An Analysis of Current Creativity Measures Against Creative Problem Solving Processes Within the Osborn-Parnes

Angelo M. Biondi
Buffalo State College

To learn more about the International Center for Studies in Creativity and its educational programs, research, and resources, go to http://creativity.buffalostate.edu/.

Recommended Citation
Biondi, Angelo M., "An Analysis of Current Creativity Measures Against Creative Problem Solving Processes Within the Osborn-Parnes" (1976). Creative Studies Graduate Student Master's Theses. 4.
http://digitalcommons.buffalostate.edu/creativetheses/4

Follow this and additional works at: http://digitalcommons.buffalostate.edu/creativetheses

Part of the Social and Behavioral Sciences Commons
AN ANALYSIS OF CURRENT CREATIVITY ASSESSMENT MEASURES AGAINST CREATIVE PROBLEM-SOLVING PROCESSES WITHIN THE OSBORN-PARNES MODEL

ANGELO M. BIONDI
AN ANALYSIS OF CURRENT CREATIVITY ASSESSMENT
MEASURES AGAINST CREATIVE PROBLEM-SOLVING
PROCESSES WITHIN THE OSBORN-PARNES MODEL

A Thesis
Presented to
The Faculty of Creative Studies
State University College at Buffalo
Buffalo, New York

In Partial Fulfillment
of the Requirements for the Degree of
Master of Science

by
Angelo M. Biondi
December 1976
AN ANALYSIS OF CURRENT CREATIVITY ASSESSMENT
MEASURES AGAINST CREATIVE PROBLEM-SOLVING
PROCESSES WITHIN THE OSBORN-PARNES MODEL

A Thesis
by
Angelo M. Biondi

Approved by

Sidney J. Parnes
Principal Reader

Sidney J. Parnes
Program Chairman

Theodore J. Magn
Dean of Graduate Studies

12/21/76
12/21/76
12/24/76
Date
Date
Date
ABSTRACT

Angelo M. Biondi

December 1976

Directed by: Sidney J. Parnes

Program: Creative Studies

This study was designed to investigate selected creative assessment measures for any predominant focus with respect to the Osborn-Parnes five-step Creative Problem-Solving Model. It was hoped that current measures could be identified as being of some diagnostic value in determining an individual's strengths or weaknesses within the different stages of the Model.

A total of forty-one current assessment measures were examined. The test originators were contacted and asked to analyze the activities within each of their tests for relevancy to the steps within the Osborn-Parnes Model. There responses were tabulated and further analyzed.

Of the forty-one measures, seven, or 17.1 percent related to Fact-Finding; six, or 14.6 percent related to Problem-Finding; twenty six, or 63.4 percent related to Idea-Finding; six, or 14.6 percent related to Solution-Finding; and ten, or 24.4 percent related to Acceptance-Finding.

Most of the measures investigated tend to identify divergent abilities. Only six of the forty-one measures, identified as being
convergent in nature by the test originators, related to Solution-Finding. Parnes himself feels that none of them truly did in terms of his model, because they did not specifically relate to deliberate criteria development, which is the crux of the Solution-Finding step.

Within the purpose, scope, and limitations of this study, the hypothesis that current assessment measures can be matched with creative problem-solving processes within the Osborn-Parnes Model appears to be supported.

Much experimental research is needed to determine whether these measures can indeed be used to identify individual strengths and weaknesses within the Model.
ACKNOWLEDGEMENTS

The writer wishes to express his appreciation to the many people who helped make this study both meaningful and enjoyable.

First and foremost, thanks is given to Dr. Sidney J. Parnes and Dr. Ruth B. Noller for their assistance and professional guidance through the years. The writer is particularly grateful to Dr. Parnes, Chairman of the Committee and the writer's primary advisor, for his time-less efforts in guiding this writer to the completion of the study.

Special thanks is also extended to the following who willingly shared their friendship and expertise: Dr. J. P. Guilford, Dr. E. Paul Torrance, Dr. John C. Flanagan, Dr. Sarnoff A. Mednick, Dr. William A. Owens, Dr. Alvin L. Simberg, Jr., Dr. Gary A. Davis, and Dr. Walter G. Mettal.

Sincere appreciation it extended to Dorothy M. Hunter for her support and untiring assistance in typing the many revisions. Additional thanks to Fern E. Innes for her support.

To Mr. and Mrs. C. Biondi, the writer's parents, a well earned thanks for their encouragement and continued sacrifices.

Last, but not least, a very special thanks to Ann.
TABLE OF CONTENTS

ACKNOWLEDGEMENTS ........................................... v
LIST OF TABLES .............................................. viii
Chapter
I. INTRODUCTION .............................................. 1
   General Introduction ...................................... 1
   The Need for the Study ................................... 5
   State-of-the Art Overview ................................ 6
   Purpose of the Study ...................................... 7
II. A REVIEW OF THE LITERATURE RELATING TO THE ASSESSMENT
    OF CREATIVITY ........................................... 8
    Some Unresolved Issued Relating to Creativity
    Assessment ............................................. 15
III. THE RESEARCH PROBLEM AND THE HYPOTHESIS .............. 18
    Some Background ........................................ 18
    The Need for the Present Study ......................... 21
    The Specific Problem ................................... 22
    Limitations and Delimitations of the Study .......... 22
    Hypothesis ............................................... 22
IV. METHODOLOGY ............................................. 23
    Study Sample ............................................ 23
    Procedure and Nature of Data Collection ............. 24
    Definitions .............................................. 25
V. PRESENTATION AND DISCUSSION OF DATA .................... 27
    The Guilford Battery ................................... 27
    The Torrance Battery ................................... 31
    The Flanagan Battery ................................... 34
    The Owens & Schumaker Test ............................ 34
    The Mednick & Halpern Test ............................. 34
    The Harris & Simberg Test ............................... 35
    A Summary-Analysi of the Forty-One Assessment
    Measures Examined ..................................... 35
## VI. CONCLUSIONS AND RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Conclusion</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusions</td>
<td>43</td>
</tr>
<tr>
<td>Recommendations</td>
<td>43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPENDICES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SELECTED BIBLIOGRAPHY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>
LIST OF TABLES

1. Structure-of-Intellect Abilities which Guilford Analyzed as Probably Most Relevant to the Osborn-Parnes Model, and Suggested Tests Published by the Sheridan Psychological Services ........................................ 28

2. Comparison of the Terminology of Steps Within the Torrance and Osborn-Parnes Models of Creative Problem-Solving ............................................................... 31

3. Relationships of Tasks Within the Torrance Creativity Tests to Stages Within the Osborn-Parnes Model .................................................................................. 32

4. Relationships of the Forty-one Assessment Measures Examined in this Study to the Stages Within the Osborn-Parnes Model of Creative Problem-Solving .......... 38
CHAPTER I

INTRODUCTION

General Introduction

A review of the literature revealed a considerable variety of definitions of creativity. Rhodes'\(^1\) was able to examine and sort fifty-six major definitions into four major categories dealing with: 1) persons, 2) process, 3) interaction of human and environment, and 4) product.

Since this study will focus on process, Rhodes'\(^2\) definition is quite significant:

*The term process applies to motivation, perception, learning, thinking, and communicating.*

He went on to raise several essential questions:

*What are the stages of the creative thinking process? Can the creative thinking process be taught?*

The literature also revealed a number of responses as to the nature of the creative process.

Simpson\(^3\) defined creative ability as:

*... the initiative which one evidences by his power to break away from the usual sequence of thought into an altogether different thought.*

---


\(^2\)Ibid., p. 308.

According to Spearman, creativity involves:

... the power of the human mind to create new content—by transferring relations and thereby generating new 'correlates'—extends its sphere not only to representation in ideas, but also to fully sensuous presentations.

Ghiselin suggested that creativity is:

... the process of change, of development, of evolution in the organization of subjective life.

Harris described the process as:

... realizing the need, gathering information, thinking through, imagining solutions, verification, and putting ideas to work.

Stein and Murray shared the opinion that creativity is a process which produces novel works that have social worth.

Mednick described the creative thinking process as:

... the forming of associative elements into new combinations which either meet specified requirements or are in some way useful. The more mutually remote the elements of the new combination, the more creative the process or solution.

---


Thurstone\textsuperscript{10} felt that:

\ldots the moment of insight which characterizes creative and inventive thinking is normally followed by explicit and deductive thinking in testing the new idea.

Koestler\textsuperscript{11} offered his theory of 'bisociation,' the ability to draw together unusual frames of reference. He viewed creative thinking as operating on more than one plane, in comparison to routine thinking which occurs on a single plane.

Dewey's\textsuperscript{12} problem-solving model involved:

- awareness that a problem exists
- analysis of the problem
- an understanding of the nature of the problem
- suggestions for possible solutions
- testing the alternative solutions and accepting or rejecting them.

Wallas\textsuperscript{13} believed that by examining a single achievement of thought, he could distinguish four stages:

The first in time I shall call Preparation, the stage during which the problem was "investigated \ldots in all directions"; the second is the stage during which he was not consciously thinking about the problem, which I shall call Incubation; the third, consisting of the appearance of the "happy idea" together with the psychological events which immediately preceded and accompanied that appearance, I shall call Illumination. And I shall add a fourth stage, of Verification. \ldots


\textsuperscript{12} J. Dewey, \textit{How We Think} (Boston: D. C. Heath, 1910).

Based on his research with inventors, Rossman\(^4\) expanded Wallas' four stages to seven steps:

- Observation of a need or difficulty
- Analysis of the need
- A survey of all available information
- A formulation of all objective solutions
- A critical analysis of these solutions for their advantages and disadvantages
- The birth of a new idea—the invention
- Experimentation to test out the most promising solution, and the selection and perfection of the final embodiment by some or all of the previous steps.

Taylor\(^5\) divided the creative process into successive stages of mental labor, incubation, illumination, and deliberate effort.

Torrance\(^6\) viewed it as:

... a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty, searching for solutions, making guesses or formulating hypotheses about the deficiencies, testing and retesting these hypotheses and possibly modifying and retesting them, and finally communicating the results.

Founder of the Creative Education Foundation, Alex F. Osborn\(^7\) described a seven-step process consisting of:

- Orientation - pointing up the problem
- Preparation - gathering pertinent data
- Analysis - breaking down the relevant material
- Ideation - piling up alternatives by way of ideas
- Incubation - letting up to invite illumination
- Synthesis - putting the pieces together
- Evaluation - judging the resulting ideas.


\(^{15}\)C. A. Taylor, "Clues to Creative Teaching," *The Instructor* 73 (October 1963): 5.


Parnes, an associate of Osborn, defines the process as consisting of: Fact-Finding, Problem-Finding, Idea-Finding, Solution-Finding, Acceptance-Finding. Each step is multifaceted, using both divergent and convergent processes, and interrelated with the others. This model is most frequently referred to as the Osborn-Parnes Model of Creative Thinking. It will be the main focus of this study.

**The Need for the Study**

In the first chapter of a book on *Creativity in Industry*, Whitfield discussed creativity:

> As a process, creativity was presented as something timeless and not wholly within our control, as a flash of inspiration producing form where no form existed a moment before. But one flash of inspiration did not produce Beethoven's Choral Symphony, Leonardo's Mona Lisa or Shakespeare's *Macbeth*. By general agreement each would be acclaimed as masterpieces of creative effort in detail and in the whole, but much more was needed to bring them to their finished state than just creativity—craftsmanship in applying the rules of the appropriate art form, analysis and judgment in achieving balance and effect, and sheer hard work in bringing all the bits together into one final composition.

Yet, while there is some agreement that creative acts result from the proper implementation of a multi-staged process, Maier and his associates point out that:

> Most studies of creativity avoid the question of a mechanism or process and are concerned with individual differences and personality variables.

---


Furthermore, the literature is very sparse concerning longitudinal studies which demonstrate the ability of creativity assessment measures to predict future performance.

Owens\textsuperscript{21} reported success with his battery of tests for the prediction of creativity in machine design. Similarly, Torrance\textsuperscript{22} reported success in longitudinal studies (of varying timing) which utilized the Torrance Tests of Creative Thinking. But, he went on to point out that:

\begin{quote}
No attempt has been made yet to determine whether creativity tests administered to elementary school children will predict adult creative achievements.
\end{quote}

In light of the nature and sparsity of the literature, the above findings can be viewed as providing only marginal evidence of creative performance predictability.

\textit{State-of-the-Art Overview}

A state-of-the-art overview points up:

1. The existence of a considerable variety of definitions of creativity.

2. The existence of a large number of creativity assessment measures with only marginal evidence of creative performance predictability.

3. The development of a creative process model identifying five distinct sequential stages, which is known as the Osborn-Parnes Model.


4. The lack of evidence that creativity assessment measures have been formally related to the Osborn-Parnes five-step Creative Problem-Solving Model. This was substantiated by Parnes\textsuperscript{23} who further noted lack of evidence of creativity measures used diagnostically to determine an individual's strengths or weaknesses within the different stages of the Osborn-Parnes Model, except for related work now being done by members of the Structure-of-Intelligence Institute and the general classification work with groups reported on some S-O-I factors by Reese et al.\textsuperscript{24}

\textit{Purpose of the Study}

The purposes of this study are as follows:

1. To initiate an introductory investigation into the area of diagnostic creativity assessment measures.

2. To examine selected creative assessment measures, both in a general way and specifically, for any predominant focus with respect to the Osborn-Parnes five-step Model.

3. To determine which current measures might be of diagnostic value in determining an individual's strengths and weaknesses within the different stages of the five-step Osborn-Parnes Model.

4. To encourage others to conduct further research into the development and application of diagnostic creative assessment tools.

\textsuperscript{23}Personal interview with Sidney J. Parnes on September 10, 1976.

CHAPTER II

A REVIEW OF THE LITERATURE RELATING TO THE ASSESSMENT OF CREATIVITY

In his recent book on creativity and intelligence, Welsh remarked that:

"... very few persons, laymen and psychologists alike, assume that creativity is well understood and susceptible to accurate measurement."

The origin of the empirical study of creativity has been traced back to Galton's efforts more than a century ago. Using historical biographies as his source of data, Galton studied the genealogy of hundreds of geniuses and eminent men including authors, poets, and playwrights. He proposed that mental capacities are inherited and follow observable laws of transmission.

Closely allied with this was Cattell's efforts involving ratings of creativity. He made use of the judgments of people qualified to report on the work of others.

---


Terman's work with an ingenuity test led him to view inventive qualities as being separate from intelligence.

Chassell devised a battery of tests of originality including: Word Building, Picture Writing, Analogues, Original Analogues, Chain Puzzle, Triangle Puzzle, Royce's Ring, Completion Test, Economic Prophecies, Code Test, Invention for Sheet Music, and Novel Situations (consequences). It would seem that Chassell and Terman's efforts marked the start of the cognitive or intellectual orientation to creativity.

Reference to several of the above tests again appear in a work by Boraas. Descriptions and scoring directions for eight tests of "imaginative thinking" including the Painted Cube Test, Interpretation of Ink Blots, and Imaginary Journey Test are presented by the author.

A short time later Hargreaves called particular attention to the role of imagination in creative thinking. He firmly believed 'fluency' to be the essential element in imagination, and the twelve tasks which he employed were scored for fluency and originality.

Simpson's Test for Creative Imagination deals primarily with visual imagery stimuli to creative action. It was his opinion that a


30J. Boraas, Teaching to Think (New York: Macmillan, 1922).


creativity test should be administered in conjunction with an intelligence test in order to get a more accurate picture of the individual's capabilities.

Thorndike's\textsuperscript{33} contribution came through his experiments on the problem-solving behavior of cats. Considered a classic by many, these experiments minimized the deliberate approaches to problem-solving and emphasized trial and error behavior.

Hargreaves\textsuperscript{34} scored these tasks for fluency and originality: Word Building and Composition, Ebbinghams Test, Invention of Stories, Indeterminate Picture Completion, Unfinished Stories, Ink Blots, Indeterminate Language Completion, Unfinished Stories, Writing Words, Probable Situations, and Imaginary Situations.

Focus on personal dimensions surfaces again in Lehman's\textsuperscript{35} productivity approach to creativity. In what has become a classic work in the field, Lehman\textsuperscript{36} plotted the relationships between creative productivity, age, and profession.

Welch\textsuperscript{37} introduced the assessment of creativity through tasks involving the formation of new combinations. Tasks included: (1)

\begin{itemize}
\item Hargreaves, The Faculty of Imagination.
\item H. C. Lehman, \textit{Age and Achievement} (Princeton: Princeton University, 1953).
\item L. Welch, "Recombination of Ideas in Creative Thinking," \textit{Journal of Applied Psychology} 30 (1946).
\end{itemize}
constructing meaningful sentences, (2) constructing letters of the alphabet, (3) constructing a short story, and (4) constructing pieces of furniture from wooden blocks.

Vernon's\(^{38}\) Imaginative Construction Test for children involves story telling based on four colored pictures: The Elder-Tree Fairy, The Shipwrecked Sailor, the Queen and the Magician, and The Man on the Camel.

Among the researchers of the past quarter century, Guilford and his associates are the most prolific. Their battery of tests include the following which are commercially available:\(^{39}\) Alternate Uses, Associative Fluency, Consequences, Expressional Fluency, Ideational Fluency, New Uses, Pertinent Questions, Possible Jobs, Seeing Problems, Simile Interpretations, Utility Test, Word Fluency, Decorations, Making Objects, and Sketches. Much of contemporary research, such as that conducted by Parnes and Noller,\(^{40}\) utilizes one or more of these measures.

The findings of Getzels and Jackson's classic research on creativity and intelligence were reported in 1962.\(^{41}\) Creativity was defined as "a fairly specific type of cognitive ability reflected in performance on a series of paper-and-pencil tests." The five tests in the creativity


\(^{39}\)``SPS Psychological Tests,'' Sheridan Psychological Services, Inc., P. O. Box 6101, Orange, California 92667.


battery were: Word Association, Uses for Things, Hidden Shapes, Fables, and Make-up Problems.

Harris defines creativity as the ability to produce a quantity of unique and workable ideas when presented with new or routine problems. His creativity test is a combination of five measures: Problem Sensitivity, Common Situations, General Reasoning, Practical Judgment, and Originality.

Harris and Simberg's AC Spark Plug Test asks for consequences of a described situation, explanations of statements assumed to be true, improvements of common appliances, solutions to situational problems, and uses of common objects.

Owens and his associates developed tests to discriminate between creative and non-creative machine designers. The battery included the Power Source Apparatus Test, Design-a-Machine Test, Three Dimensional Space Relations Test, and Figure Matrices Test.

Flanagan developed a multiple choice assessment measure, Inventious Solutions to Problems, which he administered to college subjects.

---


43 R. H. Harris and A. L. Simberg, AC Test of Creative Ability, Examiner's Manual (Flint, Michigan: AC Spark Plug Division, General Motors Corporation [Circa 1955]).


It tests the ability to invent or discover a solution which represents an unusually neat, clever, or surprising way of solving an existing problem.

Among the originality assessment measures employed by Barron and his associates are the Mosaic Constructions, Anagram Test, Inkblot Test, Symbol-Equivalence Test, and the Barron-Welsh Art Scale.

Torrance and his associates developed several batteries of test tasks applicable to all cultures from kindergarten through graduate school. They are among the most widely used measures of their kind, and include: (1) tasks designed to reveal subject's ability to fill in gaps in knowledge—Ask-and-Guess; (2) tasks evaluated for fluency, flexibility, originality, and elaboration—Product Improvement, Unusual Uses, Just Suppose, Imaginative Stories, Sounds and Images, Mother Goose; and (3) tasks that tend to discriminate between good elaborators and productive original thinkers—Picture Construction, Figure Completion, and Repeated Closed Figures.

Mednick's Remote Associates Test is a 30-item convergent-type measure. Respondents are asked to see relationships between seemingly mutually remote ideas and to form them into new associative combinations which are useful or meet specified criteria.

---


Worthen and Clark\(^49\) have developed the Functionally Remote Associates Test, which they claim is more a measure of divergent thinking or creative ability and less a measure of intelligence than Mednick's Remote Associates Test.

Starkweather\(^50\) focused on assessment measures designed for use with preschool children. The Starkweather Form Board Test and Color-Preference Test measure conforming (complying, adhering to standards) and non-conforming (willing to be different) behavior; the Starkweather Target Game measures willingness to try difficult tasks, to accept the challenge of a calculated risk; and the Starkweather Originality Test tests for original ideas (the greatest variety of responses).

Gough,\(^{51,52,53}\) the originator of the Adjective Check List, has developed and administered several new measures to the scientific and engineering communities: the scientific incomplete sentences test, a scientific word association list, and a scientific uses test.


Some Unresolved Issues Relating to Creativity Assessment

There is the term "creativity" itself. Thorndike,\(^{54}\) in an article concerning the measurement of creativity, asked:

... whether there is any common characteristic running through these tests to which the common term "creativity" may legitimately be applied. This is an important question, because if the various so-called "creativity tests" are measuring different and largely unrelated characteristics of people, then using a common term to include all of them, or applying a common designation to groups of people identified by different ones of them, can be productive of nothing but confusion.

Addressing their research to provide information about the meaning of creativity, Bennett and his associates\(^{55}\) concluded:

... creativity is far from a unitary concept and that careful structuring of the methods of measuring it is needed.

Barron\(^{56}\) points out that:

A primary strategic consideration in building tests of creativity derives from the practical need for tests which (a) can be administered to groups of subjects rather than to one subject at a time, (b) can be mechanically scored without the intermedation of a rater, and (c) depend on simple enumeration which can yield frequency distributions readily susceptible of statistical analysis.


But, he went on to say:

This set of requirements, however, immediately bumps head-on into the nature of the creative act, which most commonly is quite complex and to be recognized must have an observer capable of embracing its complexities.

What seems to be required then is that the measures be administered and/or interpreted by individuals who have been well trained in test theory and test interpretation and demonstrate interrater reliability.

And, although a survey of the literature revealed that a large number of creativity assessment measures, in varying degrees of levels of sophistication, are currently available, we should not overlook Lindauer's\(^57\) warning:

_However, sophisticated technique may not always be an advantage, in that one may become overdependent on tests and overvalue their correlations._

To summarize, it would seem that past efforts have focused on assessing aspects of a concept on whose definition there is not general agreement, and that these measures, if not properly administered and interpreted would generate data which might be misconstrued and misused.

Although most studies analyzed creative individuals, they did so by groups, noting highs and lows, etc. They did not analyze individuals within the groups. Parnes, in the previously cited interview, claimed that he had no knowledge of anyone attempting to use assessment measures to determine an individuals strengths and weaknesses within the

creative process as defined by the Osborn-Parnes Model. Nor did a review of the literature reveal any evidence to the contrary.

Reese et al.\textsuperscript{58} did make a start on relating some of the Guilford S-O-I factors to the Osborn-Parnes Model.

\textsuperscript{58}Reese et al., Effects of a Creative Studies Program.
CHAPTER III

THE RESEARCH PROBLEM AND THE HYPOTHESIS

Some Background

Osborn's attitude towards creativity as being an applied, teachable, and learnable art, is shared by his associate Parnes. Their approach to creativity from a rational, problem-solving point of view led them to the formulation of the increasingly popular Osborn-Parnes five-step Creative Problem-Solving Model.

Torrance and his associates\(^{59}\) described this model as:

\[\text{... flexible and can be applied to almost any problem or subject matter. It is teachable at almost any age from kindergarten through graduate and professional school.}\]

Numerous studies have confirmed that training in the creative process does, in fact, enhance creative thinking abilities.\(^{60}\) Addi-


tional supportive evidence is reported by Parnes and his associates. 61

It is appropriate to note, however, that there is some argu-
mentation over the nature and usage of commonly used assessment meas-
ures to chart behavioral changes as brought about by creativity training
or instruction.

Welsh 62 points out that:

On any test that requires specific kinds of knowledge—word
meanings or items of information, for example—a person who
lacks this background is at a disadvantage. He cannot answer
items of this nature and will get a low score on such a cogni-
tively-based measure, whether it is called a test of creativity,
divergent thinking, or even general intelligence. Thus, a
subject may be classified as 'uncreative' or 'unintelligent'
merely because he lacks some particular bits of knowledge re-
quired by such a test.

Treffinger and Poggio 63 cite Covington's arguments (in press)
that:

... in our attempts to develop measures of creativity that
"fit" well into established psychometric procedures, we have
often sacrificed some of the essential attributes of the crea-
tive process. He contended that traditional mental measure-
ment procedures are characterized by timed, speeded perform-
ance on a large number of discrete items, items which repre-
sent artificial and highly contrived situations, and an
emphasis on standardized scoring procedures and unique,
specific abilities, with clearly defined and presented

61 S. J. Parnes and A. Meadow, "Effects of 'Brainstorming' Instruc-
tions on Creative Problem-Solving by Trained and Untrained Subjects,"
Journal of Educational Psychology 50 (1959):171-176; S. J. Parnes and
E. A. Brunelle, "The Literature of Creativity, Part I," Journal of Cre-
tative Behavior 1 (1967):52-109; Reese et al., Effects of a Creative Studies
Program.

62 Welsh, Creativity and Intelligence, p. 3.

63 D. J. Treffinger and J. P. Poggio, "Needed Research in the
requirements and directions. By contrast the creative process is usually characterized by intense, personal involvement in one real problem, over a long period of time, with an emphasis on ordering the problem, co-ordinating or managing one's efforts, and attaining a personal solution.

Granted, current measures may leave a great deal to be desired, but in spite of their shortcomings, researchers have and will continue to use these measures to (1) assess creativity in group studies, and/or (2) track behavioral changes in groups following exposure to creativity seminars and programs.

Researchers like Parnes and Noller are keenly aware of these shortcomings and other pitfalls connected with the usage of creativity assessment measures within their course offerings. Their approach is worth examining:

> It is important to note that the tests used in the evaluation of the Creative Studies courses were not tests in the usual sense, constructed around the language of the course. Because of the wide variety of tests used, most of them required considerable transfer from the kinds of exercises and materials the students used in the classes.

> . . . none of the tests called for pure recall of knowledge. All of the tests called for utilization of knowledge in a wide variety of increasingly difficult mental tasks, none of which had been specifically presented anywhere in the courses.

---

64 Treffinger and Poggio, Needed Research in Measurement of Creativity.

65 Parnes and Noller, Toward Supersanity, pp. 39-40.
The Need for the Present Study

There is a paucity of literature concerning the use of creativity assessment measures as diagnostic tools to identify the degree of individual facility with each of the steps within the Osborn-Parnes Creative Problem-Solving Model.

Parnes himself began preliminary investigations in that direction during his involvement with high school populations. He administered to his subjects a series of fluency measures throughout the semester, providing them with individual feedback. The students, in turn, graphed their individual progress based on their test responses.

In subsequent research with Noller involving students of the State University College at Buffalo, Parnes made a similar attempt at informal diagnostic procedures. Introduction to Creative Studies (CS 105) students were administered measures at the beginning, middle, and end of the semester. This time the results were used as a basis for the student interviews which were conducted throughout the semester.

The efforts cited above may, at best, be considered limited and somewhat informal. What is needed, then, is additional research focusing on this area.

---


67 Parnes and Noller, Toward Supersanity.
The Specific Problem

This study will attempt to categorize commonly used creativity assessment measures as they might identify the degree of individual facility with each of the steps of the five-step Osborn-Parnes Creative Problem-Solving Model.

Limitations and Delimitations of the Study

1. The scope of the study was limited to reviewing the more frequently used or discussed creative assessment measures, focusing on their potential use as diagnostic tools.

2. Recognizing that Parnes and Noller comprehensively analyzed the tests developed by Guilford and his associates, this study will utilize only those Guilford battery tests which they identified as being most pertinent to the five-step Osborn-Parnes Model.

3. Greater emphasis was given to examples from the battery of tests developed by Guilford and his associates. Guilford's Structure-of-Intellect Model has broken down the creative process into numerous dimensions so that comprehensive research studies have utilized them.

4. Each test originator was provided with a set of definitions for the five-step Osborn-Parnes Model. However, a limitation of this study is the degree of inconsistency among their interpretations of the steps as they apply to their own tests.

Hypothesis

The following is the hypothesis of the research:

There are current assessment measures which can be matched with creative problem-solving processes within the Osborn-Parnes Creative Problem-Solving Model.

Parnes and Noller, Toward Supersanity.
CHAPTER IV

METHODOLOGY

Study Sample

The selection of tests from the Guilford battery was made on the basis of their use in research conducted (from 1959-1972) by Parnes and his associates69,70 and Parnes and Noller.71

Parnes and his associates comprehensively analyzed and selected those tests of the Guilford battery which most paralleled the five-step Creative Problem-Solving Model developed by Osborn and Parnes:72

While we talk about 'fact-finding' and 'problem-finding,' Guilford covers these processes in his first two operations, 'cognition' and 'memory'; our 'idea-finding' parallels Guilford's operation of 'divergent production'; and our 'solution-finding' deals with processes similar to those in Guilford's 'convergent production' and 'evaluation.' Hence, in our research design, we select tests of each operation in Guilford's Structure-of-Intelect in order to determine which ones our courses are affecting.

The remaining tests were selected from among those reported in articles appearing in the Journal of Creative Behavior between the years 1967-1976. These articles have been compiled into a series of two mini-books and are attached as Appendix C.

69Parnes and Meadow, Effects of Brainstorming.


71Parnes and Noller, Toward Supersanity.

By way of further information, the *Journal of Creative Behavior* was organized to seek out and publish the most current and pertinent material relating to creativity and problem-solving, including creativity assessment. Among the members of the *JCB* Advisory Board, listed below, are recognized authorities in the area of creativity assessment:

- J. P. Guilford
- Harry Hansen
- Harold F. Harding
- S. I. Hayakawa
- Donald W. MacKinnon
- J. H. McPherson
- Ross L. Mooney
- Leo B. Moore
- Sidney J. Parnes
- Calvin W. Taylor
- E. Paul Torrance
- Albert Upton
- Frank E. Williams

**Procedure and Nature of Data Collection**

Once the assessment measures to be included in the study were identified, a summary sheet containing the following information was prepared for each one:

1. Name of Test;
2. Name(s) of Originator(s);
3. Population Intended For;
4. Purpose of Test;
5. Test Description;
6. Originator's Comments (including steps of Osborn-Parnes Model which the test predominantly focused on).

The following test originators were contacted by mail: J. P. Guilford, E. P. Torrance, John C. Flanagan, S. A. Mednick, W. A. Owens, and A. L. Simberg, and asked to provide information relative to their measures. A data collection sheet (Appendix A) was prepared for each
assessment measure showing data for items one through five. The originators were asked to complete each sheet by adding their comments for item six. In addition to the letter of request, a copy of Parnes' definitions for the five-steps of his model was attached.

Although the merits of this procedure can readily be seen, it does pose one limitation; i.e., there may be a degree of inconsistency among the test originators' interpretations of the five-step process.

Definitions

The following definitions were basic to the study. They were drawn from a recent monograph by Parnes:73

Osborn-Parnes Creative Problem-Solving Method--five-step method which can be applied to all types of problems. The five steps are: Fact-Finding, Problem-Finding, Idea-Finding, Solution-Finding, and Acceptance-Finding.

Fact-Finding--the object is to provide as accurate and complete a picture as possible of the situation being dealt with, by listing everything known about the situation including opinions and feelings. No attempt is made to isolate the most important facts during the free-flow period; the most pertinent data is sifted out and clarified later.

Problem-Finding--statements of the problem to be attacked are formulated from the facts gathered in the previous step. Besides stretching for the broad statement of a problem, it is important to break down the comprehensive general challenge into its subproblems. After moving into broader as well as more specific aspects of the situation, deferring judgment so as to

produce many alternatives in each direction, it is necessary to stop to evaluate and select the problem-statement that seems to be most fruitful to explore for specific ideas.

Idea-Finding--in this step, ideas are stimulated and allowed to pour out without evaluating which are more relevant than others. Once the idea-listing phase is exhausted, then the most potentially promising ones are singled out for further development.

Solution-Finding--deferred judgment is employed to develop the longest possible list of criteria, including potential consequences, repercussions, and effects by which to evaluate the tentative solutions. Selected criteria are then applied to the most promising ideas.

Acceptance-Finding--ways of implementing the selected ideas are thought up, again, with no mental restrictions. Then judgment is applied to select the best ways and to work them into a plan of action.
CHAPTER V

PRESENTATION AND DISCUSSION OF DATA

The Guilford Battery

Table 1 shows Guilford's Structure-of-Intellect (S-O-I) abilities assessed by him as being most relevant to the Osborn-Parnes Model and the corresponding Guilford assessment measures. The interpretation of the trigram symbol for each S-O-I category is shown in Appendix B.

All tests are designed for adult level except those in parentheses which are in the battery of Creativity Tests for Children. These tests, while recommended by the originators for use below the junior-high school level, are also quite usable above that age level.74

Although Guilford was originally asked to respond to thirteen selected measures, he expanded the listing to thirty-two measures, including examples from the battery of Creativity Tests for Children. This additional data serves to make this study more comprehensive.

Guilford's analysis identified eighteen different S-O-I categories (out of the total 120 in the S-O-I Model) as being most relevant to the Osborn-Parnes Model: two in the Fact-Finding phase, five in Problem-Finding, eight in the Idea-Finding, four in Solution-Finding, and two in Acceptance-Finding. His comments on each step of the Osborn-Parnes Model are also shown in Table 1.

74Personal correspondence with J. P. Guilford dated September 8, 1976.
<table>
<thead>
<tr>
<th>Step within Osborn-Farnes Model</th>
<th>Guilford's comments</th>
<th>S-O-I Ability</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact-Finding</td>
<td>This phase seems most concerned with becoming aware that a problem exists; things are not as they should be or as we want them. This suggests abilities for seeing or cognizing implications, which are dominant in tests designed to measure &quot;sensitivity to problems.&quot;</td>
<td>CMI</td>
<td>Pertinent Questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Seeing Problems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CBI</td>
<td>Cartoon Predictions</td>
</tr>
<tr>
<td>Problem-Finding</td>
<td>This activity seems most concerned with structuring or understanding the problem. Most problems have some degree of complexity, with more than one relation being involved. The problem is a conceived system, hence cognition of systems is most important. Where flexibility is needed in revising the conception of the problem, abilities involving transformations are important.</td>
<td>CFS</td>
<td>Guilford-Zimmerman Aptitude Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Spatial Orientation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CMS</td>
<td>Guilford-Zimmerman Aptitude Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>General Reasoning Ship Destination</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CBS</td>
<td>Missing Cartoons</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CFT</td>
<td>Guilford-Zimmerman Aptitude Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Spatial Visualization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CBT</td>
<td>Social Translations</td>
</tr>
</tbody>
</table>
## TABLE 1—Continued

<table>
<thead>
<tr>
<th>Step within Osborn-Parnes Model</th>
<th>Guilford's comments</th>
<th>S-O-I Ability</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea-Finding</td>
<td>This is the stage of generating ideas for solutions, or steps in that direction. The S-O-I operation category is divergent production, by which alternative items of information are brought out.</td>
<td>DFU, DMU, DFC, DMC, DFS, DMS, DFT, DMT</td>
<td>Sketches, Ideational Fluency, Plot Titles, Alternate Uses, Making Objects, Expressional Fluency, Match Problems, Plot Titles, (Make Something Out of it), (Names for Stories), Utility Test, (What To Do With It), (Making Objects), (Writing Sentences), (Hidden Letters), (Picture Writing)</td>
</tr>
<tr>
<td>Step within Osborn-Parnes Model</td>
<td>Guilford's comments</td>
<td>S-O-I Ability</td>
<td>Test</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Solution-Finding</td>
<td>This phase seems to involve the S-O-I operation of evaluation, especially for which there are very few published tests, but many unpublished ones.</td>
<td>EFU</td>
<td>Guilford-Zimmerman Aptitude Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Perceptual Speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ESU</td>
<td>Symbol Identities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EMI</td>
<td>Logical Reasoning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(also EM)</td>
<td></td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td>Reference to &quot;implementing solutions&quot; suggests abilities in the area of divergent production of implications; the elaboration abilities. Where judgment is involved, the operation of evaluation is relevant. Evaluation tests were just mentioned.</td>
<td>DFI</td>
<td>Decorations (Adding Decorations)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DMI</td>
<td>Possible Jobs (Kinds of People)</td>
</tr>
</tbody>
</table>
The Torrance Battery

Table 2 is a comparison of the terminology of steps within the Torrance and Osborn-Parnes Models of creative problem-solving. It is interesting to note that the first step is defined as "sensing problems and challenges" in the Torrance Model and as "fact-finding" in the Osborn-Parnes Model. This by no means constitutes a disagreement, since awareness to objectives, needs, problems, and challenges is expected or called for before the first step of the Osborn-Parnes Model. The model pertains once such awareness exists.

**TABLE 2.**—Comparison of the terminology of steps within the Torrance and Osborn-Parnes Models of creative problem-solving

<table>
<thead>
<tr>
<th>Step</th>
<th>Torrance Model</th>
<th>Osborn-Parnes Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sensing problems and challenges</td>
<td>Fact-Finding (into area of prior initial awareness or concern)</td>
</tr>
<tr>
<td>2</td>
<td>Recognizing the real problem</td>
<td>Problem-Finding</td>
</tr>
<tr>
<td>3</td>
<td>Producing alternative solutions</td>
<td>Idea-Finding</td>
</tr>
<tr>
<td>4</td>
<td>Evaluating ideas</td>
<td>Solution-Finding</td>
</tr>
<tr>
<td>5</td>
<td>Preparing to put ideas to use</td>
<td>Acceptance-Finding</td>
</tr>
</tbody>
</table>

75 Personal conversations with Sidney J. Parnes.
Torrance's analysis of the relationships of his tasks within the Osborn-Parnes Model is contained in Table 3. Further analysis indicated the following:

There was no relationship between the tasks within any of the tests reviewed and the fourth (Solution-Finding) step within the Osborn-Parnes Model.

The tasks within the Torrance Creativity Tests are divergent-oriented, with heavy emphasis on Fact-Finding, Idea-Finding, and Acceptance-Finding.

The relationships of the eighteen tasks within the four tests examined were as follows: seven activities related to Fact-Finding; six activities related to Idea-Finding; three activities related to Problem-Finding; and nine activities related to Acceptance-Finding.

Seven of the twenty-five activities were each related to two different steps within the Osborn-Parnes Model.

Only the Torrance Tests of Creative Thinking (Thinking Creatively with Words) contained activities which related to four of the five steps within the Osborn-Parnes Model. The remaining tests contained activities related to three steps.

TABLE 3.—Relationships of tasks within the Torrance Creativity Tests to stages within the Osborn-Parnes Model

<table>
<thead>
<tr>
<th>Steps within Osborn-Parnes Model</th>
<th>Activities</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact-Finding</td>
<td>Activity 1: Asking Questions</td>
<td>Torrance Tests of Creative Thinking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verbal Forms A &amp; B (Thinking Creatively</td>
</tr>
<tr>
<td></td>
<td>Problem-Finding</td>
<td>with Words)</td>
</tr>
<tr>
<td>Idea-Finding</td>
<td>Activity 2: Guessing Causes</td>
<td></td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td>Activity 3: Guessing Consequences</td>
<td></td>
</tr>
<tr>
<td>Idea-Finding</td>
<td>Activity 4: Product Improvement</td>
<td></td>
</tr>
<tr>
<td>(sometimes)</td>
<td>Activity 5: Unusual Uses</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 3.—Continued

<table>
<thead>
<tr>
<th>Steps within Osborn-Parnes Model</th>
<th>Activities</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact-Finding</td>
<td>Activity 6: Unusual Questions</td>
<td>Torrance Tests of Creative Thinking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verbal Forms A &amp; B (Thinking Creatively with Words)</td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td>Activity 7: Just Suppose</td>
<td>(Continued)</td>
</tr>
<tr>
<td>Problem-Finding</td>
<td>Activity 1: Picture Construction</td>
<td>Torrance Tests of Creative Thinking</td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td></td>
<td>Figural Forms A &amp; B (Thinking Creatively with Pictures)</td>
</tr>
<tr>
<td>Problem-Finding</td>
<td>Activity 2: Incomplete Figures</td>
<td></td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idea-Finding</td>
<td>Activity 3: Repeated Figures</td>
<td>Thinking Creatively About the Future</td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td></td>
<td>Forms A &amp; B</td>
</tr>
<tr>
<td>Fact-Finding</td>
<td>Activity 1: untitled</td>
<td></td>
</tr>
<tr>
<td>Idea-Finding</td>
<td>Activity 2: untitled</td>
<td></td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td>Activity 3: untitled</td>
<td></td>
</tr>
<tr>
<td>Fact-Finding</td>
<td>Activity 1: Common Problems</td>
<td>Thinking Creatively About Teaching and Learning, Forms A &amp; B</td>
</tr>
<tr>
<td>Fact-Finding</td>
<td>Activity 2: Observations</td>
<td></td>
</tr>
<tr>
<td>Fact-Finding</td>
<td>Activity 3: Provocative Questions</td>
<td></td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td>Activity 4: Prediction</td>
<td></td>
</tr>
<tr>
<td>Idea-Finding</td>
<td>Activity 5: Improvements</td>
<td></td>
</tr>
<tr>
<td>Acceptance-Finding (sometimes)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Flanagan Battery

Flanagan's tests seem to be related to the Solution-Finding phase of the Osborn-Parnes Model. But, Flanagan points out that:

These items are intended to measure a combination of idea-, solution-, and acceptance-finding as a combined operation. The emphasis is on the ability to find an unusual, very neat, very effective solution to a problem—not by arraying all possible alternatives and weighing their usefulness but by a flash of insight that I have felt is best called ingenuity.

If one had to pick one of the three, I'd say it was closest to solution.

The Owens & Schwarker Test

Owens\textsuperscript{77} reported that the Power Source Apparatus Test significantly discriminated creative vs. non-creative machine designers. In his mind the test is largely a measure of Idea-Finding as defined in the Osborn-Parnes Model.

The Mednick & Halpern Test

Mednick\textsuperscript{78} feels that the Remote Associates Test is related to the Idea-Finding, Solution-Finding, and Acceptance-Finding steps of the Osborn-Parnes Model.

\textsuperscript{76}Personal correspondence with John C. Flanagan (undated, 1976).

\textsuperscript{77}Personal correspondence with William A. Owens dated October 18, 1976.

\textsuperscript{78}Personal correspondence with Sarnoff A. Mednick dated October 14, 1976.
The Harris & Simberg Test

Simberg\textsuperscript{79} stated that the AC Test of Creative Ability:

\ldots measures fluency, flexibility of thought and originality. Probably all three of those factors are pervasive through Parts I, II, and V of the test. What is being measured is an ability to verbalize a quantity (fluency) of thoughts, consequences, ideas and the like, without being constrained by habit, stereotyped thinking and conformity (flexibility).

It would therefore appear to me that Parts I, II, and V should correlate with Fact-Finding, Idea-Finding, and Acceptance-Finding, since you would be seeking a large list of alternatives from which to choose, prior to getting judgmental.

In addition, these three parts of the test would yield an estimate of originality.

A Summary-Analysis of the Forty-One Assessment Measures Examined

The forty-one tests examined in this study are tabulated in Table 4. Based on the test originators' own comments, the following relationships were found between the assessment measures and the stages within the Osborn-Parnes Model of Creative Problem-Solving:

<table>
<thead>
<tr>
<th>Step within Osborn-Parnes Model</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact-Finding</td>
<td>Only seven out of the forty-one tests showed a relationship to the Fact-Finding step. They may be broken down as follows:</td>
</tr>
<tr>
<td></td>
<td>Three tests from the Guilford Laboratory were directly related; three tests from the Torrance battery contained at least one activity within each test which was related; and the Harris-Simberg AC Test of Creative Ability contained three activities related,</td>
</tr>
</tbody>
</table>

\textsuperscript{79} Personal correspondence with Alvin L. Simberg dated October
<table>
<thead>
<tr>
<th>Step within Osborn-Parnes Model</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-Finding</td>
<td>Only six out of the forty-one tests showed a relationship to the Problem-Finding step. They may be broken down as follows:</td>
</tr>
<tr>
<td></td>
<td>Four tests from the Guilford Laboratory were directly related, one of these tests had three activities; two tests from the Torrance battery contained at least one activity within each test which was related.</td>
</tr>
<tr>
<td>Idea-Finding</td>
<td>Of the forty-one tests, twenty six showed a relationship to the Idea-Finding step. They may be broken down as follows:</td>
</tr>
<tr>
<td></td>
<td>Nineteen tests from the Guilford Laboratory were directly related; four tests from the Torrance battery contained at least one activity within each test which was related; Mednick-Halpern's Remote Associates Test and Owens-Schumaker's Power Source Apparatus Test were directly related; Harris-Simberg Test of Creative Ability contained three activities related.</td>
</tr>
<tr>
<td>Solution-Finding</td>
<td>Only six out of the forty-one tests showed a relationship to the Solution-Finding step. They may be broken down as follows:</td>
</tr>
<tr>
<td></td>
<td>Three tests from the Guilford Laboratory were directly related, one of which had only one activity that was related; both Flanagan Ingenuity Tests were directly related; Mednick-Halpern's Remote Associates Test was related.</td>
</tr>
</tbody>
</table>
Step within Osborn-Farnes Model

Acceptance-Finding

Comments

Of the forty-one tests, ten showed a relationship to the Acceptance-Finding step. They may be broken down as follows:

Four tests from the Guilford Laboratory were directly related; four tests from the Torrance battery contained at least one activity within each test which was related; Mednick-Halpern's Remote Associates Test was related; Harris-Simberg Test of Creative Ability contained three activities related.

Converting the data into percentages, we find that:

17.1 percent of the tests examined related to Fact-Finding,
14.6 percent related to Problem-Finding,
63.4 percent related to Idea-Finding,
14.6 percent related to Solution-Finding,
24.4 percent related to Acceptance-Finding.
<table>
<thead>
<tr>
<th>Step within Osborn-Parnes Model</th>
<th>Test originator(s)</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact-Finding</td>
<td>Guilford's Laboratories</td>
<td>Cartoon Predictions (CBI)*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pertinent Questions (CMI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seeing Problems (CMI)</td>
</tr>
<tr>
<td></td>
<td>E. Paul Torrance</td>
<td>Thinking Creatively with Words</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 1: Asking Questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 2: Guessing Causes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 6: Unusual Questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thinking Creatively About the Future</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 1: Untitled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thinking Creatively About Teaching and Learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 1: Common Problems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 2: Observations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 3: Provocative Questions</td>
</tr>
<tr>
<td></td>
<td>D. H. Harris &amp; A. L. Simberg</td>
<td>AC Test of Creative Ability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Part I: (Possible Consequences)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Part II: (Explanations of Statements)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Part V: (Other Uses)</td>
</tr>
</tbody>
</table>

*Structure-of-Intellect trigram symbol is included in the identification of each assessment measure in the Guilford battery, denoted by italics after test titles.
<table>
<thead>
<tr>
<th>Step within Osborn-Parnes Model</th>
<th>Test originator(s)</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-Finding</td>
<td>Guilford's Laboratories</td>
<td>Guilford-Zimmerman Aptitude Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spatial Orientation (CFP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Reasoning (CMS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spatial Visualization (CFP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Missing Cartoons (CBS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ship Destination (CMS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social Translations (CBI)</td>
</tr>
<tr>
<td></td>
<td>E. Paul Torrance</td>
<td>Thinking Creatively with Words</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 2: Guessing Causes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thinking Creatively with Pictures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 1: Picture Construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 2: Incomplete Figures</td>
</tr>
<tr>
<td>Idea-Finding</td>
<td>Guilford's Laboratories</td>
<td>Alternate Uses (DMC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consequences (DMT &amp; DMU)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>**(Different Letter Groups) (DFC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expressional Fluency (DMT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Hidden Letters) (DFT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ideational Fluency (DMU)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Make Something Out of It) (DFU)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Making Objects (DES)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Making Objects) (DES)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Match Problems (DFT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Match Problems V (DFT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Picture Writing) (DMT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Names for Stories) (DMU)</td>
</tr>
</tbody>
</table>

**Test titles from the Guilford battery which are in parenthesis may be found in the battery of creativity tests for children.
<table>
<thead>
<tr>
<th>Step within Osborn-Parnes Model</th>
<th>Test originator(s)</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea-Finding</td>
<td>Guilford's Laboratories</td>
<td>Plot Titles (DMU &amp; DMT) Simile Interpretations (DMS) Sketches (DFU) Utility Test (DMC &amp; DMR) (What To Do With It) (DMC) (Writing Sentences) (DMS)</td>
</tr>
<tr>
<td></td>
<td>E. Paul Torrance</td>
<td>Thinking Creatively with Words Activity 3: Guessing Consequences Activity 4: Product Improvement Activity 5: Unusual Uses Thinking Creatively with Pictures Activity 3: Repeated Figures Thinking Creatively About the Future Activity 2: untitled Thinking Creatively About Teaching and Learning Activity 5: Improvements</td>
</tr>
<tr>
<td></td>
<td>S. A. Mednick &amp; S. Halpern</td>
<td>Remote Associates Test</td>
</tr>
<tr>
<td></td>
<td>W. A. Owens, C. F. Schumaker et al.</td>
<td>Power Source Apparatus Test</td>
</tr>
<tr>
<td></td>
<td>D. H. Harris &amp; A. L. Simberg</td>
<td>AC Test of Creative Ability Part I: (Possible Consequences) Part II: (Explanations of Statements) Part V: (Other Uses)</td>
</tr>
<tr>
<td>Step within Osborn-Parnes Model</td>
<td>Test originator(s)</td>
<td>Tests</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Solution-Finding</td>
<td>Guilford's Laboratories</td>
<td>Guilford-Zimmerman Aptitude Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceptual Speed (EPI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Logical Reasoning (EMI &amp; EMR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Symbol Identities (ESU)</td>
</tr>
<tr>
<td></td>
<td>J. C. Flanagan</td>
<td>Flanagan Ingenuity Test -</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ingenious Solutions to Problems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flanagan Industrial Test -</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ingenuity</td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td>S. A. Mednick &amp; S. Halpern</td>
<td>Remote Associates Test</td>
</tr>
<tr>
<td></td>
<td>Guilford's Laboratories</td>
<td>(Adding Decorations) (DFI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decorations (DFI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Kinds of People) (DMI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Possible Jobs (DMI)</td>
</tr>
<tr>
<td></td>
<td>E. Paul Torrance</td>
<td>Thinking Creatively with Words</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 3: Guessing Consequences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 4: Product Improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(sometimes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 7: Just Suppose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thinking Creatively with Pictures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 1: Picture Construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 2: Incomplete Figures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 3: Repeated Figures</td>
</tr>
<tr>
<td>Step within Osborn-Parnes Model</td>
<td>Test originator(s)</td>
<td>Tests</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Acceptance-Finding</td>
<td>E. Paul Torrance</td>
<td>Thinking Creatively About the Future</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 3: untitled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thinking Creatively About Teaching and Learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 4: Prediction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity 5: Improvements (sometimes)</td>
</tr>
<tr>
<td></td>
<td>S. A. Mednick &amp; S. Halpern</td>
<td>Remote Associates Test</td>
</tr>
<tr>
<td></td>
<td>D. H. Harris &amp; A. L. Simberg</td>
<td>AC Test of Creative Ability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Part I: (Possible Consequences)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Part II: (Explanations of Statements)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Part V: (Other Uses)</td>
</tr>
</tbody>
</table>
CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Creativity and problem-solving have been studied in a variety of ways, rewarding the many researchers with valuable insights. The largest number and perhaps the most meaningful advances have been made during the past quarter of a century. Although these appear to be on a broad spectrum, three major areas of focus can be easily identified: (1) the identification of creative characteristics, (2) the nature of the creative process, and (3) the nurture of creative behavior.

Admittedly the literature offers an abundance of approaches within these three areas. But, summarizes Davis:80

... no theoretical or empirical approach has a corner on truth. Rather, the approaches supplement each other, particularly, and I suppose, indirectly by pointing out important dimensions... which other viewpoints have ignored.

Among the approaches which appear repeatedly throughout the literature was the increasingly popular Osborn-Parnes Creative Problem-Solving Model. Its five distinct sequential stages appear to synthesize the most crucial dimensions of the many preceding as well as concurrent viewpoints in the area of creative problem-solving.

During the past twenty-five years, literally tens of thousands of individuals have participated in classes, seminars, and institutes which utilized this five-step process. For the most part these programs

80Davis, Psychology of Problem Solving, p. 164.
were regarded as group process. Thus, the many participants gained insights into and collectively practiced the art of creative problem-solving.

But more recently there has been a noticeable and significant shift of emphasis from group process to an individual process which may also be utilized by groups. Much of this change can be attributed to the efforts of Sidney J. Parnes and the Creative Education Foundation.

In an article focusing on the Annual Creative Problem-Solving Institutes (CPSI) which are cosponsored by the Creative Education Foundation and the State University College at Buffalo, Parnes describes the process:

Thus the problem-solving process becomes one of opening up the self to the fullest possible awareness of the storehouse of energy and resources within oneself--in one's vast mental library of life experience--as well as in the vast data of the external world. Problem-solving becomes the task of finding the greatest number of interconnections and inter-relationships among these vast resources, including the layer upon layer of primary information stored in our brain cells from birth and even from embryonic states. One searches for the kinds of synergistic connections that one can make toward the solution of one's problems, one's goals, one's wishes, one's aspirations, one's hopes, one's dreams--for oneself, one's family, one's group, one's society, one's world, one's universe.

The basic model used in the beginning programs of the Annual CPSI's is the Osborn-Parnes five-step process. Yet neither at the CPSI's nor at any of the other programs is any formal attempt made to diagnostically determine an individual's strengths or weaknesses within

---

the process that he/she is encouraged to internalize. Were we capable of actually measuring an individual's weakness within the model, then the program could be augmented (on an individual basis) to insure more effective internalization of this life-long problem-solving process.

It was with this aspiration that this research was conducted to test the hypothesis that current assessment measures can be matched with creative problem-solving processes within the five-step Osborn-Parnes Creative Problem-Solving Model. Within the purpose, scope, and limitations of this study, the hypothesis appears to be supported.

But, there are certain factors which should prompt us to proceed with caution:

1. There is the general problem of what it is that a test really measures. Welsh\textsuperscript{82} points out that:

   \begin{quote}
   What is measured, then, by the test is not some entity—intelligence (or aptitude, achievement, ability, or whatever)—but the behavior of a subject who is asked to perform certain tasks in a specified way. Anastasi continues, "Whether such behavior can serve as an effective index of other behavior can be determined only by empirical tryout" (p. 23). In other words, we are comparing two sets of behavior, test behavior and non-test behavior.
   \end{quote}

   It is not difficult to imagine that differences may exist between the way in which individuals respond to problem-solving tasks in test situations and the way in which they might actually respond to real life challenges. Therefore, we cannot assume that actual real life problem-solving processes are taking place 'within' an individual when we have not been able to establish that as a matter-of-fact; at least not solely on the basis of current assessment measures.

\textsuperscript{82}Welsh, Creativity and Intelligence, p. 21.
Parnes\textsuperscript{83} describes his training programs as operating more or less on a "shotgun" approach, utilizing everything known and examining the results. He would prefer to use the "rifle" approach which would involve zeroing in on each person's needs as diagnosed. But this may be some time in the future.

2. If we attempt to gain insight into an individual's strengths or weaknesses within the Osborn-Parnes Model through the use of creativity assessment measures, then we should exercise caution in the selection and use of the test tasks; and with good reason.

There is still some controversy surrounding some of the assessment measures investigated in this study. For example, Mednick's Remote Associates Test is considered by some to tap verbal intelligence more than a creativity test should, and to offer the possibility that it punishes imaginative answers.\textsuperscript{84}

It would seem also, that if we expect to use current assessment measures for individual diagnosis, we should expect some of these measures to have a higher degree of reliability than they currently show.

3. Most of the assessment measures investigated tend to identify divergent abilities. Only six of the forty-one measures, identified as being convergent in nature by the test originators, related to the Solution-Finding step of the Osborn-Parnes Model. Parnes\textsuperscript{85} feels that none of the six measures truly relates to Solution-Finding in the Osborn-Parnes Model. By his definition, Solution-Finding involves deferred judgment to develop the longest possible list of criteria, including potential consequences, repercussions, and effects by which to evaluate the tentative solutions; after this is done, the most pertinent criteria are selected and applied to the most promising ideas. None of the assessment measures investigated in this study call for this type of behavior.

\textbf{Recommendations}

Based on this study, including the experiences of the investigation in conducting it, the following recommendations are proposed:

\textsuperscript{83}Personal conversations with Sidney J. Parnes.

\textsuperscript{84}G. A. Davis, "In Frumious Pursuit of the Creative Person," \textit{Journal of Creative Behavior} 9 (1975):76.

\textsuperscript{85}Personal conversations with Sidney J. Parnes.
1. Studies should be conducted to check the classifications in actual experimental designs.

2. Additional studies should be conducted to determine just how effectively current assessment measures can be used to diagnose the individual's strengths or weaknesses within the Osborn-Parnes five-step Creative Problem-Solving Model.

3. If the currently available creative assessment measures are to be used for individual diagnosis, then additional effort should be extended to insure that these measures have a sufficiently high degree of reliability.

4. Additional investigations should be focused on developing assessment measures specifically relating to criteria development. Deliberate criteria development, while a crux of the Osborn-Parnes Model, seems to be ignored by the test originators represented in this study.

5. Some effort should be made to encourage originators of current assessment measures (investigated in this study) to combine forces to develop a measure or series of measures specifically designed to determine an individual's weaknesses or strengths within the Osborn-Parnes Creative Problem-Solving Model.

6. Once the proper instruments are identified, modified, or developed, then some procedure should be established whereby participants of the Annual CPSI's and creative problem-solving courses or seminars should be tested to determine their individual weaknesses or strengths within the process being utilized. Having identified relative weaknesses, short or long range remedial efforts (in the form of personal consultation, exercises, etc.) can be taken to correct the deficiencies.
APPENDIX A.—Data collection sheets for the assessment measures investigated

NAME OF TEST:

NAME OF ORIGINATOR(S):

POPULATION INTENDED FOR:

PURPOSE OF TEST:

TEST DESCRIPTION:

ORIGINATORS COMMENTS:
NAME OF TEST: Alternate Methods (unpublished)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: Junior high school through college and adult levels

PURPOSE OF TEST: Measures cognition of semantic implications

TEST DESCRIPTION: Subjects are presented with problem situations to which they are to find as many alternate solutions as possible.

ORIGINATORS COMMENTS: In this case, appearances are deceiving. Analysis showed that it measures S1 ability CMI (cognition of semantic implications), which was originally known as "sensitivity to problems." This would put it in the area of Fact-finding.

There are better tests for this factor—Pertinent Questions or Seeing Problems, both of which are published; Alternate Methods is not.
NAME OF TEST: Alternate Picture Meanings (unpublished)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: Junior high school through college and adult levels

PURPOSE OF TEST: Measures ideational fluency and spontaneous flexibility

TEST DESCRIPTION: Subjects are presented with drawings of facial expressions and gestures, and are asked to list as many different meanings as possible.

ORIGINATORS COMMENTS: A very strong test for DBU. Most pertinent to Idea-finding in behavioral problems but possibly also in Problem-finding phase.
NAME OF TEST: Alternate Uses (AU) (published)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: Junior high school through college and adult levels

PURPOSE OF TEST: Measures spontaneous flexibility

TEST DESCRIPTION: Subjects are asked to list other uses for common objects.

ORIGINATORS COMMENTS: Has been consistently successful for factor DMC (divergent production of semantic classes).

Could apply in Problem-finding phase where the problem solver tries to put the problem in its best class by thinking of one class after another. Perhaps he then has a known, stock solution for that kind of problem.

Could also apply in Idea-finding when, in a very broad search the solver first thinks of kinds (classes) of solutions, then of particulars within the class (the latter involving DMU).

Published test is available in two forms.
NAME OF TEST: Apparatus Test (unpublished)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: Junior high school through college and adult levels

PURPOSE OF TEST: Measures ideational fluency and originality

TEST DESCRIPTION: Subjects are asked to suggest two improvements for the common objects presented.

ORIGINATORS COMMENTS: Successful for CMI, hence for Idea-finding. (Two published tests for CMI already suggested.)
NAME OF TEST: Consequences (CQ) (published)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: Junior high school through college and adult levels

PURPOSE OF TEST: Measures ideational fluency and originality

TEST DESCRIPTION: Subjects are asked to list as many different consequences as they can in connection with the new and unusual situations described.

ORIGINATORS COMMENTS: Successful for DMU and for DMT. Mainly useful in connection with Idea-finding phase; but DMT could also apply in Problem-finding phase, where problems must be reinterpreted.

It might be noted that this test is scored in two ways--number of obvious consequences for DMU and number of remote consequences for DMT.
NAME OF TEST: Multiple Social Problems (unpublished)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: College students and adults

PURPOSE OF TEST: Measures divergent production of behavioral implications

TEST DESCRIPTION: Two people of a typical family are described in each test item. Subjects are asked to list personal problems that they feel the people might have with others.

ORIGINATORS COMMENTS: A DBI (divergent production of behavioral implications) test. Logically applies to Solution-finding (because of its generation of "potential consequences, repercussions, and effects" in problems of human inter-relationships.

Also applies to sensing social problems, hence relevant for Fact-finding.
<table>
<thead>
<tr>
<th>NAME OF TEST:</th>
<th>Pertinent Questions (PQ) (published)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME OF ORIGINATORS:</td>
<td>Guilford's Laboratories</td>
</tr>
<tr>
<td>POPULATION INTENDED FOR:</td>
<td>High school, college, and adult levels</td>
</tr>
<tr>
<td>PURPOSE OF TEST:</td>
<td>Measures conceptual foresights, or cognition of semantic implications</td>
</tr>
<tr>
<td>TEST DESCRIPTION:</td>
<td>Subjects are presented with situations to which they must seek additional information through the formulation of pertinent questions.</td>
</tr>
<tr>
<td>ORIGINATORS COMMENTS:</td>
<td>A good test of CMI for Fact-finding, as mentioned earlier.</td>
</tr>
</tbody>
</table>
NAME OF TEST: Plot Titles (PT) (published)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: High school, college, and adult levels

PURPOSE OF TEST: Measures ideational fluency and originality

TEST DESCRIPTION: Situations are described in story-telling fashion. Subjects are asked to list as many titles as possible for each.

ORIGINATORS COMMENTS: Successful for DMU and DMT in Idea-finding, possibly also in Problem-finding.

It is for DMU when number of non-clever responses are counted and for DMT when clever responses are counted.
NAME OF TEST: Possible Jobs (PJ) (published)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: Junior high school through college and adult levels

PURPOSE OF TEST: Measures ability to elaborate upon given information and/or suggest alternate deductions or extensions

TEST DESCRIPTION: Subjects are presented with a series of emblems and are asked to think of as many possible jobs which might be indicated by the emblems.

ORIGINATORS COMMENTS: Good for DMI. Could apply in Fact-finding, Idea-finding, or Acceptance-finding, the latter most likely.
<table>
<thead>
<tr>
<th>NAME OF TEST:</th>
<th>Procedure Application (unpublished)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME OF ORIGINATORS:</td>
<td>Guilford's Laboratories</td>
</tr>
<tr>
<td>POPULATION INTENDED FOR:</td>
<td>College students and adults</td>
</tr>
<tr>
<td>PURPOSE OF TEST:</td>
<td>Measures ideational fluency</td>
</tr>
<tr>
<td>TEST DESCRIPTION:</td>
<td>Each item describes a certain procedure and shows its use in one specific instance. Subjects are asked to describe other instances in which the same procedure may be used.</td>
</tr>
<tr>
<td>ORIGINATORS COMMENTS:</td>
<td>Possibly for NMS and DMI.</td>
</tr>
</tbody>
</table>
NAME OF TEST: Seeing Different Meanings (unpublished)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: Junior high school through college and adult levels

PURPOSE OF TEST: Measures ideational fluency and flexibility

TEST DESCRIPTION: Subjects are asked to list as many different meanings of each word given.

ORIGINATORS COMMENTS: Good for CMT--being able to see different meanings or interpretations as in Problem-finding when flexibility is needed.
<table>
<thead>
<tr>
<th>NAME OF TEST:</th>
<th>Sketches (SKET) (published)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME OF ORIGINATORS:</td>
<td>Guilford's Laboratories</td>
</tr>
<tr>
<td>POPULATION INTENDED FOR:</td>
<td>Junior high school through college and adult levels</td>
</tr>
<tr>
<td>PURPOSE OF TEST:</td>
<td>Measures figural fluency or divergent production of figural units</td>
</tr>
<tr>
<td>TEST DESCRIPTION:</td>
<td>Four simple figures are repeated twelve times each. Subjects are asked to make each one into a recognizable object.</td>
</tr>
<tr>
<td>ORIGINATORS COMMENTS:</td>
<td>Good for DFU. Found perhaps most in Idea-finding among visual material.</td>
</tr>
</tbody>
</table>
NAME OF TEST: Utility Test (UT) (published)

NAME OF ORIGINATORS: Guilford's Laboratories

POPULATION INTENDED FOR: High school, college, and adult levels.

PURPOSE OF TEST: Measures ideational fluency and spontaneous flexibility when scores are number of uses vs. number of classes are given, respectively.

TEST DESCRIPTION: Subjects are asked to list as many uses as possible for common objects.
NAME OF TEST: Torrance Tests of Creative Thinking: Verbal Forms A & B: Thinking Creatively With Words (published)

NAME OF ORIGINATOR: E. Paul Torrance

POPULATION INTENDED FOR: Kindergarten through graduate and professional education

PURPOSE OF TEST: To assess verbal abilities/skills involved in solving problems; to evaluate effects of experimental educational programs, instructional materials; to identify creatively gifted students; to identify strengths in verbal creative thinking

TEST DESCRIPTION:

Activity 1 - asking questions to know exactly what is taking place in a given picture

Activity 2 - list possible causes of the action in given picture

Activity 3 - list consequences of what is taking place in picture

Activity 4 - list of eleven interesting and unusual ways to improve stuffed toy

Activity 5 - list interesting and unusual uses for empty cardboard boxes (Form A)/tin cans (Form B)

Activity 6 - list thought provoking and unusual questions about cardboard boxes (Form A)/tin cans (Form B)

Activity 7 - given an improbably situation, list all possible consequences.

ORIGINATORS COMMENTS:

Activity 1 -(Asking Questions) - sensing problems and challenges

Activity 2 - (Guessing Causes) - recognizing the real problem; sensing problems and challenges

Activity 3 - (Guessing Consequences) - producing alternative solutions; preparing to put ideas to use
ORIGINATORS COMMENTS:

Activity 4 - (Product Improvement) - producing alternative solutions; sometimes preparing to put ideas to use
Activity 5 - (Unusual Uses) - producing alternative solutions
Activity 6 - (Unusual Questions) - sensing problems and challenges
Activity 7 - (Just Suppose) - preparing to put ideas to use
NAME OF TEST: Think Creatively About the Future: Forms A & B (unpublished)

NAME OF ORIGINATOR: E. Paul Torrance

POPULATION INTENDED FOR: High school and college

PURPOSE OF TEST: To assess abilities and/or skills in solving future problems; to assess the effects of experimental curricula in problem solving, futurism, etc.

TEST DESCRIPTION: Three problems (Activities 1, 2, 3) based on future predictions are presented. Subjects are asked to imagine the predictions to be true and to suggest possible alternative solutions.

ORIGINATORS COMMENTS: Activity 1 - sensing problems and challenges
Activity 2 - producing alternative solutions
Activity 3 - preparing to put ideas to use
NAME OF TEST: Thinking Creatively About Teaching and Learning: Forms A & B (unpublished)

NAME OF ORIGINATOR: E. Paul Torrance

POPULATION INTENDED FOR: Education majors (college undergraduates) and teachers

PURPOSE OF TEST: To assess abilities in solving creatively problems associated with school learning, teaching, etc.

TEST DESCRIPTION:

Activity 1 - presented with a common teaching problem, list all of the problems the situation suggests
Activity 2 - shown a photograph of children in a learning task, list all things they might be learning
Activity 3 - list as many provocative questions as possible about a given topic
Activity 4 - predict as many problems as possible concerning a given situation
Activity 5 - ways of improving a given situation

ORIGINATORS COMMENTS:

Activity 1 - (Common Problems) - sensing problems and challenges
Activity 2 - (Observations) - sensing problems and challenges
Activity 3 - (Provocative Questions) - sensing problems and challenges
Activity 4 - (Predictions) - preparing to put ideas to use
Activity 5 - (Improvements) - producing alternative solutions; possibly preparing to put ideas to use
NAME OF TEST: Torrance Tests of Creative Thinking:
Figural Forms A & B: Thinking Creatively With Pictures (published)

NAME OF ORIGINATOR: E. Paul Torrance

POPULATION INTENDED FOR: Kindergarten through graduate and professional education

PURPOSE OF TEST: To assess figural abilities/skills in creative thinking; to identify strengths in thinking in figural terms; to identify creatively gifted students; to evaluate effects of training programs, teaching methods, etc.

TEST DESCRIPTION:
Activity 1 - draw uncommon, completed object which utilizes piece of colored paper provided
Activity 2 - add lines to series of incomplete figures to make uncommon completed objects or pictures - title each picture
Activity 3 - make uncommon objects or pictures from series of pairs of straight lines provided (Form A)/circles provided (Form B)

ORIGINATORS COMMENTS:
Activity 1 - (Picture Construction) - recognizing the real problem; preparing to put ideas to use
Activity 2 - (Incomplete Figures) - recognizing the real problem; preparing to put ideas to use
Activity 3 - (Repeated Figures) - producing alternative solutions; preparing to put ideas to use

New scoring concepts and checklists of creative strengths give indicators for the following: sensing problems and challenges; recognizing the real problem; producing alternative solutions; and preparing to put ideas to use.
NAME OF TEST: AC Test of Creative Ability

NAMES OF ORIGINATORS: D. H. Harris and A. L. Simberg

POPULATION INTENDED FOR: College through adult levels

PURPOSE OF TEST: Measures fluency, flexibility, and originality

TEST DESCRIPTION:
- Part I - list as many possible consequences for five described situations;
- Part II - list as many reasons or explanations of five given statements assumed to be true;
- Part III - list improvements for five given common machines or appliances;
- Part IV - list least expensive and time consuming solutions for five given problem situations;
- Part V - list all possible uses for five given common objects.

ORIGINATORS COMMENTS:
The AC Test of Creative Ability measures fluency, flexibility of thought, and originality. Probably all three of those factors are pervasive through Parts I, II, and V of the test. What is being measured is an ability to verbalize a quantity (fluency) of thoughts, consequences, ideas and the like, without being constrained by habit, stereotyped thinking and conformity (flexibility).

It would, therefore, appear to me that Parts I, II, and V should correlate with Fact-Finding, Idea-Finding, and Acceptance-Finding since you would be seeking a large list of alternatives from which to choose, prior to getting judgmental.

In addition, these three parts of the test would yield an estimate of originality.
<table>
<thead>
<tr>
<th>NAME OF TEST:</th>
<th>Remote Associates Test (RAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAMES OF ORIGINATORS:</td>
<td>S. A. Mednick and S. Halpern</td>
</tr>
<tr>
<td>POPULATION INTENDED FOR:</td>
<td>College students and adults</td>
</tr>
<tr>
<td>PURPOSE OF TEST:</td>
<td>Measures ability to form mutually distant associative elements into new and useful combinations</td>
</tr>
<tr>
<td>TEST DESCRIPTION:</td>
<td>Each test item consists of three stimulus words drawn from remote association clusters. Subjects must find a fourth word which could serve as an associative link between them.</td>
</tr>
</tbody>
</table>
NAME OF TEST: Power Source Apparatus Test


POPULATION INTENDED FOR: College through adult levels

PURPOSE OF TEST: To discriminate between creative and non-creative machine designers

TEST DESCRIPTION: The subject is asked to "bridge the gap" between a specified power source and a given motion sequence.

ORIGINATORS COMMENTS: Significantly discriminated creative vs. non-creative machine designers. In my mind the test is largely a measure of idea-finding.
<table>
<thead>
<tr>
<th>NAME OF TEST:</th>
<th>Flanagan Industrial Tests – Ingenuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME OF ORIGINATOR:</td>
<td>J. C. Flanagan</td>
</tr>
<tr>
<td>POPULATION INTENDED FOR:</td>
<td>Primarily for people who are seeking jobs</td>
</tr>
<tr>
<td>PURPOSE OF TEST:</td>
<td>Measures creativity or inventiveness</td>
</tr>
<tr>
<td>TEST DESCRIPTION:</td>
<td>Test items describe life-like problems. Although some aspects of the solutions are given, subjects must really develop the solution.</td>
</tr>
<tr>
<td>ORIGINATORS COMMENTS:</td>
<td>These items are intended to measure a combination of idea-, solution-, and acceptance-finding as a combined operation. The emphasis is on the ability to find an unusual, very pat or neat, very effective solution to a problem—not by arraying all possible alternatives and weighing their usefulness, but by a flash of insight that I have felt is best called ingenuity. If one had to pick one of the three, I'd say it was closest to solution-finding.</td>
</tr>
</tbody>
</table>

NAME OF TEST: Ingenious Solutions to Problems
                      Ingenuity Test

NAME OF ORIGINATOR: J. C. Flanagan

POPULATION INTENDED FOR: Primarily for high school levels

PURPOSE OF TEST: Measures creativity or inventiveness

TEST DESCRIPTION: Test items describe life-like problems. Although some aspects of the solutions are given, subjects must really develop the solution.

ORIGINATORS COMMENTS: Same as for FIT, FACT, Project TALENT, and PCG forms of the Ingenuity or Creativity Tests (see previous page).
APPENDIX B.—Interpretation of code designation for tests selected

After twenty years of uninterrupted research in the Aptitudes Research Project at the University of Southern California, the Sheridan Psychological Services, Inc. has become the repository of tests developed for research purposes. A number of the tests have already been published. With few exceptions, others have been copyrighted for their protection and are available at nominal costs in single copies, with approval for reproduction for research purposes. Some of these tests may be published at later times.

The listing of the tests is organized according to the Structure-of-Intellect (S-O-I) categories. The major blocks are for the S-O-I operation categories. Each S-O-I ability is noted by its S-O-I trigram code designation.

The trigram symbol for each ability includes a letter for each parameter of the S-O-I Model, the first letter for the kind of operation involved, the second letter for the content, and the third for the product, as follows:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Content</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>C - cognition</td>
<td>F - figural</td>
<td>U - unit</td>
</tr>
<tr>
<td>M - memory</td>
<td>S - symbolic</td>
<td>C - class</td>
</tr>
<tr>
<td>D - divergent production</td>
<td>M - semantic</td>
<td>R - relation</td>
</tr>
<tr>
<td>N - convergent production</td>
<td>B - behavioral</td>
<td>S - system</td>
</tr>
<tr>
<td>E - evaluation</td>
<td></td>
<td>T - transformation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I - implication</td>
</tr>
</tbody>
</table>
APPENDIX B.—Continued

APPENDIX C.--Assessing Creative Growth: The Tests -- Book One
Assessing Creative Growth: Measured Changes -- Book Two

The above two titles are bound at the end of this thesis.
SELECTED BIBLIOGRAPHY

Books


Articles in Journals


Reports and Dissertations


SPS Psychological Tests. Sheridan Psychological Services, Inc., P.O. Box 6101, Orange California 92667.