Improving Student Achievement

Slide 1	Have you read research studies that report contradictory results? That is why it is important to analyze a body of research rather than just review one or two studies. A meta-analysis does just that and this presentation will provide an overview of one of the most important meta-analyses in the history of educational psychology. My name is Bill Huitt and I am Professor Emeritus at Valdosta State University and Adjunct Professor at Capella University. The presentation in narrated by Geoff Huitt who is assisting me with the production of these videos.
Slide 2	In 2009, John Hattie published a meta-analysis of
Slide 3	800 meta-analyses related to factors that predicted student achievement as measured by scores on standardized tests of basic skills.
Slide 4	Several colleagues and I reviewed and critiqued that analysis and suggested some changes in the framework used to report his findings as well as identifying some factors that were not included in his analysis but which had been reported as significant by others.
Slide 5	One of the most important features of a meta-analysis is a statistical analysis that produces a statistic labeled *effect size*.
Slide 6	The effect size essentially provides a standardized measure of the standard deviation between the correlation of two variables or between two treatments. This provides an estimate of the amount of change a variable might have on student achievement when that variable is manipulated.
Slide 7	Hattie used Cohen's D (1988) method of calculation of the effect size statistic.
Slide 8	In general, an effect size of 0.40 is considered a cut-off for selecting important variables and will be used in this project.
Slide 9	Hattie's analysis identified 138 variables that were significant.

Slide 10	However, when using the 0.40 cut-off, that number was reduced to 66 variables. That is, of the hundreds of variables studied in the thousands of research studies reviewed in the 800 meta-analyses included in Hattie's own meta-analysis, only 66 variables met the criteria of having an effect size greater than 0.40. These are simply the most important variables to consider if the goal is to improve learners' scores on standardized tests of basic skills.
Slide 11	This overview will describe some of the variables with the largest effect size, using a framework for grouping those variables into four major categories.
Slide 12	The first category is labeled home context variables and includes factors that describe important characteristics related to the home life of learners,
Slide 13	The second category is labeled school-level context variables and contains factors related to important school characteristics and processes that are outside the control of classroom teachers.
Slide 14	The third category is labeled classroom input variables; these include factors describing the characteristics that teachers and learners bring with them to the teaching-learning experience within the classroom.
Slide 15	The fourth category is labeled classroom process variables and includes factors that identify important teaching strategies, teacher and student behaviors, and general classroom processes. All of these categories contain variables that meet the rather stringent criteria of an effect size equal to or greater than 0.40.
Slide 16	Notice that this is a dynamic framework in that there are feedback loops within it. For example, the student achievement of one year impacts the student characteristics for the next year.
Slide 17	Additionally, the school-level context variables can impact the home context variables through parents moving into an area with good schools as well as when the school implements a parent education program.
Slide 18	In the category of home context variables, Hattie identified three variables that met the cut-off criteria including a general descriptor that he labeled the home environment,
Slide 19	the socioeconomic status of the family, and

Slide 20	the level of parental involvement in the education of the child. One variable that was not included in Hattie's analysis was
Slide 21	the educational level of the mother even though a number of studies over the last four decades have shown this to be an important factor in children's readiness for school and subsequent academic achievement. Notice that all of these factors had an effect size of 0.51 or greater. That means that learners with high levels on one of the factors would likely have an achievement score of one-half standard deviation higher than learners with low levels on one of the factors.
Slide 22	Hattie (2009) identified twenty-one specific school-level context variables that meet the 0.40 cut-off criteria of which 15 related to school-wide implementation of specific curricula. One variable that has received considerable attention is that of
Slide 23	school size. However, notice that while it meets the cut-off criteria it ranks only as 59 out of the 66 variables that do so. An analysis of the review shows that this is an important factor for low SES and rural schools, but it is not as important for urban schools with learners from high SES families.
Slide 24	However, one of the most important school-level variables is providing formative feedback to teachers related to classroom performance. Identifying exactly what to look for will be discussed later in the presentation.
Slide 25	Three additional school level variables include the availability of acceleration for high-performing learners, implementing a school-wide classroom behavior program, and having comprehensive interventions for students with learning disabilities.
Slide 26	In terms of school-wide curricula programs, implementing instruction that considers learners' Piagetian cognitive development is one of the most important actions schools can take. That means that curricular materials need to be available for those who are in a specific Piagetian stage regardless of the expectations for a particular age or grade. Notice that when this is done, expectations for scores on standardized tests are over one standard deviation higher than when such curricula are not available.
Slide 27	Additional curricula that have a major impact include vocabulary programs, repeated reading programs, and creativity programs.

Slide 28	Overall, the school effects had a D score of 0.46.
Slide 29	One variable that was not included in Hattie's review was the extent to which the content taught in the classroom overlapped with the content tested. This is unfortunate as Alan Cohen found effect sizes of greater than 1 for many of the studies he reviewed. This would mean it is one of the best predictor variables to have been studied in the past several decades.
Slide 30	One of the teacher characteristic variables that was important was whether or not teachers had been exposed to microteaching during their preservice programs. This involves guided, specific practice of such teacher events as asking questions and providing effective feedback. This has implications for professional development of educators in that this activity could be provided throughout their careers.
Slide 31	In fact, professional development is an important component of continually preparing educators for meeting the challenges of everyday practice. This was the 19th best predictor of student achievement.
Slide 32	A third teacher characteristic factor related to teacher expectations, which in more recent literature has been referred to as teacher efficacy. The beliefs of parents, teachers, and even learners themselves have an important influence on learner behavior.
Slide 33	The overall effect size for teacher characteristic did not meet the cut=-off criteria of 0.40. Recall that home effect sizes were between 0.51 and 0.57 while the school effect size was 0.46; this is an indication that teacher characteristics, while important, might not be as important as home and school effects.
Slide 34	Hattie identified eight student input or student characteristic variables as important.
Slide 35	In fact, the best predictor variable identified in Hattie's study was that of self-report of grades. This is a proxy for a measure of self-efficacy or the learner's belief that he or she will do well on a specific task.

Slide 36	Notice that a measure of learners' prior achievement, while it meets the cut-off criteria, has a much smaller impact on learners' future academic performance. This demonstrates the important of teachers not only facilitating the demonstration of mastery of required content, but also providing time for learners to reflect on that mastery experience. Learners operate on their mental representations of past events, not on the actual events themselves.
Slide 37	A third student characteristic identified by Hattie was the concentration/persistence and persistence of the learner. This relates to Carol Dweck's concept of a growth mindset; those learners who believe their ability can improve through effort will do so while those who believe their ability is fixed will not.
Slide 38	While not reported in Hattie's meta-analysis, a learner's intelligence or IQ score has been identified as an important predictor of student achievement. If this had been included it would have been on of the best predictor variables. This makes sense because the time spent in school learning is held constant for the vast majority of learners. Those who process information a little quicker would be expected to do well in that situation.
Slide 39	Classroom process variables have the most direct influence on measures of student achievement outside of the classroom. There are three sub-categories of classroom processes:
Slide 40	teacher behaviors, which will be discussed as teaching strategies and teaching events,
Slide 41	student behaviors, and
Slide 42	miscellaneous or other classroom processes that do not fit well in either of those.
Slide 43	Hattie grouped 59 of the 138 variables he identified as either a teacher characteristic or a teacher behavior. The first set of classroom processes, which he labeled as teaching strategies, relates to different approaches to classroom practice.
Slide 44	The best predictor of these 14 strategies was reciprocal teaching. This refers to a strategy of having students perform as the teacher in small groups sessions where they share with other learners what they know and can do.

Slide 45	Two related strategies of meta-cognitive strategies or teaching learners to become aware of and regulate their thinking and specifically teaching techniques of problem-solving were also identified as important.
Slide 46	Another identified strategy was that of teaching specific study skills. All of these relate to aspects of increasing learners' self-regulation of the learning processes.
Slide 47	The strategy of direct instruction was also identified as important. It should be remembered that for most of the time period this was the dominant strategy used in classrooms in the studies used in Hattie's meta-analysis. While there were a other strategies used, there was not a systematized alternative in which educators received specific training. Research completed in the last decade is beginning to identify alternatives that complement or compete with direct instruction in terms of effectiveness.
Slide 48	Overall, the effect size of teaching strategies was 0.60. Remember that this means that when these teaching strategies are used, it is expected that learners will have scores on achievement tests that are one-half standard deviation higher than those learners who are in classrooms where these teaching strategies are not used.
Slide 49	Hattie identified eight teaching events that met the cut-off criteria.
Slide 50	The first two, where the teacher provides clear instructions and then provides effective feedback on student performance are the eighth and tenth best predictors of student achievement. This high ranking suggests these would be excellent candidates for microteaching opportunities during annual professional development.
Slide 51	A third teaching event highlights the importance of spaced versus massed practice. Teachers can implement this event rather easily by having regular opportunities for learners to revisit concepts and skills that were taught previously. For example, when I taught eight-grade mathematics, I would have 20 to 40 percent of any homework problems or quizzes cover content discussed previously. And when I taught college courses, I would do the same for any quizzes or tests. Incorporating such a process into one's daily activities can impact student learning significantly.
Slide 52	Overall, Hattie identified the quality of teaching as having an effect size of 0.44. And while this shows that teaching quality is important, it is probably better to focus on specific strategies and events as these have larger effect sizes.

Slide 53	The second sub-category of classroom processes, student behaviors, was not included by Hattie in his meta-analysis. However, given the importance of identifying classroom factors that teachers can use to estimate classroom learning, we have included this in our framework.
Slide 54	Hattie identified teaching learners to self-verbalize and ask questions was identified as an important predictor variable. Implementing the teaching strategy of reciprocal teaching or involving learners in cooperative learning can impact this variable.
Slide 55	And time-on-task, while it did not meet the cut-off criteria, has been identified by other researchers as an important intermediate measure of learning. Time-on-task is actually a combination of the teacher providing time-to-learn or allocated time and student engagement. However, this variable as been critiqued as providing only a measure of the quantity of time.
Slide 56	In order to measure the quality of time, it is necessary to measure learner's daily success as well as the overlap between content taught and content tested. Remember that in the discussion of curricula, this variable was identified as having an effect size of greater than 1.
Slide 57	The combination of these three variables, time-on-task, daily success, and content overlap, results in a variable labeled Academic Learning Time. This variable, which addresses both the quantity and quality of learning, is defined as "the amount of time students are successfully engaged in content that will be tested." This variable has been promoted for over four decades as a means of recognizing learning as it occurs in real time and for that reason alone should be a focus of efforts to improve student achievement.
Slide 58	There were four miscellaneous or other classroom variables that Hattie labeled either as teacher, teaching, or school-level variables, but which seem to us as more properly classroom variables.
Slide 59	The first is the quality of the teacher-student relationships which had a rank as the 11^{th} best predictor of student achievement as measured outside the classroom. This highlights the importance of social and emotional factors that have become important topics of research over the last several decades.
Slide 60	Another is the use of peer tutoring, which is related to the teaching strategy of reciprocal teaching and is often used in cooperative learning.

Slide 61	And finally, the variables of classroom cohesion and of peer influences on the learning occurring within the classroom as a whole adds to the importance of social and emotional aspects of learning.
Slide 62	In summary, Hattie's meta-analysis of 800 meta-analyses addresses some important concepts for those interested in improving student academic achievement.
Slide 63	First, it is important to recognize that learning occurs in a dynamic system that demonstrates learners are embedded in at least the three domains of the family, school, and classroom and that each includes factors that influence student achievement.
Slide 64	Schools can provide parent education programs that can impact the home environment and help parents prepare their children for school success.
Slide 65	They can provide curricula that encourages teachers to address instruction at the learners' levels of cognitive development and addresses content that will be tested outside the classroom.
Slide 66	Additionally, they can provide professional development with micro teaching that focuses on specific teaching strategies and events that research has shown to be effective in improving student learning.
Slide 67	Schools can also provide formative feedback on teaching practices and can facilitate the collection of data on Academic Learning Time as a way to address learning in real time rather than waiting until the end of the year to review test scores.
Slide 68	Finally, they can provide opportunities with after-school or summer programs that keep learners from falling behind so they are better prepared for the next set of learning experiences.
Slide 69	Hattie's work should be studied by all educators who are interested in using research to improve students' academic performance.

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