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## Use of the Kirton Adaption-Innovation Inventory With Middle School Students

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The realities of our changing world require today's learner to become skilled in group and independent endeavors. Constant change calls for the continuing development of creative solutions to old and new problems. In an effort to meet this challenge, educational research has developed several successful approaches including learning styles instruction (Dunn and Dunn, 1978; Dunn, Dunn and Treffinger, 1992; Hilgersom-Volk, 1987) and creativity instruction (Isaksen and Treffinger, 1991; Perkins, 1984; Torrance, 1987; Treffinger and Isaksen, 1992).

Learning styles instruction is an attempt to understand and capitalize on student differences. It has been shown to improve achievement and reduce discipline problems (Hilgersom-Volk, 1987). Mismatching learning and teaching style has been shown to be detrimental to a student's development (Carbo and Hodges, 1988).

Treffinger (1989; 1987) noted that even though we are able to measure the level of creative abilities one may display at a given time, we must be cautious in using such data to make overall categorizations of people as "more" or "less" creative. Educators lack the ability to assess the behavioral styles students bring to creative problem solving situations. While we may never be able to predict who will be creative in a particular situation, there are available potential tools for assessing how individual students are creative which, when used with other appropriate instructional strategies, may help to improve individual problem solving approaches.

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The Kirton Adaption-Innovation Inventory (KAI; Kirton, 1976) has been successful, for example, in describing two different styles of creativity and problem solving among adults. *Adaptors* are described as individuals who frame and solve problems within the existing structure or paradigm (Isaksen, 1989; Kirton, 1976). They are resourceful, efficient, organized, and dependable. They are sometimes viewed as closed-minded and dogmatic. Within groups, adaptors seem to supply stability, order, and continuity. *Innovators*, on the other hand, solve problems by creating a new framework (Isaksen, 1989; Kirton, 1976). They are original, energetic, individualistic, spontaneous, and insightful. They can be seen by others as impractical, abrasive, and creators of confusion. In groups, innovators often focus attention on underlying problems by breaking with the accepted theories and may provide the dynamics needed for periodic radical change.

The distinction, as theorized by Kirton, has been validated experimentally (Goldsmith, 1985a; Holland, 1987). Several studies supported the conclusion that the KAI is valid across cultures and various populations (Beene and Zelhart, 1988; Carne and Kirton, 1982; Foxall, 1990; Kirton, 1978; Prato-Previde, 1991). Studies by Kirton (1987a) and McHale and Flegg (1986; 1985) found useful applications for the KAI in business, administration, management training, and dealing with interpersonal problems within organizations. Considering the needs of early adolescents for individualized instruction, group instruction, and training in creative thinking and creative problem solving (Armstrong, 1987; Dembo, 1988; Hennessey and Amabile, 1987; Torrance, 1987), the KAI may have useful applications in the world of education. According to theory the KAI should bear little or no relation to age or education (Kirton, 1987b). It is reasonable to assume that if norms were established on the KAI for middle school students, or if needed adjustments were identified so that a KAI appropriate for this age group could be constructed, a device would become available which could aid in identifying this aspect of a student's creative style. Use of such a device might improve the effectiveness of school programs focusing on creative thinking and creative problem solving.

With this in mind, a study was undertaken to investigate the ability of the KAI to identify behavior in American eighth grade students along the adaption-innovation continuum (Kirton, 1976). A second purpose was to correlate student

inventory responses with the norms established for the adult population. In addition the internal reliability of the KAI when taken by a group of American eighth grade students was analyzed, to identify possible areas of weakness occurring in the KAI when dealing with this population.

The questions investigated in the study were:

- Do American eighth grade students display the behavior described by adaption-innovation theory, and, if so, can parents and teachers describe this behavior through use of the KAI?
- Is the performance of male and female eighth grade students on the KAI comparable?
- How do the KAI scores of a group of American eighth grade students compare with the adult norms published by Kirton (1987a)?
- Will there be a significant correlation between students' achievement as measured by the Comprehensive Test of Basic Skills (CTBS; CTB/McGraw-Hill, 1981) and their KAI scores?

**METHOD** The study used the KAI responses of American eighth grade students, their parents, and their teachers to describe the behavior of the students along the adaptive-innovative continuum. Student responses (sKAI-1) were compared and correlated with observations of their parents (P-1). The responses of mothers (P-M) and fathers (P-F) were also compared separately. Student responses were correlated and compared with those of their teachers (T-1 and T-2) and the published KAI norms. After one month the students took part in a second administration of the KAI (sKAI-2).

**Subjects** The study included 86 eighth grade students (39 males and 47 females) attending a rural American middle school. Subjects were selected from a class of 142 on the basis of their attending that school, having taken the CTBS during previous spring, and parental permission for participation.

Seventy-five mothers and 41 fathers took part in the study. Student behavior was rated by both parents in 30 cases. Fourteen experienced teachers who had been assigned the students in the final subject pool agreed to use the KAI to rate individual student behavior.

**Description of Tasks** With their parents, students received a brief description of adaption- innovation theory, the KAI, and the proposed study. Students were then asked to complete the KAI about

themselves. The sessions, including an explanation and completion of the KAI, lasted 45 minutes.

Parents attended the testing session along with their children at one of the two group sessions or by appointment in their home. Parents were asked to complete the KAI from the viewpoint of how they believed others would see their child.

Parents were asked to relate any memories that would indicate their child's tendencies for innovation or adaption. They were instructed that this information was optional and should be provided only if they had a clear recollection of a relevant event. The parents of 13 students responded.

Teacher responses were made at the teachers' convenience over three days. Teachers rated from 2 to 12 students each. Twenty-one students received ratings from two teachers.

A student retest was administered during a scheduled study one month later in the school cafeteria. Retesting took 10 to 15 minutes. Sixty-six students took part in the group retesting. Due to absence, 19 students were retested individually. One student was not retested due to an extended illness.

Statistical  
Procedures

A t-test was calculated between the means of the sKAI-1 scores and the adult norms. The internal reliabilities of sKAI-1 and sKAI-2 were calculated using the Cronbach alpha. Pearson Product Moment correlations and t-tests were calculated between sKAI-1 and P-1, sKAI-1 and P-M, sKAI-1 and P-F, P-M and P-F of the same child, P-1 and T-1, sKAI-1 and T-1, sKAI-1 and T-2, and T-1 and T-2 of the same child. The national percentile scores on the CTBS were correlated with sKAI-1 scores using the Pearson Product-Moment. Another t-test was calculated between the means of the male and female sKAI-1 scores. A t-test and Pearson Product-Moment correlation was calculated for sKAI-1 and sKAI-2 scores.

Analyses were carried out for the magnitude and direction of difference between each student's score and the adult ratings for that student. Ratings below the student's score were assigned a negative direction, while ratings above the student's were assigned a positive direction. Ratings within half a standard deviation of the student's score were considered matching.

RESULTS A comparison of the means and standard deviations of the various administrations of the KAI which comprised this

study are presented in Table 1. Compared are the means of: the scores of the first administration of the KAI to the student subjects (sKAI-1), the scores of the student re-test (sKAI-2), the ratings by parents when the rating of one parent was matched with the score of each child (P-1), the ratings by mothers (P-M), the ratings by fathers (P-F), the ratings by teachers when the rating of one teacher was matched with the score of each child (T-1), the ratings of 21 students by a second teacher (T-2), the scores of female students, the scores of the male students, the ratings of the same children by 30 fathers (PF30) and 30 mothers (PM30), and three adults groups (K-1, K-2, K-3) reported by Kirton (1987b). Also presented in Table 1 are the mean and standard deviation of the students CTBS scores.

TABLE 1 Comparison of the mean scores of the various administrations of the KAI which comprised this study

	sKAI-1	sKAI-2	P-1	P-M	P-F	T-1	T-2	K-1	K-2	K-3
N	86	85	86	75	41	86	21	532	562	808
mean	100.66	101.58	97.01	96.43	97.32	89.85	88.19	95.33	94.99	94.23
s.d.	13.90	13.73	18.63	18.91	17.82	18.11	25.23	17.54	17.90	17.74

  

	Female sKAI-1	Male sKAI-1	PF30	PM30	CTBS
N	47	39	30	30	86
mean	101.15	100.08	96.43	94.13	72.64
s.d.	14.17	3.02	18.71	19.68	22.70

The means of the students scores were higher, therefore, more innovative, than the scores reported by Kirton (1987b). This difference was significant,  $t=3.37$ ,  $p < .05$ . These findings are contrary to expectations based on previous research (Kirton, 1987b; 1990) in which younger subjects displayed more adaptive behavior.

Kirton (1987b) noticed a slip from the .88 internal reliability using the Cronbach alpha with the adult population to alphas ranging from .76 to .86 with younger subjects. He considered an internal reliability of .70 or above to be acceptable. The Cronbach alpha calculation for sKAI-1 was .74. An analysis of the sKAI-2 scores resulted in an alpha of .78.

Parent observations of their children's behavior along the adaptive- innovative (A-I) continuum had a significant positive correlation with student perception of their own behavior.

The correlation between sKAI-1 and P-1 was .63 ( $r > 0$ ,  $p < .05$ ). The correlation between sKAI-1 and P-M was .61 ( $r > 0$ ,  $p < .001$ ). The correlation between sKAI-1 and P-F was .51 ( $r > 0$ ,  $p < .001$ ). An analysis of the magnitude and direction of the difference between the sKAI-1 scores and the ratings of parents, where more adaptive ratings were labeled as negative and more innovative as positive, showed mothers differing an average of -3.92 with a range of from -40 to +32. Fathers differed an average of -3.27 with a range of from -31 to +34. That is, on average, mothers and fathers described their children slightly more adaptive than the students described themselves on the KAI. Even so, comparisons of the mean of the student scores for sKAI-1 and the means of the several parent ratings indicated that these differences were not significant.

Parents of the same child seemed to generally agree with one another as to how they perceived their child's A-I behavior. The ratings of the 30 fathers and 30 mothers of the same children had a correlation of .55 ( $r > 0$ ,  $p < .001$ ). In these cases no significant difference was found.

Of the 13 parents returning the qualitative survey, six responses dealt with the child's level of creativity, seven dealt with style. The contents of these seven responses were rated first as adaptive, innovative, or centered (indicating that the reported behaviors were balanced between innovative and adaptive). These ratings were then compared with sKAI-1 and sKAI-2 scores (see Table 2).

TABLE 2 Comparison of qualitative statements of parents with sKAI-1 and sKAI-2 scores.

Student	Rating of parent comments	sKAI-1	sKAI-2
04.	Innovative	122	135
07.	Centered	97	103
13.	Centered	90	93
17.	Innovative	106	101
26.	Adaptive	93	76
37.	Adaptive	82	95
40.	Adaptive	90	84

While limited, these data support the belief that parents are able to observe and accurately report on their early ado-

lescent's behavior along the A-I continuum. They indicate that, at least in some cases, a parent's anecdotal observations can match an early adolescent's self-perceptions.

The correlation between student scores (sKAI-1) and teacher ratings (T-1) was significant at .46 ( $r > 0$ ,  $p < .001$ ). However, a comparison between the means of the sKAI-1 scores and the T-1 ratings indicated a significant difference between teacher observations and student self-perception. Results involving the smaller group of teachers (T-2) seemed suspect, possibly due to the small number of teachers involved ( $N=5$ ).

For the most part, teacher ratings of student behavior were more adaptive than parent ratings. When the mean of the parent ratings (P-1) was compared with the mean of the teacher ratings (T-1), a significant difference was found. Significant differences were found comparing the 74 matches between teachers and mothers (P-M), and the 41 matches between teachers and fathers (P-F).

As with the observations by parents, teachers seemed to be in agreement with one another as to their perceptions of student behavior. There were 21 cases in which two teachers rated the same student. The correlation between T-1 and T-2 was .53 ( $r > 0$ ,  $p < .01$ ). No significant difference was found when the means of 21 T-1 ratings T-2 ratings of the same child were compared. However, with these calculations there was an unacceptable probability of error ( $p > .05$ ).

An analysis of the magnitude and direction of difference between sKAI-1 scores and teacher ratings showed that teachers differed from students -10.2, on average, with a range of -59 to +32. In terms of percentages 18.6% of the teacher ratings were more than half a standard deviation more innovative than the student responses, 61.8% were more than half a standard deviation more adaptive, while 19.6% were within half a standard deviation (plus or minus) of the student's score.

Table 3 contains the sKAI-1 scores compared to the adult ratings for the 14 cases in which the same child was rated by four adults. The average magnitude and direction of difference in the adult scores, as compared to the student scores, was: for mothers -2.57, for fathers -5.71, for teacher scores in the T-1 group -4.56, for teacher scores in the T-2 group -13.86.

The correlation between sKAI-1 and student CTBS scores was .28. While low, it was significant ( $r > 0$ ,  $p < .01$ ).

TABLE 3 Comparison of scores for sKAI-1, P-M, P-F, T-1, T-2

	Student sKAI-1	P-M	P-F	T-1	T-2
04.	122	124	118	129	79
09.	132	118	132	101	76
10.	81	85	63	54	42
13.	90	75	84	110	106
16.	125	118	82	107	92
26.	93	81	64	91	86
32.	84	110	118	112	113
37.	82	83	92	59	53
42.	102	99	115	104	99
44.	101	85	105	107	113
49.	89	96	90	88	77
65.	96	81	91	68	56
67.	108	116	102	110	100
86.	112	110	81	113	131
mean	101.2	98.64	95.5	96.64	87.36
s.d.	16.53	17.0	20.56	22.11	25.44

The correlation between sKAI-2 and CTBS scores was .34 ( $r > 0$ ,  $p < .05$ ). These results called previous findings into question (Goldsmith, 1985b; Kirton, 1987a).

Based on prior research (Ames, Ilg and Baker, 1988; Kirton, 1990), it was expected that scores of female students would be significantly more adaptive than those of male students. A comparison of 47 female sKAI-1 scores and 39 male scores revealed no significant difference.

Test/retest scores (Kirton, 1990) have shown adaptive-ness and innovativeness to be stable traits. The correlation between sKAI-1 and sKAI-2 was .79 ( $r > 0$ ,  $p < .001$ ). No significant difference was found between the mean of the sKAI-1 scores and the mean of the sKAI-2 scores.

The two administrations of the KAI to the student subjects indicated that several inventory items seemed much weaker when responded to by American students as compared to the original studies. Twelve items on the sKAI-1 and 11 items on sKAI-2 correlated with the rest of the inven-



tory below .20. These items should be considered suspect with this group of subjects. Of particular interest are the item-whole correlations of items 4, 11, 13, 14, 16, and 28 which were calculated as being below .20 on both sKAI-1 and sKAI-2.

#### DISCUSSION

The findings of this study support the conclusion that the Kirton Adaption-Innovation Inventory is reliable, stable, and valid when used with American eighth grade students. However, adjustments might be made to several inventory items before widespread use can be made of the KAI with this age group. These findings are limited by the size and composition of the sample and by some structural shortcomings. These limitations are not considered to have impacted significantly on the findings of the study.

There was a noticeable drop off of students participating whose CTBS scores were below the 20th percentile. The parent of the lowest scoring student, a student classified as learning disabled, expressed concern that the situation would be beyond the student's abilities. Assured that the test would be untimed in a relaxed setting, the parent encouraged the child to take part. It is not known why other parents of students with low percentile scores failed to take part. In any case, the skewness of scores toward the higher CTBS percentiles may limit the usefulness of the results.

There were limitations in the way the involvement of the 14 teachers was structured. Teachers chose students who they felt comfortable rating. The number of students rated by each teacher varied.

The implications of the teachers' ratings may have been better understood if the same teachers rated all or at least a much larger number of students.

Students seem able to use the KAI to report, at least generally, their preferences for adaptive or innovative behavior. The data suggested that adults, especially parents, can use the KAI to describe the behavior of young people. It seemed that, in general, parents tended to agree with each other regarding their perceptions of the behavior of their early adolescent children. The differences between teacher ratings and student scores suggested that observed behavior in the classroom may not always match the self-perception of the child.

Kirton's (1987b) findings, based on limited numbers, suggest that individual behavior varies along the A-I continu-

um as people age, from adaptive in the early years, to more innovative as they approach their 30's, to gradually more adaptive after 45. The findings of this study question that view. The students' mean KAI scores tended more toward innovation than the adult norms. This may have resulted from the fact that both student and parent participants were self-selected. More innovative subjects may have tended to take part in the study.

According to Kirton (1987b) males in each age group generally have more innovative KAI scores than females. If future research confirms the findings of score similarity for early adolescent males and females found in this study, researchers will have to investigate possible developmental or social factors that, result in more adaptive scores among females.

The study reinforced the conclusion that the KAI has a high degree of reliability. Two administrations of the KAI to the same group of students one month apart yielded internal reliabilities of .74 and .78 based on the calculation of Cronbach's alpha. Both alphas are well within the range of acceptability. However, the item-whole correlations for sKAI-1 and sKAI-2 indicate that, before the inventory can be applied in a diagnostic setting, certain items need to be reworded, replaced, or discarded. An item-whole correlation below .20 occurred with 12 items on sKAI-1 and 11 items on sKAI-2. Items 4, 11, 13, 14, 16, and 28 had an item-whole correlation below .20 on both tests. The items most frequently questioned by the students during the two administrations of the test seemed not to have contributed heavily to a low item-whole correlation.

The problem may lie with the items themselves. One could speculate that the substance of these items is beyond the experiences of most Americans middle school students. For instance item 4 concerns the enjoyment of detailed work and item 14 deals with a preference for thoroughness. Are these even considerations for many early adolescents? Getting students of this age to go beyond the superficial and to learn to enjoy the thorough completion of one's work are major challenges to teachers. Certainly, the parents of American eighth graders would argue that the concept of work is completely foreign to early teens.

The CTBS was considered to measure the relative level of a student's academic ability while the KAI looked at the behavioral style students bring to creative problem solving

situations. According to Kirton (1987b), level is influenced by such factors as IQ, background in the subject area, and the technique or process of creativity. Style is a personal preference for approaching a problem and is related only insignificantly to the other factors, except that an understanding of style may enhance the other factors.

Based on a line of previous research it was expected that there would be no significant correlation between the students' CTBS and KAI scores (Goldsmith 1985b; Kirton, 1978; 1987b). For instance, Goldsmith (1985b) found KAI scores to be uncorrelated with the level of cognitive-processing ability. Both administrations of the KAI failed to support that expectation. While low, the correlations were significant. It is possible, therefore, that a slight relationship exists between educational *level* and *A-I style* in American eighth grade students, or that the achievement tests may reflect not only educational level but, at least slightly, may be influenced by *A-I style* as well. It should be noted that Gary (1990) found significant differences among the learning styles of students with different achievement levels. It is clear that more information is needed in this area.

The relatively large differences among adults in their perceptions of student styles, and their possible effects on students, must be noted. The adults generally saw students as more adaptive than the students saw themselves. This might be expected in that one challenge for middle school students is fitting in, whether with peers, family, or school (Vandar Zanden, 1985). Research cited by Kirton (1989) indicates that adults feel stress in "non-fit situations." This stress increases as the gap increases. We must wonder about the stress experienced by a student whose classroom behavior causes the teacher to rate that student 59 points more adaptive than the student's self-perception. The number of "non-fit situations" indicated by the findings of this study suggest that a majority of teachers may be placing stress on some students in ways that have nothing to do with academics.

The lesson here is that teachers, even experienced teachers, must exercise great caution in their judgments concerning the personalities of their students. While teachers can know one individual well — at times as well as the child's own parents — their judgments about other students may be widely discrepant from the students' self-perception. These differences call for further investigation into the dynamics of teacher style and classroom climate as they influence stu-

dent behavior. Future study might profitably investigate the influence of parental style and expectations on early adolescent behavior and self-perceptions.

Educators need to assess their students' educational level and levels of achievement accurately. But, in order to enhance learning and learning to learn, in order to nurture each student's creative abilities, educators must design a climate that recognizes and responds appropriately to individual learning needs. These needs cannot be accessed by observation alone, no matter what the experience level of the teacher. Proven diagnostic tools, working in concert with skilled and caring observation, are called for. The KAI has the potential to become such a tool.

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