EDWIN C. SELBY
DONALD J. TREFFINGER
SCOTT G. ISAKSEN
KENNETH J. LAUER

Defining and Assessing Problem-Solving Style: Design and Development of a New Tool

ABSTRACT *VIEW: An Assessment of Problem Solving Style* (Selby, Treffinger, & Isaksen, 2002) is a new instrument for assessing problem-solving style, for use with individuals from ages 12 through adult. It measures three dimensions of style relating to creative problem solving and change management. In this article, we discuss the construction of the instrument, the initial evidence supporting the instrument's reliability and validity, and a very brief overview of the instrument's foundations. Our reliability data involve both stability and internal consistency. We report evidence for the criterion-related validity, based on correlational studies with relevant measures of learning style, cognitive style, and psychological type. We also conducted principal components factor analyses that support our three-factor structure. Researchers and practitioners studying and applying Creative Problem Solving and change management methods can use VIEW in several ways. Finally, we identify several research directions that will contribute to the refinement and development of the instrument as well as to a better understanding of the "problem-solving style" construct.

INTRODUCTION

The purposes of this article are to examine briefly the emerging construct of problem- solving style, to present a new instrument for assessing problem-solving style, called VIEW (Selby, Treffinger, & Isaksen, 2002), and to identify its potential role and applications for research and practice on effective applications of Creative Problem Solving (Isaksen, Dorval, & Treffinger, 2000; Treffinger, Isaksen, & Dorval, 2000).

PROBLEM-SOLVING STYLE

We define problem-solving styles as consistent individual differences in the ways people prefer to plan and carry out generating and focusing activities, in order to gain clarity, produce ideas, and prepare for action. An individual's natural disposition towards change management and problem solving is influenced in part by mindset, willingness to engage in and respond to a situation as presented, and the attitudinal dimensions of one's personality.

Through our work on linking person and process (e.g., Isaksen, Dorval & Treffinger, 2000), we realized that a variety of major theoretical approaches would yield valuable insights into problem-solving style. We also recognized that assessing style dimensions that are particularly relevant to the preferences of individuals or groups during problem solving involved investigating several dimensions that heretofore required a variety of separate assessments. The instrument was aimed specifically at style differences that address the preferences and behavior of people who are applying creative problem solving tools, techniques, and strategies. A comprehensive review of the theoretical foundations of problem-solving style is beyond the scope of the present paper; we have addressed this topic elsewhere (Selby, Treffinger, Isaksen, & Lauer, 2002). Briefly, the major theoretical views that contributed to our planning and development represent an integration of work in several areas, including: *psychological type* theory (Jung, 1923, 1971; Lawrence, 1993, 1997; Myers & McCaulley, 1985; Myers, McCaulley, Quenk & Hammer,1998), *learning style* theory (Dunn & Dunn, 1978; Gregorc, 1985; Hilgersom-Volk, 1987; Kolb, 1981) and *cognitive style* theory (Cattell, Eber & Tatsuoka, 1970; Guilford, 1980, 1986; Kirton 1961, 1976, 1987; Witkin & Goodenough, 1981; Martinsen & Kaufmann, 1999) . We also drew upon theory, research and field experience on creativity, creative productivity, and creative problem solving instruction and training (e.g., Guilford, 1986; Isaksen, 1987; Sternberg & Lubart, 1995; Schoonover, 1996; Selby, 1997; Alter, 2000).

Our work on the development of the instrument was also aimed at filling a perceived need relating to assessment instruments for researchers or practitioners. Many of the general assessment tools relating to style are supported by research pertaining to these applications in the broad areas of style or personality for which they were designed. When administered by an adequately trained professional, employing a battery of instruments, information similar to that provided by VIEW

might be extrapolated from the scores they provide. These combined data might be used to form the basis for understanding individual problem solving style preferences. However, these instruments may be limited in accessibility to professionals because they have extensive training requirements. They may also be more comprehensive than is practical for effective use in research or training sessions (especially in programs in which the group's goals and objectives involve content and topics beyond understanding the personal characteristics of the participants). Some generic instruments are also demanding in time requirements, user-friendliness, and ease of scoring, interpretation, and feedback. When administered, especially as part of a multi-instrument battery, they require a substantial investment of time and financial resources. When administered individually, none offered specific and in-depth information about an individual's preferences and behaviors in relation specifically to applications of creative problem solving tools, techniques, and strategies.

As a result of our early field-testing, additional research, and our professional experience in research, development, and application of Creative Problem Solving, we concluded that, in order to produce a clear picture of an individual's problem-solving style, we needed an instrument that would provide data along three distinct, but related, dimensions. We selected these dimensions, which we will discuss in detail below, because they synthesize efficiently important constructs from varied theoretical perspectives. Each of the three dimensions influences directly the ways people perceive problems and information, process data, generate possible solutions, make choices and decisions, and prepare to implement solutions. They also provide information that individuals can use constructively that enables them to solve problems and manage change more effectively. Therefore, we constructed VIEW to represent three important dimensions, drawing from several theoretical and assessment models (Selby, Treffinger, Isaksen & Lauer, 2002; Treffinger, Young, Selby & Shepardson, 2002).

THE THREE DIMENSIONS OF VIEW

VIEW: An assessment of problem-solving style[SM] assesses three independent dimensions of problem-solving style. As in all discussions of type and style, most people share some preferences associated with each style. No single score or set of scores is more or less socially valued than any other, and no approach is more (or less) creative than others. Individuals emphasize these style preferences through their typical

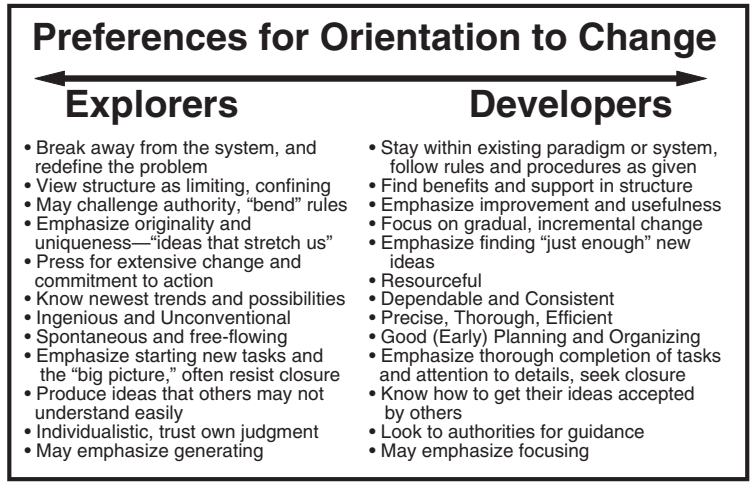
behavior across varying contexts and over sustained periods of time. The consistency or clarity of one's preferences locates one's preference score along a continuum for each dimension. Those whose behavior and preferences are more clear, certain, and consistent have scores farther from the mean. The scores yielded by the first dimension provide an overall indication of the person's perceived preferences along a continuum that we describe as Orientation to Change (OC), with two general styles: the Explorer and the Developer. The second dimension involves one's preferred manner of Processing (P), with two styles: External and Internal. The third dimension of VIEW deals with one's preferred ways of Deciding (D), in which we define two styles: People-focused and Task-focused. Let us consider each of the three dimensions in greater detail.

ORIENTATION TO CHANGE: EXPLORER-DEVELOPER

The items comprising the OC dimension represent cognitive aspects of problem-solving style. This scale addresses the questions: "How do I prefer to deal with boundaries and parameters?" "How do I feel about and react to structure?" and "How do I prefer to respond to novel challenges?" Figure 1 summarizes the major descriptors for both Explorer and Developer styles.

Scores below the mean on this dimension indicate the Explorer style. In ordinary use, an "explorer" is an individual who thrives on venturing in uncharted directions, seeks to break new ground, and follow adventurous or promising new possibilities wherever they may lead. Explorers enjoy initiating

FIGURE 1. The Orientation to Change dimension.



a broad range of tasks, and thrive on new, ill-defined, and ambiguous situations and challenges. Explorers seek to create many unusual and original options that, if developed and refined, might provide the foundation for productive new directions. They enjoy seeing unusual possibilities, patterns, and relationships. Other people may find their highly novel ideas difficult to understand or initially to "buy into." Explorers tend to embrace new experience and to "plunge" right into novel situations. They do not fear (and may seem to thrive upon) risk and uncertainty, and often improvise their planning as the situation unfolds, becoming so involved in the excitement of new, leading edge ideas that concerns about efficiency and practicality are, at times, forgotten. Explorers may continue to consider new ideas about a project, even after closure has been reached, or they may abandon a project before reaching any closure, so they can pursue new challenges. They often find plans, procedures, and structures that are imposed on them to be confining and limiting.

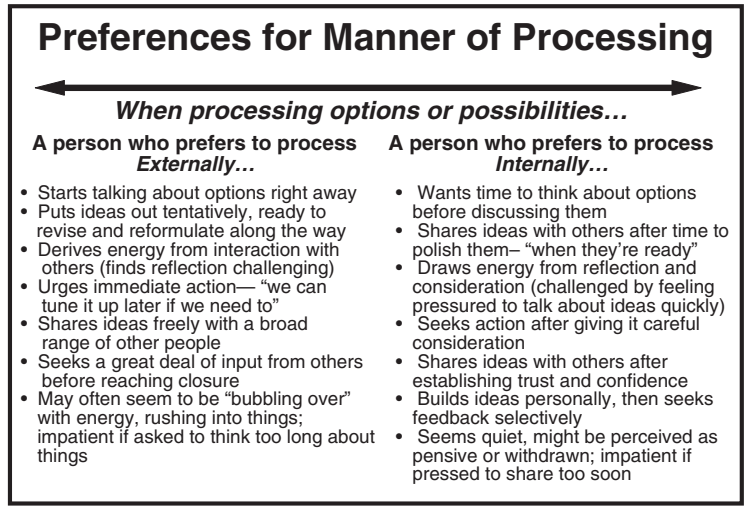
Scores above the mean on the OC scale indicate the Developer style. In ordinary use, a "developer" is an individual who brings tasks to fulfillment, who begins with the basic elements or ingredients and then organizes, synthesizes, refines, and enhances them, forming or shaping them into a more complete, functional, useful condition or outcome. Developers are concerned with practical applications and the reality of the task, and they use their creative and critical thinking in ways that are clearly recognized by others as being helpful and valuable. They prefer problems and solutions that are within the framework of their present experience, seeking change that is incremental, practical, and easily assimilated by the current reality. Developers prefer finding a small number of workable possibilities and guiding them to successful implementation. They tend to focus on bringing one task to closure before taking on a new challenge. Others often see Developers as persistent, careful, practical, methodical, well organized, and as seeking to minimize risk and uncertainty. They are comfortable with plans, details, structure, and the guidance of authority figures. They find structure and the guidance of authority helpful, or even enabling, in moving tasks or projects forward in an efficient, deliberate manner.

Manner of Processing: External–Internal

A second dimension of VIEW describes one's preferred manner of Processing (P) information during problem solving. This scale addresses the questions: "How do I prefer to manage

information and its flow when problem solving?" "When do I share my thinking?" and "Does interacting with others build or spend energy?" Figure 2 presents a summary of some typical attributes associated with Processing preferences.

FIGURE 2. The Processing dimension.



Scores below the mean indicate a preference for an "External" style of processing. Individuals who exhibit a well-developed preference for this style draw their energy from interaction with others, discussing possibilities, and building from the ideas of others. They prefer physical engagement with the environment. When learning new and difficult material those with an External style preference clarify their ideas and understandings through discussion. They find the input of authorities helpful as part of their active discussion. They are not bothered by noise in the study area, approach learning in several ways, and often find that physical mobility enhances their learning, thinking, and problem solving. When solving problems, they seek a great deal of input from others before reaching closure. "Externals" tend to be seen by others as good team members and often appear full of energy. Preferring action to reflection, they may appear to rush into things before others are ready to proceed.

Scores above the mean reflect a preference for an "Internal" style of processing. Those with a well-developed Internal style look first reflectively to their own inner resources and draw energy from their reflection. They prefer to consider ideas on

their own before sharing them with others. They embark on action only after giving it careful consideration. People with an Internal preference emphasize quiet reflection and processing information at their own pace. They tend to become engrossed in inner events, ideas, and concepts. They prefer learning privately, working at least initially without the help of peers or authority figures. They may seem quiet and might be perceived by others as pensive or withdrawn.

WAYS OF DECIDING: PERSON-TASK

The third dimension of VIEW involves preferences for Deciding (D) about options or possibilities. This scale addresses such questions as: "What factors get first priority when I focus or decide?" "Where do I start?" and "How do I make trade-offs?" Scores on this scale indicate whether one's primary focus in decision-making is on "People" or "Task." Figure 3 presents several key descriptors for the two styles in this dimension.

Individuals with scores below the mean tend to focus on the People style as their primary emphasis when deciding. They consider first the impact of choices and decisions on people's feelings and support, and on the need for harmony and positive relationships. They prefer to be emotionally involved when setting priorities. They are often seen as warm, friendly and caring. They are often quick to become aware of, and to respond to, the needs of others. They seek solutions or decisions that all concerned can "buy into."

Scores above the mean indicate a focus on the Task style. Those with this focus tend to look first at choices and decisions that are logical, sensible and can be justified objectively.

FIGURE 3. The Deciding dimension.

Preferences for Ways of Deciding

When making decisions about options or possibilities…

People **preference involves giving one's primary attention to:**	***Task*** **preference involves giving one's primary attention to:**
• What will promote harmony and positive interpersonal relationships • Criteria that are personal, sensitive to people's feelings, more subjective • What's good, attractive, or pleasing about an option (which may not mean they really like it!) • Considering the personal or interpersonal impact or consequences of a decision • Seeking a solution or decision that all concerned can buy into	• What's logical or rational • Criteria they consider objective, authoritative, and verifiable • What's wrong with an option, what it lacks, or what it needs (which may not mean they really dislike it!) • Considerations of standards, rigor, or quality • "Letting the chips fall where they may…" • Seeking the best solution or response, and being able to defend or justify the choice or decision

They prefer making judgments that are impersonal, based on well-reasoned conclusions. Individuals with a Task style of decision making seek mastery of content or information to help them arrive at the "best solution" or response, or at a solution they can readily defend or justify. They may stress the need for staying cool and free from emotion, while seeking clarity, precision, and logical order.

CONSTRUCTION AND DEVELOPMENT OF THE MEASURE

The current edition of VIEW consists of 34 items. There are 18 items dedicated to Orientation to Change (OC), and eight items each for manner of Processing (P) and ways of Deciding (D). The directions call for respondents to consider the stem, "When I am solving problems, I am a person who prefers . . ." for each of the 34 items. Then, the respondents mark one of seven points between two statements, such as:

> Thinking aloud about ideas ... Thinking quietly about ideas
> Ideas that are original..... Ideas that are workable

The respondents place a mark between each pair of statements closer to the left or right, so their choice will be nearer to the statement that best describes their personal preference, or usual way of doing things when solving problems. We ask them to think about the way of working that is most comfortable and natural for them, not the way they might wish they could be, or the way others want them to be. If both statements seem accurate but at different times, and to different degrees, respondents may place their mark on or near the center, in a position that best describes how they prefer to balance the two. Subjects with a sixth-grade level of English language reading proficiency can readily respond to VIEW in approximately 10 to 15 minutes. Items are scored from 1 to 7, so the possible scores on the OC dimension range from 18 to 126, with a theoretical mean of 72, and the P and D dimension scores can each range from 8 to 56, with a theoretical mean of 32.

VIEW's assessment design is unique, in that the two statements for each of the 34 items are written so that both present positive expressions of a well established behavioral preference when solving problems or managing change. Both options represent choices that are balanced in terms of social desirability. We chose this approach in an effort to reduce the respondent's motivation to provide responses they perceived as "socially desirable," building on Kirton's (1999) conclusion that individuals with a strong style preference considered that preference to be the most socially acceptable.

SUPPORTING PSYCHOMETRIC DATA

The current edition of *VIEW* is the outgrowth of four stages of development and revision based on data collected from more than 3,800 subjects, from 34 states and several foreign countries, ranging in age from 11 to 84.

Stage one of research and development on VIEW began in April 1997, with more than 200 subjects, and a pool of items constructed based on descriptions of behavioral preferences of individuals engaged in creative problems solving and change management activities. The authors constructed the initial item pool by generating more than 60 possible item pairs, and then focusing on a smaller set by considering the literature on style and personality, as well as our personal experience in research and teaching on Creative Problem Solving. We used the initial pool of items to begin our pilot work. Respondents in this initial stage included several groups middle and high school students, graduate students, and educators who volunteered to respond. Stage one activities involved a series or small pilot studies and field tests employing samples of convenience to provide initial guidance and direction as we began to frame the scope and structure of the instrument. We used these data to examine the average scores for each item (anticipating a mean score of 4 on a 1-7 scale), the distribution of choices across the 1-7 scale, and item discrimination (comparing the means for each item, comparing the upper and lower quartiles based on total score). The authors examined these data to eliminate poorly performing items, and to use as a foundation for refining the item pool.

Stage Two was carried out during the summer of 2001 with a revised form of the VIEW instrument. These studies involved more than 2,000 subjects. The subjects included: middle school, senior high school, community college, and university students; classroom teachers; educational administrators; church leaders; and, business managers from within the United States and from international settings. The adult subjects were participants in several workshops and training programs in which no additional style or creativity assessments were conducted. The adolescent subjects responded to the instrument as part of a larger, national evaluation project of a summer program for elementary school students (Saxon, Treffinger, Young & Wittig, 2003). Overall, the mean age for this sample was 27.39 (SD = 13.10, range 11-76). Six hundred eighty-one subjects were under 18, 1,161 were over 18, and 158 did not report their age. There were 678 males, 1,148 females, and 174 subjects who did not report their gender. All subjects in

these groups responded to the instrument on a voluntary basis. Our goals for this stage were to test and refine our item pool (which now consisted of 38 items) and to examine the factor structure of the instrument, providing and expanding the foundation for refining and strengthening the instrument. In this stage, we also examined the items' mean scores and distributions, the discrimination indices for each item, and the factor loadings for each item. We eliminated or revised items for which the mean score varied more than plus or minus .5 from a mean of 4.00, items for which the discrimination between highest and lowest scoring groups was negative and/or non-significant ($p < .05$), that loaded less than .30 on the primary factor they were intended to represent, or loaded .30 or greater on more than one factor. When revising items, we also paid close attention to the content we intended each dimension to represent, reexamining the wording of each item in relation to the theoretical foundation and the relevance of the dimension to creative problem solving.

Stage Three involved testing a revised set of 40 items. Research objectives for this stage were to determine the effectiveness of our revisions; and to establish results for the item distribution and discrimination, the instrument's structure, and correlations between VIEW and selected variables from other instruments related to problem-solving style. These studies were conducted in the fall of 2001, based on data from convenience samples involving a total of 743 individuals ranging in age from 12 to 59 (mean age = 19.7), including students from middle through graduate school, educators, and business managers. In this set of data, there were 531 subjects 18 or younger, and 180 over 18 (with 32 declining to provide age data). There were 355 males and 387 females Once again, we conducted analyses of item means, distributions, and discrimination indices (using the same criteria and procedures as in Stage Two), factor analyses (using principal components analysis with a Varimax rotation), and careful conceptual review and analysis of all item content and wording. Based on the results of Stage Three analyses, the measure was modified and published in its present 34-item format. Each of the 34 items demonstrated adequate item characteristics; that is, the responses were distributed well across all response alternatives; the means for each item ranged between 3.5 and 4.5; the items discriminated high from low quartile total scores positively and significantly ($p. < .01$); and, the items loaded consistently by factor in the factor analyses.

The studies in Stage Four of VIEW's development were conducted between December 2001 and July 2002. The total sample from these studies consisted of 903 individuals, primarily from North America. Specific socio-economic and/or ethnic data were not recorded. However, those who participated covered a broad spectrum of demographic groups. The sample consisted of 455 (50%) individuals from the business and consulting sector while 448 (50%) were educators or students. Age was reported on a voluntary basis by 663 individuals; the sample ranged in age from 14 to 79 years with a mean of 41.9 years of age (SD = 10.9). There were 394 males (44%) and 494 females (56%).

Descriptive Statistics for the Current Edition of VIEW

The number of dimensions of VIEW, the direction of scoring for items in the OC dimension, and the total number of items in the instrument varied from one stage of the instrument's developmental research to another, as we refined the instrument. Therefore, general comparisons of descriptive statistics among the initial stages are difficult to make. We will report findings from the earlier stages study in order to establish a clear picture of the instrument's development. However, the most useful data and descriptive results are those reported in our stage four studies, using the current edition of the instrument (N = 903).

Table 1 presents the mean, standard deviation, range, and standard error of measure for each of the three dimensions of the current edition of VIEW. The observed mean of the OC dimension of 72.2 was slightly higher than the theoretical mean

TABLE 1. Mean, Standard Deviation, Cronbach's Alpha, and Standard Error of Measure for Each of VIEW's Three Dimensions (N = 903).

			Range			
Dimension	**M**	**SD**	**Min.**	**Max.**	**Alpha**	**SEM**
Orientation to Change (18 items)	72.24	18.44	18	120	.91	5.55
Manner of Processing (8 items)	28.90	9.46	8	56	.87	3.48
Ways of Deciding (8 items)	32.94	9.04	8	56	.87	3.30

for the scale of 72. The scores for this scale ranged from 18 to 120; the maximum possible range is 18 to 126. The standard deviation (SD) is 18.44. Given the reliability of .91 for this scale, the standard error of the measure (SEM) was 5.55.

The observed mean of the P dimension was 28.9, while the hypothetical mean would be 32. The responses on the P dimension dispersed across the entire range of the scale, from 8 to 56. The SD for this scale was 9.46. Given the reliability of .87, the SEM was 3.48.

The observed mean of the D dimension scores was 32.9, compared with the theoretical mean of 32. The range of scores on the D scale also represented the entire range possible, from 8 to 56. The SD on this dimension was 9.04, and given the reliability of .87, the SEM was 3.30.

We found no statistically significant correlations between scores on the current edition of the three VIEW dimensions and age or gender. For age, the correlations with OC, P, and D, respectively were –.11, –.02, and –.03; for gender, the correlations were .13, .05, and .08, respectively.

Evidence Supporting the Reliability of VIEW

This section presents data on the stability and internal consistency of VIEW. The data from our developmental studies indicated that VIEW meets the customary expectations regarding reliability to support use in research and training contexts, in relation to both stability and internal consistency.

Stability

A group of 13 graduate education students at a mid-sized eastern private university participated in a stability study of VIEW. The students completed VIEW and then completed it again two months later before receiving feedback on their scores. For this small group the stability correlations were .87, .87, and .72 for the OC, P, and D scales respectively. Nineteen subjects who participated in another study also completed VIEW again after two months. The two-month test-retest correlations were .93 for the OC dimension, .93 for the P dimension, and .84 for D. Despite the small size of the samples, these correlations were all statistically significant ($p < .01$). Another reliability study involving stability over a one-month interval was carried out with 48 middle school students and nine adults. The correlations were .90, .65, and .60 for the OC, P, and D dimensions respectively. In another study of stability involving 23 adults over a one-month period, the correlations were .85, .80, and .77, respectively. These correlations were all significant ($p < .01$, with 46 df). Our most recent test-retest study involved 45 volunteer graduate and undergraduate students at

a northeastern university who responded to VIEW twice over an eight-week period. The sample ranged in age from 20 - 52 (M = 29.3, SD = 8.6), and was predominantly female (39 females and six males). The test-retest correlations for this sample were: OC, r = . 84, P, r = .83, and D, r = .75 and (all p < .001, with 43df).

These results provide evidence that support the reliability of the VIEW instrument. The reliabilities meet or exceed expectation for psychological measures, and generally, are sound in comparison with other personality instruments. We note that the stability of scores for middle school population on the P and D Dimensions, while in the acceptable range (r>.60), was not as strong as the stability results for the adult population, whereas score stability for the OC dimension was comparable among all groups. We recommend therefore that, until more data are available, users should interpret results carefully on the P and D dimensions for middle school students. We believe that, given the nature and variety of developmental changes that occur normally during adolescence, and the continuing journey towards self-understanding that accompanies the adolescent years, it is appropriate to proceed with caution in using and interpreting all self-report instruments with these age groups.

Internal Consistency

We also conducted analyses of internal consistency reliability in each stage of VIEW's development using Cronbach's coefficient Alpha. The inter-item reliability coefficients (Alpha) in Stage Three (all statistically significant at the p < .01 level, with N = 743; 741df) were: .81 for the Orientation to Change (OC) dimension, .73 for the Manner of Processing (P) dimension, and .68 for the Ways of Deciding (D) dimension. The removal of weaker items from the scales produced alphas of .81 (OC, 16 items), .80 (P, 9 items) and .70 (D, 8 items). We also carried out studies during the Winter, 2001/2002 (N = 467) among respondents that included business managers, educators, and students. The coefficient Alpha results for this sample were .91 (OC), .87 (P), and .87 (D), again all significant (p < .01, 465 df).

Since we sought to develop VIEW as an instrument that might be useful for adolescents in educational settings as well for adults, we were concerned that the reliability of scores for younger respondents might be lower than for adults, we did conduct separate analyses by age groups for 711 subjects (from the total of 743 subjects in this stage). The results for the combined group (N = 711, 709 df), were: OC, r = . 82, P, r = .74, and

D, r = .69 (all $p < .01$). For subjects at ages 12-14 (N = 311), the results were .75, .72, and .60, respectively (all $p < .01$). For subjects at ages 15-17 (N = 217), the results were .81, .78, and .70, respectively (all $p < .01$). Finally, for subjects 18+ years of age (N = 183), the results were .89, .71, and .77 (all $p < .01$). Therefore, although the reliabilities were lower for the youngest groups, the overall results suggest that the OC and P dimensions were stable across ages, and the D dimension may be slightly less reliable for subjects under the age of 15.

Since the customary expectation for instruments in psychology and education is that internal consistency correlations should exceed .70 (e.g., Nunnally, 1978), we conclude that VIEW demonstrates an acceptable level of reliability in relation to the internal consistency among its items, for each of VIEW's three dimensions.

EVIDENCE SUPPORTING THE VALIDITY OF VIEW

Demonstrating that an instrument is valid, or measures what it purports to measure, is an on-going process, not an "event" that can be established definitively in a single study or a specific set of results. Therefore, validation of VIEW, like any other new instrument, will require an on-going program of research by the developers and the active contributions of many other researchers over a period of years. We are committed to establishing and maintaining that research in our own work, and to encouraging research with VIEW by other investigators.

Our initial work included several preliminary validation efforts that we consider promising, including both quantitative and qualitative procedures.

Quantitative Results

We conducted factor analytic studies of the instrument during two recent stages of development (for the first time, with 2,000 subjects in Stage Two, and again with a sample of 743 in Stage Three). Since the initial studies were preliminary analyses, to guide us in item selection or revision, we will focus on the results of studies we conducted based on the current edition of the instrument. The results of the current investigation, an exploratory factor analysis (Principal Component with Varimax rotation), revealed six distinct factors with an Eigen value greater than 1.0. This six-factor solution accounted for 57% of the cumulative variance. Review of the scree plot suggested that a strong case could be made for a three-factor model as a valid interpretation of the data. The subsequent factor analysis to extract three factors accounted for 48% of the cumulative variance; the results are summarized in Table 2).

TABLE 2. Principal Components Analysis (Varimax Rotation) of VIEW Items (n = 903)

Item Identifier	Theoretical Scale Placement	Rotated Factor Loading		
		1	2	3
1	Orientation to Change	.784		
2	Orientation to Change	.760		
3	Orientation to Change	.703		
4	Orientation to Change	.699		
5	Orientation to Change	.670		
6	Orientation to Change	.665		
7	Orientation to Change	.648		
8	Orientation to Change	.635		
9	Orientation to Change	.633		
10	Orientation to Change	.632		.314
11	Orientation to Change	.618		
12	Orientation to Change	.612		
13	Orientation to Change	.611		
14	Orientation to Change	.575		
15	Orientation to Change	.556		
16	Orientation to Change	.550		
17	Orientation to Change	.504		
18	Orientation to Change	.388		
19	Manner of Processing		.760	
20	Manner of Processing		.755	
21	Manner of Processing		.745	
22	Manner of Processing		.742	
23	Manner of Processing		.731	
24	Manner of Processing		.726	
25	Manner of Processing		.701	
26	Manner of Processing		.600	
27	Ways of Deciding			.758
28	Ways of Deciding			.752
29	Ways of Deciding			.747
30	Ways of Deciding			.728
31	Ways of Deciding			.673
32	Ways of Deciding			.665
33	Ways of Deciding			.661
34	Ways of Deciding			.659
	Percentage of Variance	23.76	13.26	10.62
	Eigenvalues	8.08	4.51	3.61

The Varimax-rotated solution shows that for this sample all the items of the VIEW instrument are aligned with their theoretical dimensions. The results also show that only one of the 34 items, item 10, appeared to cross-over or "bleed" into another dimension at a level greater than .29. In comparing these two loadings, the stronger was on the dimension that the item was, in fact, intended to measure. We found that the hypothesized factor structure was supported.

Criterion-Related Validity: Correlations with Other Measures.

Criterion-related validity represents the extent to which an instrument demonstrates appropriate and statistically significant relationships with other instruments that purport to measure similar constructs. We have studied correlations between scores on the VIEW instrument and several other measures that represent the theories and models that influenced us in designing and developing our instrument. Our studies have included correlations between VIEW and three relevant instruments: PEPS, KAI, and MBTI. Dunn & Dunn which looks at a broad range of learning style preferences, the KAI which considers broad preferences for problem solving behavior and manner change in a group context, and the MBTI which considers psychological type in a broad context.

PEPS. We conducted a correlational study in our first round of development, with 191 subjects who completed our instrument and the Productivity Environmental Preference Survey (PEPS; Dunn, Dunn and Price, 1991). The results indicated that subjects with an Explorer preference tended to prefer Informal Design, while subjects with a Developer preference scored higher on Motivation and Persistence. These results are consistent with the descriptions of the two styles in the Orientation to Change dimension. Explorers are more likely to find informality or a casual environment to be open and inviting, while Developers feel comfortable in a more formally structured context. Developers are also likely to prefer and emphasize staying with a task and, working until it is complete, consistent with the PEPS factors of persistence and motivation.

A second study involving 28 adults who were administered our instrument and PEPS also yielded several statistically significant correlations in the expected directions. While studying new and difficult material, Developers preferred Quiet, Formal Design, and Structure, while Explorers preferred Sound, an Informal Design, and little or no imposed Structure. Those with an External processing style also preferred Mobility, working with Peers, and working in the presence of Authority figures. Subjects with an Internal processing style preferred to

work Alone and had no preference for Mobility. Subjects with a Task-oriented deciding preference were significantly higher on persistence, kinesthetic modes of learning, and learning in several ways, than were subjects with a Person-oriented deciding preference.

The most recent study involved the responses of 118 North Carolina Senior High School Students, whose VIEW results were correlated with scores on the Dunn and Dunn Learning Style Inventory (Dunn, Dunn, & Price 1993). These data yielded statistically significant correlations ($p = .05$ or beyond) in the expected directions. That is, Developers preferred Quiet, were high in Motivation and Persistence, preferred Structure and were motivated by teachers or authority figures. Explorers had a preference for Sound, preferred low external Structure, and were not motivated by authority figures. Students who preferred Internal processing also preferred Quiet, Learning Alone, learning in a set manner, and learning Visually (which includes reading). Those with an External style of processing preferred learning with Peers, in the presence of an Authority figure, and learning in Several Ways, often with Sound in the background. In relation to the Deciding dimension, students with a Task preference were significantly higher than students with a Person preference on persistence, mobility, and on bright or direct light when studying.

KAI. Kirton (1987) identified a continuum of creativity styles, from an adaptive preference to an innovative preference. Subjects with a preference for the Adapator style seek to do things better, using their creativity to add value to the current situation. They are perceived as reliable, thorough, and precise. Those with an Innovator preference seek to do things differently, and seek to use their creativity to move in bold, new directions. The Developer style in VIEW is similar in some respects to Kirton's Adaptor style, and the Explorer style in VIEW is also similar to Kirton's Innovator. We predicted, therefore that KAI scores should correlate significantly with VIEW's OC dimension, but not with VIEW's P or D dimensions. In a study during stage two of our work, 48 adult participants completed both VIEW and the KAI. The total KAI scores were correlated with the scores of VIEW with coefficients of .73, –.14, and .24 for the VIEW OC, P, and D. scales respectively. (Note that during this stage, higher OC scores indicated an Explorer preference, and lower scores the Developer style; these were reversed starting in stage three.) These results were statistically significant ($p < .01$, 46 df), in the expected direction, for

the OC scale. Subjects who preferred the Developer style in VIEW tended to prefer the KAI Adaptor style, while Explorers tended to prefer the KAI Innovator style. As expected, since the KAI does not purport to measure Manner of Processing or Ways of Deciding, the correlations for the P and D dimensions with the KAI were not statistically significant.

MBTI®. A study involving 20 graduate and undergraduate students at an urban university in New York City examined the correlations of VIEW scores with scores on the MBTI® (Myers et. al., 1998). The OC dimension correlated .67 ($p < .01$) with Sensing/Intuition and .61 ($p < .01$with Judging/Perception. These statistically significant results were all in the expected directions, in that the Developer style was more strongly indicative of a Sensing and Judging MBTI® preference (emphasizing attention to details, an organized, well-structured approach, and completing tasks in a thorough and orderly manner). The Processing (P) dimension correlated .59 ($p < .01$) with the MBTI® Extraversion/Introversion scale, in the expected direction (External processing preferences in VIEW are similar to the MBTI® Extraversion dimension, while Internal processors on VIEW tended to prefer Introversion on the MBTI®), and only minimally with other MBTI® scales (-.17 with S/N, –.15 with J/P, and .02 with T/F, all statistically not significant). The Deciding (D) dimension of VIEW correlated .49 ($p < .05$) with the Thinking/Feeling scale of the MBTI®, also in the expected direction (Task Oriented on VIEW preferred the MBTI® Thinking dimension, whereas Person-Oriented on VIEW preferred the MBTI® Feeling dimension), and minimally with the other MBTI® scales (.24 with Sensing/Intuition, .20 with Judging/Perceiving, and .11 with Extraversion/Introversion, all statistically not significant).

Qualitative Validity Evidence

Both the content and construct validity of the measure are supported by the efforts of the authors to elaborate and refine its theoretical and conceptual foundations (Selby, et al., 2002). These efforts include the definition of the concepts of Orientation to Change, Manner of Processing, and Ways of Deciding. The content validity is also supported by the item development analysis, and revisions procedures that were followed during each stage of research and development, in relation to theoretical concepts and quantitative item analysis. The instrument's "face validity" is supported by the clear and unambiguous way in which it relates to the dimensions it purports to measure.

In two stages of the development process, we also gathered qualitative data. These data are informal and limited in scientific rigor and scope; we present them only as preliminary indications that support the expectations one might hold for a new measure, and as the "first steps" in the on-going process of validating the measure.

In one study, we asked a group of 23 adults in a CPS training program to complete a questionnaire at the conclusion of the program, in which we posed the question, "Did your overall score [on VIEW] agree with your own personal assessment of your style preference?" In this group, 18 responded "yes," three answered "only partly," no one answered "no," and two participants did not respond. As part of a middle school study, 10 parents voluntarily returned a survey asking how well the measure described their perception of their child's typical behavior when solving problems. Four responded "very much so," six responded "mostly," while none responded "somewhat' or "not at all." We recognize, of course, that such self-report data may be limited by a variety of potential biasing influences. Informally, however, since the respondents were under no evaluative pressure and provided their responses voluntarily, we propose that the responses provide at least a preliminary finding of positive support.

Summary of Psychometric Support

Based on the analysis of data we have collected in our initial studies of VIEW and our interpretations of those data, we conclude that VIEW is a promising measure for use with individuals or groups with a sixth grade or better level of English proficiency when seeking to identify and describe individual problem-solving style preferences. VIEW has demonstrated acceptable levels of reliability. As true in all new instrument development initiatives, there is a need for additional evidence concerning the predictive and construct validity of VIEW. While the initial validation studies have been supportive, they are still preliminary in nature, and we are currently designing and conducting additional validation research. Through the publication of the current edition of VIEW and the development of a well-qualified user base that includes researchers as well as practitioners, we intend to continue studying the instrument's reliability, validity, and usefulness.

To date, no limitations have been found regarding the use of VIEW based on occupation, age, gender, or ethnicity factors. Among female participants, we have found a slight preference for the People style on the Ways of Deciding dimension. This finding is not surprising, however, based on type theory

and research (Myers et al., 1998). In relation to age, although our initial studies have included a small number of 11-year-old students, we do not recommend the instrument for children younger than 12, or for participants with a reading level in English below the sixth grade. As with all new instruments, caution in use and application is necessary. VIEW should not be used in situations requiring a broad assessment of individual personality dimensions, or in which there is a concern for clinical assessments of individuals. From our development and research studies to date, and with the limitation cited above, we conclude that *VIEW: An assessment of problem-solving style* is a psychometrically sound, and practical tool for assessing problem-solving style, especially when combined with well-prepared feedback in the hands of qualified group leaders, trainers, and teachers. It is also a useful tool for enabling individuals or groups involved in problem solving and change management in enhancing their teamwork and in planning for productivity.

POTENTIAL APPLICATIONS FOR RESEARCHERS AND PRACTITIONERS

The results offered by VIEW can help individuals to recognize, describe, and appreciate their own problem-solving style preferences. The data provided by VIEW can be used to guide individuals in formulating their own creative strengths profiles, and to develop and apply their personal talents as fully as possible. Individuals can use their scores to test their reported or perceived preferences against their typical behavior or performance on a daily basis in varied situations, in order to affirm or modify an understanding of their strengths or weaknesses in terms of problem-solving style. Their VIEW results can help them to grow in understanding of their unique style preferences. With this knowledge, individuals can identify ways to be at their personal best, and they can determine how, or under what conditions, they may benefit from the strengths of others. Through training they can use that knowledge and awareness to support and enhance their creative problem-solving behavior, and to use their knowledge to customize or personalize their selection and use of creative problem-solving methods and tools, either working on their own or working with a group or team.

VIEW also has implications for people who are working in, studying, or facilitating problem solving or change management with groups. It offers practitioners a common language or vocabulary for people to use constructively to understand and appreciate style similarities and differences among group members with whom they are working.

The ease of administration and scoring of the instrument makes VIEW an appropriate tool for use with young people and adults who wish to understand their own approach to change and problem solving. As such it has applicability in an effective team-building experience for adult leadership and management groups. As part of a training program, the data provided by VIEW can be very useful in helping teams and individuals develop more effective problem solving and change management strategies. When feedback is offered to students in school settings, the data provided by VIEW can be useful in helping teachers in creativity instruction, and in developing Creative Problem Solving teams. With adults, VIEW can be a helpful tool for team building and leadership development efforts. VIEW can also be used to enhance and support organizational efforts addressing strategic change, guiding change and innovation, or other deliberate change management initiatives. Project management teams can use VIEW to enhance communication and build effective collaboration among team members.

In that it draws widely from the literature on learning and cognitive style, psychological type, and Creative Problem Solving, VIEW also offers many opportunities for researchers. These include correlational studies with instruments representing the theories that formed the foundation for VIEW's development. In addition, data useful to practitioners could be provided through studies as to the efficacy of VIEW in enhancing creative productivity for both teams and individuals.

In summary, creativity research and theory and their application in real world settings are continually evolving. Part of that evolution has involved an emerging understanding of the construct of problem-solving style and the influence that construct holds on creative productivity. *VIEW: An assessment of problem solving style* is a new instrument for assessing problem-solving style. It is the result of more than five years of research and development. Recent studies indicate that it is both reliable and valid for the assessment of an individual's style of problem solving and change management. It has applications for research and in settings where individuals would gain, as a result of a better understanding of their problem-solving style.

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AUTHOR NOTE

Edwin C. Selby is an Associate, and Donald J. Treffinger is the President, Center for Creative Learning, Inc., in Sarasota, FL. Scott G. Isaksen is the CEO and President, and Kenneth J. Lauer is the Vice President of Research & Development, Creative Problem Solving Group, Inc., in Williamsville, NY.

Correspondence concerning this article should be addressed to Edwin C. Selby, P. O. Box 637, Sussex, NJ 07461.