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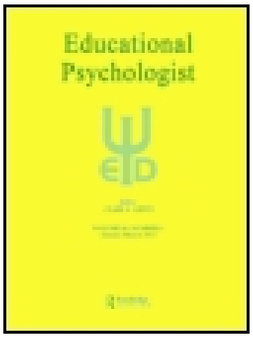

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Antagonism Between Achievement and Enjoyment in ATI Studies

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There is evidence that negative correlations between student achievement and their enjoyment of instructional methods exist under certain circumstances. In aptitude-treatment interaction (ATI) studies where two or more methods are allowed to interact with student aptitudes to predict enjoyment *and* achievement, it appears that students often report enjoying the method from which they learn the least. Selected ATI studies are reviewed, and an explanation is suggested which may account for the negative correlations between achievement and enjoyment in instructional settings. It appears that students make inaccurate judgments about the amount of effort they will have to expend to achieve maximum learning outcomes. Low ability students typically report liking more permissive instructional methods, apparently because they allow them to maintain a "low profile" so that their failures are not as visible. However, in order to experience maximum achievement low ability students require less permissive methods which lower the information processing load on them. High ability students like more structured methods which they believe will make their efforts more efficient when these lower load methods seem often to interfere with their learning. High ability students seem to learn more from more permissive approaches which allow them to bring their own considerable skills to bear on learning tasks.

Achievement and enjoyment are occasionally employed as companion outcome measures in instructional research and evaluation. One of the implicit assumptions underlying this strategy is that both outcomes are desirable and are presumed to support future attitudes towards instruction. Where contrasting treatments do not yield differences in achievement, instructional evaluators sometimes allow enjoyment differences to dictate the selection of methods. And yet, there have been few attempts to examine the effect of the interaction between student aptitudes and instructional methods on both achievement and the enjoyment of instruction.

The purpose of this discussion is to: (a) Review breifly selected aptitude-treatment interaction (ATI) studies where both achievement and enjoyment were measured as outcomes; (b) Attempt to determine the nature of the correlation between the two types of outcomes for students who receive instructional treatments which differ in the amount of information processing required; and, (c) Suggest tentative hypotheses about the reason for inverse or antagonistic relationships between these outcomes for students with different aptitudes and instructional methods which apparently differ in information processing load.

In general, there is evidence that students report enjoying instructional methods from which they learn more (e.g., Perry, Abrami, & Levanthal, 1979). However, Kulik and McKeachie (1975) and Doyle (1975) review a number of studies which employed both outcomes and report correlations between enjoyment and achievement which range from −.80 to .75. This would suggest that students do not inevitably enjoy the instructional method which yields greater achievement. In some studies, reports of positive relationships between achievement and enjoyment may be misleading. Morris and Kimbrell, (1972) for example, reported a positive correlation between the two outcomes for a Keller-type

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mastery approach to an introductory psychology course. Students appeared to both achieve more and report more positive regard for the Keller method than a conventional approach. However, closer inspection of their data suggests that if the prior knowledge of the students had been taken into account the results might have changed. Higher ability students tended to profit from both methods but liked the mastery approach much better. Lower aptitude students on the other hand, seemed to enjoy the conventional method but to learn more from the mastery approach.

Holloway and Robinson (1979) found a negative correlation of −.21 between achievement and enjoyment resulting from different methods for teaching high school students factual information about a fictitious indian tribe. The interaction between ability and treatments which varied in amount of structure was nonsignificant but tended in the same direction as the Morris and Kimbrell (1972) data. Alderman (1978) has reported a negative correlation between these two outcomes in large scale evaluations of the use of the TICCIT computer assisted instruction program for mathematics. Students preferred conventional lectures but achieved more with TICCIT.

Negative correlations between achievement and enjoyment seem to extend to situations where students are allowed to choose between different instructional methods. Solomon and Kendall (1976) examined fourth graders' predispositions to perform well in open or traditional classrooms. They found evidence that students were poor judges of the setting in which they would achieve the most. Ott and Macklin (1975) found that students who choose between conventional and audio-tutorial methods of learning college physics achieved less than those who were assigned arbitrarily to one method or another. Peterson and Janicki (1979) have reported a number of negative relationships between pretest preference and posttest measures of enjoyment with the method of choice for high school and college samples.

At best, the results of studies, where student choice of method was examined, are mixed. Yelvington (1968) and Smith (1955) provided evidence of students achieving less with methods they reported preferring, but McLaughlan (1973) found students who liked unstructured teaching performing better with the discovery method. Apparently, neither student choice of method nor arbitrary assignment seems to yield consistent achievement and enjoyment outcomes. Cronbach and Snow (1977), however, have suggested that insights about this antagonism might be gained from a review of studies which explore the involvement of student aptitudes interacting with instructional methods.

A Review of Selected ATI Studies

After surveying existing ATI reports which have examined both outcomes, nine interpretable studies were selected for review. Approximately 21 studies were rejected because design or measurement problems made them uniterpretable. The selected studies represented a variety of instructional content, student ages and levels, instructional method types, and aptitudes. Following Cronbach and Snow (1977), a decision was made to additionally limit the review to studies which employed aptitude measures which were correlated with general ability (e.g., SAT, GRE, GPA, and IQ scores).

The first task in the review was to find an adequate categorization scheme for the 21 instructional methods employed in the nine ATI studies. While four studies employed a method labeled "conventional instruction", further investigation of the different descriptions indicated that the operational procedures followed were sometimes different. Even more important was the chance that these apparent operational differences between treatments would have different psychological consequences for subjects in the experiments. A preferred categorization scheme for methods would have to differentiate between the many varieties of labels, nominal characteristics and operational procedures primarily on the basis of their presumed psychological contribution to learning.

Snow (1977) has demonstrated that students tend to profit differently from methods which differ in the amount of information processing they require. Methods which place a higher information processing burden on students often result in steeper regression slopes when general ability is predicting achievement. Methods which carry more of the information processing load for students (e.g. are more structured) yield shallower slopes when plotted with ability. It has also been suggested (Samuels, 1970; Kelly, Note 1) that enjoyment of instruction is related to student perceptions of the amount

of effort required to learn. It was presumed that students' notions of the amount of effort required was related to the amount of information processing required by the methods in the studies surveyed.

In each of the nine studies, instructional methods were categorized by the author according to the apparent amount of information processing load they placed on the participants. Methods were judged to place a lower load on the subjects if they: (a) were more highly structured; (b) were more didactic and directed the student's approach to the task; (c) modeled necessary skills; (d) were more redundant; (e) provided synthesis questions or reviews; (f) were broken into shorter sequences; (g) provided supervised time on tasks; and (h) utilized a number of mathemagenic aids such as examples, analogies, attention directing devices, and advance organizers. Treatments were judged to be relatively higher in information processing load if they: (a) provided a more scrambled presentation; (b) called on, rather than provided, relevant skills; (c) provided minimum repetition; (d) were more discovery oriented and permitted a variety of approaches to the task; (e) allowed variable time spent on the task; (f) provided only factual or opinion questions; (g) presented information in large chunks; and (h) provided very few mathemagenic aids.

There were a number of problems encountered in classifying all of the instructional methods in these studies. It is possible that methods judged higher in load for one study actually placed less burden on students than those judged to be lower in load in another study. It is also the case that the labels applied to treatments are often misleading. For example, Peterson, Janicki and Swing (1980) report a study which contrasts a lecture-recitation with an inquiry method. They expected the inquiry method to place a lower burden on students than the lecture and reported evidence that the information burden was, in fact, higher in the lecture method. As implemented in the study, lectures required extensive notetaking, organizing and memory for details. In the inquiry method, on the other hand, students were provided with detailed instructions on study requirements and guidelines for fulfilling assignments.

Wherever possible, treatments were classified after scrutinizing the description of the operational procedures used to implement each treatment. However, since there is no procedure which promises to provide reliable comparisons of methods between studies, caution must be exercised in interpreting the results of the "load" classifications. At best, these judgments are speculative and often rely on meager descriptions of the operations which defined contrasting methods.

Where investigators provided a more conventional treatment and then in a second treatment they duplicated the first but added elements which attempted to lower the information processing load (e.g. Chan, 1960; Maier & Jacobs, 1964), the second treatment was judged to be lower in load than the first. In studies which clearly varied the amount of structure in the method employed (e.g. Maier & Jacobs, 1966; Peterson, 1977, 1979; Wispe, 1951) the higher structure treatment was judged to place a lower load on the students though no comparison between the studies was possible. Other studies required more detailed review to classify. Peterson and Janicki (1979) provided large and small group instruction in fractions to elementary students. Ordinarily, small group instruction provides more support to students and might be assumed to be lower in processing load. However, small group students were told to help one another and only ask a teacher for help if they could not reach a satisfactory answer or strategy. Small group students were required to take responsibility for organization, pacing and employing relevant skills, all of which characterize the higher load treatments. In the large group, students were directed to ask the teacher directly if they had difficulties, and when they asked, they received specific directions and other aids.

Welch and Walburg (1972) and Morris and Kimbrell (1972) contrasted "conventional" methods of teaching with an "innovative" approach. Morris and Kimbrell used conventional and Keller-plan methods to teach introductory psychology to undergraduates. After reviewing the operations employed in the two methods, it was decided to classify the conventional treatment as higher in load and the Keller plan approach as lower because more study aids such as tutoring, structuring, and synthesis questions were provided to students in the Keller plan. Welch and Walburg reported research which contrasted conventional lecture and recitation ways to teach physics with the (then) recently developed Harvard Project physics. The Harvard Project approach focused on smaller steps,

more immediate feedback, liberal use of charts and graphs to illustrate concepts, more direct and systematic help from teachers and an emphasis on the history and processes in physics rather than the higher load focus on the mathematical and verbal content of the discipline.

Snow's (1977) information processing approach to categorizing treatments implies generic hypotheses concerning the relationship between methods and achievement for students who differ in general ability. Lower ability students seem often to profit most from lower load methods which remove the information processing burden from them by providing structure and direction. Higher ability students seem to achieve more with higher load methods which apparently allow them to exercise their skills. When lower ability students receive lower load methods they often seem unable to provided the many skills required to learn, and they therefore often fail with them. Higher ability students sometime fail with higher load methods because these "predigested" methods provide strategies in, for example, organization and sequencing that may interfere with more familiar and successful strategies.

While the evidence for this generic ATI between ability and the load required by different methods has not been entirely consistent, it was sufficient for Cronbach and Snow (1977, p.500) to conclude that: "When one treatment is fully elaborated, whereas the other leaves much of the burden of organization and interpretation to the learner, the regression slope in the former tends to be less steep. That is, highs profit from the opportunity to process the information in their own way; lows tend to be handicapped. This is not a universal rule but it encompasses a wide range of results,".

In seven of the nine studies reviewed (Maier & Jacobs, 1964, 1966; Morris & Kimbrell, 1972; Peterson, 1977; Peterson & Janicki, 1979; Welch & Walburg, 1972; Wispe, 1951), low ability students learned best with methods classified as lower in load. In the Chan (1960) study there were no differences between the two methods for low ability students, and in the Peterson (1979) study low ability students profited from the (apparently) higher load method.

High ability students achieved best with higher load treatments in five studies (Chan, 1960; Morris & Kimbrell, 1972; Peterson, 1977, 1979; Peterson & Janicki, 1979) and profited from both treatments equally in two studies (Welch & Walburg, 1972; Wispe, 1951).In two studies there is evidence that highs learned more from the lower load treatment (Maier & Jacobs, 1966, 1964). It may be, however, that the Maier and Jacobs treatments in both studies (randomly scrambled programmed instruction frames for learning Spanish grammar with no outside help) were too difficult for all of the students. It is reasonable to conclude, therefore, that the weight of evidence in these nine studies generally support the Cronbach and Snow (1977) hypotheses. High ability students generally learned more from the higher load treatments, and lower ability students profited most from the lower load treatments. Table 1 displays the categorization employed for the nine studies and lists tentative conclusions about the relationship between achievement and enjoyment for each study.

The Enjoyment of Instructional Methods

In these nine studies there is very little theoretical discussion of the enjoyment construct. However, the enjoyment of instruction seems to be associated with the rewarding nature of expending less effort for greater results (Lawler & Porter, 1968; Samuels, 1970; Kelly, Note 1). In a strategy very similar to those employed by investment professionals, students like to invest the least amount of mental effort to achieve the greatest learning payoff. It may also be the case that students assume they will expend less effort if they think that the method they are encountering is "easy", in other words if the *perceived load* of the method is low.

A judgment of lower perceived load may come from experience with a method. The more familiar the method the lower the student perceives the load to be. Verlyne (1964) for example, has provided evidence that experiences which fit existing schemas are regarded as more pleasurable than less familiar stimuli which are categorized as "interesting". The enjoyment of instruction would therefore be expected to be at its maximum if a student expected the greatest return for the least effort spent with a method perceived to have a low information processing load. Salomon (1981) for example, has provided evidence that students typically perceive televised instruction as much easier than written instruction and his subjects report expending much less effort watching TV than reading when the content of the lessons are held constant between the mediums. Television viewing is typically reported to be more enjoyable by students than reading.

Table 1
Aptitude Treatment Interaction Studies Which Have Examined Both Achievement and Enjoyment With Instruction

AUTHORS	CONTENT	Ss	METHOD	LOAD	TENTATIVE CONCLUSIONS
Chan (1960)	Accounting	UG	Conventional Con + Modeling	Higher Lower	High ability like low load but learned from high load. No significant difference for low ability.
Maier & Jacobs (1966)	Spanish	Elem.	Scrambled PI Logical PI	Higher Lower	High ability like low load and learned from low load. Low ability like high load but learned from low load.
Maier & Jacobs (1964)	Spanish	Elem.	TV Teacher PI alone TV Teacher + PI	Higher Medium Lower	High ability liked low load and learned from it. Low ability liked high load but learned more from low load.
Morris & Kimbrell (1972)	Psychology	UG	Conventional Keller Plan	Higher Lower	High ability like low load but learned more from high load. Low ability liked high but learned more from low load.
Peterson (1977)	Social Science "alienation"	HS	Low structure High structure	Higher Lower	High ability liked low load but learned more from high load. Low ability liked high load but learned more from low load.
Peterson (1979)	Educational Psychology	UG	Low structure High structure	Higher Lower	High ability and anxious liked low load but learned more from high load. Low ability and anxious liked low load but learned more from high load.
Peterson & Janicki (1979)	Fractions	Elem.	Small Group Large Group	Higher Lower	High ability liked high load and learned more from high load. Low ability liked high load but learned more from low load. Anxiety interacted.
Welch & Walburg (1972)	Physics	UG	Conventional Harvard Proj. Physics	Higher Lower	High ability like low load but learned equally from both. Low ability liked low load and learned best from it.
Wispe (1951)	Social Science	UG	Permissive Directive	Higher Lower	High ability liked high load but learned equally from both. Low ability liked high load but learned best with low load.

In addition to the lack of substantive theoretical discussion of enjoyment in the studies reviewed, there was very little consistency in the measurement of the variable. Enjoyment of instruction was measured using adjective rating scales (Chan, 1979; Maier & Jacobs, 1964, 1966), projective methods (Wispe, 1951), questionnaires (Morris & Kimbrell, 1972; Welch & Walburg, 1972), and Likert-style scales (Peterson, 1977, 1979; Peterson & Janicki, 1979). Some of the measures of enjoyment with instruction included an evaluation of teachers, content and method (e.g., Peterson, 1977) and some dealt exclusively with method (e.g., Chan, 1979).

In seven of the nine studies (Chan, 1960; Maier & Jacobs, 1964, 1966; Morris & Kimbrell, 1972; Peterson, 1977, 1979; Welch & Walburg, 1972), high ability students reported preferring lower load methods. In two studies (Peterson & Janicki, 1979; Wispe, 1951) highs liked the higher load methods. A similar consistency is found for lower ability students who report liking higher load methods in six of the nine studies (Maier & Jacobs, 1964, 1966; Morris & Kimbrell, 1972; Peterson, 1977, 1979; Wispe, 1951). In two studies low ability students preferred lower load methods (Peterson, 1977; Welch & Walburg, 1972), and in one study (Chan, 1960), there were no differences between low ability preferences.

There is evidence in these studies to support the generalization that students typically report enjoying the method from which they learn the least although they seem unaware that the most enjoyable method yields less achievement. High ability students typically report enjoying lower load methods but generally learn more from the higher load methods. Conversely, lower ability students seem to like higher load methods despite the observation that in these nine studies, they most often learned best with the lower load instructional methods.

Why Do Students Enjoy the Method from Which they Learn the Least?

The reason for this antagonism between achievement and enjoyment may stem from a situation where students seem to enjoy investing less effort to achieve and inaccurately assess the effect of investing less effort on their subsequent achievement. They appear to make judgments based on their perceived efficiency. They will report enjoying methods which appear to them to bring maximum achievement with less investment of time and work. The decision that one method is superior in efficiency may come from a mistaken judgment that they are familiar enough with a method to profit from it. It is the methods which students perceive to be more familiar, however, for which Berlyne (1964) would predict the greatest enjoyment scores. But again it is not clear whether students accurately assess the extent to which they actually are familiar with a method. It is possible that the manifest and nominal characteristics of a method may only seem familiar to students. Berlyne (1964) offers evidence that objectively complex or demanding stimuli are often perceived as subjectively simple by subjects who locate familiar features in a complex display and categorize the whole display as "familiar".

New instructional methods often require special cognitive skills and strategies to learn from them . . . skills which are only gained through experience with the new method. These same new methods may offer manifest features which are similar to more familiar methods and are therefore classed as enjoyable by students who do not recognize the discrepancy. The perceived load of the method is different from the actual load, and while the student enjoys the method, they fail to maximize their learning. However, if these explanations are correct, how is it that students with differing ability report liking very different instructional methods? From an examination of the nine studies reviewed, it appears that students at different ability levels make different judgments about the efficiency of their efforts.

Effort and Higher Ability Students

High ability students may report liking low load methods most often because they perceive them as offering efficient strategies for learning. Lower load methods may be perceived as *permitting* much less effort than higher ability students expect to invest in the higher load methods.

Both Chan (1979) and Peterson (1977, 1979) reported similar perceptions of the performances of higher ability subjects. Peterson (1977) notes the selection of the lower load method by her higher ability students and surmises that they selected the "cuing" offered there. As Salomon (1971) has suggested, however, these lower load treatments often provide more than cues. In many instances very detailed strategies for learning are modeled for students. These strategies aid

lower ability students but tend to interfere with the learning of higher ability students who already have successful strategies which work. This was probably the case in the Chan (1979) study, where the lower load methods modeled specific strategies for solving accounting problems for college students, and in studies by Peterson (1977, 1979) where students received goals, objectives, verbal importance markers, synthesizing reviews, and transitions both provided and elicited by teachers, and in the Morris and Kimbrell (1972) study where high ability students seemed not to require the objectives, small segments, and more structured Keller plan method.

When learning strategies provided by the lower load methods interfere with the existing learning strategies of higher ability students, they tend to profit more from higher load methods. Students seem unaware of this interference, however, and report enjoying the lower load methods. When the lower load methods do not interfere with the strategies used by higher ability students, they will learn more from them, as they did in the study by Wispe (1951) where the high load methods appeared to be beyond the existing skills of these students. It is assumed that higher general ability students have acquired a greater number and variety of learning strategies of the kind Cattell (1971) and Horn (1976) have called "crystallized" verbal-educational strategies. Lower load methods employ many tactics to externally process information for students which may seem useful to the higher ability student who does not recognize them as potentially interfering. Like the experienced baseball player who is asked to use a different strategy for an already successful batting position, accommodating the "easier" method may lower performance.

Other methods, higher in load, merely "activate" existing skills which they presume the student has already acquired. These activation (Salomon, 1971) methods are beneficial to the highly skilled student but not to the lower aptitude student who does not have the skills being activated. The lower ability student requires the compensatory function of the lower load methods where information is externally processed and therefore complements the students lack of relevant skills. When lower load treatments supplant skills which interefere with the learning of higher ability students, they will tend not to learn as well from them but they like them. When high load methods activate skills that are in the repetiore of high ability students, they tend to learn more from them but still seem to enjoy low load methods more.

Welch & Walburg (1972) contrasted conventional higher load methods of teaching physics with the newly developed Harvard Project Physics (HPP). Higher ability students like HPP but learned equally well from both methods. In a reanalysis of this data by Cronbach & Snow (1977) it appeared that HPP differed from conventional instruction *only* in the motivation strategies employed. There may have been very few differences in either activation or supplantation between the two methods. Wispe (1951) taught social science to undergraduates with a permissive higher load method which was enjoyed more by high ability students who learned as much from it as with the more directive method. From the description provided in both of these studies, it appears that the lack of achievement differences for high ability students in contrasting methods may have been due to the lack of interference in the low load method.

Hypotheses. The tentative hypotheses suggested in these studies for high ability students are:

1. If the instructional treatment serves a supplanting or modeling function and is perceived by students as requiring a lower information processing load, the treatment will be enjoyed more by higher ability students, who will learn less from the method than from higher load methods that do not present interfering strategies for learning.

2. If the instructional treatment serves an activating or cuing function and is perceived by students as requiring a lower information processing load, the treatment will be enjoyed more by higher ability students who will learn more from it than from lower load methods that present interfering strategies for learning.

Effort and Lower Ability Students

Low ability students usually have a history of lower achievement levels and may not perceive a difference between low and high load methods which will enhance their achievement. They may simply view the more structured and directive low load methods as requiring more time to achieve the same disappointing results they have experienced in the past. They may therefore report enjoying higher load approaches because these methods seems to permit less investment of effort for a similar level of academic reward. In some instances (Maier & Jacobs, 1964; Peterson,

1977; Peterson & Janicki, 1979; Wispe, 1951) the higher load method may have given the low ability student the chance to maintain a lower profile so their failure is not so visible.

The less structured and permissive methods also allow students to spend very little time without attracting the attention of teachers or peers. It is the lower load methods which cue lower ability learners to appropriate strategies, provide or model skills, and monitor the time they spend on tasks structuring devices that are noticeably absent in the higher load approaches.

It is possible that lower ability students occasionally recognize this dilemma. Wispe (1951) reported that his lower ability students "enjoyed" a permissive method but "preferred" the more directive method. Preference here may have indicated a recognition that the directive method resulted in greater achievement. In this study the permissive treatment also employed familiar humor and examples which were specifically excluded from the directive treatment. Peterson & Janicki (1979) found that students initially preferred the approach in which they though less effort would be required. In this study the high load treatment was a small group instruction setting where little direction was provided unless the student specifically requested it. The lower ability student could find considerable anonymity in this setting and avoid expending more than a minimum of effort.

Hypotheses. Tentative hypotheses concerning lower ability students are:

3. If a higher load instructional method serves an activation function and is perceived by students as providing a higher information processing load, it will be enjoyed more by lower ability students, who will learn less from this method than from a lower load method.

4. If the treatment serves a supplanting function and is perceived by students as providing a lower information processing load, it will be enjoyed less by lower ability students, who will learn more from it than from a higher load method.

Other Factors which May Yield Achievement/Enjoyment Antagonism

There are many other factors which yield both negative and positive relationships between achievement and enjoyment in ATI studies. Chan (1979) has suggested that prior knowledge interacts with ability to produce different achievement and enjoyment outcomes. In her study, high prior knowledge students who were also high ability seemed bored by the supplanting lower load method she offered and preferred the higher load method. However, these students learned more from the lower load method. Chan used very few subjects, however, and it is possible that her lower ability students experienced a very difficult task and that there were floor effects in the outcome measure.

Peterson (1977, 1979) and Peterson & Janicki (1979) found interactions between ability and anxiety which were interesting. In her studies, Peterson has typically found that highly anxious students tend to do better in low load treatments regardless of ability. Presumably, the more anxious student requires the structure of the lower load method to mediate the effects of anxiety.

Peterson (1977, 1979) also has used the subscales for Achievement through Independence and Achievement through Conformity of the California Personality Inventory as aptitudes and has found interactions with this method. Independent students achieved better and seemed to like instruction better when allowed to choose from among methods which differed in load. Conforming students achieved more with low load methods and liked them better. Whether personality measures such as these eventually account for more variance in achievement and enjoyment than general ability is yet to be determined. At the present time, however, it appears that the CPI subscales are the best predictors of compatible achievement and enjoyment outcomes in ATI studies. Similar studies employing personality measures have been conducted by McLaughlin & Hunt (1973) who used conceptual complexity and Holloway & Robinson (1979) with locus of control.

Summary. There is evidence in ATI studies that sutdents tend to report enjoying the instructional method from which they learn the least. When other things are equal, high ability students prefer more structured and directive methods which lower the learning "load" on them, but learn best from more open and permissive approaches which place more "load" on them. Lower ability students prefer permissive methods, but learn best with more structured approaches. It seems to be the low ability student who is most vulnerable to this antagonism between achievement and enjoyment. Both ability groups seem to make inaccurate judgements about the efficiency of their efforts. High ability students appear to believe that more directive instructional methods will make their learning easier, but those methods sometimes interfere

with their learning by providing strategies which duplicate those they have already earned. Low ability students seem to conclude that more permissive approaches are more enjoyable, perhaps because they think that they can achieve as well with them as with the more directive methods which require much more effort. However, the more permissive approaches do not provide the structure and direction which they need to learn.

There are also indications that factors such as prior knowledge of the subject matter, independence and conformity tendencies, locus of control, and anxiety may also interact with ability and method to influence achievement and enjoyment differently.

More research is needed to clarify the reasons why students enjoy methods which do not enhance their achievement. Studies which vary the information processing load of treatments, general ability, and student perceptions of the amount of effort they need to invest for different achievement levels seem to be most profitable. In addition, the roles of novelty, prior knowledge, and anxiety in liking and achievement need to be understood.

It seems reasonable to expect that the most desirable goal of instruction would be that students come to enjoy those instructional approaches from which they learn the most. It would be premature to conclude that compatibility between these two useful outcomes is possible.

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