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Gaining Understanding through Creativity:
Comparison of the Understanding by Design Model and General Creativity Concepts

By:

Michael James Thomas Joseph Bridge

An Abstract of a Thesis
in

the Study of Creativity and Change Leadership

Submitted in Partial Fulfillment of the Requirements
for the Degree of:

Master of Science

August 2009

Buffalo State College
State University of New York
International Center for Studies in Creativity

ABSTRACT OF THESIS

Gaining Understanding through Creativity:
Comparison of the Understanding by Design Model and General Creativity Concepts

This thesis investigated general creativity concepts compared to the concepts already identified in the Understanding by Design model. A content analysis was conducted in context of the basic concepts in *Creativity*, *Knowledge*, and *Understanding* (C-K-U bridge Theory) that purported a symbiotic relationship between the sets of *Creativity* and *Understanding*. To identify the key similarities, differences, and connections between the concepts of *Creativity* and *Understanding*, data were identified from five sources to develop grounded theory in qualitative analysis. Three levels of analysis were then performed to illuminate trends and connections between the two concepts. The *Creativity* facets of *Synthesis*, *Application*, *Connect*, *Imagine*, *Openness*, and *Transpose* were compared and contrasted to the *Understanding* facets of *Explanation*, *Interpretation*, *Application*, *Perspective*, *Empathy* and *Self-Knowledge*.

Results of the content analysis indicated that concepts of *Creativity* and *Understanding* appear to support each other in a symbiotic, mutually supportive relationship. *Creativity* and *Understanding* were linked by the process of self-actualization and on values of affirmative judgment and keeping an open mind.

Michael James Thomas Joseph Bridge

Date

Buffalo State College
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Comparison of the Understanding by Design Model and General Creativity Concepts

A Thesis in
Creative Studies

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DEDICATIONS

This book is dedicated to the Divine,
for without the gifts and talents that make me who I am,
this would not exist.

To the following, for without them
their love, nagging, and support - these words wouldn't be written here

I dedicate “my precious,” ... ahem! ... I mean thesis, to my Mom. She has been the force driving me to excel in every way to be who I am. She has been there through all of the trials and tribulations that has been this thesis.

My Uncle Joe. He has been a role model, confidant, and father figure to me.

Rebecca, my best friend and confidant, who never lets me accept mediocre from myself.

Dr. Murdock, who is an angel on Earth who has put up with me and my completely abstract concept, and has guided me to bring it back down to Earth. She has been a mentor and an example for me.

To Valerie and her not so subtle nagging - a true friend.

To my family and friends, who, have put up with my struggles over this thesis. They, more than most, have seen me give birth to this baby.

To Mike Fox who has had to put up with all of my “wild” ideas

And finally to the ICSC family.

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CHAPTER 1: STATEMENT OF THE PROBLEM

Chapter Overview

This chapter contains the rationale for a study between general creativity concepts and the Understanding by Design model for understanding (Wiggins & McTighe, 1998). Additionally, this chapter will define words that will be commonly used – for example: creativity, understanding, facet, data, and knowledge.

Rationale

Understanding as a concept is a wide topic, open to many interpretations (Wiggins & McTighe, 1998) What is missing in the creativity literature is an explicit link between the general concepts of what will hereafter be referred to as the sets of *Understanding* compared to concepts of *Creativity*. The creativity literature is full of descriptions about how to understand some aspect associated with *Creativity*, so *Understanding* is most likely implied throughout the literature. Additionally, there is no reference to Understanding by Design [UbD] (Wiggins & McTighe, 1998) in the creativity literature and likewise, no connection between UbD and *Creativity* in literature (Bridge, 2004). Therefore it is clear that an examination of the relationship between general *Creativity* concepts and *Understanding*, specifically the Understanding by Design model (Appendix B), is needed to fill in gaps in the literature in this thesis.

This thesis examines the *C-K-U bridge Theory* (Appendix A) which describes the relationship between *Creativity*, *Knowledge* and *Understanding* as symbiotic. For this thesis, only the *Creativity* to *Understanding* relationship will be examined.

Core Questions Guiding the Investigation

Three questions guided this inquiry:

1. What is the relationship between general creativity and *Understanding*, as defined by the Understanding by Design (UbD) model?
2. What is similar; what is different between the UbD model and general creativity concepts?
3. What are the implications for the domain of *Creativity*?

Definitions

“It is almost axiomatic that knowledge can be more powerful when creatively applied”
– Alex Osborn. (Osborn, 1979)

The following definitions guided this investigation; they defined the major components being looked at as well as limited the scope to stay focused. The faceted definition of *Understanding* is the one used in Understanding by Design (Wiggins & McTighe, 1998). The faceted definition of *Creativity* was created by me during an earlier literature review. The definition of *Knowledge* and data were assembled from various sources.

Data

- A collection of facts from which conclusions may be drawn (Wordweb)
- An item of factual information derived from measurement or research (Wordweb)
- Specific to this investigation, data will also be defined as all those definitions, descriptions, phrases, ideas, thoughts, or theories derived from an author (writer, editor, or those referenced) that either fit into the UbD or Creativity; or they do not.

Understanding

Understanding is a personal synthesis of BOTH knowledge and creativity.

According to Wiggins and McTighe in Understanding by Design (Appendix B): When we truly understand, we:

- Can ***Explain***: provide thorough, supported, and justifiable accounts of phenomenon, facts, and data.
- Can ***Interpret***: tell meaningful stories; offer apt translations; provide a revealing historical or personal dimension to ideas and events; make it personal or accessible through images, anecdotes, analogies, and models.
- Can ***Apply***: effectively use and adapt what we know in diverse contexts.
- Have ***Perspective***: see and hear points of view through critical eyes and ears; see the big picture.
- Can ***Empathize***: find value in what others might find odd, alien, or implausible; perceive sensitivity on the basis of prior direct experience.
- Have ***Self-Knowledge***: perceive the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding; we are aware of what we do not understand and why understanding is so hard. (p. 44, 1998)

Creativity

Creativity is the drive to produce something tangible or intangible through a process resulting in a product which is born out of necessity and/or desire. When we create, we:

- Can ***Synthesize*** data (knowledge, expertise, ideas, and desires).
- Can ***Apply*** that synthesis to form some thing (tangible or intangible) which has the characteristics of being both **novel AND useful**.
- Can ***Connect*** to the primordial realm or the expression of an inner essence or ultimate reality.
- Can ***Imagine*** what is not there or what should be.
- Can establish a mindset of ***Openness*** to ideas – having no pre-set limiting barriers of prejudice, expectation, intent, or preference.
- Can ***Transpose***: making the familiar strange and the strange familiar.

Knowledge

Knowledge is defined as:

- the sum of what is known: the body of truth, information, and principles acquired by mankind...
 - **a** (1) : the fact or condition of knowing something with familiarity gained through experience or association (2) : acquaintance with or understanding of a science, art, or technique
 - **b** (1) : the fact or condition of being aware of something (2) : the range of one's information or understanding
 - **c** : the circumstance or condition of apprehending truth or fact through reasoning
 - **d** : the fact or condition of having information or of being learned (Merriam-Webster)
- Knowledge requires some level of both understanding of prior material and creativity.
- The Domain of Knowledge is separated into categories and subcategories. (Baer, 1999; Kipper, 2001; Library of Congress Manual, 2004; Wikipedia, 2004)

Facet is defined as the parts of a definition for understanding and creativity: a distinct, interconnected part of a whole concept, which supports the other parts, is necessary for each other, but do not have to be contiguous

Set of *Understanding*: this term is used to describe the set of data collected that fits within the facets of understanding.

Set of *Creativity*: this term is used to describe a subset of the data collected which fits within the facets of creativity.

There was an important style rule that will be in effect for this thesis. When the specific facets are being referred to in the body of the thesis, they will be italicized with the first letter capitalized. When the words creativity and understanding are being used to reference either the domains, sets, or facets of – these words will be italicized and first letter capitalized. Finally, when the personality traits found in (Davis, 1999) are

mentioned as a data bloc, they will be italicized as well. The reason for this convention was that these are proper names within this thesis and not to be confused with the normal definitions of the words used in common language.

Summary

This chapter explained the problem and need for a study into the relationship between *Creativity* and *Understanding*. This chapter also defined the facets of *Creativity* as well as the facets of *Understanding*. The next chapter will explore the creativity literature to examine what may be similar and to identify the gaps in the literature.

CHAPTER 2: REVIEW OF RELATED LITERATURE

Chapter Overview

This chapter examines the state of the *Creativity* literature as it pertained to the topic of understanding, and specifically to Understanding by Design (Wiggins & McTighe, 1998). Part of the review looked at models which talked about understanding something, or were similar to understanding something. This chapter will explain the differences and articulate the need to investigate the similarities and differences between *Creativity* and *Understanding*.

Review of the Related Literature

There is a clear gap in the creativity literature on the concept of *Understanding*. This literature is full of descriptions about how to understand some aspect associated with *Creativity*. What is missing is a link between the general concepts of *Understanding* to concepts of *Creativity*. Case in point, the following example from the Creativity Based Information Resource (CBIR) abstract of Basadur, Runco, & Vega, (2000) titled, *Understanding How Creative Thinking Skills, Attitudes, and Behaviors Work Together: A Causal Process Model*, in which understanding was used in the following manner, “improve understanding of how these variables contribute to the process increases a manager’s ideation and evaluation skills.”

Understanding as a concept is a wide topic, open to many interpretations (Wiggins & McTighe, 1998), so *Understanding* was most likely implied throughout the literature. In a review of the literature on CBIR for “understanding by design” or “Ubd” as search parameters, there were zero results. In a search of ERIC, ERIC – Department of Education, EBSCO, and FirstSearch electronic databases, results for “understanding by

design” yielded results for computer design and the already published materials for UbD. An interview with a research librarian at the Association for Supervision and Curriculum Development (ASCD), the publishers of *Understanding by Design*, uncovered no research completed to date on UbD (Bridge, 2004).

Davis and O’Sullivan’s Model AUTA (Awareness, Understanding, Techniques, Actualization) described a “taxonomy of creative development” (Davis, 1986). Davis listed “Awareness of the importance of creativity” and an “Understanding of the nature creativity” as the important first and second steps of the model. The *C-K-U bridge Theory* (Appendix A) may be the framework which allows for a systematic view of the support for the model by describing the importance of creativity

Csikszentmihalyi and Amabile have postulated theories which articulate a relationship between domain specific skills, creativity skills, and motivation (Collins & Amabile in Sternberg, 2002); the domain, the individual, culture, and the field (Csikszentmihalyi in Sternberg, 2002). These models are an example of frameworks which describe the relationship between *Creativity* and the *Knowledge* domain to produce a creative product. Sternberg & Lubart’s Investment Model expressed one view of the motivation and the why we create (Sternberg & Lubart, 2001), but not the relationship between *Knowledge*, *Understanding* and *Creativity*.

The Creative Learning Model (Treffinger, Isaksen, & Firestein in Parnes, 1992) described a hierarchical model that compared and intertwined affective (emotion) and cognitive (reasoning) factors with the development of a well-rounded creative individual. Rhodes (1957, 1961) developed the process oriented “4-P’s” model to organize *Creativity*. Those organizational areas were: the Person, the Process, the Product, and the Press (environment) wherein the dynamic creative process produced a product. Finally, Noller described creativity in mathematical terms, stating: $C = fA(K, I, E)$ where Creativity equaled the function of an attitude multiplied by knowledge, imagination and evaluation (Noller in Campos, 2000; Fox & Fox, 2004). Here, we find support for the

notion that *Creativity* is dependant on *Knowledge*.

Summary

These models (AUTA, Investment Model, Triarchic Models, Creative Learning Model, and Noller's Model) and the related literatures appear to focus on the relationship between *Creativity* and *Knowledge* (domain and field), and emotion/motivation of the individual; while leaving understanding more implied. The *C-K-U bridge Theory* (Appendix A) specifically explores the deeper relationship between *Creativity* and the *Knowledge* domains to build *Understanding*. This theory in essence, focused at the 'implied' hearts of these models. Therefore the literature reviewed was a starting point to dig deeper into the relationship between *Creativity* and *Understanding*. The next chapter will describe the methodology for the research.

CHAPTER 3: METHODOLOGY

Overview

For this research a qualitative paradigm was used. Strauss and Corbin (1998) stated that: “Grounded theories, because they are drawn from data, are likely to offer insight, enhance understanding,...”(p. 12).

They further noted:

Theoretical comparisons are a vital part of our method of building theory and are one of the important techniques we use when doing...analysis. ... Comparisons are additionally important because they enable identification of *variations* in the patterns to be found in the data (p. 67).

In the beginning was a thought that *Creativity* and *Understanding* as defined by Understanding by Design [UbD] (Wiggins & McTighe, 1998) shared a relationship of some kind. Through a literature review, a faceted definition of *Creativity* was established that paralleled the *Understanding* definition in UbD (Appendix B). In this way, comparisons and relationships could be made.

A literature review from five selected sources and edited collections was performed to collect a manageable amount of data. This first level of analysis sifted the coded data into two sets: *Creativity* and *Understanding*. The second level of analysis consisted of comparing the two sets to each other. Once the comparisons were complete, the third level focused on exploring the relationship between *Creativity* and *Understanding* based on the prior comparisons.

Description of Process

The research began by accident while performing a literature review to create my own definition for what is called *Creativity*. Since there was not one single universally agreed-upon definition of *Creativity* (Aleinikov, et al, 2000; Fox & Fox, 2004; and Sternberg, 2002), I wanted to create an all-encompassing definition for *Creativity* that embraced both the domain general and domain specific theories (Baer in Runco, 1999) and brought together the many disparate concepts that make up *Creativity* (Davis, 1999; Parnes, 1992; Sternberg, 2002).

It became apparent that a definition for *Creativity* appeared to fit into foundational patterns, therefore, the review was honed so that a faceted definition of *Creativity* was developed. I arrived at the final definition from that research which paralleled the faceted definition of *Understanding* in UbD (Wiggins & McTighe, 1998; Bridge, 2004). A theory was developed (Appendix A). Researchable questions were asked.

1. What is the relationship between general *Creativity* and *Understanding*, as defined by the Understanding by Design (UbD) model?
2. What is similar, what is different, between the UbD model and general *Creativity* concepts?

A straightforward quantitative analysis could not be used to answer the questions; the data did not exist in the form of test results, nor was the data measurable through tests. The data existed in the deep richness of narrative – authors’ thoughts, theories, and research result descriptions. A qualitative approach was needed to get at, identify, and record the data for analysis.

Coding Matrix

Since a qualitative approach was used, comparisons needed to be made. In order to do that, I needed to create a coding system for the data. The use of the codes was imperative for keeping the data collected organized and to perform the comparative content analysis. The *Understanding* facets were coded by the first letter of the facet in its own capital letter (except for *Empathy* which was coded as “M” because *Explanation* also begins with an “E”) with one general catch all category for those pieces of data that did not fit nicely into a specific facet. (Appendix C).

Creativity facets were coded similarly. However, to keep codes straight, the use of a lower case “C” was placed in front of the letter designations (Appendix C).

Criteria for Selected Literature

Before commencing the literature review, the next step in the process was to narrow down and select the pieces of literature that would be used in this investigation. The reason for narrowing down the field was to ensure that the depth and breadth of *Creativity* could be researched; while at the same time establishing boundaries – to focus the research, and provide some measure of manageability.

The main criteria for selecting sources were the following questions. Did it contain up-to-date research and methodologies? Was there depth and breadth to the research? Was it foundational? Five sources fit those criteria. They represented some of the foundation for and the wide breadth of the creativity literature.

The first source was the original dissertation of Rhodes (1956), titled: The dynamics of creativity: An interpretation of the literature on creativity with a proposed procedure for objective research. Rhodes was the originator of a data-based multifaceted organization of *Creativity* known as the “4 P’s.” The original data for what became the

“4-P’s” was important to include in this study because of the fact that much of what is known about the “4-P’s” model was and is derived from Rhodes’ 1961 *Phi Delta Kappan* article, “An Analysis of Creativity”. The original richness of that data was lost to a boilerplate.

The second source was found in Creativity is Forever (Davis, 1999). I used Chapters Three (“Definitions of Creativity”) and Four (“Characteristics of Creative People”) for the investigation because Davis had already gathered data from a wide variety of sources. In that same vein, Exploring the Nature of Creativity, (Fox & Fox, 2004) was chosen as the third source because it was an up-to-date synthesis of the domain of *Creativity* based on Rhodes’ “4-P’s” model. Both of these sources presented the depth and breadth of *Creativity* research and thinking.

The final two sources were edited collections which were examined in their entirety. The first, Sourcebook for Creative Problem Solving: A Fifty-Year Digest of Proven Innovation Processes (1992) edited by Sidney Parnes utilized re-prints of past pioneering and early 1990’s research articles about *Creativity* from a variety of authors and perspectives. The Handbook of Creativity, (2002) edited by Robert Sternberg was included because authors submitted articles with new viewpoints, material, thinking, and/or modernizations of past ideas with considerable depth and breadth.

Level One Analysis

Specific to this investigation, data were defined as all those definitions, descriptions, words, phrases, ideas, thoughts, or theories derived from an author (writer, editor, or those referenced) that either fit into the *Understanding* or *Creativity* facets; or not. Once the coding was set, and the sources decided, located and set the first phase could begin.

The first level of analysis was to identify and sort the data into two sets from

the literature. The first set for concepts of *Creativity* and the other set for concepts of *Understanding*. Definitions were the criterion for identifying and coding the data. First, the definition of data guided what would and would not be included as data in context of this investigation. The definitions for the facets of *Creativity* and *Understanding* were used to sort each piece of data based on the context in each source. Each piece of data was entered into an Excel document, with a number one (1) used to identify which facet(s) it belonged to. This process was done to make sure the tabulation, further subdivision, and analysis be done quickly and accurately (Appendix E).

Level Two Analysis

Once the data were sorted into their sets and facets, I compiled each data piece by the facet(s) they belonged to. When I was done, I had 14 groupings of data by facet. Within each facet, I tabulated the total number of data pieces. I then tabulated each of the shared data pieces with the other facets. In doing so, I was able to create a cross-tabulation chart by set of data AND by facet (Appendix D). These bi-directional comparisons (*Creativity to Understanding, Understanding to Creativity*) illuminated trends in which facets were similar, dissimilar, and showed the strength of each connection.

In this second level of analysis I discovered a trend; the *Personality Traits* (Davis, 1999) were skewing the tabulations. After going back to the data and analyzing the facets without the *Personality Traits* and then performing the same analysis on the *Traits* by themselves, I determined that the shifting effect did not accurately portray the facet(s) involved. I decided to separate the *Personality Traits* out and analyze them separately. I created adjusted tabulations for each facet without the *Traits* (Appendix D).

Level Three Analysis

For the final level of analysis, I went back to the data, grounding the relationships firmly in the data (*Creativity to Understanding* and *Understanding to Creativity*). I examined the text of each of the paired facets side by side to gain an understanding of and shed more light on the relationships between each facet specifically, and in the general sets as well. This level of analysis relied heavily on my own understanding of the authors' intent, the data-piece(s) involved, and the synthesized links I perceived. The result was a rich tapestry of descriptions that detail the relationships.

Summary

This chapter explained the methodology for the creation of the multifaceted definition of *Creativity*, where the facets of *Understanding* originated, what the research methodology was, what criteria for selection of sources used and how the data will be presented. The results of the final analysis will follow in the form of narrative text, images, graphs, and tables that show the themes or patterns.

CHAPTER 4: INITIAL FIRST LEVEL OF ANALYSIS OF DATA INTO SETS OF *CREATIVITY AND UNDERSTANDING*

Recap

The first level of analysis was to identify and sort the data into two sets from the literature. The first set for concepts of *Creativity* and the other set for concepts of *Understanding*. At the same time, they were further subdivided by each facet the data aligned with.

Specific to this investigation, data was defined as all those definitions, descriptions, words, phrases, ideas, thoughts, or theories derived from an author (writer, editor, or those referenced) that either fit into the *Understanding* or *Creativity* facets; or not. Facet was defined as the parts of a definition for *Understanding* and *Creativity*: a distinct, interconnected part of a whole concept, which supports the other parts, is necessary for each other, but do not have to be contiguous.

The data existed in the deep richness of narrative – authors' thoughts, theories, and research result descriptions. Definitions were the criterion for identifying and coding the data. First, the definition of data guided what would and would not be included as data in context of this investigation. The individual definitions of the facets of *Creativity* and *Understanding* were used to decide the best fit for each piece of data based on the context in each source. Each piece of data was entered into an Excel document, with a number one (1) used to identify which facet(s) it belonged to. This process was done to make sure the tabulation, further sub-division, and analysis could be done quickly and accurately (Appendix E).

Chapter Layout

Chapter 4 deals specifically with the first level of analysis. Three separate sets of data are going to be addressed in it. The first will be level one analysis of the set of *Creativity*. The second will be a first level analysis of the set of *Understanding*. The third section will be a discussion on the Davis *Personality Traits* (1999) and why they were segregated from the study.

Level One Analysis of Data for the *Creativity* Set

The first level of analysis in this chapter identified and sorted the data into the *Creativity* set and the relevant subsets of each facet. Afterwards, a tally was made (Table 4.1)

Table 4.1
Total Number of Data Pieces by Facet of *Creativity*

Facets of <i>Creativity</i>	# of data pieces out of 202
General	69
<i>Synthesis</i>	69
<i>Application</i>	56
<i>Connect</i>	70
<i>Imagine</i>	59
<i>Openness</i>	62
<i>Transpose</i>	36

Table 4.1 describes the general overview of the distribution of the data as it fell into each facet. Green highlight signifies the facet with the greatest number of data pieces associated with it. Orange is the facet with the least. The category of General was a catch-all category. For the facets of *Creativity*, the difference between the two is 34 pieces of data. 202 pieces of data were collected – each piece of data could fit into more than one facet.

Level One Analysis of Data for the *Understanding* Set

The first level of analysis in this chapter identified and sorted the data into the *Understanding* set and the relevant subsets of each facet. Afterwards, a tally was made (Table 4.2)

Table 4.2
Total Number of Data Pieces by Facet of *Understanding*

Facets of <i>Understanding</i>	# of data pieces out of 202
General	5
<i>Explanation</i>	54
<i>Interpretation</i>	59
<i>Application</i>	70
<i>Perspective</i>	99
<i>Empathy</i>	65
<i>Self-Knowledge</i>	55

Table 4.2 describes the general overview of the distribution of the data as it fell into each facet. Green highlight signifies the facet with the greatest number of data pieces associated with it. Orange is the facet with the least. The category of General was a catch-all category. For the facets of *Understanding*, the difference between the two is 45 pieces of data. 202 pieces of data were collected – each piece of data could fit into more than one facet.

Davis *Personality Traits*, Explained

I originally intended to include the *Personality Traits* which were identified in the Davis (1999) literature in the grand totals. However, at this step in the process I made a realization that the entire set of those traits might be skewing the results when I looked more closely at the *Creativity* general category (intended to be a catch all). I realized that all of the data collected from the *Personality Traits* was included in that

category, accounting for about 60% of the data in that category. I became curious and separated the 41 *Personality Traits* out. When that occurred, the skewing was plainly obvious (Appendix D). The next two tables, 4.3 and 4.4, demonstrate the totals for the *Personality Traits* and the adjusted totals as well. Table 4.4 consists of the adjusted results of Tables 4.1 and 4.2.

Table 4.3
Personality Traits Total Data Distributed by Set and Facet

<i>Creativity Facets</i>							<i>Understanding Facets</i>						
General	<i>Synthesis</i>	<i>Application</i>	<i>Connect</i>	<i>Imagine</i>	<i>Openness</i>	<i>Transpose</i>	General	<i>Explanation</i>	<i>Interpretation</i>	<i>Application</i>	<i>Perspective</i>	<i>Empathy</i>	<i>Self-Knowledge</i>
41	6	4	15	15	27	4	0	13	11	9	27	22	15

*Total number of *Personality Traits* were 41

Table 4.4
Re-Adjusted Total Data Distributed by Set and Facet

<i>Creativity Facets</i>							<i>Understanding Facets</i>						
General	<i>Synthesis</i>	<i>Application</i>	<i>Connect</i>	<i>Imagine</i>	<i>Openness</i>	<i>Transpose</i>	General	<i>Explanation</i>	<i>Interpretation</i>	<i>Application</i>	<i>Perspective</i>	<i>Empathy</i>	<i>Self-Knowledge</i>
28	63	52	55	44	35	32	5	41	48	61	72	43	40

*Adjusted number of data pieces were 161

The surprising aspect for the adjusted totals (161) was the flipping between the *Creativity* facets of *Synthesis* and *Connect*. In the grand totals, *Synthesis* was second to

Connect, in the adjusted totals, *Synthesis* came out on top, with *Connect* second. It was plainly visible that the “personality traits” skewed the results to the facets that applied more to the aspect of the person – *Perspective* and *Empathy* for *Understanding*, and *Openness* in *Creativity* (Appendix C).

After examining the data results separately, I decided the data block’s skewing of the overall results was not in keeping with the remaining 80% of the data collected. Since the *Personality Traits* accounted for about 20.30% of the collected data, I decided to pull the *Personality Traits* out of the main analysis and treated them as a set to be studied separately. Therefore, for the remainder of the analysis, except where noted as the *Personality Traits* I used the adjusted totals (161), and each table will bear that name. The second level of analysis was completed without the traits included. The *Personality Traits* will be examined separately at the end of chapter 5.

Summary

In this chapter, three separate sets of data were discussed as part of the initial first sort and analysis of the data – the sets of *Creativity*, *Understanding*, and the *Personality Traits*. This chapter also discussed the number of data pieces that fell into each facet by Set, and explained how 202 pieces of data were pared down to 161. The next chapter will delve into an analysis of the cross-comparison of the data pieces by facet.

CHAPTER 5: SECOND LEVEL ANALYSIS DATA RESULTS

Chapter Overview

Chapter 5 will report on the level two analysis of the *Creativity to Understanding* comparison; the level two analysis of the *Understanding to Creativity* comparison; and the discussion of the *Personality Traits* (Davis, 1999). In this chapter, I will review the process, explain and present the data delivery tables, and then discuss the findings.

Process Overview

Once the cursory identification, coding, and sorting of the data were completed into the respective set of concepts, the next level in the analysis was to dig deeper by comparing and contrasting the sets to look for trends in the data. Each individual facet of *Creativity* was compared to the facets of *Understanding*. To ensure a proper comparison, the same was done for the facets of *Understanding to Creativity*. Also in this chapter is discussion of the second level of analysis of the *Personality Traits* (Davis, 1999).

Using the data in the set of *Creativity*, I created a cross-comparison table against the facets of *Understanding* (Table 5.1, Appendix D). The data could or could not already be shared in common with more than one facet. The data were:

1. further separated and clustered by *Creativity* facet,
2. the data were totaled,
3. the data were then further separated by *Understanding* facet(s),
4. facets were totaled (indicating x number of shared data pieces between *Creativity* facet and *Understanding* facet) to determine a basic numeric value for which facet(s) were linked to the facet under investigation.

In this way, links or trends between the facets of *Creativity* and *Understanding* could be illuminated.

Level 2 Analysis of the Comparison between *Creativity* and *Understanding*

Explanation of Tables

Table 5.1 demonstrates the results of the comparisons between the *Creativity* facets to the *Understanding* facets. The numbers on the left hand side of the table (gray column) are the total number of data pieces from the set of *Creativity* that fit that facet of *Creativity*. The numbers to the right of the table indicate the number of data pieces of those that also correspond to the facets in *Understanding*. The green highlighting indicates the *Understanding* facet which had the highest number of shared data pieces. Orange indicates those that fall within five pieces of data of the highest. The purpose of the “close second” was to illuminate any *Creativity* facets which might cross over into another *Understanding* facet. I noticed in the events of close second, five was a good number due to a dropping off after five. The reader should read the *Understanding* facets as “x” out of “y” (gray box total) for that *Creativity* facet.

Table 5.2 represents the same data in simple percentages (“x” out of “y”) the shared *Understanding* facet’s percent of the *Creativity* facet. The color scheme is designed to visually represent the percentage in relation to the whole picture. The idea of table 5.2 is to visually represent the strengths and weaknesses of the relationships. The inspiration for this was a weather map where color saturation is used to represent temperature. The color saturation is tied to the percentages in 3% groupings.

Table 5.1
Cross-Comparison Adjusted Data from Set of Creativity to Set of Understanding

Facets of Creativity	Total Data	Facets of Understanding						
		General Understanding is a personal synthesis of BOTH knowledge and creativity.	Explanation Can Explain: provide thorough, supported, and justifiable accounts of phenomenon, facts, and data.	Interpretation Can Interpret: tell meaningful stories; offer apt translations; provide a revealing historical or personal dimension to ideas and events; make it personal and accessible through images, anecdotes, analogies, and models.	Application Can Apply: effectively use and adapt what we know in diverse contexts.	Perspective Have Perspective: see and hear points of view through critical eyes and ears; see the big picture.	Empathy Can Empathize: find value in what others might find odd, alien, or implausible; perceive sensitivity on the basis of prior direct experience.	Self-Knowledge Have Self-Knowledge: perceive the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding; we are aware of what we do not understand and why understanding is so hard.
General Creativity is the drive to produce something tangible or intangible through a process resulting in a product which is born out of necessity and/or desire.	28	4	1	2	2	4	4	2
Synthesis Can Synthesize data (knowledge, expertise, ideas, and desires).	63	4	24	33	36	34	21	8
Application Can Apply that synthesis to form some thing (tangible or intangible) which has the characteristics of being both novel AND useful.	52	1	24	31	38	31	9	6
Connect Can Connect to the primordial realm or the expression of an inner essence or ultimate reality.	57	0	7	9	11	21	18	28
Imagine Can Imagine what is not there or what should be.	44	0	18	18	16	26	21	11
Openness Can establish a mindset of Openness to ideas – having no pre-set limiting barriers of prejudice, expectation, intent, or preference.	35	1	13	15	12	25	18	13
Transpose Can Transpose: making the familiar, strange and the strange familiar.	32	2	15	18	18	24	14	7

Table 5.2
Cross-Comparison Adjusted Data Percentage from Set of Creativity to Set of Understanding

Facets of Creativity	Total Data	Facets of Understanding						
		General	Explanation	Interpretation	Application	Perspective	Empathy	Self-Knowledge
General <i>Creativity is the drive to produce something tangible or intangible through a process resulting in a product which is born out of necessity and/or desire.</i>	28	14.28%	3.57%	7.14%	7.14%	14.28%	14.28%	7.14%
Synthesis <i>Can Synthesize data (knowledge, expertise, ideas, and desires).</i>	63	6.34%	38.094%	52.38%	60.32%	53.97%	33.34%	12.70%
Application <i>Can Apply that synthesis to form some thing (tangible or intangible) which has the characteristics of being both novel AND useful.</i>	52	1.92%	46.15%	59.62%	73.08%	59.62%	17.31%	11.54%
Connect <i>Can Connect to the primordial realm or the expression of an inner essence or ultimate reality.</i>	57	0.00%	12.28%	15.79%	19.30%	36.84%	31.58%	49.12%
Imagine <i>Can Imagine what is not there or what should be.</i>	44	0.00%	40.91%	40.91%	36.36%	68.42%	47.73%	25.00%
Openness <i>Can establish a mindset of Openness to ideas – having no pre-set limiting barriers of prejudice, expectation, intent, or preference.</i>	35	2.85%	37.14%	42.86%	34.29%	71.43%	51.43%	37.14%
Transpose <i>Can Transpose: making the familiar strange and the strange familiar.</i>	32	6.25%	46.89%	56.25%	56.25%	75.00%	43.75%	21.89%

Discussion

First there will be a general overview of major findings and trends. Following the general discussion will be more specific analysis by each facet of *Creativity*.

General Results Overview

In general, many of the *Creativity* facets' strongest sharing is with the *Understanding* facet of *Perspective* (4 of 7), followed by *Application* (2 of 7), then *Self-Knowledge* (1), finally, *Empathy* only has one strong second (Table 5.1). The only *Understanding* facet not to have a strongest or a second is *Explanation*. This would make sense because the *Creativity* facets appear to be more about the 'demonstration of ...,' rather than the 'explanation of....'

However, this is not to be read as no link whatsoever. As demonstrated in Table 5.2, all of the facets are related to each other in some way, based on percentage of shared data pieces. In general, the minimum percent of shared data pieces was 11.54%, with the majority above 20%, and the highest at 75% (Table 5.2). From this angle in the comparisons, the lowest strong connection is at 49.12% (*Connect to Self-Knowledge*), the remaining were all above 60%, and the highest percent is between *Transpose* and *Perspective* at 75%. Six out of the seven strongest connections were all above 60%, with 5/6ths of all connections above 20%.

Synthesis Results

For the *Creativity* facet of *Synthesis*, the highest percentage of shared data was with the *Understanding* facet of *Application*. *Interpretation* and *Perspective* are close seconds. This makes sense when we look at the definitions of the facets – *Perspective* is about looking at alternate points of view, critically. A synthesis is usually derived from the combination of ideas into a larger and more complete whole or from the conflict

between a thesis and an antithesis. One's interpretation of the background or situation, perspective for alternate points of view and ideas leads to the application of the new construct in new or different ways.

Application Results

Not surprisingly, *Application* and *Application* were strongly linked. Looking at the definitions, they say pretty much the same thing, just in different ways. The *Creativity* facet version is more specific to the *Creativity* notion of something being both novel and useful, which would explain why the strength is not 100%. It is the second strongest connection of this entire comparison at 73.03%. *Self-knowledge* is the lowest with 11.54%, the lowest of this comparison. *Explanation*, *Interpretation*, and *Perspective* also have strong connections with 46.15% and 59.52%.

Connect Results

The *Creativity* facet of *Connect* had an interesting set of results. Rather obviously, *Connect* has its strongest linking to *Self-Knowledge* at 49.12% with no close second. Both *Connect* and *Self-Knowledge* appear to address the topic of self-actualizing, so the connection makes sense. What was interesting were the clear separations: *Explanation*, *Interpretation*, and *Application* (first three of the *Understanding* facets) are all under 20%; whereas *Perspective*, *Empathy*, and *Self-Knowledge* (last three understanding facets) are over 30%.

Exploring this, *Explanation*, *Interpretation*, and *Application* seem to be more product based. Rather, *Perspective*, *Empathy*, and *Self-Knowledge* all deal with personal points of view and altering one's perspective – the person. *Perspective*, *Empathy*, and *Self-Knowledge* appear to deal with understanding the person and can be seen as ways to connect to one's inner essence.

Imagine Results

Imagine had as its strongest connection *Perspective* (68.42%) with a close second of *Empathy* (47.73%). Again, *Self-Knowledge* is the lowest link at 25% which is understandable seeing that *Self-Knowledge* is more about self actualization rather than forward thinking, seeing the larger picture, or putting yourself into someone else's shoes.

Openness Results

The strongest connection with *Openness* was *Perspective* (71.43%) – being open to other points of view. In this comparison, the lowest connection is not with *Self-Knowledge*, rather it is with *Application* (34.29%). This is the lowest strong connection in the entire comparison. Because *Openness* to ideas and perspectives are cornerstones in the field of *Creativity*, so to do they appear important to *Understanding*. One needs to have an open mind to explore topics, peoples, and one's self.

Transpose Results

The strongest connection with *Transpose* was the *Understanding* facet of *Perspective* (75%). Transposition is about making the familiar into something strange, and/or something strange into something more familiar. It requires altering the perspective to be able to see and hear alternate points of view. This altering of perspectives also aids understanding of some thing or idea because one can look at it from various points of view. The lowest connection was with *Self-Knowledge* at 21.89%, all the other *Understanding* facets have a minimum 43.75% connection, suggesting transposition is important to *Understanding*.

Level 2 Analysis of the Comparison between *Understanding* and *Creativity*

In similar fashion to the discussion of the *Creativity* facets, tables 5.3 and 5.4 will follow the same format for the discussion of the *Understanding* facets. Table 5.3 visually represents the cross-comparison between the facets of *Understanding* and the facets of *Creativity* by number of data pieces. Table 5.4 visually represents the percentage of connection between the facets.

Discussion

First there will be a general overview of major findings and trends. Following the general discussion will be more specific analysis by each facet of *Understanding*.

General Results Overview

The general trend for the *Understanding* facets connecting with *Creativity* facets was with the facets of *Synthesis* (4 of 6) and *Application* (2 of 6) followed by *Connect* (1 of 6) and *Imagine* (1 of 6). There was no strong connection for a facet with *Openness*; however, the *Understanding* facet of *Empathy* had *Openness* as a strong second. The *Creativity* facet of *Transpose* has no strong primary or secondary connection with any of the *Understanding* facets from this perspective. This makes sense because the *Understanding* facets were designed for a demonstration of understanding, so it makes more sense that *Synthesis* and *Application* connect more strongly than with an action or a mindset to reach understanding. There are two *Understanding* facets which share a strong connection with two *Creativity* facets: *Explanation* with *Synthesis* and *Application*; and *Empathy* with *Synthesis* and *Imagine*.

As data in Table 5.4 indicate there was a minimum of 15% and a maximum of 68.75% of shared data. Compared to the earlier comparison from *Creativity* to

Table 5.3
Cross-Comparison Adjusted Data from Set of Understanding to Set of Creativity

Facets of Understanding	Total Data	Facets of Creativity						
		General <i>Creativity is the drive to produce something tangible or intangible through a process resulting in a product which is born out of necessity and/or desire.</i>	Synthesis <i>Can Synthesize data (knowledge, expertise, ideas, and desires)</i>	Application <i>Can Apply that synthesis to form some thing (tangible or intangible) which has the characteristics of being both novel AND useful</i>	Connect <i>Can Connect to the primordial realm or the expression of an inner essence or ultimate reality.</i>	Imagine <i>Can Imagine what is not there or what should be.</i>	Openness <i>Can establish a mindset of Openness to ideas – having no pre-set limiting barriers of prejudice, expectation, intent, or preference.</i>	Transpose <i>Can Transpose: making the familiar strange and the strange familiar.</i>
General <i>Understanding is a personal synthesis of BOTH knowledge and creativity.</i>	5	4	4	1	0	0	0	2
Explanation <i>Can Explain: provide thorough, supported, and justifiable accounts of phenomenon, facts, and data.</i>	41	1	24	24	7	18	13	15
Interpretation <i>Can Interpret: tell meaningful stories; offer apt translations; provide a revealing historical or personal dimension to ideas and events; make it personal or accessible through images, anecdotes, analogies, and metaphors.</i>	48	3	33	31	9	17	15	18
Application <i>Can Apply: effectively use and adapt what we know in diverse contexts.</i>	61	3	36	38	11	16	12	18
Perspective <i>Have Perspective: see and hear points of view through critical eyes and ears; see the big picture.</i>	72	4	34	31	21	26	25	24
Empathy <i>Can Empathize: find value in what others might find odd, alien, or implausible; perceive sensitivity on the basis of prior direct experience.</i>	43	4	21	9	17	21	18	14
Self-Knowledge <i>Have Self-Knowledge: perceive the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding; we are aware of what we do not understand and why understanding is so hard.</i>	40	3	8	6	26	10	13	7

Table 5.4
Cross-Comparison Adjusted Data Percentage from Set of Understanding to Set of Creativity

Facets of Understanding	Total Data	Facets of Creativity						
		General <i>Creativity is the drive to produce something tangible or intangible through a process resulting in a product which is born out of necessity and/or desire.</i>	Synthesis <i>Can Synthesize data (knowledge, expertise, ideas, and desires)</i>	Application <i>Can Apply that synthesis to form some thing (tangible or intangible) which has the characteristics of being both novel AND useful</i>	Connect <i>Can Connect to the primordial realm or the expression of an inner essence or ultimate reality.</i>	Imagine <i>Can Imagine what is not there or what should be.</i>	Openness <i>Can establish a mindset of Openness to ideas – having no pre-set limiting barriers of prejudice, expectation, intent, or preference.</i>	Transpose <i>Can Transpose: making the familiar strange and the strange familiar.</i>
General <i>Understanding is a personal synthesis of BOTH knowledge and creativity.</i>	5	80.00%	80.00%	20.00%	0.00%	0.00%	0.00%	40.00%
Explanation <i>Can Explain: provide thorough, supported, and justifiable accounts of phenomenon, facts, and data.</i>	41	2.44%	58.54%	58.54%	17.07%	43.90%	31.71%	36.59%
Interpretation <i>Can Interpret: tell meaningful stories; offer apt translations; provide a revealing historical or personal dimension to ideas and events; make it personal or accessible through images, anecdotes, analogies, and models.</i>	48	6.25%	68.75%	64.58%	18.75%	35.42%	31.25%	37.50%
Application <i>Can Apply: effectively use and adapt what we know in diverse contexts.</i>	61	4.92%	59.02%	62.30%	18.03%	26.23%	19.67%	29.51%
Perspective <i>Have Perspective: see and hear points of view through critical eyes and ears; see the big picture.</i>	72	5.56%	47.22%	43.05%	29.17%	36.11%	34.72%	33.33%
Empathy <i>Can Empathize: find value in what others might find odd, alien, or implausible; perceive sensitivity on the basis of prior direct experience.</i>	43	9.30%	48.84%	20.93%	39.53%	48.84%	41.86%	32.56%
Self-Knowledge <i>Have Self-Knowledge: perceive the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding; we are aware of what we do not understand and why understanding is so hard.</i>	40	7.50%	20.00%	15.00%	65.00%	25.00%	32.50%	17.50%

Understanding the ranges are slightly narrower (11.54% - 75%). The majority of the remaining facets share 25% of the data with about 7/10 being 30% or higher. The lowest, strong connection at 47.22% was between *Perspective* and *Synthesis*. Four-sixths of the remaining connections were above 58% with the highest being 68.75%.

Explanation Results

Examining table 5.4, the *Understanding* facet of *Explanation* had two *Creativity* facets with the highest percentage of shared data – *Synthesis* and *Application*. There were no close seconds. This could be because when one explains, he/she describes a synthesis of data and possibly the application of it. The next highest facet connections were with *Imagine*, followed by *Transpose* and *Openness*. this is not unexpected in providing for a ‘thorough and justified account.’ Imagining makes a leap; transposition delves deeper by making the familiar strange; and openness allows the person to keep an open mind – all completely necessary for a thorough and supported report.

Interpretation Results

The highest connection with *Interpretation* is with the *Creativity* facet of *Synthesis* with 33 pieces (Table 5.3), a close second was with *Application* at 31 pieces of shared data. *Transpose* was third highest with 37.5% (Table 5.4). Here, the data suggest a very clear process to attain the *Understanding* facet of *Interpretation*: to offer meaningful stories; translations; and new dimensions to ideas does require the *Creativity* facets of *Transpose*, *Synthesis*, and *Application*. Transposition allows individuals to expand their horizons and delve into something or to translate by making the strange familiar, and/or the familiar strange. A person would then synthesize that newness and apply it. Appearing to supplement this process are the *Creativity* facets of *Imagine* (35.42%) and *Openness* (31.25%).

Application Results

The third highest connection with the *Understanding* facet of *Application* was the *Creativity* facet of *Application* with 63% of shared data. The major difference was that the *Creativity* version was geared more to the aspect of novel and useful. *Synthesis* was a close second with 59.02%, which makes sense because at least the definition of the *Creativity* facet of *Application* specifically states that it applies a synthesis.

Perspective Results

In the *Creativity to Understanding* analysis, *Perspective* was the major link between *Creativity* and *Understanding*. This was not the case from this analysis point of view. Of all the understanding facets, *Perspective* was the most... average. It shared 30% or more of the data with all the creativity facets, while the strongest connection was the lowest at 47.22%. It was also the facet with most pieces of data fitting into it (72/161). *Perspective* had the highest connection with *Synthesis* at 47.22%, a close second with *Application* at 43.05%, while the rest of the facets were between 30% to 35% of shared data.

In light of the definition of *Perspective*, “see and hear points of view through critical eyes and ears; see the big picture (Wiggins & McTighe, p 77);” these results would tend to make sense. It could be said that *Creativity* is about changing one’s perspective to see and be open to alternate points of view.

Empathy Results

Examining table 5.4, *Empathy* has two strong connections with the *Creativity* facets of *Synthesis* and *Imagine*, and two close seconds with *Openness* and *Connect*. All four of these connections are 42% or higher. These results are reasonable because empathy is a personal value judgment, so *Imagine*, *Openness*, and *Connect* deal more with the personal side of the *Creativity* facets. The surprise here was that *Transpose* was

not the highest, rather it was 5th, a full six percentage points below *Connect* at 32.56%.

I would have thought based on the definitions that *Transpose* with the “making the familiar strange and the strange familiar (p. 3)” would have matched well with *Empathy’s* find value in odd or alien (Wiggins & McTighe, p. 77).” One possibility was that from the *Understanding* facets, transposition is more of a process, rather than a personal perspective, in the same way that *Application* was the lowest of the *Creativity* facets to connect to Empathy. However, that does not explain *Synthesis* being one of the highest.

Self-Knowledge Results

This *Understanding* facet had the second highest connection with *Connect* at 65%, as well as the lowest connection, *Application* at 15%, in this comparison. *Self-knowledge* does not have a close second. Most of the data connected at 32.5% or lower. Both *Self-Knowledge* and *Connect* deal with self-actualizing.

Discussion of the Davis *Personality Traits*

This section contains a brief overview about why the original Davis results were omitted from the previous tables. Following, there will be a discussion of each table 5.5 (*Creativity to Understanding*) and 5.6 (*Understanding to Creativity*) separately.

Overview

The collected *personality traits* found in *Creativity is Forever* (Davis, 1999) were originally a part of this investigation; in fact they were an inspiration for the C-K-U bridge Theory in this thesis. I removed the data pieces from the main comparisons because these traits had a skewing effect on the results. However, enough data were collected and interpreted to illuminate trends, report them, and include.

Table 5.5

Cross-Comparison “Personality Trait” (Davis 1999) Data from Set of Creativity to Set of Understanding

Facets of Creativity	Total Data	Facets of Understanding						
		General Understanding is a personal synthesis of BOTH knowledge and creativity.	Explanation Can Explain: provide thorough, supported, and justifiable accounts of phenomenon, facts, and data.	Interpretation Can Interpret: tell meaningful stories; offer apt translations; provide a revealing historical or personal dimension to ideas and events; make it personal or accessible through images, anecdotes, analogies, and models.	Application Can Apply: effectively use and adapt what we know in diverse contexts.	Perspective Have Perspective: see and hear points of view through critical eyes and ears; see the big picture.	Empathy Can Empathize: find value in what others might find odd, alien, or implausible; perceive sensitivity on the basis of prior direct experience.	Self-Knowledge Have Self-Knowledge: perceive the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding; we are aware of what we do not understand and why understanding is so hard.
General Creativity is the drive to produce something tangible or intangible through a process resulting in a product which is born out of necessity and/or desire.	41	0	13	12	10	27	22	16
Synthesis Can Synthesize data (knowledge, expertise, ideas, and desires)	6	0	5	5	2	6	1	1
Application Can Apply that synthesis to form some thing (tangible or intangible) which has the characteristics of being both new AND useful	4	0	3	1	2	3	0	1
Connect Can Connect to the primordial realm or the expression of an inner essence or ultimate reality.	13	0	2	2	2	9	11	4
Imagine Can Imagine what is not there or what should be.	15	0	4	4	4	11	8	5
Openness Can establish a mindset of Openness to ideas—having no pre-set limiting barriers of prejudice, expectation, intent or preference.	27	0	7	8	6	21	18	9
Transpose Can Transpose: making the familiar strange and the strange familiar.	4	0	3	3	2	4	2	0

Table 5.6
Cross-comparison “Personality Trait” (Davis 1999) Data from Set of Understanding to Set of Creativity

Facets of Understanding	Total Data	Facets of Creativity						
		General <i>Creativity is the drive to produce something tangible or intangible through a process resulting in a product which is born out of necessity and/or desire.</i>	Synthesis <i>Can Synthesize data (knowledge, expertise, ideas, and desires)</i>	Application <i>Can Apply that synthesis to form some thing (tangible or intangible) which has the characteristics of being both novel AND useful</i>	Connect <i>Can Connect to the primordial realm or the expression of an inner essence or ultimate reality.</i>	Imagine <i>Can Imagine what is not there or what should be.</i>	Openness <i>Can establish a mindset of Openness to ideas – having no pre-set limiting barriers of prejudice, expectation, intent, or preference.</i>	Transpose <i>Can Transpose: making the familiar strange and the strange familiar.</i>
General <i>Understanding is a personal synthesis of BOTH knowledge and creativity.</i>	0	---	0	0	0	0	0	0
Explanation <i>Can Explain: provide thorough, supported, and justifiable accounts of phenomenon, facts, and data.</i>	13	---	5	3	2	4	7	3
Interpretation <i>Can Interpret: tell meaningful stories; offer apt translations; provide a revealing historical or personal dimension to ideas and events; make it personal or accessible through images, anecdotes, analogies, and models.</i>	11	---	5	1	2	4	8	3
Application <i>Can Apply: effectively use and adapt what we know in diverse contexts.</i>	9	---	2	2	2	4	6	2
Perspective <i>Have Perspective: see and hear points of view through critical eyes and ears; see the big picture.</i>	27	---	6	3	9	11	21	4
Empathy <i>Can Empathize: find value in what others might find odd, alien, or implausible; perceive sensitivity on the basis of prior direct experience.</i>	22	---	1	0	12	8	18	2
Self-Knowledge <i>Have Self-Knowledge: perceive the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding; we are aware of what we do not understand and why understanding is so hard.</i>	15	---	1	1	6	5	9	0

Facets of *Creativity* to Facets of *Understanding* Results

Evident in Table 5.5, the clear trend for the *Creativity* facets is still with the *Understanding* facet of *Perspective*. Five out of the six facets have *Perspective* as the strongest connection. The *Understanding* facets of *Application* and *Self-Knowledge* do not have any strong or second strongest connections. In a switch from table 5.1, the *Creativity* facets of *Synthesis* and *Application* shifted from connecting with the *Understanding* facet of *Application* to *Perspective*. *Connect* shifted from a strong connection with *Self-Knowledge* to connecting with *Empathy*. The *Creativity* facet of *Application* gained *Explanation* as a strongest connection as well.

Facets of *Understanding* to Facets of *Creativity* Results

As the notes in Table 5.6 state, the yellow column was zeroed out since the “Total Data” was the same number as all of the *Personality Traits* which fell into the *Creativity* general catch-all category. None of the *Personality Traits* fell into the *Understanding* general category. From this perspective, it is clear that the *Personality Traits* align with the *Creativity* facet of *Openness*. In fact, all 6 of the facets have their strongest connection with *Openness*. This makes sense when looking at the definition of openness, ‘having no pre-set limiting barriers or prejudice, expectation, intent, or preference (pg, 3);’ pretty much what the *Personality Traits* describe as a creative individual (Appendix E).

Summary

In this chapter, the level two analysis for the investigation into the relationship between general *Creativity* concepts and *Understanding* as defined in Understanding

by Design (Wiggins & McTighe, 1998). From the point of view of *Creativity* facets connecting with the facets of *Understanding* it was demonstrated that *Creativity* connects most strongly with the facet of Perspective (4 of 6). From the perspective of *Understanding*, the general trends were to connect with the *Creativity* facets of *Synthesis* (4 of 6) and *Application* (2 of 6). It was also demonstrated that the *Creativity* facet of *Connect* and the *Understanding* facet of *Self-Knowledge* were linked by the common thread of self-actualization. Finally, for the *Personality Traits* described in *Creativity is Forever* (Davis, 1999), it was found that they align with the *Understanding* facet of *Perspective* and the *Creativity* facet of *Openness*.

The next chapter will discuss the final level of analysis. These connections will be examined in further detail, and insights gleaned from the data.

CHAPTER 6: FINAL ANALYSIS OF THE COMPARISON BETWEEN THE FACETS OF *CREATIVITY* AND THE FACETS OF *UNDERSTANDING*

Chapter Overview

This chapter contains results of the third and final level of analysis of the relationship between *Creativity* and *Understanding*. This chapter will present discussion of the cross-comparison averages between the *Set of Creativity* and the *Set of Understanding*. Facilitating this data presentation will be Table 6.1, the cross-comparison of the data averages from the *Set of Creativity* to the *Set of Understanding*, followed by a discussion of the key findings linking *Creativity* to *Understanding*. Finally, this chapter will dig deeper into the relationship between *Creativity* and *Understanding* through the results of analysis of the facets of *Perspective*, *Empathy*, *Synthesis*, *Application*, *Transpose*, *Connect*, and *Self-Knowledge*.

Discussion of the Cross-Comparison of the Data Averages from the *Set of Creativity* to the *Set of Understanding*.

Explanation of Table 6.1

Table 6.1, “Cross-comparison adjusted data percentage averages from *Set of Creativity* to *Set of Understanding*” is a comprehensive visual on the relationship between *Creativity* and *Understanding*. I took Table 5.2 and averaged each cell of comparison with the same cell comparison in Table 5.4. I then added the original “total data” column from table 5.4 and turned it into a row just below the facets of *Understanding*. I did this to cement the fact that each facet had a different number of data points from the overall data, and so, the only way to have a table of cross-comparison was by the

Table 6.1
Cross-Comparison Adjusted Data Percentage Averages from Set of Creativity to Set of Understanding

Facets of Creativity	Total Data	Facets of Understanding						
		General	Explanation	Interpretation	Application	Perspective	Empathy	Self-Knowledge
Total Data		5	41	48	61	72	43	40
General <i>Creativity is the drive to produce something tangible or intangible through a process resulting in a product which is born out of necessity and/or desire.</i>	28	47.14%	3.01%	6.70%	6.03%	9.92%	11.79%	7.32%
Synthesis <i>Can Synthesize data (knowledge, expertise, ideas, and desires)</i>	63	43.17%	48.32%	60.57%	59.67%	50.60%	41.09%	16.35%
Application <i>Can Apply that synthesis to form some thing (tangible or intangible) which has the characteristics of being both novel AND useful</i>	52	10.96%	52.35%	62.10%	67.69%	51.34%	19.12%	13.27%
Connect <i>Can Connect to the primordial realm or the expression of an inner essence or ultimate reality.</i>	57	0.00%	14.68%	17.27%	18.67%	33.01%	35.56%	57.06%
Imagine <i>Can Imagine what is not there or what should be.</i>	44	0.00%	42.41%	38.17%	31.30%	52.27%	48.29%	25.00%
Openness <i>Can establish a mindset of Openness to ideas – having no pre-set limiting barriers of prejudice, expectation, intent, or preference.</i>	35	1.43%	34.43%	37.06%	26.98%	53.08%	46.65%	34.82%
Transpose <i>Can Transpose: making the familiar strange and the strange familiar.</i>	32	23.13%	41.74%	46.88%	42.88%	54.17%	38.16%	19.70%

strength of connection percentages. This connection, based on percentage of shared data pieces represents the conceptual connections between facets and between *Creativity* and *Understanding*.

Discussion of General Trends Evident in Table 6.1

This section will examine the general trends from the cross-comparison of the data averages to illuminate where and in what ways the facets of *Creativity* and the facets of *Understanding* are linked. This section will also examine apparent clusters found in the data.

General Overview

The research findings do suggest some kind of conceptual link between *Creativity* and *Understanding* because out of 161 (adjusted) pieces of data, 100% of that data connected to either *Creativity* or *Understanding*. Data supporting this link was spread in a range from 19.75% to 44.72% of the overall data that fit per facet. In the cross-comparisons, the average percent of the shared data pieces narrowed compared to Tables 5.2 and 5.4.

The strongest connection between facets was between the *Understanding* facet of *Application* and the *Creativity* facet of *Application* at 67.69%. Both were about applying something; for *Creativity* it was the generation of something new and useful from a synthesis, and for *Understanding* it is about applying in diverse contexts. They were similar, but have different end results.

The lowest average connection between facets was between the *Understanding* facet of *Self-Knowledge* and the *Creativity* facet of *Application* at 13.27% (Table 6.1). *Application* is about producing some thing, either tangible or intangible. *Self-Knowledge* deals with self-actualization. That said, there was a 13% strength in connection so

they were not entirely opposite each other. Because there was a connection between these two facets (Table 6.1) the definitions of the facets may disjoint them. However, the connection may be as simple as noting that if someone were to create an intangible thing that was both novel and useful for themselves, that could lead to better self-understanding, and self-understanding could lead to a novel and useful leap.

Examination of Clusters Found in the Data

Through the cross-comparison averages, several trends were evident. Examining the connection between facets by the percentage of shared data pieces, there was an obvious clustering between the *Understanding* facets of *Explanation*, *Interpretation*, *Application*, and *Perspective* with the *Creativity* facets of *Synthesis* and *Application*, between 48.32% and 67.67%. Those *Understanding* facets revolved around producing something which demonstrates one's own understanding – either the actual product or the process of being open and critical. The *Creativity* facets dealt in the creation of something new.

The next clustering of the data averages was with most of the facets of *Creativity* and the *Understanding* facet of *Perspective*. The highest connection for *Perspective* was with *Transpose* (54.17%); the lowest was with the *Creativity* facet of *Connect* (33.01%). Most of the confluence of data was in the 50% range. This suggested a connection in the areas of affirmative judgment and keeping an open mind.

Another cluster was between the *Creativity* facets of *Imagine*, *Openness*, and *Transpose* with most of the facets of *Understanding* (hovering in the 30% to 50% range). One's being open to new ideas, being able to imagine and leap to something new, and to be able to morph something from the familiar to the strange or unique may lend itself quite handily to being able to effectively understand – to keep open to alternate possibilities, other mindsets, and alternate pieces of data.

Finally, the last major trend evident from Table 6.1 was in the facets of *Connect* to *Self-Knowledge*. Looking at each facet's trend, it was clear that the connections were weaker – in the teens for half of the comparisons, then 20's and 30's, and a jump to 57.06% where these two facets met. Both of these facets deal with the process of self-actualizing. Looking at this trend, we see that those facets pertaining to products or applying something were lower than those facets dealing with the personal level.

The *Creativity* facet of *Synthesis* was strongly linked to five of six *Understanding* facets: *Explanation*, *Interpretation*, *Application*, *Perspective*, and *Empathy* with 41.09% to 60.57% of shared data pieces (Table 6.1). Because these *Understanding* facets dealt with the articulation of an understanding, *Synthesis* can be seen as the foundation for each of those *Understanding* facets.

Based on the averages of shared data pieces, the *Understanding* facet of *Empathy* connected strongly to 5/6ths of the facets of *Creativity* with a range from 35.56% to 48.29% (Table 6.1). The stronger connections to *Empathy* were with those *Creativity* facets that dealt with the person being open – *Imagine*, *Openness*, and *Synthesis*. The significance of this for creativity revolves around values. *Perspective* is being open. *Empathy* is valuing those alternate points of view, data, customs, or ideas.

Digging Deeper

Relationships can be messy, and complicated. The relationship between *Creativity* and *Understanding*, while not completely ironed out, can be simplified to a point. The findings of this thesis so far have suggested mutual support between the *Creativity* and *Understanding* facets: which appeared to be symbiotic. Through the analysis of the connections and definitions of the facets of *Perspective*, *Empathy*, *Synthesis*, *Application*, *Transpose*, *Connect*, and *Self-Knowledge* this deeper relationship between *Creativity* and *Understanding* can be illuminated.

Perspective

There was a clear relationship between most of the facets of *Creativity* and the *Understanding* facet of *Perspective*. Most of the confluence of data was in the 50% range. But, *Creativity* was not just *Perspective* in the Understanding by Design model (Wiggins & McTighe, 1998), rather it was a point where the two met on the grounds of affirmative judgment and keeping an open mind.

Perspective is defined as the ability and mode of operation where we “See and hear points of view through critical eyes and ears; see the big picture.(p. 44)” and “a penetrating and novel viewpoint; effectively critiques and encompasses other plausible perspectives; takes a long and dispassionate, critical view of the issues involved (p. 77).” Based on these definitions, it was clear why *Perspective* linked with *Creativity*. *Creativity* professionals and practitioners often profess affirmative judgment, keeping an open mind, searching for the alternate possibilities as bedrock for being able to create an outcome that is both novel and useful, and thus creative. (Wiggins & McTighe, 1998)

Empathy

The *Understanding* facet of *Empathy* connected strongly to 5/6ths of the facets of *Creativity* with a range from 35.56% to 48.29% (Table 6.1). *Empathy* is defined by Wiggins & McTighe (1998) as, “find value in what others might find odd, alien, or implausible; perceive sensitivity on the basis of prior experience (p. 44).” and “disposed to see and feel what others see and feel; unusually open to and willing to seek out the odd, alien, or different (p. 77).” If one truly understands something they can empathize, or put themselves in the shoes of others.

As Table 5.1 demonstrated, *Empathy* was often a close second to *Perspective*. The stronger connections were with those *Creativity* facets that dealt with the person being open – *Imagine*, *Openness*, and *Synthesis*. The significance of this for *Creativity* revolved around values. *Perspective* is being open; *Empathy* is valuing those alternate

points of view, data, customs, or ideas. By truly valuing alternate ideas, and viewpoints, one can gain understanding and insight to make the next leap or spark a new idea.

Synthesis

The *Creativity* facet of *Synthesis* was strongly linked to five of six *Understanding* facets: *Explanation*, *Interpretation*, *Application*, *Perspective*, and *Empathy* at a range between 41.09% and 60.57% (Table 6.1). The definition of the facet of *Synthesis* is “can synthesize data (knowledge, expertise, ideas, and desires (pg. 3).” Because these *Understanding* facets dealt with the articulation of an understanding, *Synthesis* could be seen as the foundation for each of the *Understanding* facets.

These facets required justification, support, translations, personal interpretations, being open to and valuing ideas and viewpoints. A synthesis is usually the result of a conflict between a thesis and an antithesis. To do just that requires open and critical examination. Through this combination, one can gain an understanding of a rich and complex thing or idea.

Application

As a facet of *Creativity*, *Application* was strongly linked to four out of five of the *Understanding* facets (51.34% or higher) with two of the connections being the strongest of the entire cross-comparison – *Interpretation* at 62.10% and *Application* at 67.69%. The *Understanding* facets of *Empathy* and *Self-Knowledge* fell lower with 19.12% and 13.27% respectively. As has been stated in Chapters 5 and 6, the *Creativity* facet of *Application* dealt with the generation of something that was both novel and useful; the *Understanding* facet of *Application* dealt with the effective use and adaptation into diverse contexts. For *Understanding*, the *Creativity* facet of *Application* supported a personal new and useful understanding from a synthesis of alternate points of view to create a justifiable explanation, a meaningful and rich interpretation.

Transpose

The *Creativity* facet of *Transpose* was the smallest of the facets in amount of data collected, yet in terms of connecting to the *Understanding* facets it was integrated, connecting at a range peaking at 54.17%. This confluence demonstrated a consistent link with the facets of *Understanding*.

When reviewing the data pieces which fit with *Transpose*, a large number were also shared with *Synthesis*. However, *Transpose* is a different mental action. *Synthesis* is a coming together and merging. *Transpose* is a complete morphing of a familiar concept into something strange or unfamiliar, or taking something strange and morphing it into something more familiar to better understand all the complexities of a thing or idea. That is the key, this mental gymnastics exercise of forcing a different perspective aids in the understanding of the topic, idea, or problem.

Connect – Self-knowledge

These two facets were definitely linked because both methods of clustering the data have demonstrated that these two facets go together, without a close second. Of all the facet connections, this seems to be where the two *Sets of Creativity* and *Understanding* actually link. Both the facets of Self-Knowledge and Connect pertain to different aspects of the larger topic of self-actualization. As the definition from the facets of *Creativity*, the facet of *Connect* is: “*Connect* to the primordial realm or the expression of an inner essence or ultimate reality.” Lubart (2002) added to this idea by stating: “... this conceptualization is similar to humanistic psychology’s conception of creativity as part of self-actualization (p. 340).” In *Understanding by Design* (Wiggins & McTighe, 1998) the definition of *Self-Knowledge* is:

perceive the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding; we are aware of what we do not understand and why understanding is so hard (p. 44). ...deeply aware of the boundaries of one’s own and others’ understanding; able to recognize his

prejudices and projections; has integrity – able and willing to act on what one understands (p. 77)

From the data collected, Maslow (in Parnes 1992) stated:

Any technique which will increase self-knowledge in depth should in principle increase one's creativity (p. 103). Once we transcend and resolve this dichotomy [between conscious and unconscious in order to create], once we can put these together into the unity in which they are originally... then we can recognize the dichotomizing or the splitting is itself a pathological process. And then it becomes possible for your civil war to end. This is precisely what happens in people that I call self-actualizing (p. 103).

Supporting the relationship to self-actualization are the data in Table 6.1 where the two facets were weakest against all other facets except each other where there is a minimum 20 percentage point increase over the next facet. This thesis was initiated to look at a theoretical construct suggesting that *Creativity*, *Knowledge*, and *Understanding* were linked. This indicated a common thread between the two definitions in that the growth of creativity or growth in one's own creativity and growth in understanding are part of a person's self-actualizing.

Summary

Results of the analysis presented here indicated that there are clusters of connections which suggest a moderate to strong link between the facets of *Creativity* and the facets of *Understanding*. Examining the facets of *Perspective*, *Synthesis*, *Empathy*, *Application*, *Self-Knowledge*, and *Connect* demonstrate the relationship appears to be a mutually supportive symbiosis between the *Creativity* and *Understanding* facets. This symbiosis from *Creativity* strengthens and supports the *Understanding* facets, and from *Understanding* strengthens and supports the *Creativity* facets.

CHAPTER 7: CONCLUSIONS, IMPLICATIONS, NEXT STEPS, AND FINAL THOUGHTS

Chapter Overview

This chapter is divided into two sections. The first will present the conclusions from the questions this thesis addressed: *What is the relationship between general Creativity and Understanding, as defined by the Understanding by Design (UbD) model? What is similar; what is different between the UbD model and general creativity concepts? What are the implications for the domain of Creativity?.* The final section will present next steps that can be taken from the findings of this thesis.

Conclusions

What was the Relationship between General Creativity and Understanding, as Defined by the Understanding by Design (UbD) Model?

Relationships, as any wise man or woman knows, can be messy and complicated. Based on this exploratory investigation, so too is the one between *Creativity* and *Understanding*. Although each concept was defined using individual, and mutually supported facets, the definitions of these individual facets were loose and sometimes seemingly incongruent with the other facets under comparison. While this may have seemed chaotic, an accurate description of the relationship appeared more like a rich tapestry in which these disparate facets lent support and interwove with each other.

Based on the analysis in this study, the relationship between *Creativity* and *Understanding* was symbiotic in that the concepts and meaning of the facets of both *Creativity* and *Understanding* mutually supported each other. This symbiosis creates

an infinite circular process continuum where *Creativity* supports *Understanding* which supports new creative endeavors which then supports new understandings. This was best exemplified through the analysis of the facets of *Perspective*, *Synthesis*, *Empathy*, *Application*, *Self-Knowledge*, and *Connect*.

- The *Understanding* facet of *Perspective* supported the underlying *Creativity* mindset of affirmative judgment.
- The *Understanding* facet of *Empathy* supported the *Creativity* facets of *Imagine*, *Openness*, and *Synthesis* by demonstrating the value the mindset of openness to ideas and alternate points of view.
- The *Creativity* facet of *Synthesis* supported the *Understanding* facets by serving as a foundational process by which a person's understanding is supported.
- The *Understanding* facet of *Application* supported *Creativity* by demonstrating the effective use and adaptation of creativity concepts in diverse contexts.
- The *Creativity* facet of *Application* supported the presentation of personal new and useful understandings.
- The *Creativity* facet of *Transpose* supported *Understanding* because the mental gymnastics of forcing an alternate point of view onto some thing or idea that is essentially different, aided the understanding of the new elements that were formed. By taking something familiar and making it strange, or making something strange familiar, both new and existing structures, principles, and patterns can be better understood and articulated as novel thinking and outcomes.
- Finally, the basic elements of the *Creativity* facet of *Connect* and the *Understanding* facet of *Self-Knowledge* related to the process of self-actualization. This process increases a person's understanding and

creativity in regard to personal growth and development, and was the engine behind the symbiotic process continuum.

What was Similar; What was Different between the UbD Model and General Creativity Concepts?

What was Similar?

- *Creativity* and *Understanding* concepts aligned with basic premises of the process of self-actualization.
- The *Creativity* facets of *Synthesis*, *Application*, and *Transpose* aligned with the *Understanding* facets of *Explanation*, *Interpretation*, *Application*, and *Perspective* as part of a process that leads to a product.
- The facets of *Creativity* and *Understanding* have, as an underpinning, the value of affirmative judgment – keeping an open mind, see and hear points of view, and being open to one’s own limitations.

What was Different?

- *Creativity* facets by their basic definition and context dealt with the creation of some thing or idea.
- *Understanding* facets by their basic definition and context dealt with the comprehension of some thing or idea. It was these basic differences that added depth to the relationship.
- Each one has a different stated end result, create some thing or idea that is new vs. grasping an understanding of some thing or idea.
- The Understanding by Design model is part of an educational paradigm which aids in determining whether a product demonstrates understanding.
- The *Creativity* facets describe how and in what ways people create.

What are the Implications for the Domain of *Creativity*?

The implications for the domain of *Creativity* (Murdock, 2003, Csiksentmihalyi in Sternberg, 2002, Magyari-Beck in Runco, 1999, Kauffman in Isaksen, et. al., 1993) that this thesis presented were in the realm of conceptual clarity. Kauffman (1993) identified conceptual clarity as the building up and clarification of the theoretical foundations for the discipline [domain]. He described a need to compare creativity against other disciplines to better understand the conceptual parameters of the topic and to more clearly articulate how its concepts relate to other domains. Kauffman builds off of the work of Phenix (1965), who described three dimensions to measure the quality of a discipline – Analytic Simplification, Synthetic Coordination, and Dynamism. The following describes each dimension and how this thesis supports the conceptual clarity for the domain of *Creativity*.

Analytic Simplification

Phenix (1965) described Analytic Simplification in the following way:

A discipline is essentially nothing more than an extension of ordinary conceptualization. It is a conceptual system whose office is to gather together a large group of cognitive elements into a common framework of ideas. ... its goal is the simplification of understanding. This is the function of the techniques, models, and theories which are characteristics of any discipline. They economize thought by showing how diverse and apparently disparate elements of experience can be subsumed under common interpretive and explanatory schemes (p. 61).

Kauffman described analytic simplification as a common framework. In this thesis the multifaceted definition of *Creativity* was that framework. The definition of *Creativity* was pulled out of the *Creativity* literature, clarified from the various points of

view of what the literature indicated defined as creativity, what made something creative, and descriptions of creative processes. That synthesized definition was connected to the broader field of *Understanding* and then analyzed for content connections. The results bring conceptual clarity to the relationship between *Creativity* and *Understanding*, as well as clarity to *Creativity* itself.

Synthetic Coordination

Phenix (1965) described synthetic coordination in the following way:

The simplifications of abstraction make possible the construction of cognitive complexes – i.e., the weaving together of ideas into coherent wholes. Concepts are no longer entertained in isolation, but are seen in their interconnections and relationships (p. 62).

In this thesis, the synthesized definition of *Creativity* itself was the result of weaving of various concepts in the literature ranging from the domain specific (Baer in Runco, 1999), Creatology (Magyari-Beck in Runco, 1999), other definitions of creativity (Aleinikov, et al., 2000, Fox & Fox 2004), and the discussion around eastern and western concepts of creative expression (Lubart in Sternberg, 2002). The definition provided order for examining, at the most basic level, the interconnections of the thoughts and ideas compiled under the rubric of *Creativity*.

Thus, the thesis itself was a simplification of an abstraction: the relationship between general *Creativity* concepts and the Understanding by Design model for *Understanding* (Wiggins & McTighe, 1998). Through the research process and the three levels of analysis, the relationship was simplified to one that was symbiotic, in that the concepts and meaning of the facets of both *Creativity* and *Understanding* mutually supported each other.

Dynamism

Phenix (1965) described dynamism in the following way:

By this is meant the power of leading on to further understandings. A discipline is a *living* body of knowledge, containing within itself a principle of growth. Its concepts do not merely simplify and coordinate; they also invite further analysis and synthesis. A discipline contains a *lure to discovery* (p. 63).

This thesis built off of previous knowledge from the domain of creativity when a synthesized a definition of *Creativity* was used. Through the analysis of that definition compared to another concept, *Understanding*, growth of the domain through an articulation of enlarged and enriched connections found in the similarities, differences, strengths of relationships, and the description of the symbiosis.

Part of the dynamism that this thesis presents would be a call for continued exploratory and development work to establish more of a balance between exploratory thinking and confirmatory thinking in the domain. This is akin to what Kauffman wrote in 1993 (In Isaksen et al), “It may be argued that the research program in creativity has been driven too exclusively from an operational ‘bottom up’ perspective, where development of tests of creativity has taken priority over the clarification of basic conceptual and theoretical issues (p.141).” To follow up more conceptual work in both the domain of *Creativity* and in its relationships to a variety of other domains with both analysis and synthesis is needed.

The dynamism or energy for growth inherent in the domain of *Creativity* as defined here also spills into other domains. Results from this thesis indicate that *Understanding* and UbD can strengthen our specificity and accurate use of *Creativity* terms, concepts and uses. *Creativity* lends support and strength to *Understanding* and Understanding by Design (Wiggins & McTighe, 1998) which can spark new ideas and thinking into completely different domains.

Next Steps

The dynamism of conceptual development between *Creativity* and *Understanding* does not end with this thesis; rather, this work has the potential to spark more study into this relationship. There are a number of steps that might be taken to expand, clarify and further verify the initial similarities and differences between *Creativity* and *Understanding*.

- To verify the results, the raw data could be re-evaluated using the same definitions of *Creativity* and *Understanding*.
- To clarify the similarities and differences between *Creativity* and *Understanding* would include a re-evaluation of the *Personality Traits* from *Creativity is Forever* (Davis, 1999) utilizing the same definitions of *Creativity* and *Understanding*.
- To further expand upon the similarities and differences between *Creativity* and *Understanding* it will be important to compare these faceted definitions based on new data sets. This data would include sources from the *Creativity* literature that were not included in this study.
- This relationship between *Creativity* and *Understanding* should be compared to models, paradigms, and curriculums which pertain to education. The symbiotic relationship between *Understanding* and *Creativity* is going to be vitally important to the education processes here in the United States and globally, as the importance and need for teaching for understanding grows.
- *Understanding by Design* (Wiggins & McTighe, 1998) describes a process for designing a curriculum, unit, or lesson to lead to student understanding. Puccio, Murdock, and Mance (2007) articulate the idea of the creative problem solving process in terms of a thinking skills

model. Based on the relationship between *Creativity* and *Understanding* articulated in this thesis designed understanding and creative thinking skills should be compared the Designed Thinking process (Brown, 2008, Burney quoted in Hyer, 2006) and to the Thinking Classroom from Project Zero (Tishman, Perkins, and Jay, 1995).

Another next step would be to further clarify and expand upon the support for the multifaceted definition of *Creativity*.

- To further clarify the facets of *Creativity*, they should be compared to the 4-P's model described by Rhodes (1956, 1961) and rearticulated by Fox & Fox (2004).
- To further expand upon the support of the *Creativity* facets it will be important to compare these faceted definitions to new data sets. This data would include sources from the *Creativity* literature that that were not included in this study. Also, it would be important to compare the facets to the Creative Problem Solving Process(es) – thinking skills model, version 5, v6.01.2, etc.
- It would also be important to compare the multifaceted definition of *Creativity* to other similar problem solving processes like Design Thinking (Brown, 2008).
- Lastly, the multifaceted definition of *Creativity* should be compared to models of creativity which pertain to education, because the domain of *Creativity* is going to be vitally important to the education processes here in the United States and globally (Friedman, 2006, Pink, 2005). Ken Robinson (2006) professes the idea that schools teach students out of their natural creativity. As the importance and need for creative potential is understood, so *Creativity* should be easily transferable in a coherent manner.

Final Thoughts

This thesis illustrated the mutual support that exists between *Creativity* and *Understanding*. In a speech to the TED Conference, Robinson (2006) stated:

And my contention is, all kids have tremendous talents and we squander them, pretty ruthlessly. ... My contention is that creativity now is as important in education as literacy, and we should treat it with the same status. ...

kids will take a chance. If they don't know, they'll have a go. Am I right? They're not frightened of being wrong. Now, I don't mean to say that being wrong is the same thing as being creative. What we do know is, if you're not prepared to be wrong, you'll never come up with anything original. If you're not prepared to be wrong. And by the time they get to be adults, most kids have lost that capacity. They have become frightened of being wrong.

And we run our companies like this, by the way, we stigmatize mistakes. And we're now running national education systems where mistakes are the worst thing you can make.

And the result is, we are educating people out of their creative capacities. ... What I think it comes to is this: Al Gore spoke the other night about ecology and the revolution that was triggered by Rachel Carson. I believe our only hope for the future is to adopt a new conception of human ecology, one in which we start to reconstitute our conception of the richness of human capacity. Our education system has mined our minds in the way that we strip-mine the earth, for a particular commodity, and for the future, it won't serve us.

Robinson's speech spoke to the need our society is facing, the need for creativity in reforming our world. This kind of change cannot occur without a deeper understanding of *Creativity* and how it functions. Robinson spoke of the need for major change, for that to happen, more conceptual clarity is needed, and this thesis is a step in that direction.

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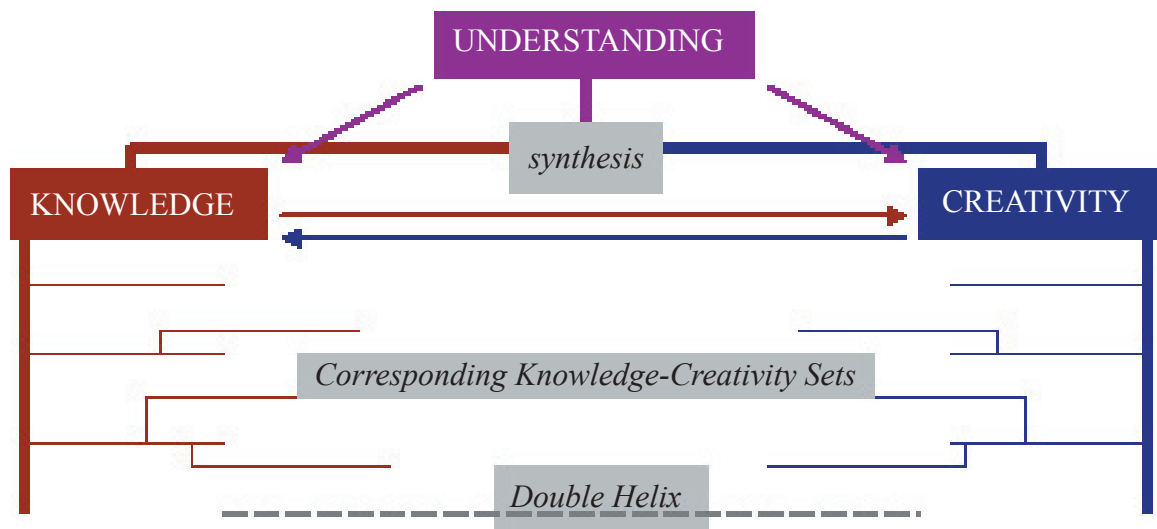
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APPENDIX A: C-K-U BRIDGE THEORY

(Human) Understanding is a synthesis of BOTH knowledge and creativity. Knowledge is its own domain with specific fields and skill sets. Creativity is its own domain with field specific sets corresponding to the knowledge domain.

The relationship between Creativity, Knowledge, and Understanding is symbiotic. The continued attainment of knowledge requires a form of prior understanding and creativity. Creativity requires some form of prior knowledge and understanding.



- *Creativity is its own domain (As evidenced by the enormous literature including: Isaksen, 1995; Magyari-Beck, 1999; Murdock, 2003) with specific skill sets that relate specifically to the domains of knowledge (Baer, 1999)*
- *Recognized knowledge domains and fields are those defined within the Library of Congress Catalogue of Subject Headings, as well as the work by Kipper on The order of things(2001).*
- *Creativity and Knowledge interact and require each other (Noller, in Campos, 2000; Csiksentmihalyi 2002; Collins & Amabile 2002; Fox & Fox, 2004)*
- *The whole of human knowledge can be described as a domain “tree” moving from the most general category to the most specific category of data (Kipper, 2001; Library of Congress Catalogue of Subject Headings, 2004; Wikipedia, 2004).*

APPENDIX B: UNDERSTANDING BY DESIGN

<u>Explanation</u>	<u>Interpretation</u>	<u>Application</u>
<i>Sophisticated</i> : an unusually thorough, elegant, and inventive account (model, theory, or explanation); fully supported, verified, and justified: deep and broad: goes well beyond the information given.	<i>Profound</i> : a powerful and illuminating interpretation and analysis of the importance, meaning, significance; tells a rich and insightful story; provides a rich history or context; sees deeply and incisively any ironies in the <u>different interpretations</u> .	<i>Masterful</i> : fluent, flexible, and efficient; able to use knowledge and skill and adjust understanding well in novel, diverse, and difficult contexts.
<i>In-depth</i> : an atypical and revealing account, going beyond what is obvious or what was explicitly taught; makes subtle connections; well supported by argument and evidence; novel thinking displayed.	<i>Revealing</i> : a nuanced interpretation and analysis of the importance, meaning, significance; tells an insightful story; provides a telling history or context; sees subtle differences, levels, and ironies in <u>diverse interpretations</u> .	<i>Skilled</i> : competent in using knowledge and skill and adapting understandings in a variety of appropriate and demanding contexts.
<i>Developed</i> : an account that reflects some in-depth and personalized ideas: the student is making the work her own, going beyond the given – there is supported theory here, but insufficient or inadequate <u>evidence and argument</u> .	<i>Perceptive</i> : a helpful interpretation or analysis of the importance, meaning, significance; tells a clear and instructive story; provides a useful history or context; sees different levels of interpretation.	<i>Able</i> : able to perform well with knowledge and skill in a few key contexts, with a limited repertoire, flexibility, or adaptability to diverse contexts.
<i>Intuitive</i> : an incomplete account but with apt and insightful ideas; extends and deepens some of what was learned; some “reading between the lines”; account has limited support, argument, data or sweeping generalizations. There is a theory, but one with <u>limited testing and evidence</u> .	<i>Interpreted</i> : a plausible interpretation or analysis of the importance, meaning, significance; makes sense of a story; provides a history or context.	<i>Apprentice</i> : relies on a limited repertoire of routines; able to perform well in familiar or simple contexts, with perhaps some needed coaching, limited use of personal judgment and responsiveness to specifics of feedback/situation.
<i>Naïve</i> : a superficial account; more descriptive than analytical or creative; a fragmentary or sketchy account of facts and/or ideas or glib generalizations; a black-and-white account’ less a theory than an unexamined <u>hunch or borrowed idea</u> .	<i>Literal</i> : a simplistic or superficial reading; mechanical translation’ a decoding with little or no interpretation; no sense of wider importance or significance; a restatement of what was taught or read.	<i>Novice</i> : can perform only with coaching or relies on highly scripted, singular “plug-in” (algorithmic and mechanical) skills, procedures, or approaches.

From: Wiggins, G. & McTigue, J (1998). *Understanding by Design*. Alexandria, VA:

<u>Perspective</u>	<u>Empathy</u>	<u>Self-Knowledge</u>
<i>Insightful</i> : a penetrating and novel viewpoint; effectively critiques and encompasses other plausible perspectives; takes a long and dispassionate, critical view of the issues involved.	<i>Mature</i> : disposed and able to see and feel what others see and feel; unusually open to and willing to seek out the odd, alien, or different.	<i>Wise</i> : deeply aware of the boundaries of one's own and others' understanding; able to recognize his prejudices and projections; has integrity – able and willing to act on what one understands.
<i>Thorough</i> : a revealing and coordinated critical view/ makes own view more plausible by considering the plausibility of other perspectives; makes apt criticisms, discriminations, and qualifications.	<i>Sensitive</i> : disposed to see and feel what others see and feel; open to the unfamiliar or different.	<i>Circumspect</i> : aware of one's ignorance and that of others; aware of one's prejudices; knows the strengths and limits of one's understanding.
<i>Considered</i> : a reasonably critical and comprehensive look at all points of view in the context of one's own; makes clear that there is plausibility to other points of view.	<i>Aware</i> : knows and feels that others see and feel differently; somewhat able to empathize with others; has difficulty making sense of odd or alien views.	<i>Thoughtful</i> : generally aware of what is and is not understood; aware of how prejudice and projection can occur without awareness and shape one's views.
<i>Aware</i> : knows of different points of view and somewhat able to place own view in perspective, but weakness in considering worth of each perspective or critiquing each perspective, especially one's own; uncritical about tacit assumptions.	<i>Developing</i> : has some capacity and self-discipline to "walk in another's shoes," but is still primarily limited to one's own reactions and attitudes; puzzled or put off by different feelings or attitudes.	<i>Unreflective</i> : generally unaware of one's specific ignorance; generally unaware of how subjective prejudgments color understandings.
<i>Uncritical</i> : unaware of differing points of view; prone to overlook or ignore other perspectives; has difficulty imagining other ways of seeing things; prone to egocentric argument and personal criticisms.	<i>Egocentric</i> : has little or no empathy beyond intellectual awareness of others; sees things through own ideas and feelings; ignores or is threatened or puzzled by different feelings, attitudes, or views.	<i>Innocent</i> : completely unaware of the bounds of one's understanding and of the role of projection and prejudice in opinions and attempts to understand.

From: Wiggins, G. & McTigue, J (1998). *Understanding by Design*. Alexandria, VA:

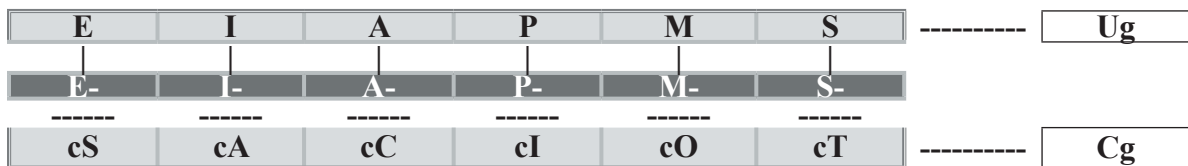
ASCD p. 77

APPENDIX C: CODING MATRIX

(Modified form of the UbD model found in *Understanding by Design* [1998, Appendix B])

Creativity literature data sources will be coded by letter of the facet(s) that they correspond to. These will be retyped in a separate database (Appendix F), this code will be used to plug into the main matrix (Appendix D), rather than full text.

E	Explanation	cS	Synthesis
I	Interpretation	cA	Application
A	Application	cC	Connect
P	Perspective	cI	Imagine
M	Empathy	cO	Openness
S	Self-Knowledge	cT	Transpose
Ug	Aligns to understanding, but does not fit a facet (miscellaneous)	Cg	Aligns to creativity, but does not fit a facet (miscellaneous)
(-)	Complete opposite to Understanding		



By using this method of coding and use of a matrix, possible trends or connections might become more apparent and or describable.

Tabulation and Data Collection Matrix:

Data will be “checked” using the numeral 1 by the facet(s) that apply.

data	Ug	E	I	A	P	M	S	Cg	cS	cA	cC	cI	cO	cT
------	----	---	---	---	---	---	---	----	----	----	----	----	----	----

Main Matrix: (see Appendix D for tabulated results)

Once the Data has been “checked” using the numeral 1; sums will be created by each facet, then cross-tabulated from facet to facet.

(note: chapter 4 explains why the Personality Traits found in the Davis source are treated separately)

APPENDIX D: TABULATION CHARTS

	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S
T	69	69	56	70	59	62	36	5	54	59	70	99	65	55

	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S
T: Cg	69							4	14	14	12	31	26	18
T: cS		69						4	29	38	38	40	22	9
T: cA			56					1	27	32	40	34	9	7
T: cC				70				0	9	11	13	30	29	32
T: cI					59			0	22	21	20	37	29	16
T: cO						62		1	20	23	18	46	36	22
T: cT							36	2	18	21	20	28	16	7

	Ug	E	I	A	P	M	S	Cg	cS	cA	cC	cI	cO	cT
T: Ug	5							4	4	1	0	0	0	2
T: E		54						14	29	27	9	22	20	18
T: I			59					14	38	32	11	21	23	21
T: A				70				12	38	40	13	20	18	20
T: P					99			31	40	34	30	37	46	28
T: M						65		26	22	9	29	29	36	16
T: S							55	18	9	7	32	15	22	7

Adjusted Totals by Facet:

	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S
A	28	63	52	55	44	35	32	5	41	48	61	72	43	40

	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S
A: Cg	28							4	1	2	2	4	4	2
A: cS		63						4	24	33	36	34	21	8
A: cA			52					1	24	31	38	31	9	6
A: cC				57				0	7	9	11	21	18	28
A: cI					44			0	18	18	16	26	21	11
A: cO						35		1	13	15	12	25	18	13
A: cT							32	2	15	18	18	24	14	7

	Ug	E	I	A	P	M	S	Cg	cS	cA	cC	cI	cO	cT
A: Ug	5							4	4	1	0	0	0	2
A: E		41						1	24	24	7	18	13	15
A: I			48					3	33	31	9	17	15	18
A: A				61				3	36	38	11	16	12	18
A: P					72			4	34	31	21	26	25	24
A: M						43		4	21	9	17	21	18	14
A: S							40	3	8	6	26	10	13	7

Personality Traits – Davis Totals by facet:

	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S
T	41	6	4	15	15	27	4		13	11	9	27	22	15

	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S
T: Cg	41							0	13	12	10	27	22	16
D: cS		6						0	5	5	2	6	1	1
D: cA			4					0	3	1	2	3	0	1
D: cC				13				0	2	2	2	9	11	4
D: cI					15			0	4	4	4	11	8	5
D: cO						27		0	7	8	6	21	18	9
D: cT							4	0	3	3	2	4	2	0

	Ug	E	I	A	P	M	S	Cg	cS	cA	cC	cI	cO	cT
D: Ug	0							0	0	0	0	0	0	0
D: E		13						13	5	3	2	4	7	3
D: I			11					11	5	1	2	4	8	3
D: A				9				9	2	2	2	4	6	2
D: P					27			27	6	3	9	11	21	4
D: M						22		22	1	0	12	8	18	2
D: S							15	15	1	1	6	5	9	0

Another look at the same data

	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S	Data point totals
T	69	69	56	70	59	62	36	5	54	59	70	99	65	55	828
A	28	63	52	55	44	35	32	5	41	48	61	72	43	40	619
D	41	6	4	15	15	27	4	0	13	11	9	27	22	15	209
T: Cg	69	12	9	20	19	30	7	4	14	14	12	31	26	18	285
A: Cg	28	6	5	4	4	3	3	4	1	2	2	4	4	2	72
D: Cg	41	6	4	16	15	27	4	0	13	12	10	27	22	16	213
T: cS	12	69	30	11	18	21	24	4	29	38	38	40	22	9	365
A: cS	6	63	28	10	16	16	21	4	24	33	36	34	21	8	320
D: cS	6	6	2	1	2	5	3	0	5	5	2	6	1	1	45
T: cA	9	30	56	7	17	15	17	1	27	32	40	34	9	7	301
A: cA	5	28	52	7	15	13	16	1	24	31	38	31	9	6	276
D: cA	4	2	4	0	2	2	1	0	3	1	2	3	0	1	25
T: cC	20	11	7	70	20	21	7	0	9	11	13	30	29	32	280
A: cC	7	10	7	57	15	10	6	0	7	9	11	21	18	28	206
D: cC	13	1	0	13	5	11	1	0	2	2	2	9	11	4	74
T: cI	19	18	17	21	59	35	13	0	22	21	20	37	29	16	327
A: cI	4	16	15	16	44	21	12	0	18	18	16	26	21	11	238
D: cI	15	2	2	5	15	14	1	0	4	4	4	11	8	5	90

T: cO	30	21	15	21	35	62	13	1	20	23	18	46	36	22	363
A: cO	3	16	13	10	21	35	10	1	13	15	12	25	18	13	205
D: cO	27	5	2	11	14	27	3	0	7	8	6	21	18	9	158
T: cT	7	24	17	7	13	13	36	2	18	21	20	28	16	7	229
A: cT	3	21	16	6	12	10	32	2	15	18	18	24	14	7	198
D: cT	4	3	1	1	1	3	4	0	3	3	2	4	2	0	31
T: Ug	4	4	1	0	0	0	2	5	0	0	1	2	2	0	21
A: Ug	4	4	1	0	0	0	2	5	0	0	1	2	2	0	21
D: Ug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T: E	14	29	27	9	22	20	18	0	54	38	33	34	14	10	322
A: E	1	24	24	7	18	13	15	0	41	29	28	24	10	7	241
D: E	13	5	3	2	4	7	3	0	13	9	5	10	4	3	81
T: I	14	38	32	11	21	23	21	0	38	59	41	41	19	8	366
A: I	3	33	31	9	17	15	18	0	29	48	36	30	14	4	287
D: I	11	5	1	2	4	8	3	0	9	11	5	11	5	4	79
T: A	12	38	40	13	20	18	20	0	33	41	70	47	21	12	385
A: A	3	36	38	11	16	12	18	0	25	36	61	39	17	8	320
D: A	9	2	2	2	4	6	2	0	5	5	9	8	4	4	62
T: P	31	40	34	30	37	46	28	2	34	41	47	99	49	30	548
A: P	4	34	31	21	26	25	24	2	24	30	39	72	34	21	387
D: P	27	6	3	9	11	21	4	0	10	11	8	27	15	9	161
T: M	26	22	9	29	29	36	16	2	14	19	21	49	65	23	360
A: M	4	21	9	17	21	18	14	2	10	14	17	34	43	15	239
D: M	22	1	0	12	8	18	2	0	4	5	4	15	22	8	121
T: S	18	9	7	32	15	22	7	0	10	8	12	30	23	55	248
A: S	3	8	6	26	10	13	7	0	7	4	8	21	15	40	168
D: S	15	1	1	6	5	9	0	0	3	4	4	9	8	15	80

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
10	“The power to connect a multitude of assimilated items into a novel, synthetical way.” (Rhodes, p. 14)		1		1							1	1	1	
11	“Creativity is an integrative force, because it is fundamentally based on love, and on the happy, guilt-free disposal of aggression in socially-acceptable channels.” (Rhodes, p. 14)				1							1			
12	“... growing, climbing from peak to peak toward the sun.” (Rhodes, p. 15)				1										1
13	“Discovery of the structure of the reality as it reveals itself to (the artist) through his eyes.” (Rhodes, p. 15)				1	1							1	1	
14	“Revelation of vision of the world, a profound sense of existence...” (Rhodes, p. 15)				1								1		1
15	“An operative technique which can be learned and controlled.” (Rhodes, p. 15)	1													
16	“The process of change, of development, of evolution, in the organization of subjective life.” (Rhodes, p. 15)		1	1						1	1				
17	“The process of forming new combinations or patterns out of past experiences, resulting in an original product.” (Rhodes, p. 15)		1	1								1	1		
18	“Spontaneous reorganizations of acquired elements under the aegis of an event which is in reality not a mere addendum to, but rather an interpenetration of the levels of human experience.” (Rhodes, p. 15)		1		1						1			1	
19	“The adaption of something which is in essence familiar, to conditions other than those with which it has been conjoined in the past.” (Rhodes, p. 15)		1	1				1			1	1			
20	“The transplanting of a familiar relation into a new context, such that a new correlate is generated.” (Rhodes, p. 15)				1			1		1	1	1	1	1	

#	Data Piece/Quotation	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S
21	“The completion of a pattern or configuration which was previously recognized as incomplete by transposition of a member of one configuration to another.” (Rhodes, p. 16)			1		1				1	1				
22	“A simplification of reality in active enjoyment of a natural spectacle or manifestation of human life, and subsequent transformation into communicable form.” (Rhodes, p. 16)				1								1	1	1
23	“... a synthesis, and the result of a synthesis occurring in the unconscious ego, promoted by relative freedom from repression.” (Rhodes, p. 16)		1							1	1	1			
24	“Fusion of images or elements of past experience into new combinations according to the laws of association.” (Rhodes, p. 16)		1							1	1	1	1		
25	“The interaction of ‘fringe ideas’ belonging to different fields of interest, with resultant integration of the personality.” (Rhodes, p. 16)				1		1						1	1	
26	“... a choice among many combinations imperatively governed by the sense of (scientific) beauty.” (Rhodes, p. 16)						1			1					1
27	“Bringing to society new and original values.” (Rhodes, p. 16)			1		1				1	1	1			
28	“Arousing permanently and in the highest degree that positive, scientifically-grounded feeling of worth and value in a wide group of human beings.” (Rhodes, p. 16)				1	1	1						1	1	1
29	“... the immeasurable enrichment of a ‘total situation’ resulting in a symbol rich in potentialities for productivity.” (Rhodes, p. 17)				1						1	1	1		

#	Data Piece/Quotation	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S
37	<p>“The word idea is used here to mean something conceived in the mind which is communicated to other people in words, paint, clay, metals, stone, or other materials. When we speak of an original idea or creation, we imply something in which there is a degree of newness; either in concept, in application of a familiar concept, or in the way a concept is articulated. The term product is used here as a substitute term for an articulated or embodied idea” (Rhodes, p. 63)</p>	1													
38	<p>Guilford described “an ability to see problems, or to be sensitive to the existence of problems” as an important ability in the nature of creativity. (Rhodes, p. 92)</p>	1													
39	<p>Fluency of ideas. Rhodes paraphrased Thurstone’s discovery of three types of Fluency: (1) “Word fluency - “the ability to call up rapidly words with which one is very familiar.” (2) Associational fluency - “the ease with which one can think of synonyms or opposites.” (3) Ideational fluency - “the speed with which one can call up ideas that are related to a given topic.” (Rhodes, p. 93)</p>			1		1	1				1	1	1		
40	<p>Flexibility: “ability of the examinee to break away from former habits of thinking and to do things in a new and unusual way.” (Rhodes, p. 94)</p>			1		1		1			1	1	1	1	
41	<p>Originality: “statistical uncommonness of responses, ... remoteness of associations, ... degree of cleverness of responses.” (Rhodes, p. 94)</p>			1	1	1	1			1	1	1	1		
42	<p>Redefinition: Ability to improvise, to “redefine the functions ... in order to adapt them to their use.” (Rhodes, p. 94)</p>			1		1		1		1	1	1	1		

#	Data Piece/Quotation	Cg	cS	cA	cC	cI	cO	cT	Ug	E	I	A	P	M	S
54	“creativity in the arts springs from imaginative interpretations of experience, whereas creativity in science springs from reasoned extensions of knowledge.” (Rhodes, p. 124)	1													
55	“Originality is the expression of the individual self in relation to its environment; ... Every man who is <u>himself</u> , and not a careful copy of others, is an original person.” Knowlson in Rhodes, p. 128)				1					1			1		1
56	“... ‘through which the various operations of life - biological, sensitive, and intellectual life - are performed, emanate from the soul.’ ... ‘Thus, intelligence does not exist for the senses, but the senses exist for the intelligence. Consequently, we must say that imagination proceeds or flows from the essence of the soul through the intellect, and that the external senses proceed from the essence of the soul through imagination.’” (Maritain in Rhodes, p. 135)				1										
57	“At opposite ends, of ... a continuum of creative thought, lie <u>semantic thinking</u> on the one hand, and <u>intuitive thinking</u> on the other. The one is the deliberate act of the conscious mind, the other the gracious gift of the subconscious in return for the previous labors of the conscious mind.” (Green in Rhodes, p. 144)				1	1	1			1	1	1	1		
58	Systematic thinking - “the pursuit of new knowledge by observation and experiment alone, ... empiricism.” (Green in Rhodes, p. 146)		1	1							1	1	1		
59	Omphalaskesis (deep meditation) - “Opposed to empiricism is the purely rational approach through formulation of theory” (Green in Rhodes, p. 146)		1		1	1							1	1	1
60	“every human being strives to be a ‘self’ and that to the extent he is successful in selfhood, he is creative.” (Rhodes, p. 148)				1	1							1	1	1

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
72	“knowledge is positively correlated to creativity. Rather than breaking out of the old to produce the new, creative thinking builds on knowledge.” (Weisberg in Sternberg, p. 226)		1	1				1		1		1	1		
73	“the ability to do creative work depends on deep knowledge of one’s chosen field.” (Weisberg in Sternberg, p. 227)		1	1				1		1		1	1		
74	“knowledge is necessary, not sufficient for creative achievement.” (Weisberg in Sternberg, p. 248)		1	1				1		1		1	1		
75	“In order to select or shape the environment to suit oneself, one requires the imagination to create a vision of what the environment should be and how this idealized environment can become a reality.” (Sternberg & O’Hara in Sternberg, p. 251)		1			1						1			
76	“Synthetic ability is the ability to generate ideas that are novel, high in quality, and task appropriate.” (Sternberg & O’Hara in Sternberg, p. 255)			1								1	1		
77	“Synthetic part of intelligence as applied to creativity also involves three knowledge acquisition components ... <u>selective encoding</u> [underline added], which involves distinguishing relevant from irrelevant information;” (Sternberg & O’Hara in Sternberg, p. 255)		1					1			1	1	1		
78	“Synthetic part of intelligence as applied to creativity also involves three knowledge acquisition components ... <u>selective combination</u> [underline added], which involves combining bits of relevant information in novel ways;” (Sternberg & O’Hara in Sternberg, p. 255)		1	1						1	1	1	1		

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
88	"... the creative artist is one who contacts the 'psychic reality within the depths of himself, ... strive[s] to make it manifest, ... to become one with it, integrating it through differentiation, meditation, and self-realization.'" (Maduro quoted by Lubart in Sternberg, p. 340)				1										
89	"In Hinduism, creativity is seen as a spiritual or religious expression rather than as an innovative solution to a problem." (Lubart in Sternberg, p. 340)				1										
90	"in the Eastern view, creativity seems to involve the reinterpretation of traditional ideas - finding a new point of view - whereas in the Western approach, creativity involves a break with tradition." (Lubart in Sternberg, p. 340)		1		1			1			1	1	1		
91	"The Western definition of creativity as a product-oriented, originality-based phenomenon..." (Lubart in Sternberg, p. 347)	1		1	0	1									
92	"...an Eastern view of creativity as a phenomenon of expressing an inner truth in a new way or of self-growth." (Lubart in Sternberg, p. 347)	1			1			1							1
93	"it can be argued that the ability to think <i>well</i> requires both creative and critical capabilities, that neither type of thinking can be effective without the other." (Nickerson in Sternberg, p. 398)	1	1	1			1		1			1	1	1	
94	"creative and critical thinking are two sides of the same coin. Good thinking requires both and requires that there be a balance between their contributions. ..." (Nickerson in Sternberg, p. 399)	1							1						
95	"... Creative thinking, at its best, generates original ideas, unusual approaches to problems, novel perspectives in terms of which to view situations: ..." (Nickerson in Sternberg, p. 399)	1	1	1		1	1	1			1		1	1	

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
96	"... critical thinking evaluates what creative thinking offers, subjects the possibilities to criteria for acceptability, and seeks among them some for further consideration." (Nickerson in Sternberg, p. 399)	1	1	1						1	1	1	1	1	
97	"Necessity may be the mother of creative effort, but fun is the father." (Osborn in Parnes, p. 5)	1													
98	"The one thing all these sources have in common is the sense of resourcefulness, the feeling that above and beyond the requirements of daily living we possess extra powers with which to cope with unforeseeable needs or mischances. ... unsupplied, it leaves us uncomfortable or unhappy." (Feland quoted in Osborn in Parnes, p. 7)	1			1										
99	"The senior author [E. Paul Torrance] has chosen to define creativity as the process of sensing problems or gaps in information, forming ideas or hypotheses, testing and modifying these hypotheses, and communicating the results. This process may lead to any one of products - verbal and nonverbal, concrete and abstract." (Torrance & Goff in Parnes, p. 79)	1													
100	"The production of something new or original is included in almost every definition of creativity." (Torrance & Goff in Parnes, p. 79)		1	1											
101	"... contribution of original ideas, a different point of view, or a new way of looking at problems." (Torrance & Goff in Parnes, p. 79)		1				1						1	1	1
102	"... being open to experience and permitting one thing to lead to another, recombining ideas or securing new relationships among ideas, etc." (Torrance & Goff in Parnes, p. 79)		1					1					1		1

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
109	“Independent Inquiry [&] Self-direction” from Creative Learning Model: Cognitive - Level III (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)					1	1			1	1	1	1	1	
110	“Application” from Creative Learning Model: Cognitive - Level II (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)		1	1								1			
111	“Analysis” from Creative Learning Model: Cognitive - Level II (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)		1	1						1	1		1		
112	“Synthesis” from Creative Learning Model: Cognitive - Level II (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)		1					1		1	1	1	1	1	
113	“Evaluation” from Creative Learning Model: Cognitive - Level II (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)		1	1			1	1		1	1		1		
114	“Transformations” from Creative Learning Model: Cognitive - Level II (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)							1					1	1	1
115	“Metaphor and analogy” from Creative Learning Model: Cognitive - Level II (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)							1			1		1	1	
116	“Fluency” from Creative Learning Model: Cognitive - Level I (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)		1	1						1	1	1			
117	“Flexibility” from Creative Learning Model: Cognitive - Level I (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)		1	1		1	1	1		1	1	1			
118	“Originality” from Creative Learning Model: Cognitive - Level I (Treffinger in Treffinger, Isaksen, & Firestein in Parnes, p. 94)		1	1				1		1	1	1			

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
132	“Any technique which will increase self-knowledge in depth should in principle increase one’s creativity by making available to oneself these sources of fantasy, play with ideas, being able to sail right out of the world and off the earth, getting away from common sense... creative people are people who don’t want the world as it is today but want to make another world.” (Maslow in Parnes, p. 103)				1	1	1	1							1
133	“most important element in innovative problem-solving was <i>making the familiar strange</i> because break-throughs depend on ‘strange’ new contexts by which to view a ‘familiar’ problem.” (Gordon in Parnes, p. 165)							1							
134	“Interdependent with the innovation process is the learning process where one gains an understanding of a new problem or a new idea by <i>making the strange familiar</i> . Understanding requires bringing a <i>strange</i> concept into a <i>familiar</i> context.” (Gordon in Parnes, p. 165)		1					1	1				1	1	
135	“Thus, through an example of his own experience the student creatively contributes to his own learning. He <i>makes the strange familiar</i> to himself by means of a highly personal connection process.” (Gordon in Parnes, p. 165)	1	1					1	1						
136	“ Making the Strange Familiar. ... The mind compares the given strangeness with data previously known and in terms of these data converts the strangeness into familiarity. Three basic procedures are involved: Analysis, Generalization, and Model-seeking or Analogy.” (Prince in Parnes, p. 170)					1	1	1		1	1	1	1	1	

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
137	<p>“Making the Familiar Strange. ... It is a conscious attempt to achieve a new look at the same old world, people, ideas, feelings, and things.” (Prince in Parnes, p. 171)</p>							1				1	1	1	
138	<p>“We choose to define creativity as the ability to leave structured paths and modes of thinking and merge previously unconnected pieces of knowledge and experience to arrive at an idea of how to solve a given problem.” (Geschka in Parnes, p. 283)</p>	1	1			1	1						1	1	
139	<p>“... creativity is defined as the ability to combine different elements of knowledge and experience, ...” (Geschka in Parnes, p. 284)</p>	1	1						1						
140	<p>“Creativity is considered ‘as the process of recombining know elements to produce more valuable (satisfying) ideas than previously existed in the mind of the thinker.’” (Parnes quoted by Noller in Parnes, p. 366)</p>		1			1						1	1		
141	<p>“we might also define creativity as a function of ‘knowledge,’ ‘imagination,’ and evaluation.” (Noller in Parnes, p. 367)</p>		1			1	1						1	1	
142	<p>“One’s knowledge, past experience, sensory input, etc., are the bits and pieces from which the patterns are made, and only when the drum is turned [teledoscope] or the stored data manipulated through the imagination, will new patterns or ideas be formed. The greater number of pieces and the greater manipulation of them produces the greater potential for creativity.” (Noller in Parnes, p. 367)</p>		1			1	1	1					1	1	

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
143	“The creative process... is the emergence in action of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people, or circumstances of his life on the other. ... the mainspring of creativity appears to be... man’s tendency to actualize himself, to become is potentialities.” (Rogers quoted by Harmon & Rheingold in Parnes, p. 418)			1	1						1	1	1		1
144	“Dr. Ruth Noller, an early pioneer in the field, and a mathematician, presented it as a simple yet elegant equation: Creativity equals the function of an attitude multiplied by knowledge, imagination and evaluation. ... $C = fA(K, I, E)$ ” (Fox & Fox, p. 15)		1			1	1			1	1	1		1	
145	“A robust ideation process ought to combine originality and usefulness in the broadest of applications.” (Fox & Fox, p. 147)		1	1						1	1	1			
146	“ <i>New</i> : The creative product must be original. There must be a sense of novelty about it.” (Fox & Fox, p. 206)			1		1						1	1		
147	“ <i>Useful</i> : The product must be adaptable to reality. It must serve to solve a problem, fit the needs of a problem situation, or accomplish some recognizable goal.” (Fox & Fox, p. 206)			1								1			
148	“ <i>original?</i> Is the product one in which some concept of ‘newness’ is introduced?” (Fox & Fox, p. 207)			1								1	1		
149	“Two traits of creative people are attraction to complexity and tolerance for ambiguity.” (Davis, p. 41)					1	1						1	1	

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
161	<p>“Theresa Amabile’s Three-Part Model: ... First component is <i>domain-relevant skills</i> - skills that produce competent performance within a domain. ... <i>Creativity-relevant skills</i>, the second component, contribute to one’s creative performance across domains. ... The third component is <i>task motivation</i>, ... one’s attitude toward the task, ... one’s intrinsic motivation toward the task.” (Davis, p. 56)</p>		1	1		1					1	1		1	
162	<p>“Creativity conscious” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 1. Aware of Creativeness</i> (Davis, p. 80)</p>	1			1									1	1
163	<p>“Values own creativity” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 1. Aware of Creativeness</i> (Davis, p. 80)</p>	1													1
164	<p>“Values originality” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 1. Aware of Creativeness</i> (Davis, p. 80)</p>	1											1		1
165	<p>“Alert to novelty” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)</p>	1										1	1	1	
166	<p>“Avoids entrenched ways of thinking” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)</p>	1					1			1	1		1	1	1
167	<p>“Builds and rebuilds” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)</p>	1								1					
168	<p>“Constructs” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)</p>	1	1	1				1		1	1	1	1		

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
169	“Enjoys pretending” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1				1	1					1			
170	“Flexible in ideas and thought” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1		1			1					1	1		1
171	“Innovative” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1											1		
172	“Modifies (objects, systems, institutions)” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1				1	1	1					1	1	
173	“Unique” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1								1	1	1	1		1
174	“Versatile” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1				1	1			1	1	1	1	1	1
175	“Avoids perceptual sets” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1													1
176	“Bored by the routine and obvious” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1				1	1						1	1	
177	“Inventive” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1		1		1				1					
178	“Manipulates ideas” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1	1				1	1		1	1		1		
179	“Sees things in new ways” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1				1	1				1		1	1	

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
180	“Uses analogies, metaphors” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 2. Original</i> (Davis, p. 80)	1				1	1			1	1	1	1		
181	“Believes in oneself [&] Self-accepting [&] Self-confident [&] Self-organized [&] self-aware [&] Self-directed [&] Self-sufficient [&] Strong willed [&] High Self-esteem [&] uninhibited [&] unconcerned with impressing others” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 3. Independent</i> (Davis, p. 80)	1			1										1
182	“Freedom of spirit that rejects limits imposed by others” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 3. Independent</i> (Davis, p. 80)	1			1	1	1						1	1	1
183	“Does not fear being different” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 3. Independent</i> (Davis, p. 80)	1			1	1	1							1	1
184	“Dissatisfied with the status quo” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 3. Independent</i> (Davis, p. 80)	1			1	1	1					1	1	1	1
185	“Critically examines authoritarian pronouncements” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 3. Independent</i> (Davis, p. 80)	1	1			1	1				1		1		1
186	“Not afraid to try something new” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 4. Risk Taking</i> (Davis, p. 81)	1			1		1							1	
187	“Organized [&] Disciplined and committed to one’s work [&] Perfectionist” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 6. Thorough</i> (Davis, p. 81)	1								1					

#	Data Piece/Quotation	Cg	cS	cA	cC	cl	cO	cT	Ug	E	I	A	P	M	S
188	“Seeks interesting situations [&] Inquisitive [&] Open to the irrational [&] Wide interests” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 7. Curious</i> (Davis, p. 81)	1				1	1							1	
189	“Experiments” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 7. Curious</i> (Davis, p. 81)	1	1	1		1	1			1			1		
190	“Likes to hear other people’s ideas” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 7. Curious</i> (Davis, p. 81)	1					1						1	1	
191	“Tolerant of ambiguity [&] tolerant of incongruity” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 10. Attracted to Complexity, Ambiguity</i> (Davis, p. 82)	1					1							1	1
192	“Open to impulses” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 12. Open-Minded</i> (Davis, p. 82)	1			1		1						1	1	1
193	“Receptive to other viewpoints” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 12. Open-Minded</i> (Davis, p. 82)	1					1						1	1	
194	“Open to new experiences and growth” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 12. Open-Minded</i> (Davis, p. 82)	1			1		1							1	
195	“Perspective” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 14. Perspective</i> (Davis, p. 82)	1			1	1	1						1		
196	“Discerning” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 14. Perspective</i> (Davis, p. 82)	1	1				1			1	1		1		
197	“Insightful” In Table 4.2 <i>Recurrent Personality Traits of Creative People - 14. Perspective</i> (Davis, p. 82)	1			1	1	1						1		

APPENDIX F: DATA CITATIONS

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APPENDIX G: ORIGINAL CONCEPT PAPER

Theme:
<i># 4: Organizing, Developing, and Disseminating Knowledge about Creativity</i>
Initiative:
<i>Expanding disciplinary perspectives in the domain of creativity</i>

Thesis Title: Gaining Understanding through Creativity: *Comparison of the Understanding by Design Model and General Creativity Concepts.*

Rationale:

This thesis will explore the relationship between general creativity concepts and the definition of understanding as stated in Understanding by Design, by Grant Wiggins & Jay McTighe, (1998, Appendix B). It is the inauguration of a theory, the *Double-Helix Theory of Creativity-Knowledge-Understanding* (Appendix A), posited by Michael Bridge. This theory is an explicit description of the symbiotic relationship between creativity, knowledge and understanding.

Questions:

What is the relationship between general creativity and Understanding, as defined by the Understanding by Design (UbD) model?
 What is similar; what is different between the UbD model and general creativity concepts?
 What are the implications for the domain of creativity?

Statement of Significance

There is a clear gap in the creativity literature on the concept of ‘understanding.’ The literature is full of descriptions about how to understand some aspect associated with creativity. What is missing is a link between the general concepts of ‘understanding’ to concepts of creativity. Case in point, from the CBIR abstract of Basadur, Runco, & Vega, (2000) titled, *Understanding how creative thinking skills, attitudes, and behaviors work together: A causal process model*, which uses understanding in the following manner, “improve understanding of how these variables contribute to the process increases a manager’s ideation and evaluation skills.” ‘Understanding’ as a concept is a wide topic, open to many interpretations (Wiggins & McTighe, 1998), so understanding is most likely implied throughout the literature. In a review of the literature on CBIR for “Understanding by Design”(UbD), there were zero results. In a search of ERIC, ERIC – Department of Education, EBSCO, and FirstSearch electronic databases, results for “understanding by design” yielded results for computer design and the already published materials for UbD. An interview with a research librarian at the Association for Supervision and Curriculum Development, the publishers of *Understanding by Design*, uncovered no research completed to date on UbD (Summary, 2004).

Therefore it is clear that an examination of the relationship between general creativity concepts and understanding, specifically the Understanding by Design model, is needed to fill in gaps in the literature in a thesis. Additionally, as a theory that describes relationships between creativity,

knowledge and understanding which has not been described in such a way before, it is important to develop and examine the *Double-Helix Theory of Creativity-Knowledge-Understanding* (Appendix A).

Davis and O'Sullivan's Model AUTA (Awareness, understanding, Techniques, Actualization) describes a "taxonomy of creative development" (Davis, 1986). Davis lists "Awareness of the importance of creativity" and an 'Understanding of the nature creativity' as the important first and second steps of the model. The *Double-Helix Theory of Creativity-Knowledge-Understanding* (Appendix A) may be the framework which allows for a systematic view of the support for the model by describing the importance of creativity and lend itself to adding a new piece to the understanding of creativity.

Csikszentmihalyi and Amabile have postulated theories which articulate a relationship between domain specific skills, creativity skills, and motivation (Collins & Amabile, 2002); the domain, the individual, culture, and the field (Csikszentmihalyi, 2002). These models are an example of frameworks which describe the relationship between creativity and the knowledge domain to produce a creative product. Sternberg & Lubart's Investment Model expresses one view of the motivation or the why to create (Sternberg & Lubart, 2001), but not the relationship between knowledge, understanding and creativity.

These models appear to take for granted the relationship between creativity, knowledge (domain and field); while leaving understanding more implied. The *Double-Helix Theory of Creativity-Knowledge-Understanding* (Appendix) specifically explores the deeper relationship between creativity and the knowledge domains to build understanding. This theory in essence, focuses at the heart of these models.

Description of the Method/Process:

The use of a qualitative research paradigm will be used to review various components to the development of this theory and this thesis. The theory has a basis in literature, and to the literature will seek concrete grounding through comparison of general creativity concepts and understanding concepts.

Strauss and Corbin state that "Theoretical comparisons are a vital part of our method of building theory and are one of the important techniques we use when doing...analysis. ... Comparisons are additionally important because they enable identification of *variations* in the patterns to be found in the data"(p. 67, 1998).

The first step will be to establish an analysis matrix for the collection and sorting of data based off of the UbD model. Next, a review the characteristics and traits of creative people found in "Creativity is Forever" (Davis, 1999) will be undertaken as a means to refine the matrix. A review of the understanding and creativity literatures will be undertaken to compare and contrast general creativity concepts and understanding (based on the *Understanding by Design* model). From this, data will be gathered and analyzed. Each data component will be coded by source and location. The creativity data will be compared and placed into the analysis matrix (Appendix C).

The principles of 'grounded theory' will the analysis. Strauss and Corbin state that "Grounded theories, because they are drawn from data, are likely to offer insight, enhance understanding,..."(p. 12, 1998).

Data in the form of definitions, descriptions, words, phrases will be coded, sorted, and grouped

according to similarities. Differences will also be noted and reported (Appendix C). Data will be analyzed for themes, based on definitions, characteristics, clustering, linking, and other emergent data. Those items that may not fit will cluster out and will be analyzed and reported.

▶ Data will be presented in the form of text, images, graphs, tables

Personal Learning Goals:

- Develop qualitative analysis skills
- Challenging self to cope with the normative structure of this thesis and to stay on task
- Challenge self to objectively analyze personally developed theory and dimensions under study
- Develop a working knowledge of this material to take to a possible PhD program
- Develop an understanding of dimension to apply as a possible axis to Mike Fox's '*Genome of Creativity*' project/*Ontological Model of Creativity*

Outcomes:

1 Thesis Write-up

Principle Investigators:

Dr. Mary Murdock, Michael J.T.J. Bridge