried that "moving students around was always affecting another discipline area." If a student did not demonstrate mastery and had to retake a module that meant a class had to be changed during the third trimester. Aimee, stated that meant a student may have to "drop another required course." Megan recalled that some of the other staff members became very concerned about how the retaking of modules was going to impact them. She stated that some of the teachers "felt that some of their programs were going to be sacrificed."

During year two further adjustments were made to the scheduling of students for algebra I. There were many students during year one who were misplaced. These students had not been successful in any math class for a number of years and the requirement to take algebra was beyond their current skill set. The data used for question five, how did ATW impact student performance, indicated that over 50% of the students needed more than three trimesters to complete algebra. Mindy recalled being surprised at how deep some of the deficits were for some students. Based on the review of documents it was clear that the administration, teachers, and guidance department determined that a pre-algebra class was necessary to assist students beginning with the class of 2013. At some point during the implementation process, most likely during the spring of 2010, the principal attended a conference at the Central Indiana Educational Service Center (CIESC). Unfortunately, the documentation from the conference cannot be located; however, the principal does recall that during the conference he learned how important it was for at risk students to have solid footing when they began high school. The information

received from this conference indicated that if at risk students can feel or see themselves as being successful early on in high school they have a greater chance of graduating. Students who had failed the ISTEP multiple times and had not been successful in a traditional math course followed this schedule during their freshmen year: the first trimester they took no math, during the second and third trimesters they took pre-algebra and beginning the fall of 2010 these students were enrolled in algebra I.

**“The probability that we may fail in the struggle ought not to deter us from the support of a cause we believe to be just” (Lincoln, n.d).**

Like all new programs having support from colleagues, administrators both within the building and at the corporate level, and from the school board is essential to the success of any curricular program. ATW is no different. Teachers, administrators, board members all commented on how they supported the program.

Clare stated that having the support of the other teachers during implementation was extremely important. One area that she thought was critical was the common planning period. She indicated that during this time the teachers heavily involved with the implementation could and did work through many of the problems they were encountering. Having the time to sit down together and work through a problem that one of them encountered was extremely helpful according to Clare. Lucy who began working at DPCHS during year two of implementation concurred with Clare; however, for her the common prep was helpful. Lucy stated that Clare, Kim, and Megan always made time to answer her questions so she “could take the time to understand what they really wanted me to do.”

All of the teachers, indicated that having support from the administration and board was the singular part that helped them work through the challenges of implementing ATW. Megan



stated, “none of this could have happened if we didn’t get support from the administration and the school board. All the administration concurred with Megan’s assessment. Cam saw his sole role as providing support to the teachers. Jeff believed that his sole role was to provide support to the building leadership, the teachers, and the board. He viewed his role as providing “whatever resources were necessary to make that happen.”

Board members were supportive from the initial presentation. Brian indicated that when the program was introduced to him that “it made sense to me.” The process of not moving a student forward in the class until he/she demonstrated mastery appealed to him because he knew from his own experience that “if I didn’t get the early stuff I wasn’t going to get it down the road.” Jeff echoed Brian’s sentiment by describing how he “lost math” during seventh grade because he did not have the building blocks. Janey recalled the same presentation wishing her oldest child would have had the opportunity to participate in this program. Once Jeff understood that teachers were going to ensure that students learned the material, the program was easy for him to support.

Board member Walt brought two distinct points of view to supporting the program. He stated that because he came from “a business world the concept of mastery learning appealed to me because that’s how everybody functions.” But, it was not this business background that sold him as to why he should support the program:

There were teachers actually involved in the actual classroom teaching that subject who went and investigated and said we want to do this. That was the thing that sold me more than anything was that. Whether it was mastery learning or anything else because what they were saying is that we’ve

been teaching a subject to our students we're not happy with the results and we see this thing that we think can work and we want to do it. And that's where I said I'm in.

Walt firmly believed that because the principal, teachers and even the guidance department were so up front with the challenges they expected to see and still wanted to move forward it was very easy to support them if and when community push back occurred.

### **Hindrances to Implementation**

Each teacher that was interviewed for this case study indicated that there was one hindrance to implementation. In their opinion it was the parents. The reaction to the implementation of ATW was exceptionally difficult for the teachers at DPCHS. Administrators, board members, and the counselor concurred that the parents were the biggest hindrance to implementation. This however, was not the only hindrance to implementation. The interviews and document review revealed that the traditional grading methods and lack of student preparation were also issues.

### **Parental Reaction to Change**

A large portion of the parental issues seemed to stem from the fear of change. The three board members, Brian, Walt, and Janey described the community of DePaul as being a place that was reluctant to change. Brian indicated that he was concerned about the community buy-in. His concern was focused on how this program was largely an unknown. From the initial presentation to the school board in April of 2008, Walt knew that there was going to be resistance to this program. Walt stated that this program was different than anything else that had been tried. He knew that "we live in a community that doesn't always like different." Walt did not elaborate on how he knew the program was going to receive significant pushback. He did indicate however,

that he felt that once “good” students did not advance through the program at the six week point that is when the parents would be coming with “pitchforks and torches.” From his perspective, the good students had never struggled and when they began to struggle it could not be their fault it had to be the fault of the program.

As stated earlier, Janey was looking forward to this program making a difference for the students of DePaul. She began receiving complaints shortly after school started and she recalled the parents being afraid of how the change was going to impact their child’s grades. Common complaints received by the board members and district administrators focused on why they, the parents, were not informed of the change. Most did not understand why the change was necessary and for many parents this was the first time their child had struggled with any content area. Superintendent Jeff indicated that this fear of change often stemmed from an “unwillingness to look at other approaches to get a better result.” Jeff also shared that parents did not understand why their children had to be the first ones to go through the program. He mentioned that parents felt that if the program could have been used on other students or the kinks worked out first then they would be more supportive ATW.

Parents Mark, Jennifer, and Diana, all indicated that this program was totally foreign to them. Mark was not overly concerned because his son Andy was not struggling. Diana stated she had trouble understanding why the change had to occur and often referred to the program as “algebra that works but ain’t working for Jacob.” Diana had trouble understanding the vocabulary associated with the program. In the review of e-mails many parents had trouble understanding why algebra had become so important and was considered to be more important than other content areas. Terry Moore and his wife Melissa, were very outspoken against ATW. These two were not participants in the study; the information regarding their position was

obtained through e-mails and document review of notes shared with the principal. They believed that the program was ill conceived and was hurting students more than helping them. Terry took issue with the concept of mastery and how that was established with ATW. He was convinced that taking the test three times did not demonstrate mastery. In the document he was convinced it simply exposed students to the test multiple times so they could memorize the concepts and regurgitate them on the quiz. In an e-mail received from Kathy Britain, who also did not participate in the study, she believed that students should not be graded on accuracy. She felt strongly that if the student could show that they understood the concept, they should receive partial credit.

Jennifer Fagley was candid during her interview and she indicated that she was not pleased with the eighth grade math program. She felt that Julia was unprepared for high school math and she expected Julia to struggle. Unlike Kathy Britain, she felt informed about the program and that the teachers executed the program as it had been advertised. She recalled sharing with Julia that if she didn't get something in class it was her responsibility to get the help during morning tutoring. She indicated that with the support provided to the students that they were bound to be successful. One other parent took the time to e-mail the teachers, Eddie Rickenbacker. Mr. Rickenbacker shared that he appreciated the effort the teachers were making to raise the bar for the students.

**Traditional Grading: “When you create something new, you're breaking tradition - which is an act of defiance” (Strogatz, n.d).**

Board members, administrators, teachers and counselor spent a great deal of time listening to parent's state that because their child was not receiving the same grade that they had always received the program must not be working. Assistant Principal Cam indicated that initially the poor grades students were earning created a lot of anxiety for parents and students.

Board Member Janey recounted that she spent a great deal of time working with parents to understand the concept of mastery. She stated parents had trouble understanding that “they’re not going to have an F in there at the end.” Board President Brian recalled a parent complaining about their child not being able to grasp the content and their child had always made straight As and this program was going to ruin their child’s GPA. Board President Walt recalled that he received more phone calls about ATW than any other issue he encountered as board member. Specifically many of the calls he and his colleagues received were around the grades students were earning. These comments focused on how the children were not receiving the grades they had always received and as a result the program must not be working.

Superintendent Jeff, described the mindset of parents needing to change and the fear of that change. He spent a lot of time explaining to parents why the change was necessary and he spent an equal amount of time listening to parents tell him their children were crying and frustrated. Jeff stated, “kids who have traditionally always gotten As but never really performed at that level now they’re getting identified at the level they’re performing at get frustrated and then they start to cry.” He also shared that most of his conversations with parents rarely focused on learning rather they focused on how their children felt or how it impacted the parents financially. “The trend I heard is that my kid won’t get a discount on their insurance because they are getting a C. It never had anything to do with their knowledge level.” Shannon stated something similar in that “when parents are concerned they’re not concerned about the content they are learning, they are concerned about how their kids are being treated.” Aimee indicated that parents in her opinion were struggling with change. She indicated that some students and parents were concerned about sports eligibility, college admittance, and scholarships. She stated that parents want things to stay the same so they can understand their child’s progress. “Parents

want things to stay the same so when they look at a grade on some old traditional system and they see a C or a D then they know that measures learning.” She indicated that when students were earning incompletes or Fs, in the minds of parents their students were not learning.

The teachers directly involved with implementation, Kim, Clare, Mindy, Lucy, plus the department head Megan, all received an increase volume of phone calls and e-mails from concerned parents. These calls and e-mails began early during implementation and many of the calls were focused on the grades students were earning and why there was a need for such a program. They recalled the additional time it took to contact the parents and explain the program and additionally explain how their child was performing. Kim stated:

As soon as their good kid wasn't doing well it was obviously this new program was at fault. Not that these kids had skated by on the seat of their pants for such a long time and sort of a little bit understood and was still able to get an A or B. Now, we we're saying you don't just get to a little bit understand it and get an A or B you have to really understand it.

### **Student Lack of Preparation**

The preparation of the students was a concern for the teachers during the first year. Clare recalled thinking that the students were having trouble with content and they were having trouble with the structure of the program. Kim did not think the students were prepared to handle something so different after working in the same environment for nine years. Mindy wondered if the students were actually prepared for it cognitively. Additionally, Mindy also wondered because of her experience as a coach, if the kids in DePaul weren't used to being pushed. She stated that sometimes, “the students at DePaul, weren't the toughest, they didn't have quite the

perseverance.” Beyond the increased expectations and increased work load skill deficits were unintentionally discovered.

Documents revealed that in October 2008 a vertical articulation day was scheduled between the middle school and high school teachers. During the September parent meeting, the administrators and the teachers learned that the parents of the students who were struggling were contacting their child’s middle school math teacher. They wanted to know why their student didn’t seem to know the material and why they were struggling. Documents showed that meeting was held, in May of 2008, with Director of Learning Services Shannon, the Principal from DPCHS, and Christie Secrest, a DPCMS teacher, who was teaching algebra I to the eighth grade students. It was clear from the discussion that Christie was not interested in using ATW. During the vertical articulation meeting DPCMS Principal Matt Bench, a meeting which Christie attended, indicated that he and his staff were not interested in fixing blame to why the students were doing poorly. He and the teachers wanted to know what they could do to get better. The teachers from DPCHS explained ATW to the middle school math teachers. The teachers from the high school spent time describing the skill deficits they were seeing from students. The middle school teachers found out that some of the essential skills needed for success in algebra I were not being covered or covered so quickly at the end of the year, there was little chance the students knew the content. For example, the notes from the meeting revealed that the teachers from DPCHS shared that the students were having difficulty setting up linear equations. DPCMS teachers shared that was not part of their curriculum until late in the school year and often it was not taught. Additionally, the teachers from both schools had a discussion about homework during this meeting. It was at this meeting that the DPCMS teachers shared that homework was worth between 60-70% of the students’ grade.

The parents and students had different perspectives when it came to preparation for algebra I. Diana believed that her son, Jacob, was prepared for class because, “he always seem to do fine . . . he passed everything with A’s and B’s.” She was surprised to see Jacob struggle once he started algebra I. Diana indicated that her son Jacob was a hands on learner and Jacob “couldn’t see how to apply it.” She indicated that when Jacob moved to geometry, he did fine, “because it is more hands on seeing how to apply things.” Jennifer was not pleased with the preparation Julia had received prior to starting algebra I. Jennifer stated that “she was not real happy with eighth grade math.” She commented that Julia often came home and said “I don’t understand this and I would say did you ask? And she would say this was the only way they would explain it to me.” Jennifer indicated that this process was a frequent occurrence in their home. When Julia was asked if she was prepared she stated, that “coming into it from middle school math that I had, no I wasn’t.” Julia shared that she had taken pre-algebra in eighth grade and she commented that “pre-algebra was kind of like statistics to me in college it was a whole another language.” Andy also stated that he wasn’t prepared for a math program either. He stated that many of his classmates “really struggled because it was so different” and this was being mixed in with all the other anxieties that freshmen had when they were starting high school. Andy indicated that ATW required students to take ownership of their learning. He recalled that one of his friends Anthony Payton, “was one of those guys who didn’t like math, he just struggled with it, and he was just a creature of habit and didn’t like taking ownership of his learning.” Andy’s father Mark was not concerned about Andy. He felt that the way Andy “took care of business” was a big part of why he was not worried, even if Andy did not feel prepared.

The teachers indicated that students for the most part were not prepared for the increased expectations being placed on them. Mindy believed that many students lacked “perseverance” to



work through the parts that were hard for them. Mindy also noticed that because class sizes were small and because the extra time the teachers spent with students in morning tutoring, they could really “find where all the holes were in understanding the material.” She recalled being surprised how far back some of those deficits went. As the teachers worked through the implementation they did find that many students had skill deficits and this was going to cause students to struggle.

In the spring of 2008 the ECA test was piloted for high school students, while for middle school students enrolled in algebra I was counted as part of their graduation qualifying exams. The DOE allowed this course to count because this test was going to be GQE for this cohort. If the students passed the test in eighth grade they met one of the two parts required by the state of Indiana in order to graduate from high school. The results across the state for eighth grade students were that 67% of these students passed the ECA. At DePaul 56% of eighth grade students passed the ECA. The performance of the students at DPCMS was concerning to the administrators and teachers at DPCMS and DPCHS. The students in algebra I in the eighth grade were considered to be high ability and the performance of these students was not what either building expected.

#### **Research Question #4**

##### **How was ATW perceived by community stakeholders?**

This question specifically looks at how the community was reacting to the implementation of ATW. The educational staff and board members indicated that the program was not well received by the community. The themes that were found around this question are: Lack of information, feelings vs. learning, and preparation.

##### **Lack of information: How come I wasn't told about this?**

On May 1 and May 15 of 2008 two informational meetings were held regarding the implementation of ATW. The May 1 meeting was held at DPCHS while the May 15 meeting was held at the middle school. Both meetings were poorly attended. The meeting held on May 1 consisted of one parent and the meeting on May 15 consisted of six sets of parents. At these two meetings the reasoning for the change was explained and how the program worked was also shared with the attendees. Jennifer, did attend one of the two meetings in the spring and felt very informed about the program. She stated that she thought it was “sad that there were only three parents there.”

The documents revealed that on September 17, another meeting was held for the community. This meeting was well attended. There were approximately 250 parents and students in attendance. At this meeting the program was explained, why the change was necessary, and there was time for parents to ask and have questions answered. During her interview, Megan recalled cautioning the teachers about having this meeting because of the general negativity surrounding the implementation of the program. She gave the teachers a lot of credit for going through with the meeting and stated, “they wanted to have everything out in the open, they didn’t want any secrets about the program, they wanted everyone to know exactly what they were doing and what they expected.”

The teachers took the feedback from the meeting and made some adjustments to classroom processes. A letter, which was reviewed during the document review, was sent to the parents on September 20, 2008 that included what changes were made. The teachers indicated that some homework was going to be graded for completion and when it was graded it was going to be worth a maximum of four points. If the work was incomplete the students only lost one point. The teachers decided to send the answers to the homework home. A webpage was

created that contained the syllabus, homework assignments and answers, and all worksheets. (The creation of the web page was the only thing that did not occur). When the students reached mastery on the indicator tests, if they missed one question and earned a 40/50, the score was changed to a 50/50. When students reached the third test and did not earn mastery, the teachers were going to check the performance carefully to see if the problem was missed because of improper computation or if it was missed because the student did not understand the concept. The administration at DPCHS was going to monitor the testing room to allow the teachers to spend more time tutoring students.

The parents, Mark and Diana, did not have much information about the program. These two parents could not recall the meetings in the spring. Mark recalled seeing something from the school about a change in math but did not think much of it and Diana could not recall any meetings from the spring or receiving any information from the school. Mark and Diana attended the meeting in the fall hoping to learn more about the program. Jennifer attended one of the two meetings in the spring and did not attend the meeting in the fall.

Mark recalled the meeting in the fall:

When we heard other parents talk prior to going to the meeting at sporting events and they would say how much trouble their son or daughter was having with the new program, and we weren't really noticing anything with Andy . . . so when we went to the meeting we were surprised there were a lot of people who were really up in arms.

Board President Walt recalled that he wasn't surprised by the meeting turnout or that people were so upset about the implementation of this program. He felt that when students hit that first

mark where decisions were made about students progressing through the program, “there’s going to be a line and they’re going to have pitch forks and torches.” Board President Brian attended this meeting and he stated, “I sat in the back like a fly on the wall and it was brutal.” In his e-mail Eddie Rickenbacker stated that he was “sorry for the way you were all treated last night.” Diana attended the meeting hoping to gain a better understanding about the program, she recalled never being able to “understand what indicators were or what modules were.” The parents expressed their concerns throughout this meeting that they did not know about the program, they did not understand why the change was needed and they did not understand how the program worked. Terry Moore was one of the more outspoken parents at this meeting.

Mark recalled specifically how upset Terry was at this meeting. In Mark’s opinion Terry was a math guy, but he could not make sense of this program. Terry was vocal during this meeting. Mark even recalled that Terry stormed out of the meeting shortly after it started. Two days following the meeting he scheduled an appointment with the principal. Terry brought questions he wanted to have answered and this document was reviewed for this study. He also shared that his abrupt departure from the meeting was to make a point. The document that Terry shared with the principal was one that contained specific questions that he wanted answered. Other e-mails from parents were not as specific nor did any other parents schedule a meeting with the principal to discuss ATW in depth. Additionally the notes taken by the principal at this meeting were also reviewed. Terry did not believe from the beginning that this program was necessary, regardless of the data. Terry believed that the student performance on the tests was poor because the students had not taken the test seriously. His opinion on why the scores were poor was similar to the teachers and that the administration and the teachers of DPCHS should have waited another year before implementing a new program. Terry felt that DPCHS had done a

terrible job of informing the students and the parents of the implementation of ATW. Terry also had no idea the testing requirements for students had changed. Terry had four main ideas that he wanted changed: 1.) he felt the distribution of points between tests, quizzes and homework was too broad. In his opinion the fact that a student could pass all the tests and fail the homework and quizzes and earn a passing grade of a B was inappropriate. 2.) Terry also believed that the points between tests and homework should be split along a 50/50 ratio. 3.) He did not agree that students should have three opportunities to take the test as this did not show mastery. 4.) The high rate of failure was an indicator that the program was a failure and it should be abandoned immediately.

In November 2008, the principal received a letter from Melissa Moore, Terry's wife, who asked for more information regarding the progress of this program. Many of the questions she asked were similar to the ones that were asked and answered during the meeting in September and the questions that Terry had asked in September. In this letter Melissa was concerned about the number of students who were not progressing through the program on schedule, and the number of students who attended tutoring. Melissa also wanted to know how the students had performed on the final exam that was given at the end of the first trimester. Melissa was seeking more information regarding the program, specifically asking to see the curriculum, syllabus, and grading practices.

Jennifer, who attended one of the meetings in the spring, had the exact opposite opinion of the majority of parents who attended the meeting. She felt very informed. She indicated that the explanation she received regarding ATW and how students would have the opportunity to retake tests sounded good to her. She also was disappointed that the turnout was so poor at the meeting she attended. Not all parents who attended the spring meetings had the same opinion as

Jennifer. An e-mail was reviewed for this study from Kathy Britain who attended a meeting in the spring and the September 17 meeting. She indicated that she was not pleased with the program. She indicated that she was pleased that DPCHS was increasing the expectations for students after the spring meeting but as ATW was implemented she believed that what she was told was going to happen in the spring was not at all what was happening in the fall. Kathy stated that “many students have lost their drive to succeed.” Her concerns largely focused on the increased work load of the student, the need to attend tutoring and the awarding of partial credit after the third test.

### **Does the emotional state of the student impact academic performance?**

The parents and students spent a great deal of time sharing their concerns with administrators, board members, and the educators within the building. These concerns were shared through e-mails, phone calls. Counselor Aimee indicated that she set up more parent/teacher conferences with the teachers implementing ATW than she had done with other teachers. Teachers Kim, Clare, and Mindy indicated during their interviews that they received significantly more parent communication than they had in the past. Board President Walt recalled that the implementation of ATW was the biggest point of contact he had with parents during his 16.5 years on the board. During the interviews the teachers recalled they spent some time talking with parents about the process of ATW and then they realized that the conversation often shifted to how the children were feeling.

Teachers, Kim, Clare, Mindy, and to a lesser extent Lucy, recalled that the concerns being shared with them were largely focused on how their children felt not whether or not they were learning the material. Many of these conversations were focused around how their child was struggling and how this struggle was making them feel. Many conversations indicated that

students were spending several hours on algebra homework and neglecting their other work. Mark indicated that when he was at the meeting he realized “there were a lot of kids that never struggled that were struggling for the first time and that was what the parents were most upset.” Superintendent Jeff stated that the conversations he had with parents, “never had anything do with their knowledge level once they completed Algebra I.” Mindy recalled that most of her conversations with parents weren’t about learning. “When I talked with them at least they weren’t as interested in the learning part of it. It was really about my kid feels bad because . . .” Mindy recalled spending time with parents that told her that she was “ruining his kids’ self-esteem and his future.” When Mindy spoke with parents she recalled spending more time talking about how the child felt than the learning that was or was not taking place.

Lucy recalled, that the students were often emotionally spent when they did put in the effort to be successful. She indicated that they would become really upset when they found their mistakes to be simple and these simple mistakes prevented them from moving forward with the rest of their classmates. The teachers directly involved with the implementation, Kim, Clare, Mindy, and Lucy, all recalled most of the conversations they had with parents were not about how their children were struggling with the content. As a result of the challenges the child was facing, many of the conversations between the teachers and parents evolved into discussion on how these challenges were making the child feel.

### **Question #5**

#### **How did ATW Impact Student Performance?**

In this question we will look at the ECA results from each trimester beginning with trimester 2. Once students completed all four modules students took the ECA for algebra I. The

numbers of students taking the test from the class of 2012 varies for each semester. See the chart below. It is important to note that this research was not designed to make casual connections between the data and student learning. It was designed to describe the experiences of those involved with the implementation of ATW.

Number of students taking the ECA	Number of students passing the ECA	Number of modules students repeated	Percent Passing	Date of Test	Trimester
21	21	0	100	February 2009	2
57	53	1	93	May 2009	3
16	14	2	88	November 2009	4
6	5	2	83	November 2009	4 (Re-testers)
16	14	3	88	February 2010	5
4	4	3	100	February 2010	5 (Re-testers)
30	14	4	47	May 2010	6
5	3	4	60	May 2010	6 (Re-testers)
155	128		82.5		

(Table 5: DPCHS performance results from the class of 2012)

This chart demonstrates the different rates at which the students were completing the course. There were 155 students who began algebra I in the fall of 2008. The number of students listed as taking the ECA represents when the course was complete. In order to clarify, the number of modules repeated is listed in the third column. During the review of the test scores the module the students repeated could not be determined. Andy was able to recall that he had to repeat the third module. For example, the 57 students who took the ECA in May of 2009 had to repeat one module. Of those 57 students they may have had to repeat module 1 or module 2 or module 3. Andy recalled struggling with the module that included some trigonometry and this stuff “was a little out of my realm.” Diana’s son Jacob was one of the 16 students who had to retake two modules. In her opinion Jacob had difficulty connecting algebra to the real world and that was why he struggled. Julia, was one of the 21 students who completed the course in two trimesters.



In the fall of 2008 a separate algebra I class was offered for 10<sup>th</sup> grade students and above. These students had all failed algebra I during the 2007-08 school year. These students were taught using the traditional method, the teacher began with chapter one and worked their way through the text book. This teacher was not part of the implementation of ATW and the students in these algebra I classes did not have to pass the ECA to graduate. They were still required to pass the ISTEP/GQE. The results for this class are as follows: trimester two, one of twenty students passed the ECA, and trimester three zero of twenty-three students passed the ECA. It is difficult to determine that ATW was effective based on the small sample size, along with other factors, because we did not control other variables like previous math scores on the ISTEP+, etc. that ATW was better than the model that had been used before,

Both Julia and Andy felt extremely prepared for the ECA and both of them liked the process of the program. Jennifer noted that Julia didn't complain about math as much as she had during the past. Jennifer believed the support mechanisms of tutoring and having more time really benefited Julia. When Julia took the ECA she recalled thinking, "it was pretty easy actually." She believed that having the extra trimester as a back-up if she didn't pass was comforting to her.

### **Was ATW just test prep?**

As the data for this case study was coded and reviewed this question continued to present itself. Megan and Kim had two different perspectives regarding student knowledge. Megan was convinced that because of ATW students really knew algebra, while Kim felt that students who had deficits continued to have them in later courses. The narrowed curriculum was completely focused on the ECA. Each learning indicator aligned proportionately to the ECA. As a result the curriculum was not designed to get into major depth on each indicator. Simply, it was

designed to make sure students passed the ECA. As mentioned earlier this study was not designed to find causal relationships. Because of this studies design this question will remain unanswered.

## **Chapter V Findings**

### **Overview**

This chapter will begin with a summary of the findings from chapter 4. The discussion of these findings will follow. DPCHS began the process of implementing ATW by studying data from the piloted ECA assessments. Accountability measurements for DPCHS were also important; however, they did not seem to carry the same weight as the performance results. The poor performance data led the administration to search for something that could ensure learning. During the research, DPCHS administration found a program which used mastery learning and it was appealing to the administration and teachers at DPCHS because of the student performance seen at this school. This mastery learning process was different from what the research indicated was a best practice and it was opposite of what the NCTM proposed for mathematics curriculum. The administration and teachers at DPCHS used mastery as a way to correct student skill deficits which in turn controlled when the students could take the ECA. The implementation of ATW confirmed the importance of fidelity, specifically fidelity to implement the program as it had been designed. Additionally, strong levels of commitment to the processes of ATW were seen from the teachers, district and building administrators, and the school board. Also, the social network developed between the teachers directly involved with implementation played a major role with the process of creating and implementing ATW. During the implementation of ATW teachers had autonomy to build and design the program; however, it was group autonomy that reigned not individual. Resistance toward ATW from parents and students was high because the administration did not effectively communicate the changes in algebra processes and the need for change. The community did not have ownership or acceptance of ATW which made implementation difficult. Much of the resistance stemmed from the fact that many students were

struggling with content and these trials and tribulations caused an emotional reaction many parents had not seen from their child. Further research could be done in how schools use performance data to make adjustment to curriculum and instruction. Also, additional research into how students and parents react to changes in educational processes could be beneficial to schools implementing new programs. Finally additional research should be done to determine if mastery learning is more effective in discrete content areas.

### **Summary of Findings in Relation to Research Questions**

#### **Research Question # 1 Why was it necessary to implement a mastery learning program?**

1. The administration and teachers expressed concern about student's previous performance on the piloted ECA.
2. New state mandates, the algebra I ECA becoming the accountability measure for the class of 2012 coupled with the performance data from the piloted tests provided a reason for change.
3. The teachers recognized that their current practice was ineffective in preparing students for this test and needed to change their processes.
4. Based on the perception of the teachers and administration mastery learning provided the best opportunity for DPCHS to ensure that students learned the content.

#### **Research Question # 2 How did classroom processes change?**

1. The teachers and the Director of Learning Services wrote curriculum without a textbook. They sequenced the state standards for algebra I logically instead of historically.
2. The teachers at DPCHS changed the following things in their classrooms:
  - a. Their lessons were organized to the standards.

- b. The teachers changed how homework was graded and factored into the students' grades. They moved from a completion model to a model based upon accuracy.
- c. The impact of homework on the students overall grade dropped significantly.
- d. The way homework was used caused some of the biggest resistance from students and parents.
- e. To take a test at the end of each unit all homework had to be completed.
- f. When the students reached mastery on their tests and if they only achieved the minimum percentage of 80, then they were awarded 100% of the point value for that test.

**Research Question # 3 What were the factors that fostered or hindered implementation?**

1. The teachers reorganized the curriculum to reflect the standards not the textbook.
2. The reorganization of the curriculum narrowed the scope of algebra I.
3. The teachers developed a strong social network.
4. The logistics of the program were difficult to develop and they were essential.
  - a. The creation of morning tutoring provided extra help for students.
  - b. The trimester schedule provided flexibility. If necessary some students could take more than two semesters to complete algebra I.
  - c. In year two of implementation the administration, teachers, and guidance department changed how struggling math students were scheduled providing them additional time to work on skill deficits prior to taking algebra I.
5. Parents were afraid of the change introduced by DPCHS. The change created anxiety for themselves and for their child. Parents had a difficult time understanding why the

- change was necessary and why students who had been successful in math prior to algebra I were struggling.
6. Parents had difficulty understanding how grades were calculated. They did not like the reduced point value of homework and the increased emphasis placed on the testing.
  7. Based on the review of documents students by and large were not prepared for this course. They were not prepared either through their lack of content knowledge or having increased expectations placed on their performance.

**Research Question # 4 How was ATW received by community stakeholders?**

1. Parents did not feel that they had received adequate information regarding the need for this program. They also did not understand the processes within the classroom and the concept of mastery.
2. The parents' largest complaint was not about whether the child was learning the content. It largely focused on how their child felt or how the performance of the child was going to impact them.

**Research Question # 5 How did ATW impact student performance?**

1. The test results indicated that not all students took the ECA at the same time. Students only took this test once they finished the course or when they were required at the end of the sixth trimester.
2. About one half of the students finished the class in three trimesters.
3. The students who participated in ATW had a greater passage rate than the students who took the ECA in a traditionally taught algebra I. class

4. It is difficult to determine if the students mastered content or if ATW was simply test preparation for the ECA.

### **Discussion of Lessons Learned**

The implementation of any curricular program is often done to counter some type of perceived deficiency administrators and teachers are seeing from their students. Schools rely on data from student performance. The administrators and teachers at DPCHS relied solely on the piloted data from the ECA. The student performance on these tests was so poor that it could not be ignored. The administrators and teachers relied on this performance data and it is unclear as to why this data was the driving force behind the implementation of ATW. Data from the current ISTEP+/GQE was not considered nor was the curriculum being used. This study did not find out why the piloted data was the only data point used.

Schools are also dependent upon teachers accepting the data and then implementing the change. The process of implementation is exceptionally difficult and often met with a great deal of resistance. Fullan stated, “the more that teachers or others have had negative experiences with previous implementation attempts in the district or elsewhere, the more cynical or apathetic they will be about the next change present, regardless of the merit of the new idea or program” (Fullan, p.80, 2001). This case study revealed that the teachers at DePaul Community High School (DPCHS) accepted the performance data from the piloted ECA tests and were willing to try something different. They understood students were struggling when the algebra I exam which was piloted from 2005-2008. The data indicated that something different with instruction needed to occur or students from DPCHS were going to continue struggling with the ECA, which in turn could impact the student’s ability to graduate from high school and the

performance rating of DPCHS. I could not find out why the data from the piloted ECA was the only driving factor in implementing ATW.

*[The implementation of ATW was necessary because] our ECA scores were so low and we knew that or the assumption was the new ECA test was going to be even more difficult and kids had to pass it to graduate so we could not continue on the same path. (Kim)* I undertook this case study to get a deeper understanding of why and how the administration and teachers implemented Algebra that Works (ATW). I wanted to know how the classroom processes changed and what the factors were that fostered or hindered the implementation of ATW based on the experiences of those directly involved. Additionally, I also wanted to know what the perception of ATW was from the end users, parents and students. What I found was that the implementation of this program was the most challenging thing that these teachers had done in their careers. The challenges existed in two areas: 1.) what the teachers implemented was totally different than what they had done traditionally. Practices such as grading homework on completion or providing whole group remediation during class stopped and 2.) there was a large negative reaction toward ATW from the parents and students. What the students and parents saw was significant change in classroom processes. These changes caused many students to struggle with math for the first time in their academic careers. The struggles created negative feelings toward ATW, which created a great deal of resistance. It is clear that the parents needed more communication regarding the changes to algebra I prior to the start of the school year. The administration at DPCHS did a poor job in communicating the changes to them and this behavior caused problems throughout implementation. Regardless of the push back and negativity, the administrators and teachers persevered with the implementation of ATW. When the class of 2012 took the ECA the results improved; however, this study was not designed to determine if



ATW was responsible for the change in student performance. Other factors were at play, which included but were not limited to the fact that students had to pass ECA in order to graduate.

### **Why Change?**

#### **Increased accountability for schools**

In 2001, the federal government enacted legislation, *No Child Left Behind* (NCLB). This new legislation was the beginning of high stakes accountability in this country. In 2008 schools in Indiana were not assigned letter grades, rather they received category placements. DPCHS was placed in the category of “Academic Watch,” which is one level above being considered a failing school. DPCHS earned this rating because they were not making Adequate Yearly Progress (AYP) under the guidelines of NCLB. Administrators and teachers at DPCHS knew that they were going to be held to higher expectations and in order to meet these challenges instruction and classroom processes needed to change, specifically with algebra I.

The increased expectations from the state required schools to do their best to ensure that all students were learning the content. Prior to the class of 2012 this was measured by the ISTEP+ (Indiana Statewide Testing for Educational Progress-Plus) test, or more commonly known to high schools as the GQE (Graduation Qualifying Exam) (ISTEP+/GQE). Beginning with the class of 2012, high schools were measured on two new GQE tests which were subject specific, algebra I and English 10. This new testing mandate was a large portion of how the schools grade was determined. Increased school accountability was a reason for change; however, it was not the driving factor.

#### **The data from DPCHS indicated that students were not prepared for the algebra I ECA**

As presented in chapter four the data produced during the piloted tests got the attention of the administrators and teachers. The data were something that could not be ignored and really

forced change to occur. The results each year had steadily decreased to the point that less than 1/5 of the students taking the piloted test were passing. Prior to the ECA becoming the new GQE the DPCHS administration struggled with making curricular changes because the performance on the previous ISTEP+/GQE had been adequate. DPCHS had been and continues to be compared to the five other high schools in the county. The performance on the ISTEP+/GQE had been comparable to the other county schools. DPCHS did not produce the highest scores in the county on the ISTEP+/GQE and they did not produce the lowest scores either. For example, in the fall of 2008 when the last ISTEP+/GQE was given 83.7% of the students passed the math portion the first time. Because of these previous positive ratings, convincing staff that they needed to do something different in mathematics instruction was difficult. The closer student performance moves toward 100% the greater the risk is in making a change. The implementation dip (Busik 1992) as discussed in chapter 2, often stops schools from changing on their own. Outside factors, for example a new graduation qualifying exam, will force schools to look at instructional practices if data from these exams indicates something is wrong. Prior to the poor performance data on the piloted ECA exams, the administrators and teachers felt that their instructional practices were satisfactory and they did not want to change their practices and risk the implementation dip typically surrounding the advent of new curricular programs.

The data from the piloted ECA tests were drastically different. Table 2 found in chapter 4, showed DPCHS was consistently one of the worst performing schools in the county. The data were convincing; however, the staff at DPCHS had trouble believing that the students were that poorly prepared. Where the teachers and administrators differed was whether or not the students were or were not taking the test seriously. The teachers and even Board President Walt, gave

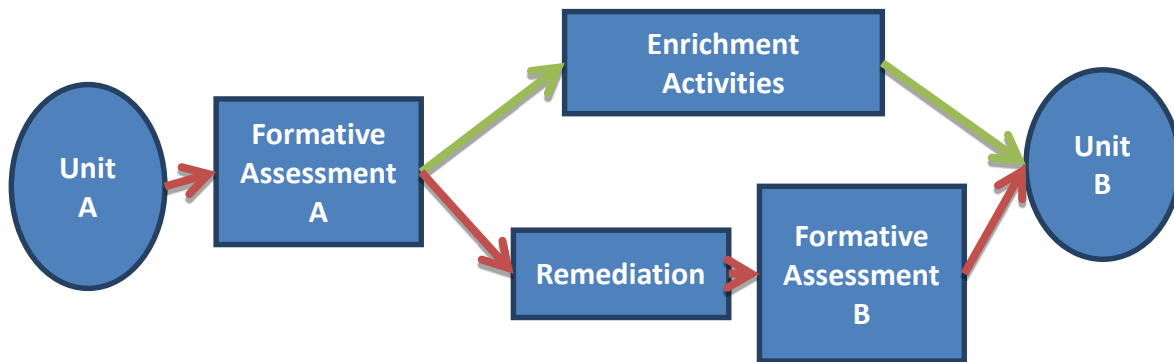
that conclusion some legitimacy. Walt stated, that he did “recognize there was a little bit of caveat in that algebra wasn’t a high stakes test, until 09. So, you realize kids are taking a test and kids are like ok so, this doesn’t matter if I graduate or not, I recognize that.” There were many conversations suggesting that if the students were not taking the test seriously, maybe no change was necessary. The teachers and administrators had to give this thought consideration, prior to any conversation regarding the implementation of ATW. They realized it was one thing to think that the students were not taking the pilot tests seriously, it is an entirely different process to prove that students were not learning. This study could not determine why the data from the ECA was the only point the administrators and teachers used to implement ATW. The fact that this study could not determine why the ECA data was the only point considered may be because the study took place seven years after the implementation of ATW and the participants may have forgotten key details of implementation. Other factors were at play as well for example, poorly aligned curriculum, poor instructional practices, lack of student preparation, and students taking the test seriously. The reason for the implementation of ATW could have been all of these factors; however the only data point that the administrators and teachers indicated moved them to change was the student performance data on the piloted ECA. Kim summed up the need to change by stating, “continuing the way we were teaching, continuing to do the same thing we had always done was going to generate more problems.”

### **The Appeal of Mastery**

From the outset the use of mastery learning as an instructional strategy was appealing. Teachers Clare and Megan indicated that conceptually this type of teaching methodology is something all educators should want to do. As the literature indicated everyone could agree that all students learn at different rates. Set up properly and similar to the description given by

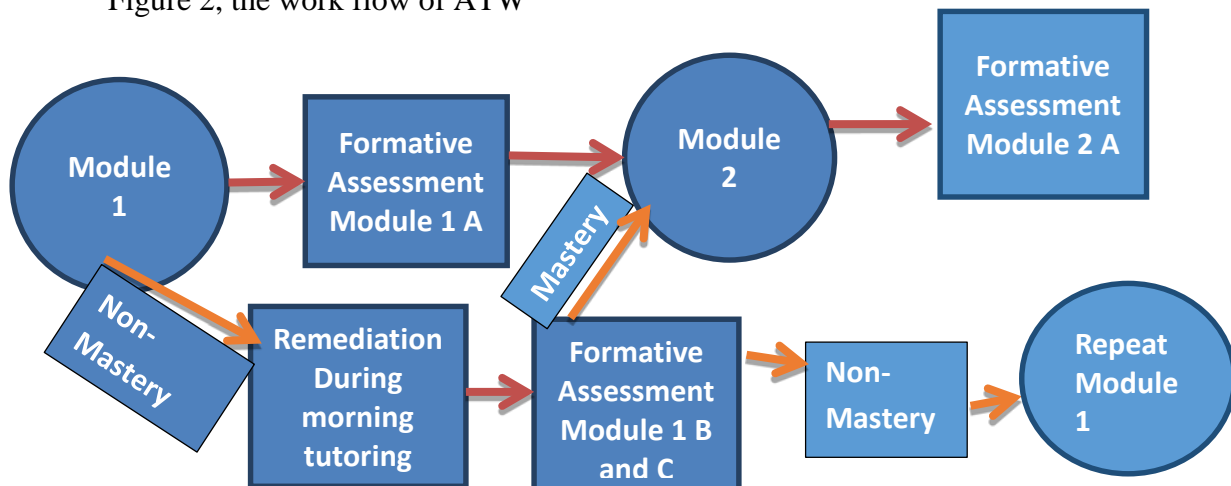
Guskey (2007), where students are taught and assessed then split into two groups one for remediation and one for enrichment, teachers can address the learning needs of students. If mastery learning was implemented correctly, then there was the potential students' test scores could improve. The figure below (from Chapter 2) demonstrates Guskey's ideas on student work flow.

Figure 1, the work flow for Thomas Guskey's view of mastery learning (2007)



The teachers at DPCHS set up a different process for mastery. The teachers designed the curriculum to keep all students moving forward. After indicator tests were given at the six week mark students continued to move forward with new content. The teachers did not provide enrichment activities or remediation activities during class. All remediation occurred during morning tutoring. An example of the work flow for ATW is in figure 2 below,

Figure 2, the work flow of ATW



The ATW model moved students into an entirely different class. If students demonstrated mastery on assessment B or C then they continued on pace with the class. If students did not achieve mastery the class was separated and these students repeated the indicators they did not master. In Guskey's model, students were separated; however, they remained in the same class. An issue with this model is that those students who are doing enrichment activities may have felt as if they are being punished by being asked to do more work while they wait for classmates. The way time is used in Guskey's model is why Arlin (1982) was concerned with how time was allocated in mastery learning.

The separation of students inside ATW allowed for different learning rates. Washburne (1922) and Parkhurst (2007) struggled to keep students on pace in their models because the pace was established by the students. As they developed their models they eventually implemented deadlines, and the students still procrastinated until the deadline to submit their work and there was no mention of students not moving forward with their classmates. With ATW, the students were expected to keep pace with the teacher. The students also had to meet the deadlines to meet mastery established by the teachers, and if they did not show mastery at the end of the module they did not move forward with their peers.

The separation of students was an important logistical development of ATW. Students could receive additional help and have a longer period of time to work on content they did not understand. Moving at a slower pace benefited some of the students at DPCHS. The elements discussed here all involve time and knowing that DPCHS was on the trimester made the use of mastery learning even more appealing.

The trimester system provided greater flexibility for instruction which made the use of mastery appealing. Part of the appeal is how the schedule can be designed to help students who

need additional help and not slow down those students who were keeping pace with the teacher. Arlin (1982) indicated that time was a critical problem with mastery learning. Arlin was concerned that the additional time needed for remediation was going to be taken from those students who did not need assistance (see figure 1 chapter 5). How ATW solved Arlin's concerns regarding time was the requirement of students attending morning tutoring for remediation and re-testing. Time during class was not set aside for remediation; instead each student received the same amount of instruction daily.

The trimester schedule allowed a student who fails a class to have it built back into their schedule during the same academic year. The teachers and administrators felt that they could be creative within the schedule of the trimester and help the class of 2012 be successful on the ECA. The effort was designed to be proactive instead of reactive. Additionally, the teachers and administrators felt they could design a program for students that did not impede the students' progress toward graduation. If a mastery program was going to be successful at DPCHS, the trimester system provided the best opportunity for students to achieve mastery and maintain a path toward graduation.

The literature review indicated that there are supporters and detractors for the use of mastery learning as a methodology. Some data presented from research indicated that mastery learning programs could work. The research from Bloom (1984), Guskey (1986) and Kulik et. al (1990) stated that students using a mastery learning program had positive gains in test results. Other research (Arlin, 1982, 1984; Slavin 1987; Martinez, 1991), did not support the use of mastery learning, Slavin specifically indicated that student performance on standardized testing did not improve enough to justify the use of mastery learning. The teachers and administrators of DPCHS believed that the data from Jefferson County High School, which averaged an 88%

passing rate on the Georgia state assessments (Lile, 2008) was a positive indicator that ATW was going to work.

### **DPCHS moved in the opposite direction**

Current research from the National Council of Teachers of Mathematics (NCTM) specifically in the 2014 publication, *Principles to Action*, indicates that mathematics curriculum should be established along a sequence of mathematics standards that create a linkage between math and every day usage. Creating linkage between math and everyday use was not the purpose of ATW. The creation of ATW was more in line with the *Common Core*. Beginning in the fall of 2007, several governors discussed creating a system of common standards that could be used throughout the country. One of the key points that was produced for mathematics instruction was how the standards for math were going to be reduced in number and narrowed in scope. The hope being that with few standards, teachers would be able to go deeper into the standard vs attempting to cover a breadth of standards.

The curriculum used for ATW was narrow and focused on students passing the ECA. The narrowing of the curriculum, by eliminating standards, done by the teachers of DPCHS is similar to what was being done by the writers of the *Common Core*. The irony in this situation is that the administration and teachers at DPCHS had absolutely no idea that *Common Core* existed in 2008.

The *Principles to Action* and the *Common Core* both attempt to move the development of the curriculum for mathematics from something where standards are seen more as a required list of items to be learned and marked off a list. To one where the standards are robust and connect the curriculum to the real world. Both believe that students must have a strong foundations in mathematical concepts in order for the connections to occur.

Slavin (1987) held a similar position as the NCTM and the writers of the *Common Core*, in that the curriculum used by teachers should be go deeper into the content exposing students to fewer standards but at depth that allows for strong connections to be made to the real world. The DPCHS approach to improving student performance on standardized test was the exact opposite of these recommendations. When the teachers at DPCHS set up the curriculum using mastery as their methodology, they narrowed the scope of the curriculum and they were more concerned with students showing mastery on the standards specifically tied to a standardized test. Connecting the standards to everyday life was not the purpose of ATW. This generates this question: was ATW about mastery or was it about test preparation?

There is not data to prove why the administration and teachers did not consider using the recommendations of the NCTM. The data do indicate that there was no effort made to find out what the NCTM thought was a best practice. Additionally the purpose of creation of ATW was to improve student performance on the ECA. The data do not indicate that the administrators or the teachers were concerned about connecting the curriculum to everyday life. The singular focus of the DPCHS staff was to improve how students performed on a standardized test, which does not align with the NCTM position.

### **Lessons Learned**

There are several lessons in this case study that can be used by other schools should they be interested in implementing a new curricular program. It does not necessarily have to be a mastery program. When schools implement a new strategy or program they should be cognizant of some of the following lessons: 1.) Fidelity is much more than a word, it truly impacts the implementation of all programs. The fidelity of the teachers to implement a program as it had been designed is extremely important. Additionally, the social network built between the



teachers during implementation may be equally as essential to implementing the program with fidelity. Administration within the building, district administration, and the school board must be committed to supporting the teachers during the implementation. 2.) There must be a reason to initiate the change. The compelling evidence increases the buy in from the staff. 3.) Administrators must have a willingness not to control all aspects of program development. The development of the program must be placed in the hands of end users and in ATW's case that was the teacher. High levels of group autonomy were given to the teachers which increased ownership of the program being implemented. 4.) Student well-being and community ownership is equally as important as getting students to perform on a standardized test. The students and community did not have ownership of ATW. They did not like the processes implemented during ATW and the impact it was having on students' academics and emotional state.

### **Fidelity helps produce results**

The importance of fidelity cannot be stressed enough. The teachers had a high level of fidelity to implement ATW as it was designed. The desire to stick with how a program has been designed and only make slight adjustments to the program is essential during implementation. The teachers at DPCHS were determined to implement ATW as they had designed it. They held each other accountable and supported one another throughout implementation. They had a commitment with one another to see the process through.

During program implementation, fidelity can be confused with commitment. Fidelity of implementation lies with the teachers directly involved. At DPCHS the fidelity level of the teachers was high. They demonstrated a steadfastness to implement ATW as it had been designed and that is difficult to measure. Members of the administration, both within and

outside of the building, and the school board were committed to the implementation of ATW and were supportive of the teachers in the efforts they made throughout the enactment of ATW.

The building and district level administration and school board must demonstrate high levels of commitment. These administrators and board members must be committed to supporting those directly involved with the implementation of a curricular program. Even though they are not directly involved with the day to day implementation this fact does not lessen the impact of their support. In fact, their support to the program is essential to its success. During the implementation of ATW board members, district and building administration felt strongly about supporting this program and they wanted to see the results this program. Board member Walt recalled being committed once he understood how much the teachers and administrators from DPCHS were in favor of implementing ATW. One of Walt's biggest concerns was that members of the board were going to waiver in their commitment to ATW. He indicated that if they, the board, could handle the initial negative reaction and stay unified as a board then he thought things might turn out well. Walt was impressed with how well the board remained unified during the implementation of ATW.

In chapter two the system of measuring the levels of fidelity during implementation by Hall and Loucks (1977), was discussed. At the end of 2012, when all members of the cohort had to take the ECA, the teachers had reached level VI, renewal because the methods developed and used during the implementation of ATW became how they taught not only algebra I but other courses. Pieces of what they were using started to flow into other classes. For example, Mindy indicated that she graded homework for accuracy not completion; Lucy indicated that she made sure that students had the answers to every homework assignment. During the interviews the teachers, Kim, Clare, Mindy, and Lucy, recalled the dedication and commitment they had toward

one another for ensuring the students learned the material. The fidelity demonstrated by the teachers toward implementing ATW as it was designed was significant. They also held each other accountable and provided a great deal of support to one another throughout implementation of ATW. The teachers also felt responsible to improve what they were doing in the classroom which was going to help the students.

What helped the teachers' fidelity was the time dedicated to creating a well-planned and logically sequenced curriculum coupled with a system of delivering the curriculum which included new grading, homework and testing practices. Prior to the first class starting in the fall of 2008, the entire curriculum was built. All the lessons, homework assignments, quizzes, and tests were developed, which also allowed the teachers to handle the increased parent communication. During implementation of ATW, the teachers received significantly more communication from parents. This increased communication from parents was not anticipated. The completed curriculum and other classroom processes allowed the teachers to spend time with parents answering their questions and concerns throughout implementation. Had they been trying to develop the curriculum and classroom processes at the same time they were implementing ATW the time they had to communicate and work with parents would have been greatly reduced. The consequences of developing curriculum, classroom processes, implementing changes, and communicating with resistant parents and students could have led to none of these things being done well. When the teachers began in the fall they did not have to plan what was going to happen on day 1 or day 23, it was done. This allowed them to concentrate on the instruction and the process changes in the classroom. When implementation began the teachers followed the curriculum as written. They did not deviate from what they wrote which further demonstrated the trust and commitment that they had toward one another

and the implementation of ATW. This could be argued as rigidity, causing the teachers to lose a level of professional judgment when determining different approaches were needed to adapt when parts of the curriculum were not effective. The data did indicate that if lessons did not go well the teachers used their common planning period to discuss what worked and did not work. Problems that arose during implementation were worked through and solutions were mutually agreed upon prior to their implementation.

An element that may be as important as fidelity maybe the social network that was built by the teachers during implementation. As mentioned earlier the principal at DPCHS had implemented a program at his previous school in which he and two others developed a program to assist struggling learners. This program required the three teachers to have a common planning period which was something he insisted be a part of ATW. The teachers, Kim, Clare, Mindy, and Lucy, developed strong social network with each other. Coburn stated that “the combination of expertise and tie strengths, along with high depth interaction either concurrently or in the subsequent year can support the development of strong enactments of reform related instruction that enable to teachers to sustain over time”(2012, p. 166). Coburn also stated that “patterns of interaction and the conditions of conversation formal and informal settings influence the process by which teachers adopt, adapt, combine and ignore messages from the environment” (2001, p. 162).

The teachers at DPCHS developed a social network which allowed them to work through the issues of implementation. Be it a logistical issue, such as testing, or a curricular issue such as what type of vocabulary to use when instructing a specific concept. The teachers spent hours within the school day working with each other and hours outside of the school day. The processes within ATW required constant communication with each other and as students moved

between teachers, they could share the strengths and weaknesses of each student. The ability of Kim, Clare, Mindy, and Lucy to work together throughout implementation was a significant factor.

In addition to the curriculum all of the teachers and building administrators were in support of the process changes in the classroom. The documents and interviews revealed that during the implementation of ATW there was very little change done to the curriculum. The only changes that occurred were done when processes were tried and they proved to be ineffective or detrimental to the students, such as when students achieved mastery they were given full credit for the test even if they had missed one problem. Implementing any new program is difficult. Developing and implementing a program at the same time is impractical. In the case of ATW having the curriculum complete and the structure of the classes decided upon increased the fidelity of implementation which allowed the teachers to concentrate on ensuring students were learning.

### **There must be a Reason to Change**

Fullan (2007) relates a story from a study done by Johns Hopkins University regarding patients who have had major heart issues. This study indicated that even when patients have undergone heart surgery and are faced with the fact that they must change their lifestyle to live many do not. Change for the sake of change does not produce positive outcomes. Change must be tied to some type of reason that motivates the individual or the organization to do something different with the full understanding that what is being implemented may not succeed. Fullan and Hargreaves stated that innovations are most likely to be implemented if they “1. Address a specific need, 2. Exhibits clarity in purpose and technique, 3. Is complex and it is perceived as

ambitious, and 4. Characterized by quality and practicality” (Hargreaves and Fullan, 1998, p.57).

In the case of DPCHS, the teachers and building administrators took on the challenge of implementing ATW and this program meets all four of these criteria. 1.) The implementation of ATW was focused on improving DPCHS students’ performance on the ECA and to improve the accountability rating of DPCHS. This study revealed that the administrators and teachers relied solely on the piloted test scores. 2.) The use of mastery learning was clear and easily understood because the purpose of mastery learning was to ensure students improved their content knowledge in order to pass the ECA. Mastery learning conceptually is not complex. The development and the process which accompany this method of instruction are. Mastery learning requires that time be allocated differently to allow for the different learning rates of students. 3.) Mastery learning alone is not complex. The principles surrounding mastery are concrete and understandable. Implementing mastery learning through the processes developed during the creation of ATW was ambitious. Writing curriculum without a text, changing classroom procedures, allowing students to re-test are just some examples of something teachers at DPCHS had never attempted. 4.) In this area there is no data to determine that ATW was characterized by quality or practicality. The data do indicate that Jefferson County High School had been using a similar program and had seen increased student performance, which led the DPCHS administrators and teachers to believe that they could create a program with similar results.

The poor accountability rating and the data from the pilot tests allowed the building leadership to build a case internally to make a change. When the initial conversations began, they were all about the data, the accountability grade was not discussed. The focus of these meetings was on improving student performance and these early discussions often led to a similar

conclusion that the students were not taking the test seriously. In fact all parties involved with ATW concluded that this issue was most likely the case. What changed the dynamic of the conversation was the “what if” scenario. “What if” this was the best the students could do? When the results from the 2008 eighth grade test were shared at DPCHS, the data further convinced the teachers at DPCHS that change was essential to success. The DPCMS students who took the test that spring were considered to be high ability. If only 56% of the high ability math students were passing this test and they did take the test seriously, then we must take action.

### **Let the teachers have autonomy**

Pink (2009) discussed three critical components regarding motivation: autonomy, purpose, and mastery. When Pink’s items are broken apart and applied to the case study, the teachers had a clear purpose which was to improve student performance on the ECA, and ATW was built entirely around the concept of mastery; however, it was the group autonomy the teachers had in developing the program that made the difference. It is important to state that the teachers did not go out and do whatever they desired during implementation. They worked together as a group during implementation. The high levels of autonomy the teachers had during implementation was to create something as a group without interference from building or district administration. This process of implementation gave the teachers ownership over the success of ATW. The group autonomy demonstrated by the teachers at DPCHS helped them implement ATW exactly the same in each classroom.

Leaders can utilize the data and impress upon the staff that change is necessary; however, if the leaders attempt to control every facet of the change then the ownership of the program is in the wrong place. From the outset building leadership must find the right teachers to implement a

program. If a teacher does not want to or believe that this curricular program will be beneficial to them or their students, program implementation will be extraordinarily challenging. When the right teachers are identified for program development and implementation, building leadership must be willing to give the ownership of the program to the teachers and let them have some autonomy. The work to find the right teachers to implement a program does mean that when teachers are approached about a new program they have the choice to opt out of participating.

The documents reviewed for this case study indicate the DPCHS building leadership gave control over how ATW was going to be developed to the teachers early on in the process. This allowed the teachers to develop the program without interference. The leaders and the teachers had a trusting relationship and the two groups kept each other informed about the development and the implementation. At no point did the teachers operate without informing the building leadership of the stage of development. During implementation the teachers consulted with the leaders if process changes needed to occur. If curricular changes needed to happen the leaders trusted the teachers to make the appropriate changes.

### **Mastery Learning Requirements**

When mastery learning is implemented as a strategy one thing is clear that curriculum utilized by the teachers must be clear to both students and teachers. Washburne (1922) stated that the curriculum must be clear and have definite goals. Carroll echoed the thought of Washburne when he stated that “this model of school learning requires clear specification of the tasks to be learned” (Carroll, 1989, p.28). Carroll also indicated that the amount of time needed for students to learn material was going to vary significantly; he stated that “educational psychologists still have no adequate procedures for estimating how long a given unit of instruction will take to be learned by students” (p.27). In 1968 Bloom indicated that schools



currently operated under a fix sense of time and that learning for mastery requires that time not be restricted. Bloom stated “there is little doubt that the mastery group characteristically requires additional time” (1973 p.56). Arlin (1982) indicated that in a mastery learning model teachers struggled with the allocation of time between faster and slower learners. There are two main requirements for mastery learning programs, a well written and clear curriculum and additional time for students to demonstrate mastery.

In a traditional two semester, seven period day high school schedule the allotment of time is limited. There is a lack of flexibility with this model that does not lend itself to the use of mastery learning programs. The two-semester, seven period school day does not provide flexible solutions when students need additional time to complete a specific course. The lack of flexibility is seen when students do not master content and must repeat sections. The repeating of sections can limit the student time to complete all of their graduation requirements. Schools that want to implement a mastery learning system must have a schedule that is flexible enough to account for the different learning rates of students. The trimester system at DPCHS, which meant there are three semesters vs. two semesters, allowed for students to have an additional semester each school year to work on the material they were not mastering. During the first year of implementation students at DPCHS had an additional twelve weeks to work on content if they did not master content during the first or second trimester. If students continued to struggle in demonstrating mastery they could have an additional four semesters to work on content before they were required to take the ECA, which was the spring of 2010. During the implementation of ATW counselor Aimee indicated that she was concerned that the extra time needed for students to demonstrate mastery was going to impede the students’ progress toward graduation. The additional time some students needed to complete ATW did not slow students down in acquiring

the credits needed for earning their diploma. In fact the graduation rate for the class of 2012 according to the IDOE was 97.2%.

The trimester system not only provides an additional semester for students if they happen to fail, the class periods are longer. The length of classes at DPCHS was seventy minutes. During the implementation, the teachers had the time to review homework, present new material, and provide time for students to begin their homework.

In order for a mastery learning program to be truly effective it needs to start before high school. Slavin (1987) indicated that if a student develops for example a 25% skill deficit in math, each year of school beginning with kindergarten, when that student enters ninth grade he/she may be 225% behind students that are void of any skill deficits. 225% is the equivalent of 2.25 years. If a student enters algebra I with this type of deficit he/she will have the knowledge base of a sixth grade student. The skill deficit can be a monumental hurdle when students shift from a non-mastery to a mastery system. Kim even noted that asking students to change after doing the same thing for nine years was exceptionally challenging. The earlier the program can be introduced the better off the students will be for the future.

The use of mastery also requires a streamlined curriculum. The streamlined curriculum will limit the depth at which teachers can go with the content. It requires them to stay within the content, not reviewing eighth grade material or introducing concepts that will be seen in other subjects. Teachers must be willing to eliminate some standards and indicators written by the state. For example, the first standard and the five indicators for standard one from the Indiana algebra I state standards, published in 2009, were all covered in eighth grade. Teachers must be willing to trust their colleagues that the content was taught and students learned the material so they can focus on the new material to be learned. Streamlining the curriculum also allows for

teachers to reteach when necessary. These 2009 standards contain 54 indicators which should be taught. In a 120 day two-trimester schedule this means covering a little less than two indicators a day. The teachers at DPCHS reduced the indicators being taught to 34 which increased the amount of time they could spend on each indicator. The decision to eliminate or ignore some indicators demonstrates that the teachers at DPCHS viewed some of them as less important. Also, it confirms Slavin's (1987) thoughts that when teachers hold tight to specific learning objectives students will not be exposed to all the learning objectives students may see on a standardized assessment.

### **Student well-being and resistance**

Fullan, indicated that when schools are attempting a change they must attend to the three basics, "literacy, numeracy, and well-being of students (Fullan, p. 45-46, 2007)." The teachers and administrators' implementation of ATW focused on numeracy; however, they did not account for the student well-being. The focus of implementation was improving test scores, which in turn was going to improve the school's rating. How students felt did not factor into the implementation at all. The document review and notes indicated that parents were very concerned about how their child was struggling with ATW. The parents stated that because their child was having trouble he/she often felt "embarrassed" to be helped by older students. Another student had become extremely "depressed" about his performance in algebra I, especially when he did not demonstrate mastery by a certain deadline. The data also revealed that many parents shared that their children were not good test takers. Mindy shared that Jacob, Diana Green's son, had developed a poor attitude toward ATW. Director of Learning Services Shannon shared that the resistance comes when parents do not feel that their children are being treated fairly. The fact remains that the teachers and administrators did not address the well-being of students. The

teachers and administration at DPCHS were focused on improving ECA performance. The emotional concerns brought forward by parents regarding how they were impacting their child's ability to learn were not addressed by the staff of DPCHS. Even counselor Aimee recalled telling students and parents this was the program and they needed to get on board with the process. Support for the students existed in concrete things to help them learn the content. If children needed extra help then they needed to come to morning tutoring. If the parents could not get their students to school for tutoring, then the students should catch the elementary bus. If students did not pass the test, then they had two additional chances.

The lack of attention paid to the emotional well-being of the students, created resistance from the parents. The parents also struggled to understand the process of ATW. The terminology used by the teachers and administrators often caused confusion for parents. Parent Diana Green recalled that she could never understand what an indicator was. Other parents struggled with students having such low grades because the point values of homework had been reduced and test values were so high. Others struggled with the concept of mastery. Board member Janey indicated when she was questioned about ATW she spent a great deal of time explaining mastery and how it worked. The poor communication from the building administrators to the parents and students helped generate much of the resistance toward ATW.

It was naïve of the building leaders and the teachers to think that there was going to be little to no resistance to ATW. The administrators and teachers felt parents and students were going to understand the need for change. Walt, was the only person interviewed that thought any type of resistance was going to occur. The lack of understanding of the community's position in large part is linked to the first two meetings. The poor attendance gave a false indication that parents understood why changes were being made to algebra I. Additional information was sent

to the families of incoming students and there was zero contact with the administrators or the teachers. The apathy or lack of any response from the parents gave the administrators and teachers a false sense of acceptance that the community had received adequate information regarding ATW and they were in support of the implementation. Once the school year began, the parents and students began reacting negatively to the implementation within the first few days of school. In every school community change is difficult, regardless of what student performance data may indicate. Parents and students become comfortable with how things have been done in the past and parents in particular want to be able to relate their school experience to what their own child may be experiencing.

The parents in DePaul are no different from any other community. When new things are implemented there will always be a level of resistance because it is new. According to the interviews and document reviews this was a consistent theme during the first few months of implementation. Parents and students had come to expect that math instruction was going to follow a similar pattern from the previous years of school. When ATW was implemented, it was not that the instruction changed, it was the expectations of work and the use of mastery that changed the feel of the classroom. These two changes led parents and students to believe that the content had changed. Cam indicated that even if there had been significant preparation efforts made to inform the community once the program was implemented people were going to feel “unsettled” simply because it was different. The different experiences that students were having with ATW often made parents angry and upset with the change. During her interview Diana was clear that she did not understand ATW and was unsupportive of its implementation. Diana’s comment of “algebra that works that ain’t working” was a typical statement made by community members throughout DePaul.

The parents strongly opposed the implementation of ATW. There was a push that some parents were hoping to apply enough pressure to the school board and district administration to stop the program. Board President Walt indicated that in his 16.5 years on the board the implementation of ATW was his “biggest point of contact that I had from parents.” The letter from Melissa Moore asked specifically what it was going to take to stop the program. The teachers indicated that their commitment to continuing with the program was pushed to the breaking point. Kim recalled that some of the communication she received from parents was “hateful.” Kim recalled that the time period between August and February was “one of the worst periods of her professional life.” The documents that were reviewed from the fall of 2008 were revealing. The anger and frustration parents were feeling regarding ATW permeated each one. The teachers and administrators who were interviewed for this study were re-constructing their reality. The responses they gave were similar and it is important to note that seven years had passed since they were implementing ATW. It did become evident in both the document review and through the interviews the teachers, that regardless of the resistance the teachers continued communicating with the parents, and remained committed to implementing ATW with fidelity.

The teachers spent an increased amount of time answering phone calls and e-mails from upset parents. Primarily, many of these initial phone calls were spent explaining how the program worked, why it was necessary to make the change, and the grade their child should earn once mastery was demonstrated. The increased communication with parents consumed large amounts of time. Parents shared with the teachers and administrators how their child was feeling. Parents stated, that their child was not a good test taker, their child was depressed because of missed deadlines or poor grades, their child was embarrassed to ask for help, or their child was no longer confident in their ability to do math.

The administration at DPCHS needed to be more proactive with their communication toward parents and the community. The poorly attended meetings, and the e-mail notification of the change were ignored by the majority of parents. In August, during freshmen orientation the administration needed to have a mandatory parent meeting. At this meeting the process could have been explained and it may have made implementation easier. Determining what could have been done differently to assist the students' well-being is complex. There may have been a point in which students who were struggling to meet expectations, or understanding content may have stopped trying. There are a number of things that could have been tried, such as putting students in small study groups, or finding ways to meet with them individually to find out what their needs were. We learned that when new processes are going to be implemented that change parents' understanding of school and what students experience, the communication must be frequent and meetings may need to be mandatory. Also, monitoring and addressing the students well-being throughout the process of implementation must be of the same importance as improving student performance on test scores.

### **Further Research**

This case study revealed a number of things that suggest the need for further research to clarify and explain. Program implementation may be initiated by using only one data point, such as poor standardized test performance. It is difficult to have teachers implement new curriculum as it was designed especially with high levels of fidelity and have equally high levels of commitment from the administration. In addition communicating often and effectively with parents and students regarding upcoming curriculum changes can be equally challenging. Also, major changes in classroom processes, how homework is used and graded, how tests are given, and increased expectations for student performance can create feelings of uncertainty and

discomfort. Finally, parents desire for their children to be successful learners. When children struggle with new procedures, parents have a difficult time relating their experience as a student to what their child is experiencing and they have trouble providing both academic and emotional support.

One area that could use further research is the idea of social networking between teachers. Coburn has spent some time discussing the power of this concept and admits that measuring it is problematic. The question that continues to resonate is how much did the socialization between teachers impact implementation? The data indicates that the teachers co-constructed their reality and this happened because the amount of time they spent with each other. Collins (2001) spent time discussing getting the right people on the bus. The question remains how you know who the right people are? Furthermore, can the implementation of a program force socialization between teachers that helps or hurts implementation?

The measurement of schools, how well the state of Indiana thinks they are performing, is based mostly on standardized test performance. Further research could be done to determine how schools react to both low and high results and if schools look at other factors around each. For example, how do high performing schools maintain these levels or what changes do they make to gain a few percentage points on the standardized assessments. The case study at DPCHS, provides one example of how a school addressed the poor performance of the students on the piloted ECA. There are many other ways to improve student performance and this information could be beneficial to schools. Additional research may indicate what other factors schools should monitor beyond test performance when they are considering implementing a new curricular program. Further research in this area will greatly assist schools in how they can balance the expectations of high student performance and the emotional well-being of students.



Schools today are measured by how much a child knows. If a student attends school and is not confident about themselves or in their ability then it directly impacts the end result. Often students will enter a course, for example algebra I, after years of poor performance stating they cannot do math. An emotional state, such as explained above, can prevent students from learning. At times a student's negative attitude toward a program is learned. Jacob Greens' negative feelings toward ATW was most likely learned from his mother, Diana who was not supportive of ATW. The parental resistance and opposition to ATW, also impacted the learning environment. The students at DPCHS, not unlike other students around the world, are perceptive enough to pick up on this negative attitude displayed by their parents and classmates. This learned attitude can and often does impact the classroom environment. During the collection of data, the teachers indicated that the parents seemed more focused on the emotional status of their child, when in reality the parents were struggling to understand the new program because of the lack of communication from the school, making sure their children were learning and being successful, plus handling the emotional reaction their child was having toward the increased expectations provided through ATW. The area of research that needs further exploration is how parental and student attitudes impact change. How children feel about themselves and whether or not they feel a new curricular program is helping them learn directly impacts the implementation of this program. Truly understanding the emotional state of children will assist all schools. Specifically when it comes to students who are struggling with new programs, or challenging content. Finding out what these support mechanisms are could be extremely beneficial for schools. It may provide a clear path for schools to follow to ensure the success of students regardless of the situation.

In terms of mastery learning additional research needs to be done in whether or not mastery is more effective with discrete subjects on standardized testing in comparison to non-discrete subjects. Using ATW as an example, the content to be learned was very specific. For example, students had to demonstrate mastery on how to solve linear equations. This learning indicator is specific and can be measured fairly easily on standardized assessments. If students were expected to demonstrate mastery, for example on finding the author's voice in a reading passage, the measurement is not as easy on standardized assessments. Additionally, the use of a streamlined curriculum may cause students to be at a disadvantage as they move through different courses. For example, if concepts are eliminated from algebra I, how does that impact students in later courses, such as geometry or algebra II? The NCTM wants mathematics curriculum to be broad and provide students ways to think and become creative problem solvers. Mastery learning is not designed to have a broad curriculum nor does it help students become creative in their problem solving. There appears to be renewed interest in mastery learning. For example ASCD (Association for Supervision and Curriculum Development), dedicated their December 2013 publication toward mastery learning. Further research should help schools determine what content areas are best learned through mastery. For example is mastery better for learning discrete content areas such as math or for more non-discrete content areas such as language arts. Also, research should be conducted to determine what the long term impacts of this methodology are on other content areas.

### **Conclusion**

This study found that the implementation of ATW was predicated on there being a reason to change. Implementation of this program of ATW hinged on two things, state accountability measures, and the performance data indicating students may not pass the new ECA. This study

revealed that the poor performance data was what drove the implementation of ATW. The teachers were committed to implementing ATW with fidelity as it had been designed. The teachers were unwavering in their approach with implementation. They offered each other a great deal of support throughout the implementation process and at the same time held one another accountable to implement ATW as it had been designed. The teachers were committed to ATW and to the success of the students. They believed from its inception that it was going to improve the student performance on the ECA. Linked with the fidelity of the teachers was the autonomy they had to create ATW. The teachers at DPCHS used the model from Jefferson County High School, and the autonomy given to them by the building leaders to create a program they felt was the best fit for DPCHS.

There are some fundamental things regarding classroom instruction that can transfer to all classrooms. The teachers increased their expectations for student performance and then provided academic support to help them reach these expectations. They also focused their instructional time on the content and shifted the remediation activities to morning tutoring. The belief that homework was practice and it should have a reduced role in the overall grade of the student is significant. With a premium being placed on test performance the teachers created a process where the students became more prepared to demonstrate what they knew when they were tested because the students understood the majority of their grade came from test performance. Additionally, not allowing students to test until all homework ensured that they were better prepared to test.

The organization of the curriculum and the reduction of indicators being taught was dramatically different. The teachers were in complete control of the content and they were not dependent upon a text to map out the curriculum. This process can be uncomfortable because

the way teachers are trained to write curriculum is based upon the use of a text. The lack of text forced the teachers to be exceedingly organized with the lessons. They had to create all the examples, and provide detailed notes for the students because they were the lone reference for the content. Reducing the value of the homework, requiring the homework being completed prior to testing and organizing the content so that it had logical flow all are items that can be replicated in other classrooms.

The massive changes in classroom processes caused the students to feel that that the content had changed. The different feel of the class caused an emotional reaction from students that led them to believe that math as they had come to understand it was no longer the same. What they had come to know regarding mathematics instruction over the past eight years was completely different from what they now had to know. In the past students could count on the first several weeks of class being review and easing into the new content. When the students began ATW they began with new content and this change in instructional process unnerved many students. The teachers had designed a program that stayed within the boundaries of algebra I. They, were breaking with tradition, for example not reviewing during the first part of the semester, was what students had come to expect. Students also had to take ownership of their learning. Andy mentioned that many of his classmates struggled with this notion because in the past the teacher was responsible. All of these things plus requiring students to demonstrate mastery by achieving an 80% on each indicator test caused the students and their parents/guardians to feel unsettled.

The uncomfortable feeling students and parents had about the new process, and the mistakes made by the DPCHS administration regarding communication led to a significant amount of resistance. The change was not embraced by the community of DePaul because for

the first time many “good” students were struggling. They were struggling with the changes in procedures and with the requirement demonstrating mastery on each indicator. As a result of these changes, the parents and students did not feel that their child was being treated fairly. Interestingly, the conversations between parents, administrators, teachers, and board members had rarely focused on whether or not the child was learning. This does not mean that parents were not concerned about the learning of their child. It appears that they struggled in finding the balance between how their child was learning under the new processes of ATW and how their child was feeling regarding the processes and their success. It appears that parents used an if/then scenario. If my child is struggling to learn or my child’s self-esteem is lower, then it must be as a result of this new program. It was difficult for students who had never struggled with math to struggle and it was equally challenging for parents to watch their child struggle. Parent Diana Green shared how surprised she was to watch her child Jacob struggle since he had done well in math.

This case study revealed that the teachers and the administrators of DPCHS found themselves in a difficult position. They had to balance the requirements established by the DOE and the emotional needs of the students that were working through ATW. The teachers and the administrators had difficulty acknowledging that the emotional needs of the students were the leading cause of why implementation was difficult. It was surprising to learn that many of the conversations that teachers, administrators, and board members were having with parents were about how ATW was impacting their child emotionally. No one indicated that they were having conversations with parents about how the child was learning content. The emotional state of students truly impacted implementation. The problem for DPCHS was that the emotional needs

of the students ran counter to the requirements, passing the ECA in order to graduate from high school.

The data indicate that the students performed better on the state assessment during the first two years of implementation. After two years of implementation 82.5% of the students had passed the state ECA. This represents a 66% increase in student passing rates when compared to the last year the pilot test was given. There is still the lingering question that the program was nothing more than test preparation for the ECA. Kim commented that she noticed that students who struggled with algebra I continued to struggle when they were taking algebra II. Megan, who retired in the spring of 2010, began tutoring students during her retirement, commented about the students seeking help for pre-calculus and calculus. She indicated that she spent less time reviewing the algebra concepts because the students really knew the content which allowed her to help them with concepts they were struggling with in pre-calculus or calculus. These two different perspectives on the effectiveness of ATW raise the question of this program being nothing more than test preparation and not truly a mastery program.

Mastery learning does not allow you to reach greater depths when teaching. It is focused on covering the content that is to be tested, which was the premise of ATW. The *Common Core* was designed to limit the standards being taught and expected teachers to go deeper with each one, which in alignment with the expectations of the NCTM. ATW was not designed to go deeper into the content which further calls into question if the students at DPCHS mastered the algebra I content or if they were extremely prepared for the test.

At the beginning of this research, prior to speaking with any participant, I was convinced that what helped DPCHS be successful was the use of mastery as a teaching methodology. Requiring students to show they have mastered the content and moving forward with the course

only when they mastered, led me to believe that this process of instruction would guarantee students were learning. If the instruction guaranteed that content had been learned then DPCHS students were going to be successful on the ECA. Mastery learning was part of the success; along with the changes in classroom processes. But as I conducted the interviews and reviewed the documents I began to understand that what made the difference was the fidelity the teachers had in implementing ATW as it had been designed, their commitment to one another, and their commitment to help students be successful on the ECA. Also, the social network they built between each other is significant. These teachers developed a level of trust between one another that it impacted the implementation of ATW significantly. Had they not worked so well together, ATW may have not made it beyond the first year of implementation. In my opinion, I believe the teachers at DPCHS could have implemented another approach and they could have been equally as successful due to the responsibility the teachers felt they had in helping the students be successful. The teachers had tremendous resolve in handling the negative reaction from the parents and students, which was created by the lack of information provided by the administration. I do believe that the positive results from February and May of 2009 provided the teachers proof that their steadfast approach toward the implementation of ATW was worth the effort.

This case study, although it is small, and it relies on the participants' recollection of events which makes it difficult to make generalizable statements. Social networking between the teachers and fidelity to implementing programs as they had been designed and the commitment of those involved with implementation must be extremely high regardless of the concept being introduced. Resistance to implementation is in direct proportion to the amount of information the stakeholders have about what is going to happen. Additionally, resistance will be higher if

parents believe that their children are being mistreated. All parents want their children to be successful learners. And when parents find that their children are struggling to learn and their children are becoming upset with a lack of success they want to know what is causing both the struggle and negative emotions. This problem is magnified when students may have never had trouble learning specific content, for example math, suddenly they may find difficulty in this content where in the past they had always demonstrated success. Parents want to make sure their children are learning and being treated fairly. If they perceive that their children are not or cannot learn with a new program and they believe their child is not being treated fairly then they will resist the change. Schools today are encountering increased accountability demands that challenge their ability to help students succeed on standardized assessments and support them emotionally through the process when they confront the struggles they may face.



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**Appendix A Interview Questions**

<p><b>Teachers</b></p> <p><b>Initial Question #1</b> Tell me about yourself and your experiences as an educator?  <b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• How long had you worked at DePaul Community High School?</li> <li>• How many years of teaching experience had you prior to the 2008-09 school year?</li> <li>• Prior to 2008-09 how much experience did you have in writing curriculum?</li> </ul>
<p><b>Initial Question #2</b> Tell me about your experiences in implementing Algebra that works?  <b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• What were the steps taken to implement mastery learning at DPCHS?</li> <li>• What were your roles and responsibilities?</li> <li>• How did your classroom practices change from previous years?</li> <li>• If this was your first year of teaching, how different was this teaching experience in comparison to your student teaching?</li> <li>• What was most surprising to you?</li> <li>• What type of training did you receive during implementation?</li> <li>• What helped during the implementation process?</li> <li>• What were some of the biggest obstacles you encountered and what steps did you take to solve them?</li> <li>• What changes did you make during implementation from 2008-09 to 2009-10?</li> <li>• Did ATW change your instructional practice in other subjects? Could you tell me about these changes?</li> <li>• What resources did you utilize during implementation?</li> <li>• Did you feel that students were adequately prepared when they began the course?</li> </ul>
<p><b>Initial Question #3</b> Tell me how the students were responding to this program?  <b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• How did the specifics of this program impact their performance?</li> <li>• What were the biggest hurdles that the students had to overcome?</li> <li>• How did parents and guardians respond to ATW?</li> </ul>
<p><b>Initial Question #4</b> Tell me why you think it was necessary to implement a program of this type?  <b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• What were the actors that led to this decision?</li> <li>• How much work did you have to complete in order to be prepared to teach ATW beginning in 2008-09?</li> <li>• Did you view this program as a success after the first year?</li> </ul>
<p><b>Initial Question #5</b> Research on mastery learning indicates that additional time is necessary to ensure mastery occurs. How did the need for additional time impact your teaching?</p>
<p><b>Initial Question #6</b> Research indicates that school and community culture impacts the implementation and success of new curricular programs. How did culture impact the implementation of ATW?</p>

<p><b>Administrators</b></p> <p><b>Initial Question #1</b> Tell me about your teaching and administration experience?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• What had your experience been with curricular implementation?</li> <li>• Prior to 2008-09 what type of background knowledge did you have regarding mastery learning?</li> <li>• What type of experience did you have in curriculum writing?</li> <li>• Did you feel that this type of program was necessary?</li> </ul>
<p><b>Initial Question #2</b> What was your role during implementation?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• What were the greatest obstacles during implementation?</li> <li>• How did you help the teachers solve their problems?</li> <li>• What type of training was provided to the teachers?</li> <li>• Did you feel that teachers and students were adequately prepared for this type of instruction?</li> </ul>
<p><b>Initial Question #3</b> How did the implementation of ATW impact your work as an administrator?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• Tell me about the greatest challenge or a challenging experience relate to the implementation of ATW?</li> <li>• Tell me a success story about implementing ATW?</li> <li>• What was your perception of the communities' acceptance or resistance of this program?</li> <li>• After the first two years of ATW did you feel the program was a success?</li> </ul>

<p><b>Board Members</b></p> <p><b>Initial Question #1</b> Tell me about your experience as board member?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• Had you worked in education outside of being a board member? Tell me about this experience?</li> <li>• What were your roles and responsibilities as a board member from 2008-2010?</li> <li>•</li> </ul>
<p><b>Initial Question #2</b> During your time as a board member how many curricular implementations occurred?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• What was your level of understanding regarding mastery learning?</li> <li>• How was ATW different than other implementations?</li> <li>• How was ATW presented to you? Did you agree that there was a need for this program? What data was presented to you that justified the change?</li> <li>• During implementation what were your greatest concerns?</li> <li>• Did you feel that the students and teachers were adequately prepared to handle this program?</li> </ul>



<p><b>Initial Question #3</b> How did the community react to the implementation of ATW?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• What were some the challenges you faced as a board member during implementation?</li> <li>• What were your concerns regarding implementation?</li> <li>• How vocal were parents during implementation? How did this input influence you?</li> </ul>
<p><b>Initial Question #4</b> During the second year of implementation what changes did you hope to see?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• In your opinion did the teachers have adequate training? Resources?</li> <li>• When results were shared with you following the first year what was your reaction?</li> <li>•</li> </ul>
<p><b>Parents and Students</b></p>
<p><b>Initial Question #1</b> What were your initial impressions of ATW?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• (S) – In your opinion was the method of instruction different for this class compared to your previous experience?</li> <li>• (P) – How did this method impact your child? How did it impact you?</li> <li>•</li> </ul>
<p><b>Initial Question # 2</b> How were you informed regarding the implementation of ATW?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• (P/S) When did you first learn that the instructional approach for Algebra was going to change?</li> <li>• (P) Did you agree that a change was necessary?</li> <li>• (P/S) Did you feel that you/your child were adequately prepared for this new program?</li> <li>• (P/S) What surprised you the most regarding ATW?</li> </ul>
<p><b>Initial Question #3</b> What was the most difficult transition for you to make as a student?</p> <ul style="list-style-type: none"> <li>• (P/S) Was this method of instruction more difficult for you? Your child?</li> <li>• (P/S) How often did your child/you retest in order to demonstrate mastery?</li> <li>• (P/S) How often did your child/you attend tutoring?</li> <li>• (P/S) Were you/your child able to progress through the course without retaking any module? (If you/your child had to retake modules how long did it take for you/your child to complete this course?)</li> <li>•</li> </ul>
<p><b>Initial Question #4</b> How prepared do you think you were when you took the ECA for the first time?</p> <p><b>Possible Follow-up Questions:</b></p> <ul style="list-style-type: none"> <li>• (P/S) Did your child/you pass this assessment the first time they took it? Did you/your child feel adequately prepared?</li> <li>• (P/S) Do you feel that your child/you would have been successful on the ECA without this approach?</li> <li>• (P/S) Did this program improve your child's/your foundations in math?</li> </ul>

## **Paul Joseph Hamann**

### **Education**

- *Southern Illinois University, Carbondale, IL 1988-1990*
- *Indiana University, Bloomington IN*
  - BA Political Science May, 1992
  - Teacher Certification May, 1994
  - Masters for School Administration June, 2001
  - EdD December, 2015

### **Licensure**

*Government, United States and World History, grades 5-12, Indiana June 2021*  
*Secondary Administrative License June 2021*

### **Experience**

2006-Present Danville Community High School - Principal

- Responsible for the daily operation of the school
- Hire certified and non-certified staff members
- Assist in implementing a 1:1 computing solution, all students have access to an iPad
- Work with other district leaders to implement Mass Customized Learning
- Assist in implementing a mastery learning model for Algebra 1
  - Presented at the 2009 Indiana School Board Association fall conference
- Evaluate all staff members and implement the RISE evaluation model
- Assist in the discipline of students
- Assist in the supervision of events
- 2007 Hendricks County Educator of the Year
- 2008 IASC Administrator of the Year
- 2015 Nominated for Hendricks County Educator of the Year

2001-2006 Danville Community High School - Assistant Principal

- Responsible for the following:
  - Day to day operation of the school
  - Attendance and discipline of all students
  - Evaluation of staff members
  - Assist in the supervision of events

1999 – 2001 Center Grove High School – Administrative Assistant

- Responsible for the following:
  - Handled all the daily and walk-in discipline for 2,000 students.
  - Coordinated the activities of the attendance clerks.
  - Chaired the Student Traffic Safety Committee

- Coordinated entire student convocations.

1995 – 1999 Center Grove High School - Social Studies Teacher

- Responsible for the following:
  - Course assignments included United States History, World, and Ancient World Civilization
  - Worked as a substitute teacher
  - Helped plan and start the successful Freshman Transition Program.
  - Assisted in the curriculum writing for the Ancient World Civilization course.
  - Worked with the Indiana Student Guidance Leadership Program (ISGLP) Took part in the creation of the Academic Advocate Program to be implemented for all ninth graders during the 1999-2000 school year.
  - Contributed to the Professional Development committee
  - Participated in the Roger Taylor curriculum writing seminar and Socratic seminar training.
  - Assisted with the Boys and Girls Swimming and Diving Teams with two state runner up finishes for the girls in 1998 and 1999

1995 – 1996 Center Grove Aquatic Club - Head Age-Group Swimming Coach

- Responsible for the following:
  - Developed swimmers ages 9-14
  - Implemented a new training procedure for all age-group swimmers.
  - Started a masters swimming program
  - Assisted with the senior team
  - Continued the tradition of success that had been present at Center Grove.

1994 -1995 Pine Crest School - Head Age-Group Swimming Coach

- Responsible for the following:
  - Developed swimmers ages 8-14
  - Ran a learn to swim program for students K-2
  - Assisted with the senior national team
  - Assisted with swim camp activities
  - Recruited swimmers for the team
  - Helped win two state championships in the summer 1994 and spring 1995