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Marzano: Transforming research into action

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### Marzano: Transforming research into action

Robert J. Marzano, postmodern researcher, educator and analyst. He is an international trainer and speaker. Marzano is turning the world of education upside down. He views the educational process as being in transition. Undoubtedly known as an expert in both curriculum design and critical thinking, Marzano addresses the need for reformation through the use of research based methods. Many future educators will benefit from the research and practices he and his associates promote. The main purpose of his work has been to translate research and theory into practical implementation for K-12 teachers and administrators.

#### *The Necessity for Change*

The history of education, in particular the 20<sup>th</sup> century, is filled with ubiquitous condemnation. The century began with a huge campaign to improve K-12 schooling lead by the Carnegie Foundation for Advance of Teaching. The first five decades of the century were flooded with various attempts focused on education reformation. Nonetheless, we are presently more affected by the reform efforts that occurred in the second half of the century. The first of these efforts were due to the launching of Sputnik in 1957. Stunned by this occurrence, the U.S. public began to question the capability and thoroughness of our educational system.

The 1960's offered no interruption from the insensitive criticism of public education. It was during this decade the study that arguably produced the most concrete evidence of the inadequacies and failures of public education was conducted. As a part of the Civil Rights Act of 1962, the Commissioner of Education conducted a nationwide survey of the availability of educational opportunity. The study included participants from grades 1, 3, 6, 9, and 12 which included over 640,000 students who took aptitude and achievement tests and were categorized into six ethnic and cultural groups. Sixty thousand teachers were included in the research. They

completed questionnaires that provided information about their background and training. In July 1966, *Equality in Education Opportunity* (Coleman, et al. 1966) was published containing the results of the research. The compilations, known as the Coleman report illustrated a dismal view of the power of public education:

Taking all of these results together, one implication stands above all that schools bring little to bear on a child's achievement that is independent of his background and general independent of his background and general social context; and that this very lack of an independent effect means that the inequalities imposed on children by their home, neighborhood, and peer environment are carried along to become the inequalities with which they confront life at the end of school. (p.325)

The most detrimental sentiment of this report was that public education (teachers) could not make a difference. The findings, supported by statistic data, indicated that educators are only 10 percent effectual while 90 percent of the ability for students to achieve is influenced by the student's background characteristics.

During the 1960's and 1970's, the nation viewed public education as mediocre at best. The scrutiny deepened during the 1980's as opinions submerged even lower than previous years. As Peter Dow (1991) explains in his book *Schoolhouse Politics: Lessons from the Sputnik Era*:

In 1983 educators and the general public were treated to the largest outpouring of criticism of the nation's schools in history, eclipsing even the complaints of the early 1950's....They spoke of the fragmented state of the school curriculum, the failure to define any coherent, accepted body of learning, the excessive emphasis on teaching isolated facts, and the lack of attention to higher order skills and concepts. They called for more individualism of instruction, the development of a closer relationship between

teacher and students, and methods that encourage the active participation of the student in the learning process. (p. 243)

Public education was once again at the mercy of a solitary report. As a result of the publication of *A Nation at Risk* in 1983 by the National Commission of Excellence in Education, The American public, yet again, decided that American schools were deficient and educators were unable to satisfactorily educate our youth. Unfortunately for public education, a wave of additional assessments and evaluations followed the report. In 1989, an educational summit was attended by the nation's governors and the President to establish national goals in terms of education for America's youth. A commitment to a set of National Education Goals was declared in 1990 by the president and the governors of the United States. As discussed in Pai, Adler and Shadiow, in 1991, President George Bush released *America 2000, An Educational Strategy* which included the six goals that had been agreed to at the governor's conference. These goals, intended to be reached in the year 2000, called for:

1. All children to be prepared to start school ready to learn.
2. A high school graduation rate of at least 90 percent.
3. A high level competence in challenging subject matter.
4. Scoring first in the world in science and mathematics achievement
5. Adult literacy necessary to compete in a global economy and to exercise the rights and responsibilities of citizenship and
6. Drug and violence free schools. (p. 90)

Although *A Nation at Risk* continued to cast a clouded view of public education well into the 1990's, another research, the Third International Mathematics and Science Study (TIMSS) was seen as confirmation of the decline of U.S. education. Marzano explains, "it involved a

large scale, cross-national comparison of the education systems in 41 countries. TIMSS researchers examined mathematics and science curricula, instructional practices and school and social factors” (2003 p.3). Basically, U.S. 4<sup>th</sup> graders performed adequately: 8<sup>th</sup> graders below basic and 12 graders performed disappointingly. It appeared as though the longer a student remained in the U.S. education system the more apt he was to be labeled academically unsuccessful.

In January 2002, President George W. Bush signed into law the reauthorization of the Elementary and Secondary School Act known as No Child Left Behind.(Pai, et al. p.90). This law established a national standard that would manifest itself by 2013. All students would be proficient in literacy and mathematics, irregardless to their income, race, ethnicity or language. The United States education system has constantly been in a cycle of reform. The research overwhelmingly paints a dismal picture for the future of public education. Despite the fact that investigations have typically shown results that demean our public education system, Marzano uses research to constructively guide the field in a positive direction. Marzano is somewhat of a behaviorist. He stresses that there are key routines of effective teachers and administrators and has supported his view by the practical use of research. He (2003) views education as being in a state of rebirth. “My case for the position that public education is at the dawn of the best of times is not necessarily based on refuting the reports mentioned...My basic position is quite simple. Schools can have a tremendous impact on student achievement if they follow the direction provided by the research” (p.4). The following figures show the results of the Coleman report from two different perspectives. Figure 1.1 is based on the original Coleman findings that schools account for only 10 percent variance in student achievement. Figure 1.2 is based on a 20 percent variance in student achievement.

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Figure 1.1

## Reinterpretation of Coleman's Finding Using the BESD

Group	Outcome	
	Percentage of Students Who Pass the Test	Percentage of Students Who Fail the Test
Effective Schools	65.8%	34.2%
Ineffective Schools	34.2%	65.8%

BESD = Binomial Effect Size Display

Note: From: *What Works in Schools :Translating Research Into Action* (p. 6) by R. J.

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Figure 1.2

## Effective Versus Ineffective Schools, Assuming 20 percent of Variance

Group	Outcome	
	Percentage of Students Who Pass the Test	Percentage of Students Who Fail the Test
Effective Schools	72.4%	27.6%
Ineffective Schools	27.6%	72.4%

Note: From: *What Works in Schools :Translating Research Into Action* (p. 8) by R. J.

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*How does research fit into reform?*

An enormous amount of research has been conducted at many research centers and universities. However, non-educators and educators alike have had very little regard for the statistical results, implying that educational research is not as scrupulous or conclusive as the research in the hard sciences such as chemistry and physics. The consensus that educational research was not conclusive was the focus of a 1987 article written by Larry Hedges entitled, *How Hard is Hard Science: How Soft is Soft Science?* He studied 13 disciplines in education and psychology holistically referred to as the social sciences, and compared them to physics. The results from the comparison indicated that in terms of variability they were almost indistinguishable: “Almost 50% of the reviews showed statistically significant disagreements in both the social sciences and the physical sciences” (p. 450). Consequently, studies in physics show the same inconsistencies in outcomes as do studies in education--one shows that a particular technique does not work while another study indicates that it does. Hedges’ concludes that in terms of rigor research in the soft science such as education is undeniably comparable to research in the hard science. He suggests that educators like researchers in hard sciences, look for general trends in the findings from studies. (p. 454). In other words, findings from no single study or even a small set of studies should be taken as the final word on whether a strategy or approach works well. It was recommended that the analysis should include as many studies as possible. The composite results of those findings should be considered the best estimate of what is known about that topic. This type of comparison is called meta-analysis.

Meta-analysis is most useful in analyzing effective teachers. A meta-analysis combines the results from a number of studies to determine the average effect of a given technique. When conducting a meta-analysis a researcher translates the results of a given study into a unit of

measurement referred to as an effect size. An effect size expresses the increase or decrease in achievement of the experimental group (the group of students who are exposed to a specific instructional technique) in standard deviation units. Marzano (2003) believes that if we use the 35 years of research in a positive intensely directed manner we would then produce schools that are effective and produces more enhanced achievement. He makes three assertions that support the use of research. Assertion 1: Even those studies that have been interpreted as evidence that schools do not significantly affect student achievement do, in fact, support the potential impact of schools when interpreted properly. (p.5) Assertion 2: The research on the effectiveness of schools considered as a whole paints a very positive image of their impact on student achievement. (p. 6) Assertion 3: The schools that are highly effective produce results that almost entirely overcome the effects of student background. (p. 7) There are three broad categories in which the research to support effective schools has been divided; school-level factors, teacher level factors, and student-level factors.

### *The School-Level Factors*

“Leadership is considered to be vital to the successful functioning of many aspects of a school.” (Marzano, J, Waters, T and McNulty B., 2005 p. 5) Marzano describes the five school based factors successful leaders utilize.

A guaranteed and viable curriculum is the most important of the school level factors which can impact student achievement. It is also the most difficult to implement. Using the combination of opportunity to learn and time presents problems due to the current standard based revolution. Schools are charged with organizing the vital versus support content and assessing the order in which the materials are taught. Teachers must effectively utilize the time allocated for instruction and succinctly cover content as recommended.

Challenging goals and effective feedback is the second school-based factor. Establishing objectives that support high expectations for the school, teachers and the students is essential to meet standards. These objectives must correlate with an assessment system that provides feedback in a timely manner. The review of the assessment should address specific skills and knowledge. The school should generate their own tests, evaluating only the materials that have been taught; therefore state-developed tests would be inappropriate.

Three aspects of the third factor parent and community involvement are: mechanisms for communication, involvement in the day to running of the school, and the use of governance structures. (2003, p. 52). The fourth school-level factor, which according to Blooms taxonomy would be first, is a safe and orderly environment. School-wide rules, procedures, and the consequences in the event of violation of such regulations are in place. Programs that encourage student responsibility and self discipline are systematically implemented.

The fifth factor deals with professionalism and collegiality. As shown in the following figure, researchers use a variety of descriptive terms for this factor as well as the other factors. Edmonds used administrative leaders, Levine and Lezotte use strong leadership and practice oriented staff development. Sammons calls it professional leadership, shared vision and goals, and a learning organization (Marzano, 2003, p. 60) this addresses teacher interaction, collaborative efforts, respect for each other and the profession.

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Table A

Comparing School-Level Factors Across Researchers

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The School Level	Rank*	Marzano	Scheeners	Sammons	Levine	Edmonds
Factors			and		and	
			Basker		Lezotte	

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Guaranteed and Viable Curriculum	1	Opportunity for Learning Time	Content Coverage Time	Concentration on Teaching and Learning	Focus on Central Learning Skills	Emphasis on Basic Skill Acquisition
Challenging Goals And Effective Feedback	2	Monitoring	Monitoring	High Expectations	High Expectations and Requirement	High Expectations for student Success
		Pressure to Achieve	Pressure to Achieve	Monitoring Progress	Appropriate Monitoring	Frequent Monitoring of Student Progress
Parental and Community Involvement	3	Parental Involvement	Parental Involvement	Home School Partnership	Salient Parental Involvement	
Safe and Orderly Environment	4	School Climate	School Climate	A Learning <u>Environment</u> Positive <u>Reinforcement</u> Pupil rights and Expectations	Productive Culture and	Safe and Orderly Atmosphere Conducive to Learning
Collegiality and Professionalism	5	Leadership	Leadership	Professional <u>Leadership</u>	Strong Leadership	Strong Administrative

Cooperation	Cooperation	Shared vision	<u>Practice</u>	Leadership
		<u>and Goals</u>	Oriented Staff	
		A Learning	Development	
		Organization		

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Authors have ranked these factors by order of impact on student achievement.

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### *Teacher Based Factors ~ Research Based Strategies for Teachers*

School based factors were discussed first primarily due to the broad nature of its content. Effective schools as a whole share the characteristics found within those factors. More specifically, what the individual teachers do to execute learning produces higher student achievement levels. Marzano presents nine strategies that research supports as instrumental for the effective teacher.

The first strategy is identifying similarities and differences. By using the student's knowledge base and guidance, presenting new information in a manner in which the student compares similarities and differences enhances students' understanding of and the ability to use the new knowledge. To assists students, it is best to directly illustrate these differences and similarities between topics and or information. However, Marzano (2001) states, "Being direct in pointing out similarities and difference does not mean that instruction must be rigid or didactic" (p.15).

Students should be allowed the opportunity to make correlations of similarities and differences without the assistance of the teacher. At first, this generalization might appear contradictory to the first, but according to Marzano, it is not (2001, p. 16). It is easily assumed that the activities that are teacher directed will result in conclusions that are more homogeneous. Adversely, student directed activities will produce conclusions that are more heterogeneous. Teachers should participate in both forms of activities to achieve various level of understanding. The presentation of the lesson also depends on the objective of the lesson. If the conclusion is one dimensional, a teacher directed activity is suitable, however if more divergent responses is the goal, a student directed activity should be given. Pictorial representation or statistical information displayed in graphs and charts allow students to make comparison through observations. Utilizing graphic and symbolic representation is one of the more powerful findings that support teaching through the use of similarities and differences. "Research indicate four different forms of this activity are highly effective and enhance students understanding of material: comparing, classifying, creating metaphors and creating analogies" (2001, p 16).

The second of the nine strategies is summarizing and note taking. Summarizing is a more in depth activity than one would consider. A student must be able to synthesize the information. Summarizing entails qualifying information. The student must keep the important data, alter, change or substitute and or discard irrelevant information. Students struggle with this skill. To effectively summarize students can not function on either ends of the spectrum. Some students take too few notes while others attempt to record everything verbatim. Although it is better to have more notes than less, the information must be valuable to the process. Notes will be used to build a foundation of understanding. The student can study these notes in preparation for assessment.

Reinforcing effort and providing recognition is the third strategy. Many students don't believe that achievement will be enhanced merely from the increase of their effort. Teachers should continuously encourage students to give it their all. Counselors have stressed the importance of self esteem for success. Reinforcing a student's effort provides guidance and shows appreciation for the newly learned knowledge. "Students can learn to change their beliefs to an emphasis on effort. One of the most promising aspects of the research on effort is that students can learn to operate from a belief that effort pays off even if they do not initially have this belief" (2001, p. 50).

Homework and practice inclusive is the fourth strategy. There has been a lot of controversy about the use of homework. Kohl expressed his disapproval of homework in *Abusing Research: The Study of Homework and other Examples*, "...looked at students of different ages but found no positive effect for the younger children—only a negative effect on their attitudes (2006. p. 16). Marzano rebuts this accusation in his article, *Responses to Kohn's Allegations*. "We noted that Harris Cooper's meta-analysis of the research had reported a positive general effect for homework but this effect was not consistent across the grade levels...the report effect size for the 4-6 grade level band was only 15 which translates into an expected gain of about 6 percentile points...Cooper still recommended homework for elementary students even though the effect size was relatively small (p. 4).

Homework should be issued intently. Assignments should be grade appropriate, younger students should receive less homework than those in middle and high school. The assignment should be a task students can complete without a lot of help from their parents. "Perhaps the most important advantage of homework is that it can enhance achievement by extending learning beyond the school day" (R.J. Marzano & D.J. Pickering, 2007, p. 76). Timely comments are

necessary for homework to be meaningful. A fair amount of time should be given to structured practice for a student to master a skill. According to Marzano, “a student must practice at least 24 times before 80 percent competency can be achieved (2001 p. 67). During the practice students should shape what they have learned into information and context that is significant. This process is often one that teachers are inattentive, choosing to move on before students have actually mastered the concepts. Ultimately this results in poor performance on assessments.

The fifth strategy is has been used by elementary teachers on a regular basis. Nonlinguistic representation allows the student to illustrate their understanding of the concepts frequently clearer than the traditional assessment methods. In districts where diverse population abound, using non-linguistic representation students can communication knowledge utilizing graphs, charts, pictures, demonstrations and models.

Cooperative learning is the sixth strategy for effective teachers. Marzano cites, David Johnson and Roger Johnson (1999) recognized leaders in the field of cooperative learning, there are five defining element of cooperative learning:

1. Positive interdependence (a sense of sink or swim together).
2. Face to face positive interaction (helping each other learn, applauding success and efforts)
3. Individual and group accountability (each of us has to contribute to the group achieving its goals)
4. Interpersonal and small group skills (communication, trust, leadership, decision making, and conflict resolution)
5. Group processing (reflecting on how well the team is functioning and how to function even better) (2001, p.85).

Grouping according skill and ability level should be kept to a minimum. Homogeneous groups where all the students are on the same level seem to have a positive affect on students, however the group could be stagnant. Mixed groups, those that heterogeneous in design are most effective in terms of achievement. “Cooperative groups should be kept rather small in size, in teams of three or four seem more effective than larger groups” (Marzano, 2001, p. 87). Although cooperative groups are especially useful for discovery learning, interactive projects and activities in which critical thinking is necessary teachers should be mindful not to overuse the system. Group work can not take the place of independent practice or individual evaluation..

What is the objective of the lesson? Exactly what do you want your students to achieve? Goal setting and feedback is seventh strategy. This is probably one of the most important of all of the strategies. Successful people are masterful organizers and goal setters. Most establish short and long term objectives for themselves and others. Goal setting gives the educator and the student direction for learning. This step is essential for the student, especially those who may have difficulty getting and staying on task. A goal narrows the material so that students can focus on what is important at that particular time. However, well thought out goals being specific should also allow a little freedom for creative growth and critical thinking outside of the box. As goals are attained immediate feedback should be assessable to the student. Verbal, written or non-linguistically, students require clarification of the work they have completed. Marzano (2001) explains in depth the importance of feedback for the student:

1. Feedback should be corrective in nature. This means that it provides students with an explanation of what they are doing that is correct and what they are doing incorrectly.

2. Feedback should be timely. Feedback given immediately after a test-like situation is best. In general the more delay that occurs in giving feedback, the less improvement there is in the achievement.
3. Feedback should be specific to a criterion. For feedback to most useful, it should reference a specific level of skill or knowledge. A different way of saying this is that feedback should be criterion-referenced as opposed to norm-referenced. When feedback is norm-referenced, it informs students about where they stand in relationship to other students. This tells students nothing about their own learning. Criterion-referenced feedback tells students where they stand relative to a specific target of knowledge or skill (p. 99).

Generating and Testing Hypothesis-Research and Theory is the eighth strategy. A critical skill that students need is the ability to generate hypothesis. There are two approaches to creating a hypothesis: deductive and inductive. If a student can make a prediction about a future event or action by using a general rule he has developed his deductive skill to hypothesize. Inductive thinking is the process of developing new conclusions from data we know or data that is presented at the time. Students should be taught the skills to test their hypotheses.

“Teachers should ask students to clearly explain their hypothesis and their conclusions. A fair amount of research has demonstrated the power of asking students to carefully explain- preferably in writing- the principles they are working from the hypotheses they generate from these principles, and why their hypotheses make sense” (Marzano, 2001 p.105). This process of explaining their thinking helps students intensify their grasp of the principles they are applying.

Strategy Nine: Cues, Questions and Advance Organizers, Although it may seem to draw interest of the student, teachers should not focus on the unusual or the contrary cues and

questions should be directly related to what is important. “Higher level questions produce deeper learning than lower level questions. A fair amount of research indicates that questions that require students to analyze information—frequently call higher level questions—produce more learning than questions that simply require students to recall or recognize information frequently referred to as lower-order questions.” (Marzano, 2001 p.117) The concern arises due to the fact that teachers often ask students lower level questions. Another critical practice for teacher is to allow think time. By waiting briefly, giving students some time to really reflect, the teacher receives answers that are creative and are usually more in depth. Wait time is a highly effective tool and is relatively simple to implement. Effective questioning can stimulate a learner’s interest. Typically, we consider questioning as a part of assessment; however, questioning can be used as an instrument to keep students engaged throughout the lesson.

### *The Student Level Factors*

Both theory and research regard student level factors as being most influential in the achievement of the student. There are three indicators that have been identified: home environment, learned intelligence and background knowledge and motivation. Home environment is eminently unrelated to socio economic position as a specific alterable set of behaviors that have a much stronger relationship with student achievement than do household income, occupation, and education. There are three aspects of the home environment. Communication about school is the first of the elements in the home environment which influences educational achievement. Many students neglect to discuss activities that are occurring at school with their parents. The act of separating school from home is usually what students select to do, due to their own lack of interest. Supervision at home is also a very important factor. Instead of students being properly supervised at home, parents are not always

available. Parents may not have a choice. Survival demands may very well cause parents to be away from the home fulfilling the necessity to work. Middle school students care for their younger siblings and at-home school work is abandoned.. The third, and probably the most significant, is parental expectations. Parents who had difficulty in school revert to their own experiences and accept low performances from their children. Also often parents have different expectations for their children from those of the school. Parents expect their children to assist in the home and perhaps complete tasks that are typically the responsibility of an adult. The family structure dictates the expectations of the student. Student achievement severely suffers when the student lives in a household guided by parents with very poor parenting skills.

Marzano discuss' the difference in crystallized and fluid intelligence. "Crystallized intelligence has the stronger relationship with academic achievement" (2001. p.145). Although background knowledge and crystallized intelligence are exactly the same in relationship to academic achievement, there is a strong link between crystallized intelligence and vocabulary knowledge. This theory base implies a combined program of broad reading and direct vocabulary instruction can directly enhance academic or learned intelligence.

The research and theories in regards to student motivation is in essence a complicated set of dynamics interacting parts that direct students to either be highly resistant to motivation or extremely motivated. There are many elements that affect how motivated a student will be. The students attributions, the students' desire for self-worth, the students drive to success or failure avoidance along with the students self system collaborate to create the students motivational level.

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Figure 1.4

Comparing Student-Level Factors Across Researchers

Student Level Factors	Bloom (1976)	Walberg(1980)	Fraser et al(1987)	Marzano(2000)
Home environment			Home environment	Home environment
Learned intelligence	Cognitive	Ability or prior	Ability	Aptitude
Or Background Knowledge	characteristics	achievements or Development		Prior Knowledge
Motivation	Affective Characteristics	Motivation or self concept	Motivation	Interest

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*The Changing Spirit of School Reform*

Anyone who knows the educational history of the United States is quite aware that it is flooded with reform efforts. Marzano comprehends the necessity for a new type of reform. The three contributing factors discussed in this paper barely scrap the surface in terms of a total reformation. However, according to Marzano, these recommendations put into action can change the effectiveness of a school, teacher or a student. It is interesting to note that Marzano has a grasp on the present educational dilemma but completed very little research himself. He has used the results of others to confirm the need to make improvement in the U.S. educational

system. Marzano has the characteristics of a modified behaviorist theorist. Behaviorist theories of learning seek scientific, demonstrable explanations for simple behaviors. His recommendations are research based explanations for academic achievement. He believes that research based strategies are grounded and could revolutionize our educational system promoting academic excellence. There are some glitches with the strategies. He assumes that if these strategies are followed, positive results will always be rendered. Although there is a tendency to encourage the use of these strategies, the implementation of this model must be adapted to support the needs of individual schools. Staff development must be thorough. Halfhearted attempts to use the strategies may not achieve the desired success. The entire faculty must understand the importance of execution to capitalize and receive the most triumphant outcome for its students.

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