CALIFORNIA STATE UNIVERSITY, NORTH RIDGE

REFLECTION AND ANXIETY AS THEY AFFECT COMPREHENSION GAINS IN SPEED READING

A graduate project submitted in partial satisfaction of the requirements for the degree of Master of Arts in Educational Psychology

by

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and

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ABSTRACT

REFLECTION AND ANXIETY AS THEY AFFECT
COMPREHENSION GAINS IN SPEED READING

by
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Master of Arts in Educational Psychology

September, 1972

Fifty-five secondary students were selected for a pilot study
to test the relationship between the cognitive styles of reflection and
impulsivity with performance on speed reading tasks. Ss were divided
into three treatment groups--(group I--high pressure, impulsive atmos-
phere, stress on speed; group II--low pressure, reflective atmosphere,
stress on accuracy; group III--control group, combination of programs).
All groups were administered the Matching Familiar Figures Test, Lorge
Thorndike IQ Test, Casteneda Manifest Anxiety Test, and Learn, Inc.,
Reading Tests (pre and post). Each treatment group was compared for
reading comprehension and reading rate gains in terms of those stu-
dents identified as reflective, impulsive and "other" as well as those
identified as highly anxious or moderately anxious. Comparisons were
made using an analysis of covariance using reading comprehension and
reading rate separately as dependent variables, with IQ, anxiety,
reading level, and cognitive style as covariates. It was hypothesized that reflectives would do better than impulsives and "others" in all groups, that the reflective atmosphere (low pressure, open structure, stress on accuracy) would produce higher comprehension scores, and that highly anxious students would show little if any comprehension gain. Analysis of the data revealed no significant differences in comprehension scores between treatment groups, or between reflective and impulsives, or between highly anxious Ss and all other Ss. Only Group I (impulsive atmosphere) had a significantly greater increase in reading rate as compared with the other two treatment groups. Although all three main hypotheses had to be rejected statistically, trends were noticed which suggested the possibility of further modification of this experiment to discover new covariates which account for differences in reading comprehension growth.
REFLECTION AND ANXIETY AS THEY AFFECT COMPREHENSION GAINS IN SPEED READING

A. Introduction

1. Statement of the Problem and Rationale

The major purpose of this project was to do a pilot study to test for the significance of the reflection-impulsivity dimension and anxiety as they relate to the process of speed reading. Research has indicated that the reflection-impulsivity dimension is very important when dealing with learning in a classroom environment (Kagan et al., 1964, Kagan 1965a, Kagan 1965b, Kagan 1966, Ayabe 1969, Albert 1970). Previous investigations have established the presence of stable individual differences in this cognitive disposition and have extended the network of its correlates into other cognitive spheres including inductive reasoning, reading ability, and serial learning. With the increasing demand for structuring cognitive tasks in behavioral terms, it is increasingly important to understand the relationship between individual learning strategies and the learning task being presented to the child. Our study is an attempt to bridge the gap between the research on the reflection-impulsivity dimension, which Kagan suggests "... has the most direct implications for the education process", and success in speed reading.

Many people today feel that reading is one of the most important ways to get new information. Yet there is much criticism of the speed reading process. In commenting on the claims made by Reading Dynamics, Spache (1964) notes that reading rates above 800-900 words per minute are physiologically impossible because of the distracting
Influence of conscious eye movement and fixation time. He suggests that rates below this figure (500-600 words per minute) are probably closer to the maximum for fluent readers (those who make maximum use of the redundancy of written language) given smaller print size, below optimal lighting, variations in attention span, and so forth. Claims of reading rates above that level (500-600 words per minute), with no comprehension loss, must be due to the readers having learned something about handling visual material that complements their information processing ability. Dr. Ronald T. Carver, in an article appearing in Psychology Today, August '72, suggests that speed readers have learned to:

1. Look at groups of words in each line of print long enough to store the bit of information it carries independent of other words in that line.

2. Try to get as much information as possible without attempting to understand or store individual words or phrases or sentences the writer intended to communicate.

3. Make inferences unhesitatingly about what the author intended to communicate on the basis of fragments of information gathered.

If speed readers are to have good comprehension with the material they read based on fragments of information they pick up in skim-scan type reading, the inferences they make about the material must be based on serious thought which seeks to find something new or see what is already known in a different light in that material. Certainly comprehension will be low with skim-scan type reading if the reader has impulsive or unregulated ideas coursing through his mind. Because of this fact, speed readers must necessarily have a meaningful purpose for their reading and they must reflect on and use the material in the selection that is potentially meaningful. Setting such a goal
influences the comprehension and retention of the material.

When we ask a student to speed read, we are assuming that he will read and reflect over the various meaning patterns exposed on each page of print, using redundancy clues to formulate a complete hypothesis of meaning and verify his predictions by using visual cues provided. (see the Smith section in review of the literature.) But Kagan et al., in his 1964 monograph, suggests that some children have a more impulsive style of thinking than others. He states, in his discussion of the reflection-impulsivity dimension of cognitive style, that the child's evaluation of his own cognitive products has a great deal to do with whether the child will act upon his first hypothesis when presented with a problem situation or whether he will pause and reflect on the accuracy or appropriateness of his first hypothesis as compared to others he might generate.

Kagan further states that in a situation where a teacher rewards children who respond rapidly and correctly, the less able impulsive child who acts on his first hypothesis without considering its appropriateness may well be handicapped since the speed of response will be associated with inaccurate answers in his case. "Such a child is being taught the value of quickness, but this can only have the effect of enhancing the likelihood of failure." Kagan (1965b) has observed that among children of below average ability, reflectives consider themselves to be more capable than impulsives in problem solving situations. For children of above average ability, impulsives regarded themselves as more capable than reflectives. From this information, we suspect that impulsive children of low to moderate ability will do poorly at the speed reading task since the process
itself demands of the reader that he pick up fragments of information in a cumulative fashion and check for common attributes as they relate to a hypothesis about the writer's main idea or ideas. Being impulsive may have a debilitating effect on the speed reading process.

Kagan and Kogan (1970) further suggest that with problem solving situations the impulsive child will follow a strategy of responding quickly since he will link incompetence with slowness. Since he is risking higher and higher rates of error by responding more quickly, the speed reading task itself could become an anxious one for him. This anxiety may have a significant effect on reading comprehension. Reflective thinkers too can be anxious over the speed reading task, but their anxiety (suggested Kagan in a general sense) derives from the expectation that making mistakes is associated with incompetence. This source of anxiety may enhance the speed reading process since the more information one takes in and examines before making inferences about meaning, the greater will be the likelihood that his inferences are correct. The reflective thinker may not read as fast as an impulsive thinker, but he will get more out of his reading.

2. Hypotheses

From the above information and the review of the literature related to the reading process and cognitive styles to follow, we make the following hypotheses:

1. Students who are reflective will show more improvement than impulsives in comprehension growth using speed reading drills.

2. Reflective students in a low pressure atmosphere where
the emphasis is on accuracy will make more improvements in comprehension growth than reflective students in high pressure atmosphere where the emphasis is on speed.

3. High anxiety level will have a negative influence on reading comprehension for both reflectives and impulsives.

B. Review of the Literature

Jerome Kagan is credited as the originator of research in the area of reflection-impulsivity. The conceptualization and operational definitions were developed in his monograph on analytic and reflective attitudes (Kagan, et al., 1964). His research was an outgrowth of his concern for analytical thinking and its relationship to problem solving tasks and was based upon earlier findings in cognitive styles (Kagan, Moss, and Siegel, 1963) suggesting that analytic ability has a direct relationship to successful school performance.

In defining the type of analytic concepts being studied, the 1964 results revealed that two important fundamental cognitive dispositions contributed variance to the production of analytic concepts: the tendency to reflect over alternative solutions or classifications in situations in which several response alternatives are available simultaneously and the tendency to analyze visual arrays into their component parts.

Kagan drew information from earlier work done by Witkin (Witkin, Lewis, et al., 1954; Witkin, Dyk, et al., 1962). In other studies Witkin was attempting to find relationships between an analytic style and field independence. Witkin's work, along with others, revealed that perceptual grouping/processing was significantly related
to scores on the WISC (Woerner & Levine, 1950, p 59). In Witkin's study of children (Witkin, 1954), Witkin hypothesized "that the ability to separate an item from its context expresses itself in an individual's intellectual activities, as well as in his perceptual ability." In his factor analysis study (Witkin et al., 1952, p 62), Witkin came to the following conclusion: "The relationship between full-scale IQ scores and field dependence measure is best explained on the basis of the expression of this (analytic) cognitive style." The factor-analytic study by Karp (1963) provided good support for these conclusions.

With this background, Kagan used the visual mode as an index of the analytic variable. Whereas Witkin's research was primarily concerned with embedded designs (using The Embedded Figure Test), Kagan developed a conceptual Styles Test designed to measure analytic and relational styles of cognitive processing. Kagan felt that it was important to understand the ways in which people process information. Though his early research received much criticism, it had some important implications related to the thinking process, which Kagan recognized as indicative of thinking styles.

Kagan set out in his 1964 monograph (Kagan et al., 1964) to study the relationship between analytic thinking and various tasks. In eight separate studies, analytic tendencies were tested against performance on such tests as the Embedded Figures Test (Witkin, 1952), The Conceptual Styles Test, The Direct Recall Test, and The Matching Familiar Figures Test. All of these studies revealed that the tendency to inhibit judgment (when confronted with several solutions simultaneously) was positively related to analytic thinking.
Once this relationship was established, studies were developed to test the stability, transferability, and modifiability of this reflective preference. Kagan followed up his 1964 study with research in the areas of reading and inductive reasoning. In dealing with the reading variable (Kagan, et al., 1965), Kagan found that impulsives made more word errors in reading prose than reflectives. He concluded that learning to read was, in part, influenced by propensities toward reflection or impulsivity. This research demonstrated that the reflection/impulsivity style was indeed transferable to other learning environments other than the original test situations and directly related to reading.

Further research by Kagan (1966a) revealed that third grade impulsives made relatively more errors than reflectives in a serial recall test involving twelve familiar words. This experiment included two treatment groups designed to raise the anxiety level of children. The results of this experiment demonstrated that increased anxiety affected the reflective group more than the impulsives. Impulsives had little increase in errors over their error baseline levels. But reflectives demonstrated a large increase in errors when threatened with fear of failure. Thus, it was possible to disrupt the performance of the reflectives who were normally anxious about making errors by adding further anxiety through threat of failure. Thus anxiety could alter performance.

In an attempt to modify the reflective/impulsive mode, Kagan tried to train children specifically to alter their style. (Kagan, Peason, Welch, 1966b). Students in the training group were required to inhibit their response for fifteen seconds. The results showed
that there was a longer response time for the test group, although there was no effect in error scores.

Debus (1970) attempted to modify response times by exposing test groups to older "model" students. Students exposed to older reflective models exhibited slower response latency, yet had no decrease in error rate. Those exposed to impulsive models became faster but also had no difference on error rate. This research indicates that the reflective style is more easily modifiable than the impulsive style.

Other research has demonstrated opposite conclusions to the Kagan et al., and Debus studies. Nelson (1968) trained fourth grade boys to emphasize accuracy and ignore speed. His results showed that impulsives reduced both their rate of error and their response speed relative to changes observed in control subjects.

Stein (1970), using two types of cue discrimination, was able to show that error rate for both reflectives and impulsives could be reduced through specific training. Two test groups, one trained for cue attendance (generating descriptive clues) and one trained for cue relevance (comparing details and evaluating alternatives) were compared with a control group. After testing students (pre/post) on the Matching Familiar Figures Test and the Haptic Visual Matching Test, Stein found that there was a significant decrease on the MFF in error rate for all groups. She also found that there was a significant drop in error in the cue relevance group when compared with the other two groups.

Joseph Albert (1970) found support for the hypothesis that the impulsive style could be modified using second and third graders
divided into two treatment groups. Stein found that the group trained to scan the stimuli and eliminate incorrect alternatives before responding had a significantly longer response time on the MFF post test than those in the group told to "think and take time" before responding. Those trained to scan also had a significant decrease in response errors, as compared with the other two groups. The training in this experiment did not generalize to three other discrimination tasks.

Ayabe (1969) studying the effect of training on modifying conceptual tempo, found that training in impulsive strategy produced impulsive behavior. Training in reflective strategy was not as successful in producing reflective behavior. Using 72 fourth grade students, Ayabe provided specialized training to alter cognitive style. Using the MFF test to determine reflection/impulsivity, Ayabe set up two groups of reflectives and impulsives by placing the impulsives in an opposite style group and a control group. In the research, he found that the styles could be modified. Specifically, he found that training in impulsive behavior induced impulsive behavior with reflective students. Training in reflective strategy was not as successful in inducing reflective behavior in impulsive students. Training for this experiment was done in three sessions where the trainer (who is the same sex as the testee) provided three part instruction in the appropriate style. The students were allowed to practice applying the rules learned.

The results of these last few experiments suggest that the impulsive/reflective style can be modified if the Ss are trained specifically in scanning-error reduction techniques. These techniques
are directly related to the skills required to perform accurately and slowly on The Matching Familiar Figures Test.

Besides modifying performance through specific task training, anxiety has been found to affect performance. Extremes in anxiety seem to have a significant influence on the ability of a student to perform to his maximum ability. Kagan (1966) found this to be true when he studied the relationship between cognitive style and memory. The results of his study showed that high anxiety interfered with the normally accurate performance of reflective students. He concluded that moderate anxiety enhanced performance and high anxiety lowered performance. Anxiety conditions had little influence on impulsive students though.

The results of the Kagan study are supported in part by Frieda Fromm-Reichmann's (1955) contention that anxiety "may be experienced as an unpleasant interference with thinking processes and concentration" (pp 113-114). "In people who are more anxious, anxiety manifests itself in more or less degrees of paralysis of thought and action." The anxiety she referred to was general anxiety caused by a number of reasons. The implications here are that a general state of anxiety can affect the cognitive process by delaying or stopping it. However, it is doubtful that anxiety can change cognitive style directly. When time constraints are introduced, high anxiety levels can give the appearance of changed style preference by making the impulsive mode more expedient and allow for anxiety reduction. For reflective people, the time constraint can increase anxiety over correctness of response, resulting in decreased performance (as substantiated by Kagan, 1966).
Sarason (1960) found that test anxiety or manifest anxiety was related to performance also. He divided two test groups into "high" and "low" anxiety categories, and he found that the high anxiety group did better on specific mental tasks where alertness to errors improved the score (corresponds to practicing the reflective style). Less anxious children were better on tasks requiring flexibility and creativity. They also tended to do better on critical thinking and were more productive. Other studies have shown that students at all levels up through college who can be labeled as anxious tend to be rigid in their responses and do better on specific tasks calling for straight recall of material read. Anxiety inhibits interpretation (reflectivity) in reading situations that call for interpretation.

One further aspect of the reading task is important to consider if we are to suggest that one can predict relative success in speed reading depending on cognitive style. Frank Smith (1971) claims that

...All perception is the result of a decision making process that reflects past experience and future expectations as well as the information being received at the moment. A reader or listener extracts meaning from the environment (reduces his uncertainty) on the basis of the visual information (the surface structure of language) and all the deep structure of language and knowledge of the world at large that is contained within his brain." (p 69)

Smith is suggesting here that our fund of knowledge about the world plays an important part in the way we predict and interpret the events around us.

The reading process clearly involves components of prediction,
identification, and interpretation. The more able a reader is, the less visual information he needs from the page because he can predict what the unread material will be. An able reader also needs less perceptual information from the page because he can recognize what is familiar in print and can identify it rapidly, and through the use of redundancy (of letters, of words, of ideas), a good reader is also able to attend less to the mechanics of reading and more to the understanding of what is being said. All of these abilities are important to the speed reading process because of the physical limitations of the visual perceptual system.

Many cognitive psychologists, suggests Smith, believe that the visual image is retained in the brain in "a sensory store." This information decays very rapidly and some is lost as new information comes in to await processing or movement into short term memory. How much information gets into short term memory depends upon its form. Short term memory may contain only four or five elements at any one time but each of these elements may be a single letter or a simple word or possibly a meaning extracted from several words. Smith (1971) suggests that:

Since sentence meaning cannot be determined on a sequential word by word basis, it is obvious that information from several printed words has to be held in short term memory at any one time. The load on short term memory can be reduced by "chunking" information in larger units...but this involves making use of syntactic and semantic information that must already be stored in long term memory."

(p 78)

A good reader, claims Smith, will be a person who can ensure that the information stored in his short term memory is the most important information, and he can do that because he can predict just
what the nature of the incoming information is likely to be. This involves selection among alternative possibilities at the preconscious level. (p. 79)

In teaching speed reading, we must assume that the reader attempting the course is able to group words into meaning chunks. This grouping accomplishes for him some of the integration required to get the information into long term memory as a single semantic unit of meaning, thereby increasing his words per minute reading rate. If the reader does not have enough experience in reading to be able to take advantage of the redundancy of language—if he must use predominantly spelling or "phonic" or "analog" rules to integrate the information from identified segments of words into words and then to meaning—the visual information processing and memory system will be overloaded and much of the meaning of the material being read will be lost.

For our research, we felt that readers who read at the 6.5 or above grade level would be able to make use of orthographic, syntactic and semantic redundancy. But the connection between being a good reader (being able to focus primarily on meaning rather than word identification) and a fast reader involves other implications.

J. Harlan Shores (1961) studied two groups of sixth grade and adult Ss to assess whether fast readers were better than slower (more accurate) readers. By setting up test situations where material read and format used varied, Shores found that fast readers were better when reading some kinds of material for some kinds of purposes (reading tasks presented in standardized reading tests). However, there was no relationship between speed of reading and comprehension (for either group)
when reading scientific materials for the purpose of solving a problem or getting the main idea.

Shores also found that efficient adult readers are more flexible in adjusting reading rate to the demands of the task than are sixth grade students. This would support Kagan's hypothesis that reflection increases with age as well as Smith's contention that fluent readers attend more to meaning identification and are able to reduce the tax on memory in deriving meaning. Because the older readers were "thinking", they were better able to assess the rates at which they could assimilate the "deep structure" meaning without loss of verification of accuracy.

This ability to vary reading rate with the complexity of the material certainly involves reflective or analytic thinking. A fluent reader reflects over the various meaning patterns exposed on each page of print, uses redundancy clues to formulate a complete hypothesis of meaning, and verifies his prediction by using the visual cues provided. We think the impulsive person (as defined by Kagan's Matching Familiar Figures Test) follows a similar procedure, but he will more often reach an inaccurate conclusion with material where meaning is complex. It seems that the propensity to avoid rechecking accuracy (for the impulsive person) would hinder comprehension for some reading tasks. Using the Smith model then and the information about the disposition toward reflection or impulsivity from Kagan et al., we decided that reflective Ss would do better at the speed reading task, when increased comprehension was the measure of success and accuracy in reading was emphasized.
C. Procedures

1. The Sample

Three groups (classes) of speed reading students were selected from a summer school population of 1600. The classes were composed of semi-rural suburban middle and lower middle class Caucasians, predominately female (65%), in grades 7-12. The ages ranged from 12 to 17 years and all three classes were ungraded (included all grades). Students were assigned to classes according to the date they enrolled in summer school. As one class of speed reading filled, another was opened. A total of three speed reading classes were offered. The consequence of this enrollment procedure was that one class had 85% of its students from grades 7-9 (designated Group I), another had approximately 40% of its students from grades 10-12 (designated Group II), and the control class (Group III) had a majority of 7-9th graders.

2. Methods

Group I students, originally consisting of 30 students, were given speed reading instruction that was highly structured and constantly emphasized time as an important factor in assignment completion. The literature suggested that this approach would be anxiety producing. Students were drilled every day with timed exercises designed to push up their reading speed from their initial level. These drills were given to the large group with the instructor selecting the material to be drilled on. Comprehension questions (pencil and paper) were given periodically on the material drilled with to check for gains in effective reading rate, a measure used in the class to indicate progress (words per minute multiplied by the percent of
comprehension questions answered correctly). Other activities in-
cluded assignments on reading machines (EDL and Rateometer) in small
groups in which students were to complete a specific number of units
(reading selections with comprehension questions) at an assigned
reading rate (usually 750 words per minute). The class met for two
hours each day for six weeks, and the students were under strict time
pressure to complete all of the work assigned. Many of them had to
take the daily material home to complete the assignment, although this
was discouraged since enough classroom time was allowed for each acti-

Test Group II, consisting of 23 students initially, was
given a more student-centered test treatment. The literature indicated
this approach would produce less anxiety than the approach used with
Group I. It was felt this would be an advantage for the reflective
and the impulsive student. Students were told to read for accuracy
on comprehension. Speed reading concepts were introduced as an or-

malizational skill to ease the load on memory and speed was not
emphasized as an end in itself. The class was conducted using an open
structure where students were allowed to select their own reading
materials as well as their own work groups. Minimal assignments were
made by the teacher during the first three weeks of the six week
course to orient the students as to which kinds of activities would
prove beneficial for improvement in reading skills. The same material
as far as skill development in speed reading was available for all
groups (I, II, III) although specific assignments were not made after the third week with Group II. The last three weeks were used by the students as they desired (except on a few days of testing). Group II students were given the assurance that they would receive credit if they met the minimum course requirements. Group I, on the other hand, received letter grades of A through F with the threat of failure if class notes and assignments were not in good order and in on time.

Group III (the control group), which originally consisted of 27 students, was given a more traditional speed reading treatment where assignments were made and student progress was constantly measured and recorded. Students were allowed much more freedom in material selection than Group I students, but not as much as Group II students. Timed drilling was not a regular part of the activity. Students were directed to use the reading machines and they were assigned specific units for completion. This group was used as a control group and although students were assigned credit/no credit (as were students in Group II), Group III students had to meet strict requirements for credit.

All students were administered pre and post reading tests (informal and formal), to determine reading speed and comprehension growth. The Lorge-Thorndike IQ Test (Form 1) was administered by the instructors to measure verbal IQ, Kagan's Matching Familiars Test (elementary version) was given individually to all Ss to measure impulsivity-reflectivity, and a manifest anxiety test (Casteneda, McCandless, et al., 1951) was given to measure relative anxiety of each student.
A survey of the literature leads to the following expectations:

1. Reflectivity increases with age.
2. Reflectives in impulsive environments act impulsively.
3. Impulsives in reflective environments act impulsively.
4. Moderate anxiety is necessary for best performance.
5. High anxiety interferes or lowers performance (on recall tasks).

D. Findings

1. Predictions for performance on speed reading test will be based upon the following assumptions:
   a. Anxiety level will have the highest degree of effect on performance since anxiety can influence cognitive style (high levels should reduce performance in Group I; anxiety should be reduced in Group II allowing for more normal behavior);
   b. Cognitive Style--Reflection/Impulsivity--should have an important role in influencing performance. Impulsive style should not give cause for improvement in comprehension while reflective style should give cause for improvement (assuming that there is no interfering variable like high anxiety or classroom stress affecting performance).

2. Results: A Short Summary

Impulsive students in Groups I and II had higher mean scores in reading comprehension growth than reflectives. In Group III, reflective students did have a higher mean score in reading comprehension
growth, but these differences were not significant and hypothesis 1 (which predicted that reflectives would make greater improvements in reading comprehension growth) had to be rejected (see Table 1).

<table>
<thead>
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<th>Group</th>
<th>Actual Mean Score</th>
<th>Adjusted Mean Score</th>
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<tr>
<td>Group II</td>
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<tr>
<td>Group III</td>
<td>1.20</td>
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Reflective students in Group II (a relaxed atmosphere with emphasis upon accuracy) made more improvement than reflectives in either Group I (a pressured atmosphere with emphasis on speed) or the control group. There was a noticeable trend to support hypothesis 2 (which predicted that a reflective atmosphere would produce the greatest gains in comprehension growth for reflectives), but because the difference was not significant, hypothesis 2 had to be rejected.

High anxiety did not have a significant effect on comprehension scores for any one specific group or for all groups together. Since no significant differences were found, hypothesis 3 (which predicted that highly anxious Ss would show little if any gain in comprehension) had to be rejected.

Reading rate, a consideration that was not a part of our hypothesis statement, was significantly higher in Group I than in either Group II or in the control group. This result supported the
theory that impulsives would be responsive in an impulsive atmosphere than in a reflective atmosphere. It also gave support to Ayabe's study (1969) suggesting that reflective students act impulsively when given instruction in impulsive behavior.

3. Analysis of Data

An analysis of covariance was used to compute significance of the dependent variable, reading comprehension. Covariance was selected because such analysis allowed for adjustment of covariates (independent variables) to control for variations which were uncontrollable in the classroom. The computer program selected for this analysis (BMD 040, U.C.L.A. Computer Library) allowed for adjustment of the mean scores through regression of the mean scores of all covariates simultaneously to a mean of 0 and standard deviation of 1. The influence of these adjusted means contributed to the adjustment of the mean score for the dependent variable. Covariance also allowed for more degrees of freedom than a simple correlation table. This increase was helpful because of the relatively small sample size of 55 subjects.

A two-way analysis of variance was also used to compare mean scores of treatment groups in terms of reflective, impulsive, and "other" categories. A 3 X 3 matrix was set up through a computer program (AVAR 23, S.F. Valley State College Computer Library) to analyze the relationship between the dependent variable of reading comprehension and the independent variables of cognitive style and treatment.

The reading comprehension variable was considered the index of change (dependent variable) because the literature (Shores, 1961)
suggested that understanding what was read was the best measure of reading ability. The measurement of increase in reading speed was considered as a secondary dependent variable as a check against the gain in reading comprehension.

Data was collected from all Ss in the following areas:

1. IQ - Lorge Thorndike - Verbal Section Form 1
2. Manifest Anxiety Test - (Casteneda, McCandless, Polermo)
4. Learn Reading Tests (Pre and Post)
5. Nelson Reading Test - (Grade 3-9), Form A

Mean scores for the Lorge Thorndike IQ Test were computed for each group and were used to check for intelligence factor which could have affected results. The mean scores for Group I, II, and III respectively were: 98.85, 95.79, 103.00. Using a simple t-test, we found that there was no significant difference between the IQ levels of the three groups at 0.05 criteria of reference. (The 0.05 level of significance was used throughout all the computation in this analysis.) This finding led us to reject the notion that any difference in reading comprehension or reading rate was caused by a difference in IQ in the present population.

T-tests were also performed on the various sub groups within each treatment group (i.e. Group I reflectives with Group II reflectives, Group I reflectives with Group II impulsives, etc.) and there was no significant difference found between any two groups.

The manifest anxiety scale consisting of 53 items including 11 items used as a lie factor (see Appendix for sample items) was scored by computing the total number of "yes" answers for the 42
anxiety indicating questions. Assignment of Ss to categories of high or low anxiety was done by taking all those more than one standard deviation from the mean for their sex group and placing them in the category of the extreme. The use of extremes was suggested by Kagan (1966), where he found that extremely high anxiety had a negative effect on performance. Following the McCandless format, means were computed based on sex differences rather than treatment groups. (See Table 2)

<table>
<thead>
<tr>
<th>Sex</th>
<th>N</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>20</td>
<td>16.90</td>
<td>4.93</td>
</tr>
<tr>
<td>Girls</td>
<td>35</td>
<td>20.20</td>
<td>5.48</td>
</tr>
</tbody>
</table>

The results for this experiment were well within the range of McCandless' data for the highest grade he measured - 6th. (See Table 3)

<table>
<thead>
<tr>
<th>Sex</th>
<th>N</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>73</td>
<td>16.58</td>
<td>7.39</td>
</tr>
<tr>
<td>Girls</td>
<td>54</td>
<td>18.50</td>
<td>7.82</td>
</tr>
</tbody>
</table>

Scores for increase in reading comprehension for students one standard deviation above the mean on the anxiety scale were compared with all
others in each treatment group. No significant differences were found with students designated as highly anxious. The highest F score attained was $F = 0.975$, well below the value need for significance. These results give cause to reject hypothesis 3 which suggested that high anxiety would significantly affect performance.

Mean scores for anxiety were also compared between treatment groups and no significant differences were found in group anxiety level. The largest value for $t$ was 0.43, well below the significant level. (See Table 4)

Table 4. Mean Scores of Treatment Groups on the Manifest Anxiety Test

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Adjusted Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>21</td>
<td>19.0476</td>
</tr>
<tr>
<td>II</td>
<td>14</td>
<td>18.5000</td>
</tr>
<tr>
<td>III</td>
<td>20</td>
<td>19.6000</td>
</tr>
</tbody>
</table>

The anxiety variable was not found to be a significant covariate with the dependent variable of comprehension growth, with a $t$-test value of $-0.9428$, well below the 1.67 value needed for significance at the 0.05 level.

a. Matching Familiar Figures Test

Data was collected from each S for number of errors and average response time to the first selection. Mean scores were computed for all Ss in both categories. All Ss were assigned to three general categories based upon the following designations:
1. Reflective: Score above the mean in average response time; below the mean in number of errors.

2. Impulsive: Score below the mean in average response time; above the mean in number of errors.

3. Other: Any S who failed to meet the two preceding requirements.

Analysis was first done to see whether or not the cognitive style of reflection/impulsivity produced any difference between treatment Groups I, II, and III, in terms of the dependent variable of comprehension growth. A T-value of -0.4524 was found to be well below the absolute value needed for significance at the 0.05 level.

After finding no difference between treatment groups, each category (i.e. reflective, impulsive, other) was compared with every other category in the three treatment groups. Mean scores of reflectives in Group I were compared with reflectives in Group II, Group III, and with impulsives in Group I, II, III, etc. Analysis of these differences (table in appendix) revealed no significant difference between any one category with any other category (largest difference, F=1.163 which is not a significant value for 0.05 level).

These results reject the first hypothesis—that
reflective students will show more improvement than impulsives in comprehension growth. Casual analysis of the mean scores would suggest that there is indeed a difference (i.e. reflectives in Group II had a mean score of 21.3% above impulsives in the control Group III.) These scores are at least suggestive of a possible trend to support our original hypothesis, and further research is needed in this area. (See Table 5)

Table 5. Mean Scores in Reading Comprehension Growth for Reflectives, Impulsives, and "Others" for Each Group; S.E. Values

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Score</th>
<th>Adjusted Mean</th>
<th>S.E. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I - Reflectives</td>
<td>7.780</td>
<td>9.620</td>
<td>4.894</td>
</tr>
<tr>
<td>I - Impulsives</td>
<td>20.000</td>
<td>19.525</td>
<td>6.5017</td>
</tr>
<tr>
<td>I - Others</td>
<td>14.280</td>
<td>12.254</td>
<td>5.4661</td>
</tr>
<tr>
<td>II - Reflectives</td>
<td>15.000</td>
<td>17.020</td>
<td>10.1837</td>
</tr>
<tr>
<td>II - Impulsives</td>
<td>20.000</td>
<td>20.800</td>
<td>13.0968</td>
</tr>
<tr>
<td>II - Others</td>
<td>-1.800</td>
<td>-4.704</td>
<td>11.5356</td>
</tr>
<tr>
<td>III- Reflectives</td>
<td>1.2000</td>
<td>-0.0051</td>
<td>9.1265</td>
</tr>
<tr>
<td>III- Impulsives</td>
<td>-1.8300</td>
<td>-1.5780</td>
<td>7.8363</td>
</tr>
<tr>
<td>III- Others</td>
<td>9.8900</td>
<td>10.3884</td>
<td>6.5613</td>
</tr>
</tbody>
</table>

b. Learn Inc. Reading Comprehension Tests

Students were scored on a pre and post test (in Learn Book I and Learn Book III) for reading rate and comprehension. (See Appendix for sample of test.) Reading rate was measured in words per minute and comprehension was measured in per cent of correct answers.
of total answers tried. The difference in comprehension was used as the dependent variable in all of the covariance analyses. The mean difference between the three treatment groups was found to be not significant in terms of comprehension growth. (See Table 6)

Table 6. Mean Scores in Reading Comprehension Growth of Treatment Groups, S.E. Values

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment Comprehension Mean</th>
<th>Adjusted Mean</th>
<th>S.E. Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>12.8571</td>
<td>13.0565</td>
<td>3.613</td>
</tr>
<tr>
<td>II</td>
<td>10.0714</td>
<td>9.7922</td>
<td>4.5847</td>
</tr>
<tr>
<td>III</td>
<td>4.2020</td>
<td>4.1861</td>
<td>3.8286</td>
</tr>
</tbody>
</table>

An F test, after adjusting the mean scores with covariates, revealed that the null hypothesis could not be rejected.

\[ F(2,48) = 1.391 \] (5.80 need for significance at 0.05 level)

Reading rate was also used as a second dependent variable. The difference between pre and post test scores were compared between the three treatment groups. The results revealed that there was a significant difference between the high pressured group (I) and the other two groups (II and III). These results supported the thesis that an impulsive atmosphere would increase reading speed. (See Table 7)
Table 7. Mean Scores of Treatment Groups Increase in Reading Speed Measured in Words per Minute, S.E. Values

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Treatment Mean</th>
<th>Adjustment Mean</th>
<th>S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>572.3810 w/m</td>
<td>568.6090 w/m</td>
<td>44.8530</td>
</tr>
<tr>
<td>Group II</td>
<td>138.5714 w/m</td>
<td>134.9564 w/m</td>
<td>56.9088</td>
</tr>
<tr>
<td>Group III</td>
<td>185.4000 w/m</td>
<td>191.8911 w/m</td>
<td>47.5240</td>
</tr>
</tbody>
</table>

The mean scores were adjusted for reading level, anxiety, cognitive style, and IQ, and compared. Results revealed an F ratio of $F(-2,48) = 24.623$, for greater than the 3.23 value needed for significance.

c. Nelson Reading Test

The Nelson-Reading Test revealed scores for reading grade level, and percentile ranking with norms for comprehension and vocabulary. Reading grade level scores were compared with Ss actual grade level to determine whether or not Ss were reading at or below grade level. (See Table 8)

Table 8. Average Years Above or Below Grade Level in Reading of Treatment Groups

<table>
<thead>
<tr>
<th>Group No.</th>
<th>Mean Difference Between Grade Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.0333 Below Grade</td>
</tr>
<tr>
<td>II</td>
<td>1.1214 Below Grade</td>
</tr>
<tr>
<td>III</td>
<td>0.2450 Above Grade</td>
</tr>
</tbody>
</table>
No significant differences were found between students who read at or below grade level.

E. Discussion

Even though all three hypotheses were rejected statistically, we feel that there were important trends with regard to group treatments and the effect of cognitive style on the speed reading process. Group I students who were given a high pressured program with a major focus on speed had a very significant gain in reading rate as measured in words per minute. Almost every student tripled his initial reading rate, the average gain being 572 words per minute with an average comprehension gain of 13 points on a 100 point scale. No other treatment group came close to this group in words per minute gains even though comprehension gains were similar. It could be argued that the scores might even have been higher for Group I since we felt that the test treatment given here would most affect the anxious student, causing him not to do as well. But our data indicated that the treatment had no more effect on the anxious student than it did on any other student in the same group. This is probably due to the fact that our students, being exposed to various classroom settings in their seven years plus of schooling, saw no important difference in pressure between this class and any other they had been exposed to. This means that what we felt would be anxiety producing, as indicated by the literature, was not necessarily what the students considered anxiety producing. This theory was supported by the results of an informal course evaluation we gave at the end of the course. With regard to the students' attitude toward teacher direction and time considerations placed on assignments, the students in Groups I, II, and
III made generally the same comment—"not enough work" and "I liked this class slightly above average" (see Appendix for sample form). Taking this information into account, we still have a significant difference in Group I with regard to speed increase. It seems that Group I students were conditioned in a stimulus-response fashion to read faster when presented with any material by the teacher. During the course, students were given both fiction and non-fiction material to read and their reading time was carefully paced by the instructor—first a preview reading of the material at 1000-1500 words per minute, followed by a speed reading at 600-700 words per minute, followed by a post view of 1000-1200 words per minute. Apparently all students became accustomed to this reading approach as a consequence of the constant drill. The other groups (II and III) were exposed to this technique of reading rapidly for main ideas, but there was not the constant conditioning. The experiment was designed to give Group III more of this practice than Group II, which would account for the higher reading speed of Group III over Group II (an increase of 188 words as compared to 138 words in Group II), but it must be noted that Group II and Group III students were taught by the same teacher. We felt that this caused a watering down of the approach that was to be used with the control group.

Both experimentors also felt that the data we have on reading rate and comprehension gain was contaminated by the fact that both Group I and Group II were taught in the same building at the same time. And since Group I and Group II students used the same reading machines which were set up in a small area that was outside both classrooms yet common to both (a central core area in the building) the two
test groups did have a chance to discuss their instructor's methods of teaching. Group I students were notably upset by the fact that they had to work all the time while Group II students seemed to have fewer assignments and much more opportunity to select their activities. This fact could have driven the rate and comprehension gains for Group I lower than they would have been had there been no exchange. We realize now that to be able to make a more concrete statement about our data, we need to have test groups in different school settings and they must not be taught by either of the experimentors.

Another finding that was interesting but not significant was the fact that the reflective students in Group II did much better in reading comprehension growth than did reflective students in Group I (a 15 point gain as compared to 7.7 points on a 100 point scale). This suggested that the environment of Group II favored those who normally take time to formulate a complete hypothesis of meaning about the material being read and verify this prediction by using the visual cues provided. Kagan's research suggests that those who are scored as reflective on the MFF Test will take more time to reflect on their own cognitive products and consequently make fewer errors which is the trend we noted in the experiment. We feel that the reflective in Group II may have done even better in comprehension gain if we had used a reading comprehension test that demanded that the students formulate some hypothesis about the reading much as if they were having to solve a problem. As it was, the test we gave was a direct recall test (see Appendix for sample) which favors the impulsive thinker who does not take as much time to evaluate his own cognitive products (Kagan's definition). We feel that this possibility of favoring
impulsives certainly needs correcting when the experiment is run again.

Another factor that probably caused a distorting effect on our data was the way we administered the Matching Familiar Figures Test. None of the literature on administrating the test suggested the possibility of making a normally reflective student act impulsively because of the presence of a stop watch in the full view of the student taking the test. Both experimentors felt, however, that this made the students more anxious about the test since they knew that they were being timed, and when their suspicions were confirmed on the first test item (they saw the instructor click the watch and write something down), their reaction was to act as fast as possible. We felt that many of the students who fell into the "other" category (about 50% of each group was neither impulsive nor reflective) were indeed reflective (were anxious about making a mistake). We suggest that when this test is administered, two people give the test—one should be out of the view of the student being tested (behind a screen) with a watch recording the first response time to each question. If Kagan's test is indeed a valid measure of being impulsive or reflective, then it must be administered in a way that does not distort the outcome of the instrument.

F. Suggestions for Further Research

In addition to discovering many of the pitfalls in setting up and carrying out an experiment, the data leave the impression that we have identified an important factor to be considered when setting up a speed reading program—namely that reflective students do not react as favorably to an impulsive environment as do impulsives. We also
noted that even though reflectives do not seem to be as comfortable in an impulsive environment, they are able to adjust to it and they seemed as malleable as the impulsive students to the conditioning given to increase reading speed. We also discovered that the impulsive student is capable of speed reading, although we cannot say for sure that the impulsive student will do as well as the reflective because of our data contamination. For these reasons, we feel that it is important to run the experiment again with the following adjustments:

1. Develop a pre and post test to measure growth in reading comprehension that would more evenly test a reflective style of thinking. A measuring device which tests interpretation and the ability to generate new hypotheses based upon material present in the reading selection would possibly demonstrate an advantage for reflectives. The best test would include a combination of items to balance both the reflective and impulsive biases.

2. Administer the Matching Familiar Figures Test in a way that does not force a change in what is suspected to be a preferred cognitive style. The student being tested on his tendency to reflect and take time to evaluate his own cognitive products should not be made to feel that he is being penalized for taking more time. No student should see the stop watch during the test.

3. Test treatments should be administered at different schools with different age groups. Proximity of
the classes could have a distorting effect on the results.

4. The anxiety scale used to test for the validity of hypothesis 3 could be a measure of the wrong type of anxiety. Perhaps test anxiety was a determinant of differences in reading comprehension scores. This possibility should be tested for in following experiments.

5. The duration of the training period (six weeks for summer school) may not be long enough to allow for reflective's adjustment to the more relaxed atmosphere of the test treatment in Group II. A regular semester would give more time to assure a student's adjustment within the classroom.

6. Use additional covariates, including measures of reading background, amount of time spent in reading practice, and attitude toward reading. In addition, a statistical design using multiple dependent variables with multiple covariates might provide more information about the interaction between the components of cognitive styles, reading skills, student background and attitude, and treatment group.

G. Summary

In attempting to show a relationship between cognitive style and reading comprehension, specific trends were noticed. Both reflective and impulsive students in Groups I and II did noticeably better on reading comprehension growth than did students in the control group.
Students classified as "others" (Group I) did noticeably better than "others" in the reflective (Group II) and control (Group III) environments. Impulsive atmosphere (Group I) students did significantly better than the reflective and control groups in increase in reading speed. The reflective low anxiety environment students demonstrated much more relaxed behavior than those students in either of the other two groups. The concern for grades or failure was almost non-existent by the end of the third week in the low anxiety (credit/non credit) classroom. Thus the speed gains made in the high anxiety group (I) seem to be offset by the more relaxed atmosphere of the low anxiety group (II).

The differences in reading comprehension growth for the three treatment groups were not significantly different from each other for any one specific sub group (i.e. reflective, impulsive, etc.) compared with any other sub group or for any one of the whole groups. The trends which did develop suggested that specific treatment did make a difference in improving reading ability. Comprehension differences of 18-20 percent surely indicate that something was happening in the two treatment groups. The large error factor in the statistical analysis, which accounted for the non-significant differences, indicated that the covariates used were evidently not the factors accounting for the differences in reading comprehension scores. Since IQ, relative reading level, and anxiety were not shown to be significantly related, perhaps reading background, family background, and amount of daily reading practice were the more important factors which accounted for the different scores. Repeating the experiment with these variables included might shed more light on the relationship between
cognitive style and the speed reading process.
BIBLIOGRAPHY


Two sample items from Matching Familiar Figures (MFF) Test.
APPENDIX II

SAMPLE TEST ITEMS - MANIFEST ANXIETY SCALE

These items are representative of the Castaneda, McCandless, and Palermo Anxiety Scale which was based upon the Taylor Scale developed earlier. The Castaneda scale consisted of 53 items, 11 of which were L scale items used to check the subject tendency to falsify his responses to the anxiety items. Below are ten samples from both the anxiety and the L scale listed with their appropriate ordinal numbers as they appeared on the test.

3. I feel I have to be best in everything.
4. I blush easily.
6. I notice my heart beats very fast sometimes.
7. At times I feel like shouting.
8. I wish I could be very far from here.
9. Others seem to do things easier than I can.
11. I am secretly afraid of a lot of things.
12. I feel that others do not like the way I do things.

L Scale
5. I like everyone I know.
10. I would rather win than lose in a game.
APPENDIX III

SAMPLE READING SELECTION AND TEST ITEMS FROM LEARN, INC.
READING TESTS

This sample reading selection is an excerpt from the 4538 word essay on the History of Brazil which was included in Learn Book I as a pretest. The sample question items are included to show the direct recall nature of the test.

Test I

History of Brazil

By Wiley E. Peeples

In the history of Brazil it becomes difficult to determine whom its exact discoverer was. Pedro Alvarez Cabral, a Portuguese navigator, is generally accorded this honor. In any event it is conceded that he was the first claimant.

It is said that in the spring of the year 1600, Cabral, in charge of a fleet of ships presumably in route to India, first sighted land in what is now the Brazilian state of Bahia. Some speculation and mystery surround Cabral’s voyage since his sighting necessitated his being off course to India by several hundred miles. This would seem to be a somewhat unreasonable assumption in view of the commonly recognized high degree of competence possessed by the Portuguese navigators and astronomers of that time. The assumption has been made that his goal was, in fact, Brazil rather than
India. The strong probability exists, then, that this was the beginning of an effort by King Manuel I of Portugal to counteract increasingly widespread activity further north in the new continent by aggressive Spanish rivals.

Brazil Named

The mountain first sighted by Cabral was named Monte Pascoal (Easter Mountain) since the event occurred shortly after Easter. The land itself was named Terra de Vera Cruz (Land of the True Cross). The name given to the land arose from the circumstance of Cabral's being a Knight of the Order of Christ, the emblem of which, a red cross, was borne conspicuously on the sails of the fleet's ships. Additionally, for some time, the stars of the Southern Cross had been a prominent feature in the night skies and had much impressed the voyagers.

Answer Sheet

1. Amerigo Vespucci was the first person to claim Brazil for Portugal.
2. Particularly skilled as navigators were the (1) Spanish, (2) French, (3) English, (4) Portuguese.
3. Brazil was first named Monte Pascoal.
4. The emblem of the Order of Christ was a red star.
This evaluation form was used at the end of the six-week experimental period to measure student attitudes toward the course taken. Items 4, 7, and 8 were used as an indication of relative anxiety in treatment groups. Scores were computed on a 1-5 basis, with a comparison made between mean scores of treatment groups. No significant differences were found.

<table>
<thead>
<tr>
<th></th>
<th>Like</th>
<th>Dislike</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Did you like doing speed reading?</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Did you feel that you accomplished a lot?</td>
<td>a lot very little</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Did you feel that you succeeded in fulfilling your goal for improved reading skills?</td>
<td>fulfilled not fulfilled</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Did you like the classroom atmosphere?</td>
<td>very much disliked</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Did you feel you had enough opportunity to choose your material and activity?</td>
<td>Much opportunity no opportunity</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Are you proud of your accomplishments in this class?</td>
<td>very proud not proud</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Did you feel that there was too much pressure in this class?</td>
<td>very little too much</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Did you feel that there was too much work to do?</td>
<td>not enough too much</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Rate this class in terms of your learning.</td>
<td>Best ever very much average below poor</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10. Rate this class in terms of your enjoyment.

<table>
<thead>
<tr>
<th>best ever</th>
<th>very much</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>average</td>
<td>below</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>poor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. Rate your overall impression of this class. Include learning, enjoyment, teacher, students,—everything!

<table>
<thead>
<tr>
<th>best ever</th>
<th>very much</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>average</td>
<td>below</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>poor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX V

TABLE OF T-VALUES

This table consists of T-values comparing mean scores of reflective and impulsive students in each treatment group. Mean scores are for reading comprehension growth, the dependent variable used in the analysis of covariance.

Table 1. Comparison of Mean Scores of Reading Comprehension Growth

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>T-value with significant value at 0.05 level &amp; degrees of freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflective I/Reflective II</td>
<td>t=1.5 (13df) &lt; 2.16</td>
</tr>
<tr>
<td>Reflective II/Reflective III</td>
<td>t=1.4 (9df) &lt; 2.262</td>
</tr>
<tr>
<td>Reflective I/Reflective III</td>
<td>t=1.03 (12df) &lt; 2.179</td>
</tr>
<tr>
<td>Impulsive I/Impulsive III</td>
<td>t=0.04 (6df) &lt; 2.447</td>
</tr>
<tr>
<td>Impulsive I/Impulsive III</td>
<td>t=2.129 (9df) &lt; 2.262</td>
</tr>
<tr>
<td>Impulsive II/Impulsive III</td>
<td>t=1.57 (7df) &lt; 2.365</td>
</tr>
</tbody>
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