Maximizing Student Achievement: Using Student-Centered Learning

By

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2017 Annual Conference of the Science

Teachers Association of Texas (STAT)

November 9-11, 2017

Houston, Texas 77010

CAST 2017
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CAST 2017: 60th Anniversary: Advocacy, Professional Development, Networking

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The document is from a featured presentation at the 2017 annual conference of the Science Teachers Association of Texas (STAT) in Houston, Texas, November 2017. The conference presentation began stating questions teachers should ask: (1) what knowledge and skills do my students need; (2) what knowledge and skills do I need; (3) how can I deepen my professional knowledge; (4) how can I engage my students in new learning; and (5) what has been the impact of my changed actions.

The speakers then proceeded to answer these questions first by looking at the school and the teacher. Utilizing research findings of Robert Marzano (2003) and John Hattie (2009, 2012), the presenters identified approximately 30 attributes, grouped under seven high-impact areas, that had a major impact on student learning and achievement. These attributes and the seven high-impact components are all identified in this document with their respective effect sizes (ES) and their percent impact on student achievement.

The presentation was about the power of teachers, student feedback, and what really works in schools to improve student learning: a safe and collaborative culture, effective teaching in every classroom, student feedback, a guaranteed and viable curriculum, standard-reference reporting, and competency-based education (Hattie & Timperley, 2006; Marzano, Warnick, & Simms, 2014).

The presenters also noted Hattie's first book, *Visible Learning* (2009), was based on his 15 years' research synthesis of more than 800 meta-analyses of 50,000 research articles, 150,000 effect sizes, and 240,000,000 students primarily in North America. The book represented evidence-based research into what actually worked in schools to improve student learning. His recent second book, *Visible Learning for Teachers* (2012), took the next step by explaining how to apply the principles in *Visible Learning* to classrooms. Appendix C of his book rank-ordered the 150 influences that have had the greatest effect on student achievement, noting that 46 of his top 50 educational influences (92%) were within the school's control. Hattie set down what is being seen as a milestone in educational research, and his effect size method of evaluation for student achievement is now commonly understood worldwide.

In his 2009 book, Hattie identified the most successful methods of teaching: acceleration (ES +0.88, +31%); reciprocal teaching (ES +0.72, +26%); problem-solving teaching (ES +0.61, +23%), and student's self-verbalization/self-questioning (ES +0.64, +24%). Problem solving has traditionally been the most common method of teaching science and math. In his 2012 book, Hattie took the next-step and identified the underlying reasons for the success of these methods: the influence of peers, feedback to students, transparent learning intentions and success criteria, teaching multiple strategies, and attending to both surface and deep knowing. The least effective teaching methods seemed to focus too much on depth to the detriment of first attending to surface knowledge or skill development, failing to take into account similarities (examples) versus overemphasizing differences (non-examples), and not involving peers (p. 94).

Furthermore, the leadership role of administrators must be clearly defined (Hattie, 2012, p. 175; Padavil, 2016, p. 7). The impact of transformational leadership on student achievement is ES +0.11, whereas the impact of instructional leadership is ES +0.42. In their meta-analysis, Robinson, Lloyd, and Rowe (2008) found the impact of instructional leadership on student achievement was (ES +0.42, +16%), and the effects were strongest in promoting teacher development (ES +0.84, +30%), establishing goals (ES +0.42, +16%), overseeing teaching and the curriculum (ES +0.42, +16%), aligning resources with priority teaching goals (ES +0.31, +12%), and ensuring a supportive school climate (ES +0.27, +11%). Furthermore, the main factor that explained a teacher's decision to remain in a teaching position or resign related to the nature of school leadership.

Grissom and Loeb (2011) found in their three-year full-day observations of approximately 100 urban principals that informal walkthroughs were negatively correlated with student achievement, especially at the high school level. The evidence of the study suggested this outcome was because principals believed teachers did not view their random walkthroughs as opportunities for professional development, and principals did not use walkthroughs as a part of a larger school-improvement strategy. In contrast, time spent on teacher coaching, evaluating and developing the school's educational program predicted positive student gains. Hattie (2012) suggested the best way to begin and help teachers change was to place more attention on the evaluation of the learning effect sizes from their lessons, and use those as the first discussion point for considering whether the optimal teaching methods had been used (p. 96). The key was the impact on learning and not the method itself.

It was not about whether teachers should use any specific strategy, form professional learning communities, or conduct data teams. It was about teachers' systematic reflection into the effectiveness of the practices that had fostered significant impacts on their students' learning and evaluators paying close attention to the evaluation of the learning effect sizes from teachers' lessons as a method to foster teacher growth and change. If teachers set goals to implement research-based practices that work in their classrooms, they will be much more likely to have major impacts on student learning and close disparities in the student achievement divide.

Following the discussion of the school and the teacher, the presenters discussed topics pertaining to the student and student achievement: (1) students' soft skills; (2) process skills;

(3) why students fail; (4) how to build a classroom culture; (5) characteristics of the great teachers; (6) class engagement examples; (7) using the periodic table and applications in the real world. The presenters next discussed state tests and what teachers could do to prepare students for state testing. This included test strategies, "decoding the test," and how to choose an answer if one was unsure of the question answer. The presenters also discussed a recent ERIC document they had published: "Predicting Student Success on the Texas Chemistry STAAR Test: A Logistic Regression Analysis" (ED534647).

Then the presenters examined the use of Item Response Theory in STAAR test development. This approach to test development differs from classical test development, focusing on test-retest reliability, internal consistency, various forms of validity, and normative data and test standardization. Modern test theory or item response theory (IRT) focuses on how specific test items function in assessing constructs. IRT makes it possible to scale test items for difficulty, design parallel forms of tests, and provide for adaptive computerized testing. Following is a more in-depth article on student-centered learning.

Student-Centered Learning: The New Texas Teacher Evaluation System

By William L. Johnson, Ed.D. & Annabel M. Johnson, Ph.D.

In the fall of 2016, the Texas Teacher Evaluation and Support System (T-TESS) became the official teacher evaluation system for the State of Texas. After 19 years and the vacuum created by a lack of a supportive constituency, the Professional Development and Appraisal System (PDAS) has changed significantly to support teachers in their professional growth: goal-setting and professional development, planning, teacher-evaluation cycles, and student growth measures. The new T-TESS rubric of five performance levels, four domains, and 16 dimensions has been designed to capture the holistic nature of teaching by focusing on teachers and students alike and what's really happening in the classroom. Since T-TESS will require teachers to focus on continuous improvement (Padavil, 2016), how do we proceed to provide timely and practical strategies to promote teacher development and student-centered learning? The authors will identify approximately 30 attributes, grouped under seven high-impact areas, that have a marked and meaningful effect on student learning. The article will be about the power of teachers, student feedback, and what really works in schools to improve student learning.

Robert Marzano’s High Reliability Schools

When educators discuss research in student learning and professional development, it is rare not to hear the names Robert Marzano and John Hattie. Both have clear, specific, and concrete actions teachers can use to significantly increase student learning (Killian, 2015). The author of more than 30 books and 150 articles, Marzano has been the pioneer of large research-based studies in education. His high reliability school framework has shown how best practices, mirrored in the present Texas Educator Standards (§149.1001), work together to impact student achievement: a safe and collaborative culture, effective teaching in every classroom, a guaranteed and viable curriculum, standards-referenced reporting, and competency-based education (Marzano, Warrick, & Simms, 2014).

In Marzano's 2003 book, *Classroom Management that Works,* he found the most important factor affecting student learning was the teacher, and teacher classroom management most affected student achievement. He listed four action steps to plan for individual classroom management and gave the average effect size of each: establishing rules and procedures (-.76, -28%), implementing disciplinary interventions (-.91, -32%), fostering teacher-student relationships (-.87, -31%), and developing a positive mental set (-1.29, -40%). The effect size of -.91 meant when disciplinary procedures were used effectively, the average number of classroom disruptions was 32% less (a 32 percentile decrease) than in those classes that did not employ effective disciplinary actions (p.8). Furthermore, the effects of classroom management for student engagement and achievement were +.62 (a 23 percentile increase) and +.52 (a 20 percentile increase) respectively. His research also showed teachers' actions in their classrooms had twice the impact on student achievement than did school policies regarding curriculum, assessment, staff collegiality, and community involvement (Marzano, 2003). The distinction, however, was not less about school policies but more about the excellence in teachers that made the greatest differences in student learning.

John Hattie's Visible Learning for Teachers

John Hattie, Professor and Director of the Melbourne Education Research Institute at the University of Melbourne, Australia, has been praised for ushering in a new era of school reform and bringing education research to classroom teachers. His 1992 pioneering synthesis of 134 meta analyses demonstrated the practical utility of calculating average effect sizes across school factors like methods of instruction and learning strategies. Based on his 15 years' research synthesis of more than 800 meta-analyses of 50,000 research articles, 150,000 effect sizes, and 240 million students primarily in North America, Hattie's first book, *Visible Learning* (2009), represented evidence-based research into what actually worked in schools to improve student learning.

His recent second book, *Visible Learning for Teachers* (2012), took the next step by explaining how to apply the principles of *Visible Learning* to classrooms. His book has user-friendly summaries of the most successful educational interventions and instructional strategies impacting student learning. Appendix C of his 2012 book rank-ordered the 150 influences that have had the greatest effect on student achievement, noting that 46 of his top 50 educational influences (92%) were within the school's control. Hattie set down what is being seen as a milestone in educational research, and his method of evaluation for student achievement (effect size) is now commonly understood worldwide. Although the correlation coefficient (r), the multiple correlation coefficient (R), and the percent of variation (PV) have been referred to as effect sizes in research, the standard effect size difference method translates the difference between experimental and control group means into a Z-score form with a mean of zero and a standard deviation of one (Johnson & Johnson, 2012). And for any school intervention to be considered worthwhile, it needs to show an improvement in student learning of at least +.40 (an average effect size gain from a year's schooling). Furthermore, it would seem appropriate to posit when less than 70% of the students in a class are not learning (failing), the teacher might review the four elements of classroom management just discussed and consider that the most powerful effects on student learning are related to features within the school and the classroom teacher: classroom climate (+.56, +21%), peer influences (+.53, +20%), and the lack of disruptive students (+.68, +25%). Furthermore, since teacher-student relationships (care, trust, respect, cooperation, and team skills) have such a large effect size (+.72, +26%), teachers should begin learning their students' names at the first of school, identifying their class leaders, building relationships with all their students, and greeting students at the classroom door between class changes. At its most fundamental level, school is all about relationships. Knowing Marzano's best practices, Hattie's 150 influences on learning, and the impact of each effect size on student learning will provide teachers with impact strategies that underpin productive student achievement.

Seeking a Language of Learning and Instruction

The model of teaching and learning we are discussing combines teacher-centered teaching with student-centered learning and knowing. However, considering the high levels of student and teacher variability, how do we address this variability? Our solution is to focus on what works and what doesn't work in the classroom (research-based strategies and practices). We refer to this as 'the language of learning and instruction.' This language will allow educators worldwide to communicate using a research-based 'economy of scale.' For example, Hattie and Timperley (2006) identified the three dimensions of teaching that were critical for student learning: challenge (+.90, +32%), deep representation (+.75, +27%), and feedback (+.75, +27%). Challenge refers to students' current performance and understanding, deep representation to the teachers' ability to know what to teach and how to organize and use content information according to their students' needs, and feedback to the teachers providing confirmation where the students are in their learning and that feedback is appropriately delivered and received. Across all grades, when instruction was challenging, relevant, and academically demanding, all students had higher engagement, teachers talked less, and the greatest beneficiaries were at-risk students (Hattie, 2012, p. 80). Many classes are dominated by teacher talk between 70 and 80 percent of class time, but such talk produces the lowest student engagement and there is little teacher listening. This is not suggesting that no learning is happening; however, the power of feedback is rarely operationalized in such situations. Instead, feedback comes into its own with dissonance when students do not know, do not know how to choose the best strategies, do not know how to monitor their own learning, or do not know where to go next (Hattie, 2010, p. 138).

In his 2009 book, Hattie identified the most successful methods of teaching: acceleration (+.88, +31%), reciprocal teaching (+.72, +26%), problem-solving teaching (+.61, +23%), and students' self-verbalization/self-questioning (+.64, +24%). Problem solving has traditionally been the most common method of teaching science and math. In his 2012 book, Hattie took-the-next-step and identified the underlying reasons for the success of these methods: the influence of peers, feedback to students, transparent learning intentions and success criteria, teaching multiple strategies, and attending to both surface and deep knowing. The least effective teaching methods seemed to focus too much on depth to the detriment of first attending to surface knowledge or skill development, failing to take into account similarities (examples) versus overemphasizing differences (non-examples), and not involving peers (p. 94).

In his 2012 book, Hattie reported that homework was number 94 (+.29, +11%) in his 150 rank-ordered influences, but page 12 of his book gave the effect size of homework for elementary-school students as negative (-.08, -3%), while the effect size for high-school students was positive (+.50, +19%). What does this say about assigning homework to elementary-school students? Hattie noted learning increased about 22% when teachers provided notes (handouts), typically with sample problems and solutions, and that the average of all the effect sizes on homework improved the rate of student learning by 15 percent. But using short-cycle formative assessments in math and science, assessments conducted between two-and-five times per week, the rate of student learning increased to about 70 percent (Black et al., 2003). Subsequently, Leahy and Wiliam (2009, p. 15) found the use of ‘in-the-moment’ formative evaluation practices integrated into the minute-to-minute and day-to-day activities brought about substantial increases in student achievement in the order of a 70-to-80 percent increase in the rate of learning. This research is appealing for several reasons: bringing a fivefold increase in the rate of student learning, using frequent feedback to improve student achievement by re-teaching or modifying teaching and learning activities, and lessening the time teachers spend grading stacks of homework. Furthermore, Hattie and Timperley (2006) found the systematic use of formative classroom assessment in all classes had a powerful effect on student learning (+.90, +32%), more than twice the average effect of all the 150 influences on student learning. And if this effect size were achieved on a nationwide scale, it would be the equivalent of raising the math achievement of the United States into the 'top five' nations worldwide after the Pacific rim countries of Singapore, Korea, Japan, and Hong Kong (p. 61). These examples exemplify the new language of learning and instruction in professional dialogue using research-based strategies and practices.

Leadership Characterization in T-TESS

In the new teacher evaluation system, instructional leaders will attend to the quality of student learning, visit classrooms, and interpret evidence about the quality and nature of learning in the school (Hattie, 2012, p. 174). In their meta-analysis, Robinson, Lloyd, and Rowe (2008) found the impact of instructional leadership on student achievement was (+.42, +16%), and the effects were strongest in promoting teacher development (+.84, +30%), establishing goals (+.42, +16%), overseeing teaching and the curriculum (+.42, +16%), aligning resources with priority teaching goals (+.31, +12%), and ensuring a supportive school climate (+.27, +11%). Interestingly, Grissom and Loeb (2011) found in their three-year full-day observations of approximately 100 urban principals that informal walkthroughs were negatively correlated with student academic achievement, especially at the high school level. The evidence of the study suggested this outcome was because principals believed teachers did not view the walkthroughs as opportunities for professional development, and principals did not use walkthroughs as a part of a broader school-improvement strategy. In contrast, time spent on teacher coaching, evaluating, and developing the school's educational program predicted positive student gains. Hattie (2012) suggested the best way to begin and help teachers change was to place more attention on the evaluation of the learning effect sizes from their lessons, and use those as the first discussion point for considering whether the optimal teaching methods had been used (p. 96). The key was the impact on learning, not the method. Furthermore, teachers should answer the following questions: what knowledge and skills do my students need, what knowledge and skills do I need, how can I deepen my professional knowledge, how can I engage students in new learning experiences, and what has been the impact of my changed actions.

The success of T-TESS will depend largely on the beliefs and construction of the instructional leaders' role (Hattie, 2012, p. 175; Padavil, 2016, p. 7), the fidelity of T-TESS implementation without a state-level initiative to enable expanded capacity, and the present widely-divergent capacity challenges to local school districts in a new system that is more labor intensive than was PDAS. Going unsaid are teachers' concerns about the State of Texas maintaining the repealed federally-dictated student growth provisions and about the true intent of the new system that was to be formative in its construction.

Summary and Conclusion

Following the basic Athenian ideas about education, not much changed for the next 2000 years. But in the last few decades, researchers have begun conducting real, evidence-based research into what really works and what really doesn't work in school, teaching, and learning to increase student achievement. Research sources in this article can be thought of as an ecology of student learning. This article has shown the single most important factor affecting student learning is excellence in teachers and what great teachers do in their classrooms. Using the model of teaching and learning discussed in this article, we presented approximately 30 educational strategies and practices grouped under seven high-impact areas affecting student achievement. Following are the estimated percentile effects calculated from the pooled effect size averages of each group: planning for classroom management (33% decrease in student disruptions), student learning and school features (+23%), dimensions of instruction (+29%), teaching methods (+26%), student homework (+15%), feedback/formative assessment (+32%), and instructional leadership (+17%). The message of this article was not about whether teachers should use any specific strategy, form professional learning communities, or conduct data teams. It was not about any process becoming a mantra. It was about teachers' systematic reflection into the effectiveness of the practices that had fostered significant impacts on their students' learning and about evaluators paying close attention to the evaluation of the learning effect sizes from teachers' lessons as a method to foster teacher growth and change. If we set goals to implement research-based practices that work in our classrooms, we will be much more likely to have major impacts on student learning and close disparities in the student achievement divide. With the research cited in this article, we have many examples of a language of learning and instruction to bring about substantive student learning in all our classrooms.

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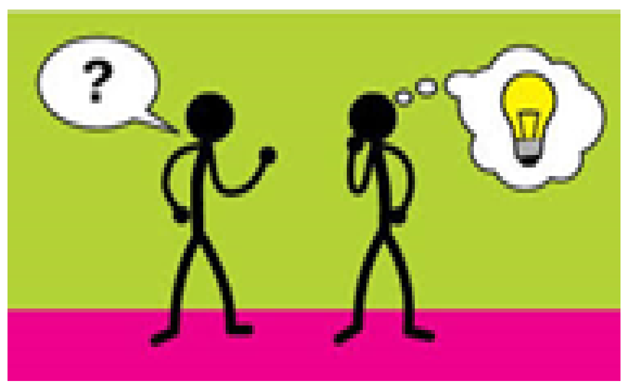
Abstract

When educators discuss research in student achievement, it is rare not to hear the names Robert Marzano and John Hattie. Both have clear, specific and concrete actions teachers can use to significantly increase student achievement. Using the research of Marzano and Hattie, the presenters will identify and list the calculated effect sizes of approximately 30 attributes, grouped under seven high-impact areas, that have a marked and meaningful effect on student learning. The session will identify what really works in schools to improve student learning, will support teachers in their professional development, and will apply to all 6-12 schools.

Questions Teachers Should Ask

- What knowledge and skills do my students need?
- What knowledge and skills do I need?
- How can I deepen my professional knowledge?
- How can I engage students in new learning?
- What has been the impact of my changed actions?



Outline for CAST Session

- **The School and the Teacher** — The curriculum and what research is finding out about student success
- **The Student** — MAP test results; Other student issues
- **State Testing** — Decoding the test; Test taking strategies

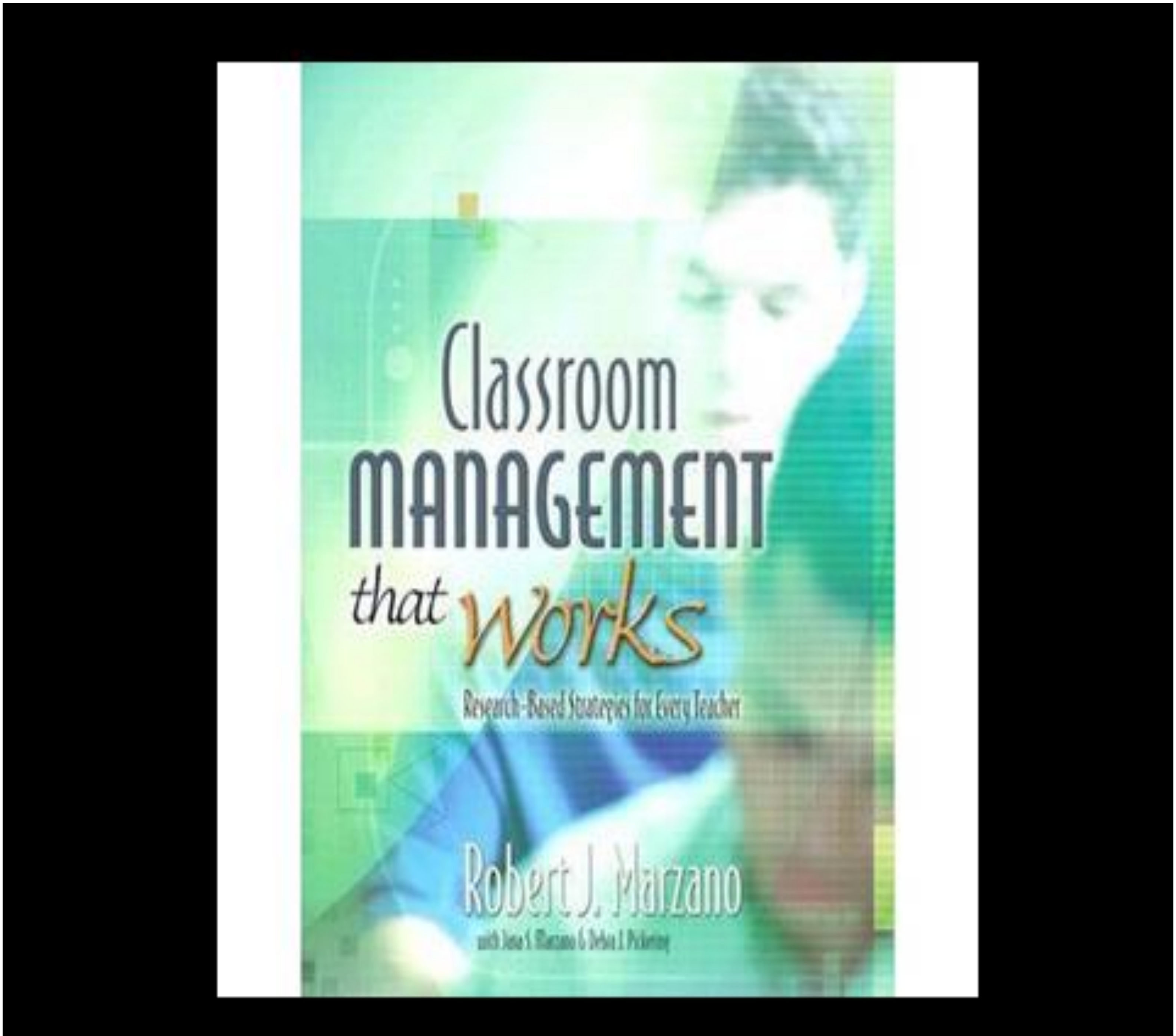

Classroom
MANAGEMENT
that works
Research-Based Strategies for Every Teacher
Robert J. Marzano

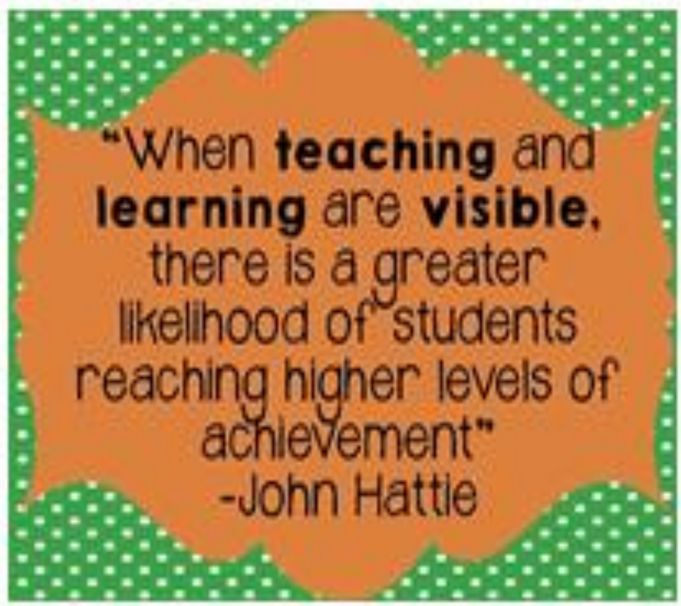
Figure 1.3. Meta-analysis Results for Four Management Factors

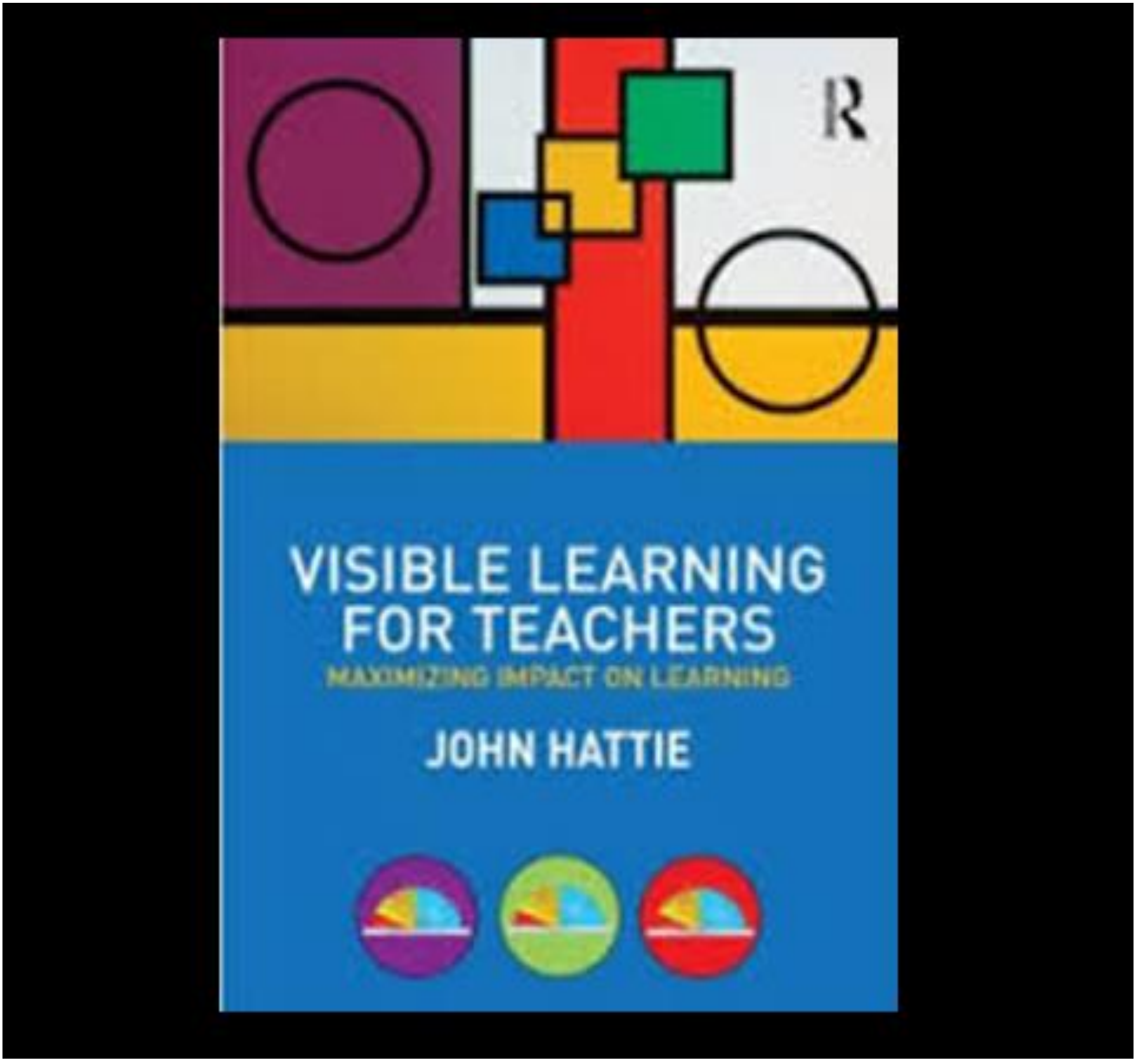
Factor	Average Effect Size	Number of Subjects	Number of Studies	Percentile Decrease in Disruptions
Rules and Procedures	–.763	626	10	28
Disciplinary Interventions	–.909	3,322	68	32
Teacher-Student Relationships	–.869	1,110	4	31
Mental Set	–1.294	502	5	40
Note: All effect sizes are significant at the .05 level.				

Visible Learning(2009)

- *What works to improve learning*

- Largest education study in the history of the world
- 15 years of research
- 800+ meta-analyses
- 52,637 research articles
- 150,000 effect sizes
- 240,000,000 students




VISIBLE LEARNING
FOR TEACHERS
MAXIMIZING IMPACT ON LEARNING
JOHN HATTIE

Visible Learning for Teachers Maximizing Impact on Learning(2012)

- *How to apply principles from his 2009 book*

- 100+ meta-analyses added
- 5,000,000 students added
- 13,428 effect sizes added

How to Maximize Student Achievement

- **Build Relationships with the Students**

John Hattie's 2012 Book
150 Influences on Achievement

Influence			Effect Size
Self-reported grades/student expectations			1.44
Piagetian programs			1.28
Response to intervention(Rtl)			1.07
Teacher credibility			0.90
Providing formative evaluation			0.90
Micro-teaching			0.88
Classroom discussion			0.82
Comprehensive interventions for learning disabled students			0.77
Teacher clarity			0.75
Feedback			0.75
Teacher-student relationships			0.72
Questioning			0.48

Major Contributors to Learning
John Hattie 2003 to 2012

Year: 2003		Year: 2012		(Effect Size)
Student	50%	Student	15%	(.39)
Home	5-10%	Home	12%	(.31)
School/Principal	5-10%	School	9%	(.23)
Teacher	30%	Teacher	18%	(.37)
Peers	5-10%	Curriculum	17%	(.45)
		Teaching	17%	(.43)

Summary of Components for the Seven High Impact Achievement Areas

#1 **Planning for Classroom Management** (ES +0.96, +33%) (Decrease in Class Problems)

Establish rules and procedures (+0.76, +28%)

Implementing disciplinary interventions (+0.91, +32%)

Fostering teacher-student relationships (+0.87, +31%)

Developing a positive mental set (+1.29, +40%)

#2 **Feedback/Formative Assessment** (ES +0.93, +32%)

Formative classroom assessment (+0.90, +32%)

Handouts with sample problems & solutions (+0.58, +22%)

Rate of learning on homework (+0.39, +15%)

Rate of learning two-to-five short assessments per week (+1.84, +70%)

#3 **Dimensions of Instruction** (ES +0.80, +29%)

Challenge (+0.90, +32%)

Deep representation (+0.75, +27%)

Feedback (+0.75, +27%)

#4 **Teaching Methods** (ES +0.71, 26%)

Acceleration (+0.88, +31%)

Reciprocal teaching (+0.72, +26%)

Problem-solving teaching (+0.61, +23%)

Self-verbalization/self-questioning (+0.64, +24%)

Summary of Components for the Seven High Impact Achievement Areas (cont.)

#5 **Student Learning and School Features** (ES +0.62, +23%)

- Classroom climate (+0.56, +21%)
- Peer influence (+0.53, +20%)
- Lack of disruptive students (+0.68, +25%)
- Teacher-student realtionships (+0.73, +26%)

#6 **Instructional Leadership** (ES +0.45, +17%)

- Impact on student achievement (+0.42, +16%)
- Promoting teacher development (+0.84, +30%)
- Establishing goals (+0.42, +16%)
- Overseeing teaching and the curriculum (+0.42, +16%)
- Aligning resources with priority teaching goals (+0.31, +12%)
- Ensuring a supportive school climate (+0.27, +11%)

#7 **Student Homework** (ES +0.39, +15%)

- Homework (+0.29, +11%)
- High school homework (+0.50, +19%)
- Rate of learning on homework (+0.39, +15%)

Summary of Seven Instructional High Impact Areas
(Percent Effect on Student Achievement)

#1 Planning for Classroom Management +33%
(Decrease in Class Problems)

#2 Feedback/Formative Assessment +32%

#3 Dimensions of Instruction +29%

#4 Teaching Methods +26%

#5 Student Learning and School Features +23%

#6 Instructional Leadership +17%

#7 Student Homework +15%

Source: Synthesis of Research Studies from Visible Learning for Teachers by John Hattie, 2012, Routledge Taylor & Francis Group, NEW YORK & LONDON.

Source: Synthesis of Research Studies from Classroom Management that Works by Robert Marzano, 2003, Association for Supervision and Curriculum Development, Alexandria, Virginia.

The Student

Soft Skills

- Getting along with others
- Dealing with setbacks
- Problem solving
- Planning
- Perseverance
- Organization
- Communication
- Have a class notebook

Process Skills

- Process skills in science
- Formulas
- Draw inferences
- Communicate scientific conclusions
- Collect and organize data
- Plan and implement experiments
- Evaluate changes based on data
- Plan, implement & ask questions
- Analyze, evaluate & critique data

Why Students Fail

- Poor academic backgrounds
- Can't read
- Can't do math
- Poor choices
- Lack of ambition
- 12% ESTJ-Thinking
- 88% INFP-Relationships
- Bad "friends"
- Not value education
- Home
- Teacher
- Curriculum

How to Build a Classroom Culture

- Class is set up so all students can succeed [ES=.521] (Tests 60%; Daily work 40%)
- Students are engaged
- Greet students at the door between classes

How to Build a Classroom Culture(cont.)

- Seat alphabetically to learn names
- Call roll orally so students learn each others' names
- Identify class leaders: win them over

How to Build a Classroom Culture(cont.)

- Stay in touch with the parents
- Put daily academic agenda on the board
- Great teaching comes from:
  - Passion of the teacher
  - Engagement of the student

The Great Teachers
[Ten years or 10,000 hours]

- Story tellers
- Know their discipline
- Positive attitude
- Make subjects interesting
- Engage students to think
- Develop relationships
- Leadership traits
  - Ability to speak
  - Ability to connect emotionally

Engagement Examples

- If all the computers in the world were connected, that would be equivalent to one human mind.
- If all the empty space in the body was taken out, each person would be the size of a pea.
- One milliliter of free electrons at the base of the launch vehicle would stop the former space shuttle from "taking off".

Increase Engagement In My Class

Engagement Examples(cont.)

- One thimble of free electrons would be powerful enough to keep the moon in orbit around the earth.
- Man in coma…largest winning lottery in New York State history.
- You have 99.5% of your parents' DNA and share the following DNA: 98% with chimpanzees, 90% with dinosaurs, and 40-50% with cabbage.

Increase Engagement In My Class

Engagement Examples(cont.)

- Which holds more moisture: Hot or Cold Air?
- One human cell is more complex than NYC
- No one can make compound from helium. Why? A Nobel prize is waiting.
- Dr. Wolfgang Kelterle, MIT, 2006 Nobel prize in Physics
  - We know cold fusion works
  - We know photons decay to elements

Increase Engagement In My Class

The Periodic Table of the Elements

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Fr	111	112	113	114				

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Cosmonaut Marina Popovich Speaks Out

http://exopolitics.blogs.com/exopolitics/2014

MOSCOW, RUSSIAN FEDERATION – Cosmonaut Marina Popovich, who is a Hero of the Soviet Union, holds 102 world records, is in the **Guinness Book of World Records, disclosed her personal experiences with UFOs and her knowledge of the extraterrestrial presence** in an exclusive May 23, 2014 ExopoliticsTV interview with Alfred Lambremont Webre.

Cosmonaut Marina Popovich, who maintained she was not punished nor censored by the Russian military or authorities when she reported these UFO experiences to them and then went public, stated she intends to visit the United States and help convince the US government and Congress along with her fellow U.S. astronauts. U.S. astronauts, the U.S. government, and the U.S. Congress have maintained a 60+ year official embargo on UFOs and extraterrestrials. U.S. Astronauts have been officially reticent to disclose and speak out about their personal experiences with UFOs and Extraterrestrials, and the repressive measures the U.S. government has used to ensure their silence.

State Testing

________________Name
________________Grade Last Year (sophomore or junior)
________________Grade This Year (sophomore or junior)
________________Chemistry Class Period

Science TAKS Scores (percent and number (#) of questions answered correctly) April 2009

	(%)	(#)	
Objective 1	______	(___)	General science questions
Objective 2	______	(___)	Biology (technical)
Objective 3	______	(___)	Biology (reading)
Objective 4	______	(___)	Chemistry
Objective 5	______	(___)	IPC Physics (15 basic formulas)

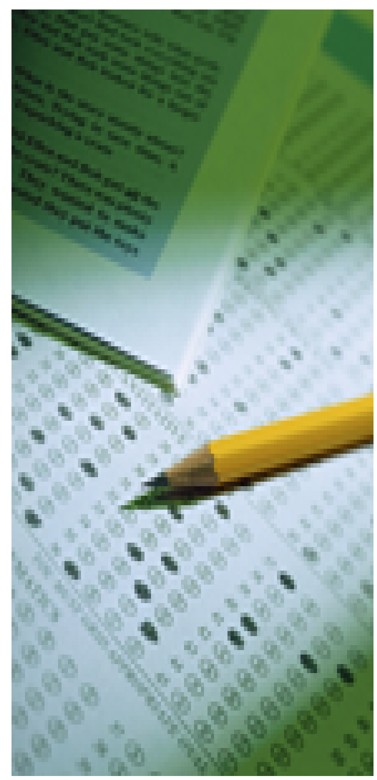
Your % and Total Questions Answered Correctly ________(____)

Sophomores # TAKS Questions		Juniors # TAKS Questions	
Obj 1	17	Obj 1	17
Obj 2	11	Obj 2	8
Obj 3	11	Obj 3	8
Obj 4	8	Obj 4	11
Obj 5	8	Obj 5	11
Total:	55	Total:	55

35 questions answered correctly in 2009 = 2100 scaled score to pass science TAKS. This year will need to answer 36 questions (or maybe 37) to pass. If you get greater than 10 questions right on Obj 1, 95% pass. If you get less than 10 on Obj 1, then Obj 5 is easiest to raise score. Most do well on Obj 3. Obj 4 is lowest score for State of Texas and Lee.

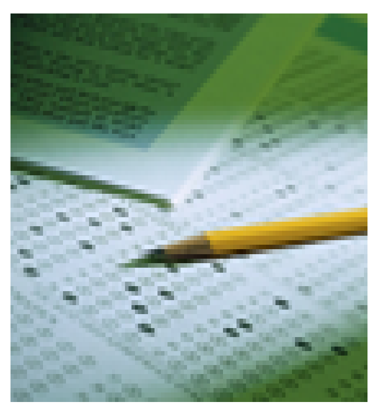
Test Strategies

- Read question twice before answering
- Underline what is given
- Underline the question
- Answer short questions first
- Answer all the questions you can



Test Strategies(cont.)

- A good night's rest
- Free breakfast at school
- Bottle of water and small snack
- Decode the test
- What to do if you don't know the answer



Predicting Student Success on the Texas Chemistry STAAR Test: A Logistic Regression Analysis

Johnson, William L.; Johnson, Annabel M.; Johnson, Jared

Online Submission

Background: The context is the new Texas STAAR end-of-course testing program. Purpose: The authors developed a logistic regression model to predict who would pass-or-fail the new Texas chemistry STAAR end-of-course exam. Setting: Robert E. Lee High School (5A) with an enrollment of 2700 students, Tyler, Texas. Date of the study was the 2011-2012 academic year. Study Sample: A sample of n = 100 students from the author's chemistry classes (32 high school sophomores and 68 high school juniors). Intervention: Developed a binary logistic regression prediction model (no control group applicable). Research Design: Statistical Modeling. Control or Comparison Condition: Control or comparison group--not applicable for the study. Data Collection and Analysis: The students' (n = 100) STAAR test scores from the new Texas end-of-course chemistry pilot test were analyzed in the 2011-2012 school year. Variables included in the logistic regression model were as follows: Students' previous years science TAKS test scores (raw data); science TAKS scores and STAAR end-of-course scores coded pass (1) or fail (0) as categorical variables; and students' grade level coded sophomore (0) or junior (1) as categorical variables. Findings: A binary logistic regression analysis was performed using the new Texas end-of-course pilot chemistry STAAR test scores as the dependent variable (DV) and the previous year's science TAKS scores and grade level as predictor variables. A total of n = 100 cases were analyzed, and the full model was significantly reliable (chi-square = 102.568, df = 2, p less than 0.000). This model accounted for between 64.1% and 85.9% of the variance in STAAR status, with 92.9% of the students passing the STAAR test successfully predicted and 93.2% of students failing the STAAR test successfully predicted. Overall, 93.0% of the predictions were correct. The Wald statistic showed that the TAKS raw score reliably predicted passing or failing the STAAR end-of-course chemistry test. Conclusion: The binary logistic regression model was significantly reliable (chi-square = 102.568, df = 2, p less than 0.000). Overall, 93% of the predictions were correct. The model had a very high predictive outcome. Logistic Regression Variables are appended to this document.

FORM NO. 882-E

NAME			
SUBJECT		TEST NO.	
DATE		PERIOD	

TEST RECORD

PART 1	
PART 2	
TOTAL	

PART 1

SUBJECTIVE SCORE
INSTRUCTOR USE ONLY

PART 1

SUBJECTIVE SCORE
INSTRUCTOR USE ONLY

FORM NO. 882-E

NAME			
SUBJECT		TEST NO.	
DATE		PERIOD	

TEST RECORD

PART 1	
PART 2	
TOTAL	

Models for Item Response Theory

$$P_i(\theta) = \frac{1}{1+e^{-(\theta-b_i)}}$$

Equation 2.4 One Parameter Logistic model of Item Response Theory (IRT-1PL)

$$P_i(\theta) = c_i + \frac{(1-c_i)}{(1+e^{-a_i(\theta-b_i)})}$$

Equation 2.5 Three Parameter Logistic model of Item Response Theory (IRT-3PL)