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Visible Learning: A Book Review

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A book review

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Introduction

This book by John Hattie has been 15 years in the making and has pulled together information from "over 50,000 studies" involving "many millions of students" (Preface, p. ix). While you would expect that conclusions based upon so much data should be warmly welcomed, this book has created some controversy in the education world. Hattie did not deliberately set out to do this. His book is not a 'how to' exercise. It has simply reviewed the literature noting those factors that promote student learning and those factors that have little or no effect on student learning. Those most disturbed by the book have been the proponents of teaching methods found to be ineffective. These issues will be addressed later in this review.

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The book examines a comprehensive list of factors that potentially could influence student learning. These have been grouped into the following categories: student characteristics, home characteristics, school environments, teacher characteristics, factors related to the curricula, and specific teaching approaches.

The base data reviewed by Hattie have not come directly from individual studies, rather they have been drawn from over 800 meta-analyses. A meta-analysis is a procedure that combines the results of a number of individual, statistically-based studies into a single set of results that represent them all. All of the component studies included in a meta-analysis must be conceptually alike in that they all focus upon the effect that the same interventions or treatments have upon a particular response measure (in this case, student learning).

Background information

In using the meta-analysis technique, Hattie employed Cohen's d statistic to compare the size of the effect that different interventions had upon students' learning. An effective intervention (treatment) implemented with an experimental group will mean that the 'after-intervention' distribution of scores measuring learning will be separate from, and greater than, the corresponding 'before-intervention' distribution of scores. The more effective the intervention, the greater this separation. Usually the change in 'before' and 'after' distributions in learning scores for the experimental group is compared with the corresponding change in scores of the control group. Now, Cohen's d statistic asks the question, "So, the change in mean scores is not chance, but does it really mean anything?"

The d statistic is defined as the ratio of the difference in the mean values of the 'before' and 'after' distributions to the pooled standard deviation (Howell, 2007). In other words, as the before and after distributions separate from each other, the difference between the mean scores become greater and hence the value of the d statistic rises.

As the two distributions separate and the d statistic rises, the percentage of non-overlap of distributions also rises. *Table 1* indicates that as the d statistic increases, the corresponding correlation coefficient (r) also strengthens. This indicates that as the 'before' and 'after' distributions get further apart, the rank order of the students, according to their scores in both distributions, become more alike. Hattie chose the value of 0.40 as the lower limit of a significant effect size. This value indicates a change in the response measure (student learning) that, while being small, is both clearly discernable and, given a sufficiently large number of participating students, unlikely to be a chance result. As the d statistic rises above the 0.40 limit, the size of the effect of the intervention strengthens.

Factors affecting student learning

While this description of Cohen's d statistic is technical, it is important background knowledge because Hattie uses it to compare the various effects on learning that differing educational factors have. The following discussion highlights the results for all those factors for which the d statistic exceeds the 0.40 limit set by Hattie.

Table 1: Cohen's statistic matched to the percentage of non-overlap of scores and correlation between 'before' and 'after' scores for the response measures*

Cohen's *d* statistic	% non-overlap of scores	Correlation coefficient (*r*)	Meaning
0.40	27	0.20	Weak but not likely to be a chance result provided *n* is large
0.50	33	0.24	Weak to moderate not a chance result
0.60	38	0.29	Moderate and definitely not a chance result
0.70	43	0.33	Moderate to strong
0.80	47	0.37	Strong
0.90	52	0.40	Strong to very strong
1.00	55	0.48	Very strong
1.50	71	0.60	
2.00	81	0.71	

* Table includes a synthesis of information from Hattie (2009) and Coe (2002).

Learners' personal characteristics

Collectively, the strongest factors influencing learning are those pertaining to the students' own characteristics. Here, the first two factors speak to student-readiness in that students need to be developmentally prepared for learning (d = 1.28) and they need to have a sufficient combination of background knowledge and skills in order to successfully approach a new learning task (d = 0.67). The next four factors indicate that successful learning occurs among those students who combine a healthy mix of self-knowledge (d = 1.44), self-concept (d = 0.43), personal motivation (d = 0.48) and willingness to concentrate and persist (d = 0.48). Two characteristics that have little effect upon learning are personality (d = 0.19) and gender (d = 0.12).

The final three characteristics relate to early development. Low pre-term birth weight is related to developmental stressors before birth (birthweight to learning: d = 0.54). Factors such as maternal illness, malnutrition and substance use (including alcohol and tobacco) all impact upon prenatal development and continue to delay cognitive development into the later years of life. However, appropriate and non-stressful early intervention programs (d = 0.47) and quality preschool programs (d = 0.45) do have positive effects on learning that flow on into the later years.

Students' homes

Hattie's book reaffirms a long held understanding that successful students tend to come from homes of higher socio-economic status (d = 0.57), homes that support and value education (d = 0.57), and homes in which parental involvement in education is significant (d = 0.51).

Essentially, these factors have to do with the nature of the home-learning environment. For example, the kinds of learning resources in the home, parental support for schooling and that unstated but pervasive expectation that students will make an effort in their schooling.

Family structure does not have a significant effect upon learning (d = 0.17). This includes sibling order or marital status of the family. This does not mean that children are unaffected by the trauma of family breakup, but does mean that once the family situation settles, the learning of children from single-parent homes is largely indistinguishable from that of other children. Finally, the presence or absence of television is unrelated to student learning (d = -0.18).

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School and classroom organisation

In general, as schools get larger, it becomes economically easier to acquire resources that promote learning. The critical size for schools appears to be about 800 students. When this number is exceeded, student learning does appear to begin to decline. In general, students learn more efficiently when working in small groups (d = 0.49) and when involved in micro-teaching (d = 0.88). Finally, gifted and talented students appear to learn best when judiciously accelerated (d = 0.88).

Those factors that do not appear to have a major influence upon student learning include: grouping students according to ability (often called streaming; d = 0.30); the general size of classes (d = 0.21) and multi-grade classrooms (d = 0.04).

Teacher characteristics

Teachers make a major contribution to student learning. Those teachers who are more effective in promoting learning:

- manage their classroom in an effective manner (d = 0.52),
- exhibit characteristics that engender classroom cohesion (d = 0.53),
- create and use positive peer influence (d = 0.53),
- employ the strategies of quality teaching (d = 0.44),
- develop appropriate and pleasant relationships with their students (d = 0.72),
- expect their students to learn (d = 0.43),
- avoid labelling students (d = 0.61),
- demonstrate teacher clarity (d = 0.75),
- are able to sequence questions appropriately (d = 0.46),
- continue to undergo professional development (d = 0.62).

These characteristics are not unexpected.

Curricular contributions

The first and major grouping of curricular factors that influence learning are connected to the development of reading skills. These involve strategies related to:

- improving visual perception (d = 0.55),
- improving vocabulary (d = 0.67),
- phonics instruction (d = 0.60),
- repeated reading (d = 0.67),
- teaching for comprehension (d = 0.58),
- using reciprocal teaching (d = 0.74).

Reading strategies that were not found to be useful in improving reading skills included whole language (d = 0.06).

Teaching strategies aimed at reducing cognitive load were found to improve mathematical skills (d = 0.45). Cognitive load is reduced when an individual ceases to see elements of a problem as discrete units, but rather sees them as related components within the problem setting (Sweller, 1999). This has to do with pattern recognition and the ability to restructure a problem state into a form that is consistent with a theory driven solution path.

Other unrelated activities that successfully promote learning include teaching social skills (d = 0.40) and outdoor and adventure programs (d = 0.52).

For young children, tactile stimulus programs promote learning (d = 0.58) as do play programs (d = 0.50).

> ***Constructivists have been aroused by some of Hattie's findings and conclusions***

Teaching approaches

Contributions to student learning that flow from teaching activities involve aspects of planning, instructional approaches, teaching for self-learning, providing specific resources and feedback and finally, ensuring that practice is spaced.

Aspects related to teacher-planning include:

- setting goals with students (d = 0.56),
- matching instruction to learning styles (d = 0.41),
- employing methods of formative evaluation (d = 0.90).

The second point relates to the deliberate rotation of modes of instruction so that over a period of time most students will have an opportunity to learn in their favoured style. Formative evaluation requires the teacher to collect information about the current levels of student interest, understanding and skills and rearranging the learning unit to suit this immediate situation.

Instructional approaches that promote learning included the use of strategies involving:

- direct instruction (d = 0.59),
- advance organisers (d = 0.41),
- concept mapping (d = 0.57),
- mastery learning (d = 0.58),
- a variety of cooperative learning approaches (d = 0.41–0.59),
- teaching for problem solving (d = 0.61),
- interactive technology (d = 0.52).

Hattie's findings also indicate that students can be taught the skills for self-learning. Those aspects of teaching that relate to skilling students for self-learning include:

- the use of peer tutoring strategies (d = 0.51),
- teaching metacognitive strategies (d = 0.69),
- teaching study skills (d = 0.59),
- teaching students to use strategies of self verbalisation and self questioning (d = 0.64).

Finally, the provision of worked examples (d = 0.57), adequate feedback (d = 0.73) and the use of spaced versus massed practice (d = 0.71) was also found to be associated with student learning.

Elements of Controversy

Constructivism is a movement that has grown out of an understanding that students create their own meaning for new information or skills from the interaction between their prior knowledge and memory of past experience and the new experience or information (Driver, 1983). This meaning-making process is covert and teachers have no direct access to it—they can only influence it. Conceptual change can be provoked by providing students with a judicious mix of experiences that challenge their current understandings and new information (Chinn & Malhotra, 2002). However, conceptual change takes place in the cognitive arena of the students' minds and the degree and nature of change can only be inferred by changes in their output.

Some constructivists carry this view of the nature of conceptual learning forward to argue that since students construct their own understanding, classroom activities, particularly in science and mathematics, should almost exclusively employ inquiry techniques (Bauersfeld, 1995). Those of this persuasion have been aroused by some of Hattie's findings and conclusions.

Table 2: A comparison of Cohen's statistic relating teaching strategies to student learning

Teacher as activator	*d*	Teacher as facilitator	*d*
Reciprocal teaching	0.74	Simulations and gaming	0.32
Feedback	0.72	Inquiry-based teaching	0.31
Self-verbalisation strategies	0.67	Problem-based learning	0.15
Metacognitive strategies	0.67	Inductive learning	0.06
Direct instruction	0.59	Smaller class sizes	0.21
Mastery learning	0.57	Individualised instruction	0.20
Goals—challenges	0.56	Different teaching for boys and girls	0.12
Frequent effective assessing	0.46	Web-based learning	0.09
Behavioural organisers	0.41	Whole-language—reading	0.06
Average activator	**0.60**	**Average facilitator**	**0.17**

Table 2 compares approaches favouring direct instruction with those that involve student-centred inquiry procedures. Hattie presents the view that the strategies employed by the 'Teacher as activator' are more successful than the strategies employed by the 'Teacher as facilitator'. Those supporting a tight constructivist approach are quick to point out that he has not included the qualitative studies that indicate that students enjoy and benefit from investigative approaches. While the quantitative studies involve forms of testing student knowledge, the qualitative studies involve observation of student activity and exploration of the change in the nature of their ideas through interviews (Hackling & Prain, 2008).

It would be a travesty if teachers responded uncritically to Hattie's information and retreated from the excitement of discovery procedures into the 'chalk and talk' methods of yester-year. There is much to be gained by running judiciously planned and carefully structured inquiry lessons. Particularly if skilling students for self-learning is, as Hattie suggests, so successful. In addition, there are important outcomes that are achievable through student inquiries. Even so, the literatures on expertise and problem solving suggest that successful student-inquiry and successful problem solving approaches mainly occur among mature students who have acquired a critical mass of systematic knowledge and understanding in their field (Feltovich, Prietula & Ericsson, 2006; Kirschner, Sweller & Clark, 2006). School students, and particularly primary students, lack this systematic knowledge. Further, it is difficult to create a systematic knowledge among immature students through the sole use of inquiry methods that involve minimal structure. What is needed is a mix of delivery processes that include guided, hedged and scaffolded inquiry procedures and the development of a systematic knowledge through the use of direct instruction and worked examples.

Conclusion

The mark of an important book is not necessarily that it gains universal acceptance. Often good books spark vigorous debates. They set people thinking. Based on this, Hattie's book is important. TEACH

> ***Often good books spark vigorous debates***

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