THE RELATIONSHIP BETWEEN STUDY SKILLS AND LEARNING OUTCOMES: A META-ANALYSIS

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Abstract

This paper reports the results of a meta-analysis of 52 studies that investigated the relationship between a range of study strategies and outcomes measures. There were some studies with more than one sample, and most had multiple indicators of the variables of interest. As a consequence, there were 653 correlations that could be coded for the

meta-analysis.
The average correlation between a study skill strategy and an outcome was .21. Of more interest than overall correlations, were the moderating effects on this overall correlation. Having many study skills (i.e., versatility), as assessed by total study skills scores, was positively related to outcomes. Various deep and achieving approaches were also positively related to outcomes. Surface approaches were negatively related to outcomes, although many surface strategies such as inflexibility and reproducing were unrelated to outcomes. Thus, most of the well known surface strategies are not helpful in enhancing achievement. In general, the strategies that students used were more related to outcomes than were their motives for study. Deep motives, particularly internal locus of control, were the only motives related positively to achievement. Merely increasing time on task was not highly correlated to outcomes. Self-regulation methods were also unrelated to outcomes.

Introduction

There have been many studies investigating the relationship between various study skills and learning outcomes. The typical study of this genre specifies a variety of study skills and then correlates the scores on tests that measure students' use of these skills with some achievement outcome, typically GPA. The results of studies which have found a positive association between achievement and the use of a particular strategy or set of strategies have been used by writers of many study skills programs to justify teaching students a pot pourri of study methods. The skills typically stressed are related to organisation and management of time, setting goals, text-book study methods (such as scanning, underlining, SQ3R), memorising, using the library, essay writing, and preparing for and taking examinations.
Not all methods that students use in learning situations are viewed as wise choices. The term learning pathologies is applied to non-strategic behaviours that hinder rather than help in learning, often because they are the antithesis of those behaviours that have been shown to assist in learning. For instance, some study skills instruments measure the extent to which students are disorganised, test-anxious, absent from school, work avoidant, or globetrotting (over-ready to jump to conclusions) -- all behaviours that could probably be typified just as well by measuring an opposite form of the behaviour. There are other behaviours about which there are conflicting views of the extent to which they represent pathological learning behaviours. For instance, strategies of memorisation are promoted in some instances as being appropriate (such as when studying

for a vocabulary test in a foreign language), whereas in other situations the use of memorisation strategies leads students to focus on surface detail at the cost of seeing relationships between different pieces of information and ideas (for example, when trying to memorise the "structure" of a novel.

Regardless of whether a study skill is perceived to be helpful or detrimental to academic performance, the theory of study skills is more sophisticated than implied by this "dust bowl of empiricism" approach. It is increasingly clear that there is not a best set of study skills. Nist, Simpson, and Hogrebe (1985) criticise some of the studies that have compared study methods on the grounds that they were not conducted in naturalistic settings in which students were free to select and employ the strategies they preferred. Often the experimental conditions were such that students were taught a particular method or methods and then placed in a situation in which they were instructed to use what they had been taught. Their achievement was then compared with that of students who had been instructed in a different method, or who had received no training at all.

Theories and research related to situated cognition and to self-regulated learning demonstrate that it is not some inherent quality in the study skill itself that will lead to improved learning outcomes (in particular, higher grades), but rather the decisions that students make about how and when they are going to use which particular set of skills to achieve a particular purpose or goal. Metacognitive awareness allows students to assess task requirements and situational restraints, and to be flexible in their choice of strategy to suit those conditions.

Versatility and time

Of particular interest in this study was the concept of "moreness". This notion can be represented in a least two different ways with respect to study skills -- versatility or flexibility of use, and the amount of time during which students use a study skill or set of skills.

First, instead of focusing on each study skill as a separate action, versatility or flexibility can be seen to represent a student's ability to engage in a range of study or learning behaviours, depending on the demands of task and context. Such a notion of versatility is signified in Derry's (1986) distinction between specific learning tactics and learning strategies. Derry proposed that a learning strategy is a complete plan formulated to accomplish a learning goal, whereas a learning tactic is any individual processing technique (such as rehearsal, imaging, and outlining) used in service of the plan. Devising an appropriate plan or strategy involves more than an indiscriminate combining of the tactics at one's disposal. Bloom (1984) argued that to be successfully combined, methods for learning must address different aspects of the learning task or learning context. It is possible that some methods compete with each other,

particularly in clearly defined contexts or when applied to specific tasks. Nevertheless, if the most appropriate learning plan is to be made, students must be aware of, and able to use as wide a range of specific skills as possible.

The research on self-regulated learning has demonstrated that effective learners possess high levels of metacognitive awareness in relation to the planning, instigating, and monitoring of learning behaviours (e.g., Garner, 1987; Pintrich & De Groot, 1990; Purdie, Hattie, & Douglas, 1995; Zimmerman & Martinez-Pons, 1986; 1988; 1990). Such research suggests that it is not reliance on a single strategy or small set of strategies that is associated with good academic performance. When strategy use has been measured, the students with higher overall strategy scores achieve more highly than those with lower overall strategy scores. Cantwell and Beamish (1994) specifically addressed the question of versatility in self-regulated learning in a study that investigated the planning and orchestration of strategy choices in secondary and tertiary populations. They maintained that the conception of self-regulated learning has generally been uni-dimensional -- the possession or non-possession of the positive attributes of effective self-regulation. Their study was based on the proposal that self-regulated learning may embrace qualitatively distinct conceptualisations of self-regulation: (1) adaptive self-regulation, marked by purposeful planning, and flexibility in the choice of strategies, (2) inflexible self-regulation, marked by an unwillingness to depart from routine behaviours; and (3) ambivalent self-regulation, marked by an inability to coherently generate or orchestrate processing options in the face of uncertainty. The results of their study indicated that flexibility was associated with better performance in academic learning, whereas both inflexibility and ambivalence were associated with markedly less successful learning outcomes.

As well as a student's academic performance possibly being related to their ability to use a range of specific study skills, some have argued that the amount of time a student spends on a task will be related to learning outcomes. Over three decades ago, Carroll (1963) conceived the degree of learning to be a function of the ratio of the amount of time the learner actually spends on the learning task to the total amount of time needed. Since then, and particularly in the decade spanning the 1980s, models of educational productivity have included time on task as an important predictor of academic achievement and attitude (e.g., Fredrick, 1980; Keith, 1982; Walberg, Fraser, & Welch, 1986). In particular, homework time has been shown to have a positive impact on achievement (Keith & Page, 1985; Keith, Reimers, Fehrmann, Pottebaum, & Aubey, 1986). On the other hand, Krantz (1983) argued that certain qualitative aspects of studying (such as the particular strategies selected to successfully complete a task) may be more important than the duration of studying. Similarly, Karweit (1984) argued that "time is a necessary, but not sufficient, condition for

learning. Learning takes time, but providing time does not in itself ensure that learning will take place. More time may result in more learning -- if adequate time was the major cause of the problem in the first place. If other factors were the real cause, then providing more time will not be an effective strategy" (p. 33).

In a synthesis of research on time and learning (Walberg, 1988), the notion of productive time (that fraction of lesson and study time that students spend on appropriate learning activities) emerged as even more important than engaged time or time-on-task. Although the effects of time allocation and engagement in learning tasks were consistent (but modest), Walberg suggested that more can be achieved by focusing on productive time. Walberg also noted that time could also be negatively correlated with achievement "if for example, students were pressed beyond exhaustion, or a school imposed a rigorous standard of achievement and slower students studied more but attained less" (p. 84).

The purpose of this study is threefold: (1) to assess which study strategies or study motives are most related to outcomes; (2) to investigate whether versatility is the most successful strategy; and (3) to compare these study strategies with increasing time on task.

Method

Sample of Studies

We first searched various computer-based information sources using the keywords: study skills, learning strategies, learning processes, cognitive style, study habits, cognitive strategies, cognitive processes, learning style, meta cognitive skills, and thinking skills. These keywords were crossed with achievement, ability and various subject topics. These keywords were searched using Psychological Abstracts (1985 to 1992), and the Educational Resources Information Center (1985 to 1992). After locating various articles, we then searched the references for further studies. Several studies with earlier dates were included to provide a sample of research that had used the Biggs' surface, deep, and achieving classification. The Holtzman and Brown (1968) study was also included because so much of the study skills research refers to this work. Criteria for including studies in the sample were that (a) they were concerned with study skills but were not designed specifically to assess the effectiveness of an intervention; (b) it was possible to calculate a correlation; and (c) the outcome measure was related to either academic performance or affect. This yielded the present sample of 52 studies (denoted by asterisks in the References). There were some studies with more than one sample, and most had multiple indicators of the variables of interest. As a consequence, there were 653 correlations that could be coded.

Variables coded from each study

The following general information was coded from each study:

publication year, publication form (journal article, book chapter, or thesis); and sample size.

The study skills measures were coded into two levels of categories, primarily using the Biggs' (1987) classification scheme. At the more general level the categories included achieving approach (divided further into achieving motive and achieving strategy), deep approach (deep motive and deep strategy), surface approach (surface motive and surface strategy), general study skills, and learning pathologies (which included globetrotting, negative attitudes, improvidence, disorganised, work avoidance, procrastinative meta-cognition, and negative attitudes).

At the second level many of these were further sub-divided. Achieving strategy included organisation (including scheduling, organising strategy), searching (e.g., visual cueing), note taking (and also including highlighting, identifying main ideas, underlining, reviewing notes), exam technique (also focusing on test relevance), and other (such as textbook reading, methodological study). Deep motivation included attitude and self-efficacy (e.g., non-dogmatism, self-efficacy, study attitudes, independence), internal locus of control, intrinsic motivation (also task motivation). Deep strategy included depth and complexity (e.g., tolerance of ambiguity, wide reading, academic complexity, adaptive strategy management, comprehension learning) deep and elaborative processing (such as hyperprocessing, elaboration, constructive processing, synthesis analysis), and other deep strategies. Surface strategies included memorisation (and recall, rehearsal, fact rote learning), reproducing (fact retention, duplicative processing, labelling, simplifying), inflexibility (e.g., intolerance of ambiguity, cognitive simplicity), and other surface strategies (usually unspecified). The study skills category related to self-regulation (also monitoring, meta cognition), time on task (e.g., hours studied), and many were a combination of many study skills which we term Total study skills. A high score on total study skills indicates that the students used a variety of strategies and thus were most versatile.

The outcome measures were coded into eight major classifications. Ability, general achievement, subject based achievement (in mathematics, science, language skills), increasing memory, changing self-efficacy or self-concept, attitude, and study skills. This last category was included to accommodate one study in which locus of control measures were correlated with study skills outcome measures.

A number of characteristics of the research design were coded. The studies were graded according to quality (coded independently and agreed to by all three authors and classified as low, medium, and high). Where there were disagreements about this coding, the third author also coded the article, and then all disagreements were resolved by discussion. The purpose of study (specifically related to study or learning skills, or study skills was secondary) was also coded.

There were a number of categories coded relating to the nature of the

participants. For example, age (primary/elementary, junior secondary, secondary, college/university, adults); ability level (low, medium, high, mixed, underachieving); and socioeconomic status (low, middle, upper, mixed). The latter two categories were reported on too few occasions, and where reported, tended to be mixed socioeconomic groups or mixed ability.

The correlation indicates the magnitude and direction of association between the study skill and outcome. The correlations were converted to zr's using Fisher's transformation. It is expected that the correlation between the learning pathologies and the outcome measures would be negative. For summaries involving breakdowns by study skills, then a negative correlation would be expected when relating learning pathologies to outcome measures. For summaries involving outcome only, however, the negative correlation would artificially decrease the mean correlation. Imagine, for example, if half the correlations in the meta-analysis consisted of relationships between learning pathologies and achievement and the average correlation of these relationships was -.4. Imagine the other half as correlations between deep processing and outcome and the average correlation of these relationships was +.4.

Thus, combining these two groups would lead to a correlation approaching zero. Instead, a more correct description would reverse the sign of the learning pathologies and thus lead to a mean correlation about .4 -- indicating more correctly the strength of the relationship between study skills and outcomes. In the results section, the signs were not changed (as most analyses related to breakdowns by study skills only) unless otherwise stated.

Results

There were 653 effect-sizes identified from 52 studies, published between 1968 and 1993. The majority of the studies (75%) were written specifically to assess the correlations between some outcome and study skills, and the others included the correlates as part of a larger study not relating specifically to study skills. The quality of articles was coded as low (7%), medium (39%), or high (55%) by two of the authors. Where there were disagreements about this coding, the third author also coded the article, and then all disagreements were resolved by discussion. The majority of articles were published in journals (88%), with only 6% in books and 7% in unpublished sources (e.g., conference papers).

Most subject were upper secondary (23%) and university or adults (59%). The others were primary (3%) or junior high (16%). The majority of students were described as mixed ability (41%). The typical study included 700 subjects, and 47% were females and 53% were males.

The average correlation between a study skill strategy and an outcome was r=.21 (zr=.21) and the standard error was r=.007. Figure 1 presents a stem and leaf diagram of all 653 correlations.

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Figure 1. Stem and leaf diagram of the correlations between study skills and achievement (with learning pathology relationships indicated in italics)

-.700
-.61
-.510
-.44400
-.398887764333322111100
-.29998877777776655555555554444433332211111111100
-.19987777666665554444444433333333322222222211110000000
-.0999999999888888777777777766666666655555555444443333332222222211111
.0
00000000111111122222222233333333333333333344444455555555555555556666666
6666
77777777777777778888888888999999999999
.1
000000000000001111111111111222222222222222333333333333444444444444444444
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.2
00000000000011111111122222222223333333333333333344444444445555556666
6666
777777777888888899999999999
.3000000000111112222222333333444445555566666777777778888899
.40112233444445666788999
.513344567
.60248889
.726
.809

Of more interest than overall correlations, are the moderating effects on this overall correlation (Table 1, in this table the signs for pathology are reversed). The higher quality studies had lower correlations than the lower quality studies.

Table 1
Outcome measure moderated by quality of the study (with zr unsigned)

Quality of study:	Count:	Mean:	Std.Error:
Low	43	.2659	.0403
Medium	253	.2196	.0121

High 357 .1849.0067

The correlations were not moderated by the age of the students (Table 2, in this table the signs for pathology are reversed).

Table 2
Outcome measure moderated by age of students

Age level:	Count:	Mean:	Std.Error:
Primary	18	.2239	.0412
Middle	103	.1664	.0187
Secondary	149	.2012	.0103
Univ/Adult	381	.2118	.0088

The study skills were coded into 12 categories (Table 3) and the learning pathologies were left in their original non-absolute form. Having a pathology is clearly related to lower outcomes. Surface approaches are negatively related to outcomes, although many surface strategies such as inflexibility and reproducing are unrelated to outcomes. Thus, most of the well known surface strategies are not helpful in enhancing achievement.

Having many study skills, as assessed by total study skills scores, is positively related to outcomes. Various deep approaches, such as deep and elaborative processing, enhancing self-efficacy and study attitudes, and depth and complexity are positively related to outcomes. Deep motives, particularly internal locus of control, were the only motives related positively to achievement. In general, the strategies were more related to outcomes than are the motives. Achieving strategies, such as note taking, searching, examination techniques, and organisation were positively related to outcomes.

Merely increasing time on task or memorising information are not highly correlated to outcomes. Self-regulation methods were also unrelated to outcomes.

Table 3
Correlations between various types of study skills and learning outcome

Study skill:	Count:	Mean:	Std.Error:
Achieve approach	32	.138	.015
Achieve motivation	18	.045	.043
Achieve strategy	95	.156	.017
Organisation	22	.113	.037
Searching	9	.136	.023
Note taking	40	.203	.030
Exam technique	14	.097	.031
Other achieve strategy	10	.164	.050

Deep approach	38	.146	.016
Deep motive	72	.152	.026
Attitude/self-efficacy	37	.181	.045
Internal locus of control	20	.143	.038
Intrinsic motivation	15	.094	.036
Deep strategy	97	.170	.016
Depth & complexity	56	.153	.019
Deep & elaborative processing	33	.211	.030
Other deep strategy	8	.120	.053
Surface approach	48	-.126	.016
Surface strategies	101	.022	.022
Memorisation	23	.064	.046
Reproducing	46	.021	.031
Inflexibility	13	-.039	.059
Other surface strategies	19	.016	.059
Self-regulation	29	.049	.039
Pathology/globetrotting	34	-.287	.029
Time on task	36	.110	.029
Total study skills	53	.284	.033

The outcomes were either achievement related (98%) or affect related (2%). They were further broken down into 10 categories (Table 4, note the signs for learning pathologies have been reversed in this Table). There are few differences across the various achievement or attitudinal categories.

Table 4
Correlation between study skill and various outcome measures

	Count:	Mean:	Std.Error:
Ability	79	.13	.012
Achievement	462	.22	.008
Memory	4	.25	.074
Subject-based	48	.22	.020
Math	10	.28	.060
Science	6	.10	.017
Language skills	21	.23	.032
Self	11	.14	.010
Attitude	4	.20	.085
Study skills	8	.15	.022

When the various outcomes are further broken down into study skills approaches (Table 5), it can be noted that a variety of study skills is more related to all types of outcomes. The surface approaches are not related to any outcome, whereas achievement and deep approaches are

positively related to all outcomes. Self-regulation is more related to subject-based than achievement-based outcomes (which tended to be GPA), although the small sample sizes adds caution to this conclusion.

Table 5
Correlation between different types of study skills and various outcome measures

Outcome:	AchieveApproach	DeepApproach	Learning Path	SelfRegul	StudySkill	SurfaceApproach	Total
	22	23	2	8	6	19	80
Ability	.09	.12	-.11	-.003	.31	-.03	.07
	106	140	24	17	61	116	464
Achievement	.15	.18	-.31	.03	.22	-.03	.09
	15	29	6	4	19	12	85
Subject-based	.12	.13	-.27	.24	.14	.04	.10
	2	15	2	0	3	2	24
Att/SS/Self	.14	.10	-.15	•	.32	-.09	.09
	145	207	34	29	89	149	653
Totals:	.14	.16	-.28	.05	.21	-.03	.09

Conclusions

1.Some study skills have a greater association with cognitive and affective outcomes than do others. The largest correlations were found for deep and elaborative processing, and notetaking; there was no correlation between various surface strategies and learning outcomes; and learning pathologies, not unsurprisingly, were negatively related to learning outcomes.

2.Versatility in the use of study skills is more highly correlated with all types of learning outcomes than is any single study skill.

3.More time spent on study is not highly correlated with learning outcomes.

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(Studies marked with an asterisk were those used in the meta-analysis).

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