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# An Investigation of Training in Creative Problem Solving and its Relationship to Affective and Effective Idea Generation of Entrepreneurial Learners

Charles Edward Leach

Nova Southeastern University, [ed.leach@dal.ca](mailto:ed.leach@dal.ca)

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An Investigation of Training in Creative Problem Solving and its  
Relationship to Affective and Effective Idea Generation of  
Entrepreneurial Learners

by

C. Edward Leach

A dissertation submitted in partial fulfillment of the requirements for the degree of  
Doctor of Philosophy in Computing Technology in Education

Graduate School of Computer and Information Sciences  
Nova Southeastern University

2008

We hereby certify that this dissertation, submitted by Ed Leach, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

\_\_\_\_\_  
John Scigliano, Ed.D.  
Chairperson of Dissertation Committee

\_\_\_\_\_  
Date

\_\_\_\_\_  
Marlyn Kemper Littman, Ph.D.  
Dissertation Committee Member

\_\_\_\_\_  
Date

\_\_\_\_\_  
Ling Wang, Ph.D.  
Dissertation Committee Member

\_\_\_\_\_  
Date

Approved:

\_\_\_\_\_  
Edward Lieblein, Ph.D.  
Dean

\_\_\_\_\_  
Date

Graduate School of Computer and Information Sciences  
Nova Southeastern University

2008

An Abstract of a Dissertation Submitted to Nova Southeastern University in Partial  
Fulfillment of the Requirements for the Degree of Doctor of Philosophy

An Investigation of Training in Creative Problem Solving and its  
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November 2008

A significant proportion of the population engages in entrepreneurial behavior but many ventures do not survive beyond startup thus decreasing the pool of entrepreneurs available to contribute to the economy. Opportunity recognition is central to entrepreneurial success and the improper delineation of opportunities is cited as a leading cause of venture failure. There is a logical link between creativity, innovation and entrepreneurship. The goal of the researcher in this study was to explore the relationships between CPS training and the generation of entrepreneurial ideas.

The investigation studied the relationship of training in creative problem solving (CPS) to the opportunity identification skills of entrepreneurial learners. It was hypothesized that CPS training would positively impact attitudes relating to divergent thinking, would increase the number of opportunities identified and would increase the quality of opportunities identified. The tutorial was targeted at novice entrepreneurs who were in the initial stages of identifying an opportunity. Quality at this early stage in the venture formation process was defined as the degree to which the idea meshed with the learner's interests and passions and the extent to which they possessed prior experience.

An experimental research design was used and participants were randomly assigned to either a treatment or control group. There were no statistically significant differences in composition between the treatment and control groups. There were statistically significant differences found in one of the two divergent thinking constructs – the tendency to make premature evaluations. Two measures of ideational fluency were tested. No statistically significant differences were found in fluency for the post-test/pre-test measure within the treatment group or between the treatment and control group. Statistically significant differences were found in the number of unique ideas generated post-test/pre-test (within the treatment group and between the treatment and control group) and statistically significant differences were

also found in the unique bottles measure (within group only). There were no statistically significant differences found in the 4 quality measures.

The findings in this study have the potential to strengthen the link between the enhancement of creative performance and the generation of entrepreneurial ideas. The research also holds the potential to provide practical guidelines for use of instructional techniques for training in opportunity recognition but also more broadly across the continuum of entrepreneurship education. The objective of the training was to increase the size and the quality of the venture idea pool that entrepreneurs draw from when initiating ventures.

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## Chapter 1

### Introduction

In chapter 1 the researcher identifies the problem to be investigated, sets the context for the research, and identifies a measurable goal. Barriers and issues relating to conducting research with university students, including the ethical considerations relating to vulnerable populations and issues arising from previous research are discussed. The experimental research design is described, hypotheses are stated, research questions are identified, independent and dependent variables are assigned, instrumentation and analytical tools are delineated. Within this framework delimitations are stated, terms are defined, and assumptions are stated. Relevant and current literature is then cited to establish both the relevance and significance of the research. Threats to validity and reliability are identified and the strategies used to mitigate them are laid out. The research design is discussed including the statement of hypotheses, independent and dependent variables, statistical tests for each of the hypotheses, the resources employed to complete the proposed research and steps remaining to complete the dissertation. Finally the findings of the study are discussed, linkages are made to existing literature and potential future research is identified.

## **Problem Statement**

It has been said that the study of business without understanding entrepreneurship is like the study of Shakespeare in which the 'Prince of Denmark has been expunged from the discussion of Hamlet' (Baumol, 1968). Many ventures do not survive beyond startup (Timmons & Spinelli, 2008). Efforts to increase the pool of entrepreneurs are hampered when entrepreneurs exit prematurely. The pursuit of opportunity without regard to the resources currently controlled is cited as a definition of entrepreneurship (Stevenson & Jarillo, 1990) but the improper delineation of opportunities is cited as a leading cause of venture failure (Fiet, Clouse, & Norton, 2004; McKnight, 2004; Shane, 2003). Many entrepreneurs attend a university prior to starting their venture yet the quality of opportunities identified by university students has been observed to be suboptimal (Little & Leach, 2002).

Historically a significant proportion of the population has engaged in entrepreneurial behavior with estimates ranging from 20% (Reynolds & White, 1997) to 50% (Aldrich & Zimmer, 1986). More recent data suggested that the role of small business in generating economic activity has continued to increase. In Canada 2.5 million people have identified themselves as self-employed, while small businesses (less than 100 employees) employ 48% of the private sector work force (5 million employees) while medium size businesses employed another 16%. The SME (Small and Medium Size Enterprise) sector accounted for 64% of Canadian private sector employment. SME's also account for a disproportionately large percentage of net new jobs created, 48% in the second quarter of 2006, representing the largest contribution small businesses have made to job creation in the private sector since the first quarter of 2004

(*Key Small Business Statistics*, 2007). On a global scale a 34 country study found that 9.3% (73 million people) of the population aged 18-64 were either nascent entrepreneurs or the owner/manager of a new business and that the phenomenon was spread across gender with 41% of the respondents being female (Acs, Arenius, & Minnitti, 2004)

Canada's then Prime Minister, Jean Chrétien, identified an innovation imperative - "In the new global economy of the 21<sup>st</sup> century prosperity depends on innovation, which in turn, depends on the investments that we make in the creativity and talents of our people"(2002a; 2002b). This imperative for innovation is being followed with an almost religious fervour by industry (Valery, 1999). The two position papers supporting the innovation imperative, *Knowledge matters; Skills and learning for Canadians (2002a)* and *Achieving excellence: Investing in people, knowledge and opportunity (2002b)* point out that real income per capita in Canada and other economies has been falling; in 2003 there will be more exits from the work force than entrants and this trend will accelerate as the baby boom generation retires; technology has shifted the skills sets needed in the economy; unemployment rates for those who lack the required skills are expected to grow while a shortage of workers with the required skills is expected to constrain economic growth and prosperity. In this challenging economic environment it is the researcher's opinion that the training studied in the investigation has the potential to ameliorate the impact of the challenges identified above.

The investigation studied the relationship of training in creative problem solving (CPS) to the opportunity identification skills of entrepreneurial learners. The first hypothesis was that CPS training would positively impact attitudes relating to preference for ideation and the tendency to not make premature evaluations of ideas. The second

hypothesis was that CPS training would increase the number of opportunities identified while the third hypothesis was that CPS training would increase the quality of opportunities identified. Quality was self-assessed where quality was defined as the degree to which the idea meshes with the subject's interests and passions and to the extent to which the subjects possess prior experience related to the idea they have identified. (Appendix A).

### **Goal**

The goal of the researcher in this study was to explore the relationships between CPS training and the generation of entrepreneurial ideas. Based on a review of current entrepreneurship texts, it is the researcher's observation that such linkages are still in the formative stage (Good, 2003; Hisrich, Peters, Shepherd, & Mombourquette, 2006; Kuratko & Hodgetts, 2003b; Timmons & Spinelli, 2008). A leading entrepreneurship text has acknowledged the "important implications for entrepreneurs who need to be creative in their thinking" and of the notion that creativity can be learned or enhanced (Timmons & Spinelli, 2008). Other authors have cited CPS literature in their chapters on innovation, creative thinking and opportunity recognition (Hisrich et al., 2006; Kuratko & Hodgetts, 2003b; Timmons & Spinelli, 2008). Personal traits such as efficacy and creativity have been identified as antecedents to entrepreneurial alertness (Ardichvili, Cardozo, & Ray, 2003).

### **Research Elements**

The research elements include the research design, hypotheses, research questions, and variables. Details are provided for each element followed by a tabular presentation that places the elements in context for the research that was conducted.

### *Research Design*

An experimental research design was employed, see Table 1 below. Participants were recruited and randomly assigned to either a treatment or a control group. Pre-test measurements were taken concurrently with all participants prior to assignment to treatment or control group. The treatment group completed the tutorial and then the post-test measurements. The control group completed the post-test measurements and then the tutorial. Both groups completed the tutorial and the tasks assigned in the tutorial booklet. The research design used a 14 item questionnaire to measure the relationship of training to affective attitudes (Basadur & Finkbeiner, 1985). Quantity scores were obtained by counting the number of ideas that the participants listed. No attempt was made to remove similar or duplicate ideas. Quality scores were self assessed (Appendix A, using a 5 point Likert scale on the 3 dimensions of solving a meaningful problem , personal passion, and prior experience (Ardichvili et al., 2003; Basadur & Head, 2001; DeTienne & Chandler, 2004).

Table 1: Experimental Research Design

<b>Group</b>	<b>Pre-test</b>	<b>Post-test Session</b>	
CPS Training	Obs <sub>1</sub>	CPS Training	Obs <sub>2</sub>
Control Group	Obs <sub>3</sub>	Obs <sub>4</sub>	CPS Training

### *Research Questions*

The initial research question examined comparability between the treatment and control groups by examining differences in key descriptive statistics. The balance of the research questions related to the three stated hypotheses.



- 1 *Are there statistically significant differences between the untrained control group and the treatment group on select descriptive data?*

An independent samples t-test was performed on the variables with integer values while a proportions z-test was performed on the variables with percentage values (gender, previous venture experience and CPSP - preferred problem solving style). These tests were performed on the following descriptive data obtained from the baseline questionnaire: Age, gender, program of study, cumulative grade point average number of jobs held in last 3 years, previous involvement in the creation of a new venture, entrepreneurial intention, creativity self-assessment, entrepreneurial alertness, technology comfort level and preferred problem solving style (DeTienne & Chandler, 2004).

- 2 *Are there statistically significant differences on pre-test and post-test scores for preference for ideation in opportunity finding when compared to pre-intervention scores:*

(a) *For the treatment group?*

(b) *For the control group?*

(c) *Between the treatment group and the untrained control group?*

The Basadur 14 item inventory (Appendix B) was administered during both pre and post test data collection. A paired samples t-test was used to test hypothesis 2a and 2b and while an independent samples t-test was used to test hypothesis 2c (DeTienne & Chandler, 2004).

- 3 *Are there statistically significant differences on pre-test and post-test scores for the number of opportunities identified when compared to pre-intervention scores:*

- (a) *For the treatment group?*
- (b) *For the control group?*
- (c) *Between the treatment group and the untrained control group?*

Pre treatment and post treatment participants were asked to think back over the events of the last 24 hours including classes, commuting, social interactions, work, family, in short any and all of their interactions including those with technology and appliances and create a list any business/venture opportunities they had observed, listing any and all ideas that came to mind. Quantity scores were obtained by counting the number of ideas that the participants listed. No attempt was made to remove similar or duplicate ideas. There were two tasks that resulted in pre and post incidences of idea generation. One was the pre-test and post-test stimulus completed by both the treatment and control groups permitting both within group and between group comparisons. The second task was completed in the tutorial booklet by all participants with the result that only within group testing for all participants was possible. A paired samples t-test was used to test hypothesis 3a and 3b and while an independent samples t-test was used to test 3c.

- 4 *What are the statistically significant differences on pre-test and post-test scores for the quality of opportunities identified when compared to pre-intervention scores:*
- (a) *For the treatment group?*
  - (b) *For the control group?*
  - (c) *Between the treatment group and the untrained control group?*

Quality scores were self assessed (Appendix A, using a 5 point Likert scale on the 3 dimensions of solving a meaningful problem , personal passion, and prior

experience (Ardichvili et al., 2003; Basadur & Head, 2001; DeTienne & Chandler, 2004). A paired samples t-test was used to test hypothesis 4a and 4b and while an independent samples t-test was used to test 4c.

### *Hypotheses*

*H1: Following training in Creative Problem Solving (CPS), there will be a statistically significant increase in preference scores for the "ideation" construct and there will be a statistically significant decrease in the preference scores for the "tendency to make premature critical evaluations" construct:*

- A. When compared to pre-intervention scores.*
- B. When compared to an untrained control group.*

*H2: Following training in Creative Problem Solving (CPS), there will be a statistically significant increase in the number of ideas identified:*

- A. When compared to pre-intervention scores.*
- B. When compared to an untrained control group.*

*H3: Following training in Creative Problem Solving (CPS), there will be a statistically significant increase in the idea quality scores:*

- A. When compared to pre-intervention scores.*
- B. When compared to an untrained control group.*

The first hypothesis will be tested by research question number 2, the second hypothesis will be tested by research question number 3 and the third hypothesis by research question number 4.

### *Variables*

Dependent variables included the preference for ideation, number of opportunities and quality of opportunities. Independent variables included age, gender, program of study, cumulative grade point average, number of jobs held in last 3 years, previous involvement in the creation of a new venture, entrepreneurial intention, creativity self-assessment, entrepreneurial alertness, technology comfort level and preferred problem solving style. These independent variables were used in research question 1 to identify statistically significant differences between the treatment and control groups. They were also used in research questions 2, 3, and 4 to identify statistically significant differences in attitude towards divergent thinking (research question 2), quantity of ideas (research question 3) and quality of ideas (research question 4) based on age, gender, cumulative grade point average and entrepreneurial intention etc.

Preferred problem solving style fell into one of 4 quadrants: generator, conceptualizer, optimizer, and implementer (Appendix C). Previous research with business students indicated that 37% and 33% fell into the optimizer and implementer quadrants while 17% fell into the conceptualizer quadrant and only 13% into the generator quadrant – the quadrant the tutorial attempted to enhance (Basadur, Graen, & Wakabayashi, 1990a). The final independent variable was the technology comfort level of the participants. It was expected that those with low comfort levels with technology would have difficulty accessing and assimilating the learning in the tutorial. Of the three dependent variables one was affective -attitude relating to preference for ideation and two were effective - the quantity of ideas generated and the quality of ideas generated.

*Tabular Summary*

Table 2: Hypotheses

---

<b>Hypotheses</b>
<p><i>H1: Training in Creative Problem Solving (CPS) for university-based entrepreneurial participants will have a positive, statistically significant relationship to participant preference for ideation in opportunity finding:</i></p> <ul style="list-style-type: none"> <li><i>A. When compared to pre-intervention scores.</i></li> <li><i>B. When compared to an untrained control group.</i></li> </ul> <p><i>H2: Training in CPS for university-based entrepreneurial participants will have a positive, statistically significant relationship to the number of opportunities identified:</i></p> <ul style="list-style-type: none"> <li><i>A. When compared to pre-intervention scores.</i></li> <li><i>B. When compared to an untrained control group.</i></li> </ul> <p><i>H3: Training in CPS for university-based entrepreneurial participants will have a positive, statistically significant relationship to the quality of ideas identified:</i></p> <ul style="list-style-type: none"> <li><i>A. When compared to pre-intervention scores.</i></li> <li><i>B. When compared to an untrained control group.</i></li> </ul>

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Table 3: Research Questions, Variables and Statistical Tests

---

<b>Research Question</b>	<b>Independent Variable</b>	<b>Instrument</b>	<b>Statistical Test</b>
<p>Are there statistically significant differences between the control group and the treatment group on select descriptive data?</p>	<p>Age, gender, program of study, cumulative grade point average number of jobs held in last 3 years, previous involvement in the creation of a new venture, entrepreneurial intention, creativity self-assessment, entrepreneurial alertness, technology comfort level and preferred problem solving style</p>	<p>Questionnaire</p>	<p>Independent samples t-test and proportions z-test</p>

---

Table 3 Continued: Research Questions, Variables and Statistical Tests

<b>Research Question</b>	<b>Dependent Variable</b>	<b>Instrument</b>	<b>Statistical Test</b>
<p>Are there statistically significant differences on pre-test and post-test scores for preference for ideation in opportunity finding when compared to pre-intervention scores:</p> <p>(a) For the treatment group?            (b) For the control group?            (c) Between the treatment group and the untrained control group?</p>	Preference for ideation in opportunity finding	Basadur 14 item preference questionnaire	Paired samples t- test and independent samples t-test
<p>Are there statistically significant differences on pre-test and post-test scores for the number of opportunities identified when compared to pre-intervention scores:</p> <p>(a) For the treatment group?            (b) For the control group?            (c) Between the treatment group and the untrained control group?</p>	Number of opportunities identified	Pre-test and Post-test Response Sheet	Paired samples t- test and independent samples t-test
<p>What are the statistically significant differences on pre-test and post-test scores for the quality of opportunities identified when compared to pre-intervention scores:</p> <p>(a) For the treatment group?            (b) For the control group?            Between the treatment group and the untrained control group?</p>	Quality of opportunities	Self Assessed Quality Score	Paired samples t- test and independent samples t-test

---

Table 4: Dependent Variables and Source of Data

<b>Dependent Variable</b>	<b>Source of Data</b>
Preference for ideation - Ideation is a creative problem solving process for generating ideas where judgment is suspended and the emphasis is on the quantity of ideas (Basadur, 1994; Basadur, Graen, & Gren, 1982).	Basadur 14 Item Inventory
Number of opportunities - Count of opportunities for each participant. Ideas that fall into the category of not enough information to make a determination were excluded.	Pre-Test and Post-Test Input Sheets
Quality of Opportunities – Quality is defined as a measure of the fit between the entrepreneur and the idea and the fit between the idea and potential markets. Dimensions include: connection to a passion or interest of the entrepreneur, previous experience, and solution of a meaningful customer problem.	Quality Assessment Rubric - Self Assessed

Table 5: Independent Variables and Source of Data

<b>Independent Variable</b>	<b>Source of Data</b>
Treatment – CPS training	Group Assignment Sheets
Age	Baseline Questionnaire
Gender (Male/Female)	Baseline Questionnaire
Program of study – Coded by major area: Science, Arts, Commerce/Management, Computer Science, Engineering etc.	Baseline Questionnaire
Cumulative grade point average – the cumulative grade point average earned by the participant while at Dalhousie University	Registrar's office
Number of jobs held in last 3 years – self reported by participants where job title and industry are identified.	Baseline Questionnaire

Table 5 Continued: Independent Variables and Source of Data

<b>Independent Variable</b>	<b>Source of Data</b>
Preferred problem solving style – participants were coded as falling into one of 4 quadrants generator, conceptualizer, optimizer and implementer. The CPSP inventory has 2 dimensions: the way knowledge is gained – direct, concrete and experiencing versus abstract detached thinking; and the way knowledge is used – for ideation (generating new possibilities) versus evaluation (possibilities).	Basadur CPSP Inventory
Previous involvement in the creation of a new venture – measures the number of ventures started by the participant or by the participant with others that created new wealth.	Baseline Questionnaire
Entrepreneurial intention – On a scale of 1-5 how likely is that they would start a venture in the next 12 months, next 5 years, next 10 years or in their lifetime.	Baseline Questionnaire
Creativity self-assessment – using a Likert scale of 1-5 from not at all creative to highly creative.	Baseline Questionnaire
Entrepreneurial alertness – using a 5 point Likert scale of from not looking for ideas to constantly looking for ideas.	Baseline Questionnaire
Technology comfort level – Using a 5 point Likert scale from very uncomfortable using technology to completely comfortable	Baseline Questionnaire

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### **Relevance and Significance of the Research**

Current opportunity recognition literature viewed opportunity recognition as part of a larger process that began with generating ideas, followed by recognition of an opportunity, followed by investigation of commercial possibilities and culminating in venture launch (Ardichvili et al., 2003; Bhave, 1994; Long & McMullan, 1984; Lumpkin., 2005). Some researchers have theorized that opportunities have objective existence and that training should focus on “discovering” the opportunity through



systematic search (Fiet, 2002; Fiet et al., 2004) while others felt that training should focus on enhancing pattern recognition skills (Baron, 2004, 2006). Prior knowledge and experience is often cited as central to successful opportunity recognition (Ardichvili et al., 2003; Shane, 2003; Shane & Venkataraman, 2000; Shepherd & DeTienne, 2005). In contrast to the assertion that opportunities have objective existence others have asserted that the entrepreneur and opportunity are inextricably linked and rather than the nexus proposed by Shane (Shane, 2003) the relationship is a duality where the interaction between entrepreneur and opportunity is the appropriate research focus. Initial work in this line of inquiry introduced the constructs of causal and effectual reasoning where effectual thinkers set out to chart new realities and the future is out there to be created rather than discovered (Sarasvathy, 2001). Subsequent work suggested that value creation is inherently an iterative process of social construction as the entrepreneur interacts with the opportunity (Sarason, Dean, & Dillard, 2006).

Opportunity identification needs to be thought of in the context of the conditions under which it is being conducted. Enhancing recognition skills makes sense when both supply and demand are known and the entrepreneur can use causal logic to locate the opportunity. Enhancing discovery skills is appropriate when either supply or demand is unknown and the entrepreneur progresses on their path of discovery utilizing cues provided by their knowledge corridor. Enhancing enactment skills has utility when neither supply nor demand are known and here the entrepreneur uses effectual reasoning to interact with the environment to create the opportunity (Sarasvathy, Dew., Velamuri, & Venkataraman, 2003).

Opportunity recognition behavior was dependent on whether the entrepreneur was externally stimulated (has already decided to start a business and is looking for a suitable opportunity) or was internally stimulated (opportunity recognition preceded the decision to start a business) (Bhave, 1994). Opportunity recognition behavior also varied dependent on whether the entrepreneur acted solo (developed business ideas on his/her own) or was a network entrepreneur (obtains ideas from their social networks (Lumpkin, Hills, & Schrader, 2004). Novelty, while a desirable quality in creating market advantage and founding a venture, dramatically increases the time needed and difficulty of founding a venture (Bhave, 1994). In spite of this, novelty and innovativeness were often used as a proxy when evaluating the quality of an idea (DeTienne & Chandler, 2004).

The research in this study investigated the impact of CPS training on the ability of participants to generate entrepreneurial ideas that may lead to entrepreneurial opportunities. It was the researcher's contention that enhanced opportunity finding skills would positively impact the generation of economic value in at least two ways. There would be greater retention of current venture participants due to the moderation of failure rates attributable to the pursuit of sub-optimal opportunities. There would also be incremental economic value attributable to the commercialization of higher value opportunities by current and future entrepreneurs. Because there were indications that creative experiences are not used in university settings to build entrepreneurial intention (Zampetakis & Moustakis, 2006), the training conducted in this study has the potential to be of value to nascent student entrepreneurs. Furthermore the need to establish practitioner action guidelines arising from research has resulted in a new stream in the entrepreneurship literature (Hindle, Anderson, & Gibson, 2004). It was

particularly relevant that the first set of guidelines were based on a seminal article by Shane discussing opportunity recognition (Hindle, 2004; Shane & Venkataraman, 2000).

Richard Florida popularized the role of creativity and its power to create innovative communities (Florida, 2003; Lee, Florida, & Acs, 2004). Teresa Amabile, a Harvard researcher, provided a framework for how creativity, innovation and entrepreneurship interact to produce value (Amabile, 1997a). Creativity was defined as the production of novel and appropriate solutions to open ended problems in a domain of knowledge. Innovation was seen as the implementation of these solutions. Entrepreneurship was a form of innovation that sees the implementation of creative ideas that result in a new organization or a new initiative within an existing organization.

Innovative acts, and the resulting “creative destruction” were seen as central to creating value and distributing wealth in an economy (Drucker, 1985; Schumpeter, 1936; Schumpeter, 1942). Since the mid 1960s there was an explosion in the number of entrepreneurship courses and complete entrepreneurship programs offered at North American Universities (Timmons & Spinelli, 2008; Vesper & Gartner, 1997). Concurrent with the growth in entrepreneurship education there have been ongoing efforts to train people to be more creative or to better access their innate creativity (DeTienne & Chandler, 2004; Fong, 2006) and how to become more creative when working in teams (Basadur & Head, 2001). McGraw Hill Ryerson has sponsored a series of studies on technology and student success. Understanding of subject matter, critical thinking and problem solving skills were identified as the 3 top learning objectives (identified by 90%, 89% and 87% of the respondents respectively) while providing a stimulating learning environment is identified as the top teaching objective, (identified by

90% of the respondents) (Lukaweski, 2006). The tutorial developed for this study spoke directly to those issues.

### **Barriers and Issues**

Graduating more students who start new organizations and increasing the success rate of those who make the attempt was a core objective of many entrepreneurship programs (Leach, 2000, 2006; Timmons & Spinelli, 2008). The researcher recruited participants from two post secondary institutions who were enrolled in three different fields of study – business/management electrical engineering and recreation. As students the participants were deemed a vulnerable population when reviewed by the Institutional Review Board (IRB), Nova Southeastern University, and the Social Sciences and Humanities Research Ethics Board (SSHREB), Dalhousie University. With this in mind, the researcher developed procedures to ensure the anonymity of the participants was protected. This reduced the level of detail that could be collected, in case it identified the participant. In conversations with the chair of the (SSHREB) at Dalhousie it was pointed out that because the research is exploratory the loss of detail is unlikely to impact the quality of the investigation (P Lindley, personal communication, July 23, 2003).

The researcher had experience in teaching entrepreneurship and had been trained and accredited to deliver the Basadur problem solving material. Although the efficacy of the Simplex<sup>®</sup> methodology had been previously validated there were threats to the validity of the research that needed to be controlled. Studies of creativity suggested that business students are less creative than other students (Cheung, 2003; Eisenman, 1969; Maier & Hoffman, 1961) and that in the workplace creative behaviors were often out of tune with the behaviors that make an organization efficient producing cognitive

dissonance (Mauzy, Harriman, & Arthur, 2003). It was anticipated that participants would experience a similar dissonance, as they completed the divergent thinking exercises in the tutorial. The university experience is often at odds with the development of creative thinking skills (Zampetakis & Moustakis, 2006). In a study of preferred problem solving styles employed by university students in an MBA program it was found a disproportionately small number of students (13%) fell into the generator quadrant, see Appendix C for detailed description (Basadur et al., 1990a). The Creative Problem Solving Profile (CPSP), Appendix C, was used to identify the preferred problem solving style of participants.

The 2 constructs within the 14 item Basadur questionnaire have been tested for validity and reliability. The 6 item scale “preference for ideation” had been found to be internally valid and moderately reliable (Cronbach alpha of .68) while the 8 item “tendency for premature critical evaluation of ideas” had been found to be internally valid and substantially reliable (Cronbach alpha of .83). External validity has been established for the “tendency for preference for ideation” construct (Basadur & Finkbeiner, 1985). The questionnaire first developed in 1985 had been used in subsequent research (Basadur, Graen, & T.A.Scandura, 1986; Basadur, Wakabayashi, & Graen, 1990b; Basadur, Wakabayashi, & Takai, 1992; Runco & Basadur, 1993).

The participants in this study encountered a paradox. On the one hand they were enrolled in a university environment where scholarly learning was expected while on the other hand formation of a new venture required practical skills. Research has clearly demonstrated that “knowing” the theoretical background was distinct from the skills needed to implement (Pfeffer & Sutton, 1999). The researcher consciously chose to

focus on training that would enhance skills rather than education to enhance knowledge. Techniques for problem solving instruction were drawn from the instructional design literature (Anderson & Krathwohl, 2001; Gronlund, 2004; Smith & Ragan, 2004) as well as from a formulary of the active ingredients arising from 172 idea generation techniques (Smith, 1998). Robert Gagne's events of instruction were incorporated into the tutorial design – gain attention, inform learners of objectives, stimulate recall of prior learning, present content, provide learning guidance, elicit performance, provide feedback, assess performance and enhance retention and transference to personal use (Gagne, 1977; Gagne, Wager, Golas, & Keller, 2004).

Amabile identified intrinsic motivation as a key construct in her componential theory of creativity (Amabile, 1983) and linked it specifically to entrepreneurial creativity (Amabile, 1997a) suggesting that affective techniques and learning objectives are appropriate for the Going Fishing tutorial. Inert knowledge gained in the classroom can be converted to practical knowledge when learners are engaged in the learning through authentic experiences (Gagne et al., 2004; Smith, 1998). With this in mind, the pre-test and post-test stimulus statement asked participants to examine their own activities and look for ideas that address problems that they have personally experienced.

Building on the theme of intrinsic motivation established by Amabile, the researcher included elements in the tutorial that reinforced the interactions between the entrepreneur, their prior experience and the idea/opportunity (Ardichvili et al., 2003). Ardichvili, Cardoza and Ray separated prior knowledge into two domains – special interest, representing the passion and commitment from the entrepreneur and industry knowledge that included knowledge of markets, customer problems and ways to serve

customers. To increase the engagement of the learner, the tutorial focused less on systematic search looking for opportunities that have objective existence (Fiet, 2002; Fiet et al., 2004; Shane, 2003) and more on the interaction between the entrepreneur and the opportunity where the learner uses effectual and causal reasoning to construct the opportunity (Sarasvathy, 2001). Over time and multiple instances entrepreneurs both shape and are shaped by the opportunity (Sarason et al., 2006).

The research conducted for this study was exploratory in nature. While the researcher was interested the latency of any effects that may result from the training and he will address this issue in future research that will not be part of this study. The instruments and tasks used to collect data (list all the opportunities you can think of, pick the best opportunity, complete the 14 item attitude questionnaire - both pre-test and post-test), may by themselves, in the absence of any other treatment, augment the idea finding abilities of the participants.

Cheung suggested that creativity among university students decreases with years of study while dogmatism, in a mirror image effect, increased, and that humanities and social science students had superior creative skills compared to science and technology students (Cheung, 2003). This and earlier studies have suggested that business students and managers were not predisposed to creative thinking (Eisenman, 1969; Maier & Hoffman, 1961) suggesting a need to provide training to enhance creativity skills. It was encouraging that there had been success in enhancing the creative performance of university students using training techniques of relatively short duration (Greer & Levine, 1991) as well in semester based approaches (DeTienne & Chandler, 2004; Fong, 2006).

Table 2 summarizes the elements of the research plan, including hypotheses, research questions, variables, data collection and statistical tests

### **Limitations, Delimitations and Assumptions**

The intended audience for this investigation was potential nascent entrepreneurs who are registered in an undergraduate program. The tutorial was a 60-75 minute treatment that was designed to be incorporated within a single semester entrepreneurship course that includes lectures, assignments, class participation and exams. The study identified statistically significant differences in three dependent variables (quantity of ideas, attitude towards divergent thinking and quality of ideas) by comparing post treatment scores to pre-treatment scores both within the treatment group and between the treatment group and the non-treatment group. The investigation was limited to enhancing the idea generation abilities of participants by training: divergent thinking techniques, strategies for deferring judgment and convergent thinking techniques for choosing the best idea. The ability to generalize to other populations was impacted by the small sample size, the specific fields of study represented among those recruited, the 90 minute length and single delivery mode of the tutorial, the specific content of the tutorial and the ability/non-ability of the multi-media format to engage the learner.

In this study the researcher only explored the immediate effect of the CPS training. The latency of any effects observed may be addressed in future research. There was no attempt to investigate the interaction among the various curriculum elements that would be present in a university course – lectures, discussion, assigned reading, quizzes, exams and projects. Similarly there was no comparison of technology moderated delivery modes with face to face modes. While the multi-media tutorial was validated by



an expert panel and with a test group there was no comparison made with multiple tutorial and media designs.

The first assumption was that the training stimulus was of sufficient duration and intensity to produce an effect. The second assumption was that the training in creative problem solving would enhance idea generation skills that in turn would enhance opportunity finding skills (Hisrich et al., 2006; Kuratko & Hodgetts, 2003b; Kuratko & Welsch, 2003; Timmons & Spinelli, 2008). The third assumption was that current university learners are representative of the population that has participated or who plans to participate in post secondary education. The fourth assumption was that the pre-test and post-test stimulus statement “think back for a moment over the events of the last 24 hours including classes, commuting, social interactions, work, family, in short any and all of your interactions including those with technology and appliances. For the next 5 minutes please list below any business/venture opportunities you have observed. List any and all ideas that come to mind” would be fertile ground for the participants to draw venture ideas from.

### **Definition of Terms**

*Convergent Thinking* – a CPS tool for choosing a preferred solution. Choice requires criteria and the criteria and weighting are derived from a divergent thinking, deferral of judgment and convergent thinking cycle (Basadur, 1994; Basadur & Gelade, 2003).

*Deferral of Judgment* – a CPS tool/discipline that requires the suspension of judgment until it is time to exercise convergent to make a choice. It requires lateral deferral of judgment within any of the eight sequential steps in the Simplex<sup>®</sup> cycle as

well as vertical deferral of judgment to ensure that each of the eight steps is followed in order (Basadur, 1994; Basadur & Gelade, 2003)

*Divergent Thinking* – a CPS tool used to generate as many ideas as possible without stopping to evaluate. Quantity matters more than quality, wild ideas are encouraged as are techniques for building on the ideas of others (Basadur, 1994; Basadur & Gelade, 2003).

*Entrepreneurial alertness* – the ability to notice without search opportunities that have been previously overlooked (Gaglio & Katz, 2001; Kirzner, 1973).

*Entrepreneurial Learner* – a university student who has been categorized as entrepreneurial based on the following criteria: enrollment in an entrepreneurship class, experience in starting a business, self-rating as entrepreneurial, and self-rating of future entrepreneurial intentions (Appendix D)

*Evaluation* - is a CPS process for selecting the best from among many ideas.

*Externally stimulated entrepreneurs* – already know they want to start a venture before beginning their search for an opportunity (Bhave, 1994).

*Ideation* - is a CPS process for generating ideas where judgment is suspended and the emphasis is on quantity of ideas.

*Internally stimulated entrepreneurs* – opportunity recognition precedes the decision to start a business (Bhave, 1994).

*Network entrepreneurs* – obtain their ideas from their social networks (Ardichvili et al., 2003; Hills, Lumpkin, & Singh, 1997; Orwa, 2003; Singh, 2000).

*Opportunity* - an entrepreneurial opportunity is one that persists over time and creates value for the venture stakeholders (Timmons & Spinelli, 2008).

*Preferred Problem Solving Style* – measured by the Creative Problem Solving Profile and falling into one of 4 quadrants: generator, conceptualizer, optimizer or implementer (Basadur, 1979, 1989; Basadur et al., 1990a; Higgins, 1996).

*Prior Knowledge* –prior information necessary to identify an opportunity (Shane, 2003) including a demonstrated special interest or passion in the subject at hand as well as a knowledge of customer problems (Ardichvili et al., 2003; Shane, 2003; Shane & Venkataraman, 2000; Sigrist, 1999)

*Problem Finding* – finding important problems to solve is the first of eight steps in the Simplex<sup>®</sup> process.(Basadur, 1994; Basadur & Gelade, 2003)

*Simplex<sup>®</sup>* - is a complete process of creative problem solving based on eight sequential steps each of which contains an ideation/evaluation cycle (Basadur, 1994).

*Solo Entrepreneurs* – develop ideas on their own (Hills et al., 1997; Orwa, 2003).

## **Summary**

The researcher investigated the relationship of training in creative problem solving (CPS) to the opportunity finding skills of entrepreneurial learners. Venturing was identified as being endemic in, and vital to a healthy economy. A case was made that early stage interventions in the business start up cycle, like training in opportunity finding, have the potential to increase the number of entrants and the resulting economic value while reducing the number of exits from the entrepreneurial pool attributable to higher success rates among entrants.

This was an exploratory study targeted at nascent entrepreneurs who are registered in undergraduate programs. In this setting it was appropriate to focus skill development on the pre-vision and point of vision stages of idea development (Long &

McMullan, 1984) recognizing that additional work would need to be done before the ideas are venture ready. Although the research did not examine downstream events following the generation of the initial idea, nor interaction among curriculum elements nor alternative delivery modes it holds the potential to make a much sought after linkage between creativity and the generation of ideas that lead to opportunities and eventual venture initiation.

An experimental design was used with random assignment to either a treatment or a control group. There were no statistically significant differences in composition between the treatment and control groups. There were statistically significant differences found in one of the two divergent thinking constructs –the tendency to make premature evaluations. Two measures of ideational fluency were tested using paired samples t-tests for within group differences and independent samples t-tests for between group differences. No statistically significant differences were found for the first measure of ideational fluency – the number of ideas generated in post-test scores compared to pretest scores and the second bottles ideation task compared to the first bottles ideation task. There were statistically significant differences found in the second measure of ideational fluency – the increment in unique ideas generated in post-test scores compared to pretest scores and the second bottles ideation task compared to the first bottles ideation task. There were no statistically significant differences found in the 4 quality measures.

The framework in this chapter provided the rigor necessary to investigate a meaningful research problem. Subsequent chapters provide context for the investigation by reviewing relevant literature, describing the methodology for conducting the

investigation, sharing the results of the study, providing conclusions, discussing implications, and making recommendations for future research.

## Chapter 2

### Review of the Literature

#### **Introduction**

The focus of the research in the study was to investigate the relationship of CPS training on the ability of participants to generate entrepreneurial opportunities. It was the researcher's contention that enhanced opportunity finding skills would be positively related to the generation of economic value in at least two ways. There would be greater retention of current venture participants due to the moderation of failure rates attributable to the pursuit of sub-optimal opportunities. There would also be incremental economic value attributable to the commercialization of higher value opportunities by current and future entrepreneurs. The need to establish practitioner action guidelines arising from research has resulted in a new stream in the entrepreneurship literature (Hindle et al., 2004). It was of particular relevance to the investigation that the first set of guidelines was based on opportunity recognition (Hindle, 2004; Shane & Venkataraman, 2000).

Teresa Amabile (Amabile, 1997a), a Harvard researcher, provided a framework for how creativity, innovation and entrepreneurship interact to produce value with creativity defined as the production of novel and appropriate solutions to open ended problems in a domain of knowledge. Innovation was seen as the implementation of these solutions. Entrepreneurship was a form of innovation that saw the implementation of creative ideas that result in a new organization or a new initiative within an existing

organization (Amabile, 1997a). A three stage process of recognition, development, and evaluation leading to venture formation has been proposed. Five factors were put forward as influencing the opportunity recognition process: entrepreneurial alertness, information asymmetry and prior knowledge, personality traits (with an emphasis on optimism, self-efficacy and creativity) and finally the nature of the opportunity itself (Ardichvili et al., 2003).

Innovative acts, and the resulting “creative destruction” were seen as central to creating value and distributing wealth in an economy (Drucker, 1985; Schumpeter, 1936; Schumpeter, 1942). Since the mid 1960’s there has been an explosion in the number of entrepreneurship courses and complete entrepreneurship programs offered at North American Universities (Timmons & Spinelli, 2008; Vesper & Gartner, 1997). Concurrent with the growth in entrepreneurship education there have been ongoing efforts to train people to be more creative or to better access their innate creativity (Hisrich et al., 2006; Kelley & Littman, 2005) and how to become more creative when working in teams (Basadur & Head, 2001).

### *Organizing Principles*

The organizing principle behind the literature review was to first look at the economic roots of entrepreneurship and the evolution of the entrepreneurial process. This is followed by an in depth discussion of the theory supporting opportunity identification with an emphasis on identifying the constructs that were used as independent variables in the study. Opportunity identification is then discussed, including appropriate search strategies, the nexus of opportunity and entrepreneur versus the duality of entrepreneur and opportunity, the role of novelty and newness, the role of

creativity as identified in the entrepreneurship literature, and finally implications for development of the training module. Next the instructional literature was examined: for strategies that would support training in creative problem solving and to establish the context of creativity training in post secondary education. Finally the creativity literature was examined: to establish a historical context, to look for connections to entrepreneurship, to look for insights from an organizational setting and finally to identify relevant creative problem solving literature.

### **Entrepreneurship**

In this section the economic roots of entrepreneurship are discussed and the dichotomous nature of opportunity recognition highlighted. This is followed by a delineation of the entrepreneurial process that fleshes out the steps needed to successfully identify venture ideas and how these steps connect to the overall process of starting a new venture.

The discipline of economics has provided two differing views of the role of an entrepreneur, and the place of opportunity recognition in economic development. Schumpeter's entrepreneur created opportunities by creating disequilibria while Kirzner's entrepreneur found opportunities by identifying disequilibria (Kirzner, 1973; Schumpeter, 1934). Schumpeter, an Austrian economist, based at Harvard, was often cited in the entrepreneurship literature due (Schoonhoven & Romanelli, 2001) to his views on innovation and the role that entrepreneurs play in a process he called creative destruction. Schumpeter proposed that development, the thing that moves an economy forward, "consists primarily in employing existing resources in a different way, doing new things with them, irrespective of whether these resources increase or not", in essence making a



new combination. New combinations generally took place in new firms not from existing firms. Being an entrepreneur was neither a profession nor a social class and was often of a transient nature, a form of serial entrepreneurship. In Schumpeter's view the entrepreneur created market disequilibria (an opportunity) through innovation and then took advantage of it (Schumpeter, 1936). Kirzner on the other hand posited a group of market players who were able to perceive the opportunities for entrepreneurial profits, selling goods at prices higher than they could be bought, "who immediately notice profit opportunities that exist because of the initial ignorance of the original market players". Kirzner asserted that entrepreneurship is inherent in the competitive market process, and that the role of the entrepreneur is that of an arbitrageur who is constantly looking for economic disequilibria (opportunities) to pursue (Kirzner, 1973). Schumpeter's entrepreneur acted to disturb an existing equilibrium by innovating while Kirzner's entrepreneur looked for disequilibria (recognition of an opportunity) and then moves the market back to equilibrium by seizing the opportunity (Swedburg, 2000).. Both of these views support the importance of training, which improves the performance of entrepreneurs in finding opportunities, so that they contribute to the productive functioning of the economy.

As the field of entrepreneurship matured researchers developed process models to explain opportunity recognition as an initial step that could ultimately lead to venture formation (Bhave, 1994; Long & McMullan, 1984). Entrepreneurship writers initially viewed opportunity as arriving as a complete idea, an epiphany, requiring no further development (Gaglio & Taub, 1992; Kirzner, 1973, 1979; Long & McMullan, 1984). Ultimately many came to view opportunity recognition as a process.

One group of researchers proposed a process consisting of four stages: pre-vision, of vision, opportunity elaboration and the decision to proceed. The pre-vision stage requires substantial work. In the point of vision stage initial ideas were often “aha” moments but were rarely venture ready. In the elaboration stage additional creative thought was required to fill in the gaps and cope with anticipated problems. When the elaboration stage was completed the entrepreneur needed to once again invest considerable effort to ensure that the opportunity was business ready. Opportunity identification took place over an extended period of time even though the point of vision may have been a distinct moment in time (Long & McMullan, 1984).

Another researcher built a process model of entrepreneurial venture creation which was described as an “iterative, non-linear, feedback driven, conceptual and physical process”. This model delineated four stages: opportunity, technology setup, organization creation and exchange. Of particular interest were the discrimination between externally stimulated entrepreneurs (they already knew that they wanted to create a business) and internally stimulated entrepreneurs (opportunity recognition preceded the decision to start a venture) and the suggestion that the opportunity recognition process between the two differs. It was found that novelty, while identified as a desirable quality in venture formation, increases the difficulty and time needed to found a venture (Bhave, 1994). The Bhave model could act as a road map for prospective entrepreneurs that could alert them to strategic issues at each stage in the venture creation process especially when significant levels of novelty are introduced. This road map was included in the tutorial developed for this study. Both of these

process models were precursors to the Ardichvili model discussed at the beginning of this section.

An entrepreneurial idea does not always equate to a venture opportunity but an entrepreneurial idea is always at the heart of a venture opportunity. Personal insights and intuition are as important for identifying opportunities as a purposeful search (Singh, Hills, & Lumpkin, 1999). Entrepreneurs filtered opportunities using several criteria: financial rewards, enjoyment, interest, motivation, excitement and fun (Orwa, 2003).

#### *Relevance to the Investigation*

Both the Long-McMullan and the Bhave process models reinforced the need to judge the quality of the ideas in light of where they are located on the venture formation continuum. It is probable that internally stimulated entrepreneurs would generate fewer ideas than externally stimulated entrepreneurs, because they have already chosen their idea and have moved passed the stage of generating alternatives. Determination of quality in early stage ideas will have more to do with the connection of the entrepreneur's passions with the idea and linkages to prior experience than a complete understanding of the market (Ardichvili et al., 2003). The sources of entrepreneurial ideas were incorporated into the tutorial and used to stimulate the generation of possible ideas.

#### **Opportunity Identification Theory**

In this section the importance of opportunity identification to the field of entrepreneurship will be established and three types of opportunities identified – recognized, discovered and created (Sarasvathy *et al.*, 2003). A process model of venture creation was used to provide context for how entrepreneurial alertness contributes to the identification of opportunities and how the antecedent constructs of personality traits,

social net works and prior knowledge contribute to entrepreneurial alertness (Ardichvili et al., 2003).

Opportunity recognition is a core tenet of the entrepreneurial process and opportunity is embedded into the definition of entrepreneurship, whether it be “the pursuit of opportunity without regard to the resources currently controlled” (Stevenson & Jarillo, 1990) or “a way of thinking, reasoning and acting that is opportunity obsessed” (Timmons & Spinelli, 2008). Not all opportunities are created equally. Three views of opportunity can be used to construct a typology of entrepreneurial opportunities based on the pre-conditions for their existence. Opportunities can be recognized, discovered or enacted (Sarasvathy et al., 2003). The original labels used by Sarasvathy were allocative, discovery and creative. Allocative was changed to recognized to better fit with the OR literature while creative was changed to enacted to minimize confusion when discussing the role of creativity. Table 6 below compares these three views along the dimensions of opportunity actualization, focus, method, the existence of known sources of supply and demand, information assumptions, management of uncertainty, definition of success, basis of competition and strategic view. The purpose of the typology was not to suggest the superiority of one view over the other but rather to define the playing field and enable a discussion of core opportunity recognition constructs.

Table 6: Comparison of Three Views of Entrepreneurship (Sarasvathy et al.2003, p29)

<b>View</b>	<b>Recognized</b>	<b>Discovered</b>	<b>Enacted</b>
<b>Opportunity Actualization</b>	Using resources to achieve ends	Correcting errors and creating new ways to achieve end	Creating new means as well as new ends
<b>Focus</b>	System	Process	Decisions

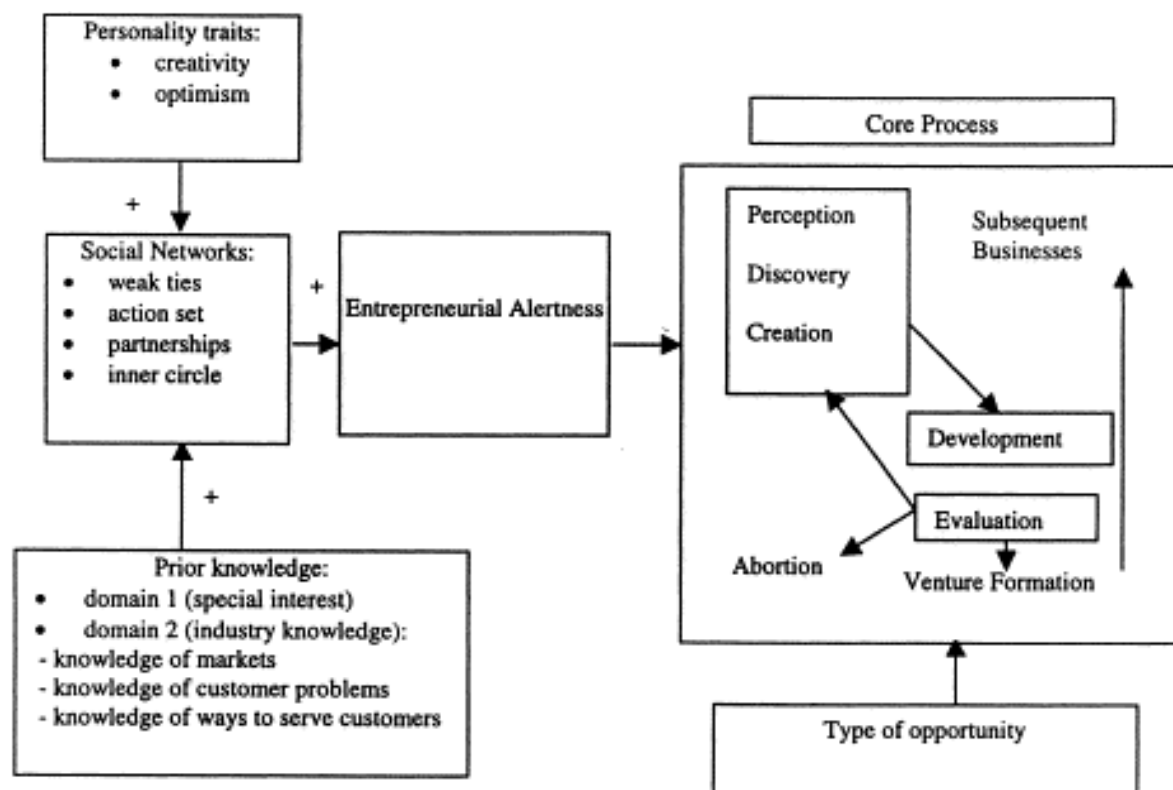
Table 6 Continued: Comparison of Three Views of Entrepreneurship (Sarasvathy et al.2003, p29)

<b>Opportunity Method</b>	Recognized through deductive reasoning	Discovered through inductive reasoning	Created through abductive reasoning
<b>Supply/Demand</b>	Both supply and demand known	Only supply or demand known	Both supply and demand unknown
<b>Information Assumptions</b>	Complete information available at aggregate and individual levels	Complete aggregate information available but imperfectly distributed among agents	Partial information at the aggregate ignorance is key to opportunity creation agents
<b>Uncertainty Management</b>	Through diversification	Through experimentation	Through effectuation
<b>Definition of Success</b>	Statistical artifact	Outliving failures	Mutually negotiated consensus among stakeholders
<b>Basis of Competition</b>	Resources	Strategies	Values
<b>Strategic View</b>	Risk management	Failure management	Conflict management

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Ardichvili explained the opportunity identification and development process using descriptors of perception discovery and creation. In this conceptualization entrepreneurial alertness, the ability to recognize potentially worthwhile goals or resources (Kirzner, 1973, 1979), was critical in perceiving, discovering or creating opportunities that could lead to venture formation.. Three constructs, personality traits, social networks and prior knowledge were seen as antecedents contributing to the overall level of entrepreneurial alertness (Ardichvili et al., 2003). A graphic presentation of how these constructs contribute to venture formation is presented in Figure 1 below. The

discussion that follows will explore the connections in the literature to these constructs and discuss how they were incorporated in the tutorial.



**Figure 1.** Model and units for opportunity identification and development (Ardichvili et al, 2003, p 118).

### *Entrepreneurial Alertness*

A propensity to notice and be sensitive to information about objects, incidents, and patterns of behavior in the environment, with special sensitivity to maker and user problems, unmet needs and interests, and novel combinations of resources were used as the working definition of entrepreneurial alertness in the study (Ardichvili et al., 2003). Kirzner, an economist, was the first to delineate the construct of entrepreneurial alertness and suggested that alertness has 2 dimensions - potentially worthwhile goals that have

remained unnoticed as well as unnoticed but potentially valuable resources. The alert entrepreneur was said to be alert to the receipt of information rather than already being in possession of it. Kirzner asserted that entrepreneurship was inherent in the competitive market process, and that the role of the entrepreneur was that of an arbitrageur who was constantly looking for economic disequilibria (opportunities) to pursue. Kirzner pointed out that Schumpeter's entrepreneur acted to disturb an existing equilibrium by innovating while he (Kirzner) saw the role of the entrepreneur to be moving the market back to equilibrium (Kirzner, 1973, 1979; Schumpeter, 1934, 1936).

The construct of entrepreneurial alertness can also be thought of in terms of cognitive and psychological properties. Entrepreneurs were seen to be opportunistic learners, they constantly filter for opportunities (Hills et al., 1997). The traditional definition, "to notice without search opportunities that have been previously overlooked" (Kirzner, 1973) was extended to include "a motivated propensity of man to formulate an image of the future" by describing a chronic/habitual schema. It was hypothesized that the alert: are more sensitive to market disequilibria; change their schema while the non-alert change the information; would appreciate the need to balance time to action with the need for complete and accurate information; know when they don't need to know more to make a good decision; would have more complex schema about change; engage in more counterfactual thinking; are more likely to break the existing means ends framework; and more alert to the profit potential of ideas. The non-alert activate schema from a set already existing and defined by the market. Not all who possess entrepreneurial alertness became entrepreneurs as opportunity identification was

but one step in a larger process that created successful new ventures (Gaglio & Katz, 2001).

Making new connections was hampered by three decision making heuristics. Representativeness occurred when stereotypes were used to place unknown chunks of information into a class without regard to rationality or logic. Availability was the tendency to parse information in the manner most easily recalled where recollection focuses on the most recent and the most frequently seen information. Anchoring was the tendency to stick close to the starting point or initial judgment suggesting that it takes discipline to diverge from our initial judgments and perceptions (Gilad, Kaish, & Ronen, 1988).

#### *Personality traits*

Creativity and high intelligence may contribute to alertness (Shane, 2003). A study of engineering students found that the participant's self-perception of creativity and a supportive family environment that promoted creative thinking has predictive value for entrepreneurial intention (Zampetakis & Moustakis, 2006). Recent experimental research has shown that emotional ambivalence was an enabler of being able to make unusual/creative connections among events and that it is possible to induce emotional ambivalence using technique of short duration. It is interesting to note that the impact of the induced emotional ambivalence was moderated by the extent to which the participants perceived the induced state as unusual (Fong, 2006).

Two sets of researchers have made the link between optimism, where optimism is related to self efficacy beliefs, and success in recognizing entrepreneurial opportunities. An experimental study found that subjects are led to believe that they are very competent



at decision making see more opportunities and take more risks (Krueger & Brazeal, 1994; Krueger & Dickson, 1994). Self-efficacy resulted from mastery of the activity through creating instances of the desired behaviour and from observing models in which the entrepreneur could see themselves engaging in the activity. It was enhanced through the provision of believable information about the activity and emotional support for performance (Bandura, 1977, 1986, 1995; Zimmerman, 1995).

### *Social Networks*

Solo entrepreneurs developed business ideas on their own while network entrepreneurs obtained their ideas from their social networks. Three groups of opportunity recognition behaviors have been categorized: solo – special alertness, opportunistic, very creative, seeing new opportunities comes naturally, the idea was theirs alone; network – opportunities in the long term are largely unrelated to each other, ideas came from an accidental process; informal – ideas came when relaxed, gut feel was most important in judging potential, opportunities are easier to see after entry (Hills et al., 1997). Consideration was given to identifying the solo and network preferences in the baseline survey for the study and also to prompting both behaviors as options in the tutorial.

The information search practices of 1,176 entrepreneurs were studied and six sources of information widely used: accountants, friends or relatives, other business owners, bankers, lawyers, and generally available books and manuals. When entering unfamiliar fields both experienced and inexperienced entrepreneurs searched less intensively. This implies that the entrepreneur has to go beyond their established information networks (Cooper, Folta, & Woo, 1995). In a more recent study, three forms

of social networking (mentors, informal industry networks, participation in professional forums) showed a direct, positive effect on opportunity recognition by entrepreneurs. The effects of mentors and professional forums were mediated by the strength of the mental schema employed by the entrepreneur informal industry networks were mediated by self-efficacy Alertness to entrepreneurial opportunities can be enhanced by assisting nascent entrepreneurs to obtain mentors and to participate in professional forums (conferences, seminars, workshops) can contribute to their success in identifying potentially valuable opportunities for new ventures by providing information and building social networks (Ozgen & Baron, 2007).

#### *Prior Knowledge*

Two domains of prior knowledge are relevant to the identification process. The first domain contained knowledge that was of special interest to the entrepreneur – it was fascinating and fun. The second domain was accumulated over the years and reflected familiarity with customer problems and issues.(Ardichvili et al., 2003). It was the special interest/resonance of the first domain that drove the entrepreneurs to deepen their competence resulting in a profound knowledge about the topic (Shane, 2003; Sigrist, 1999). Some entrepreneurs were able to discover a given opportunity because they were in possession of the necessary prior knowledge as well as the cognitive ability to value it (Shane & Venkataraman, 2000). Idiosyncratic information corridors impacted the ability of an entrepreneur to recognize a specific opportunity where the prior information is complementary with the new information, which triggers an entrepreneurial conjecture (Kaish & Gilad, 1991).

Prior knowledge and prior experience were the primary sources for searching for opportunities. In a study employing in depth interviews with 15 repeat entrepreneurs (who had collectively founded 65 ventures) it was found that these entrepreneurs narrowed their search to areas where they had specific prior knowledge (Fiet et al., 2004). The idiosyncratic nature of prior knowledge suggested that not all people possessed the same information at the same time and as a result any given opportunity was not obvious to all potential entrepreneurs (Ardichvili et al., 2003).

#### *Relevance to the Investigation*

Opportunities can be recognized, discovered or enacted (Sarasvathy et al., 2003). Ardichvili proposed a process model for venture creation built on these three types of opportunity. Entrepreneurial alertness was a key determinant in identifying opportunities and alertness was supported by three antecedent constructs: personality traits, social networks, and prior knowledge (Ardichvili et al., 2003). It is important to note that identification of an opportunity is a necessary but not the sole step in being able to initiate a venture. The original idea is likely to bear little resemblance to the product or service that eventually reaches the market due to the recursive and iterative nature of the evaluation process prior to deployment in the market (Bhave, 1994; Long & McMullan, 1984; Lumpkin., 2005). Two of the self-assessed measures of quality for the tutorial developed for this investigation used a 5 point Likert scale for the constructs of personal passion for the idea and prior experience. The third self-assessed measure was the degree to which the idea solved a meaningful user problem.

## **Issues Arising from Opportunity Identification Theory**

This section will first discuss the different opportunity search strategies and how they relate to the three types of opportunity – recognized, discovered or enacted. A separate section will be devoted to comparing and contrasting the assumptions underlying recognizing and discovering opportunities versus enacting them. Next the role of newness and novelty in the generation of valuable venture ideas will be described. There is substantial linkage between creativity and opportunity identification and these linkages were identified. Issues that impacted the development of the tutorial were reviewed.

### *Opportunity Type – Appropriate Searching Strategies*

Three types of opportunities have been identified – those that are recognized, those that are discovered and those that are enacted. Appropriate search strategies are a function of the type of opportunity. For opportunities that are recognized (both supply and demand known), deductive reasoning is used to either actively or passively filter for venture worthy ideas.(Sarasvathy, 2001). Entrepreneurial alertness is deemed to be the behaviour that enables recognition because the entrepreneur is sensitive/alert to information available in the environment. Personal insights and intuition are as important for identifying opportunities as a purposeful search (Singh et al., 1999). Accidental recognition occurs in the passive search mode and is more likely when the entrepreneur possess heightened entrepreneurial alertness (Ardichvili et al., 2003). There is evidence to suggest that firms founded on the basis of accidental recognition reach breakeven sales faster than a more formal process (Teach, Schwartz, & Tarpley, 1989).

Purposeful search is appropriate for opportunities that are discovered (either supply or demand known). Some argue that alertness does not account for the success of

repeat entrepreneurs in finding opportunities. One study used in depth interviews with 15 repeat entrepreneurs to explore their use of systematic search to discover opportunities. Collectively they had launched 65 successful ventures. It was found that these entrepreneurs narrowed their search to areas where they had specific prior knowledge. None indicated that they relied on alertness.(Fiet, 2002; Fiet et al., 2004).

The third type of opportunity is based on the principle of enactment (neither supply nor demand known) where the entrepreneur creates new means as well as new ends by using effectual reasoning which reasoning includes three types of means: the entrepreneur themselves, prior knowledge and experience, whom they know (social and professional networks for example). From these means the entrepreneurs begin to imagine (rather than recognize or actively search) for opportunities that represent the implementation of a variety of possible futures.(Sarasvathy, 2001; Sarasvathy et al., 2003).

*Nexus versus Duality (Causation versus Effectuation and Structuration)*

Both the recognition and discovery types of opportunity assumed that the opportunity has objective existence over time and that the entrepreneur will either recognize it through entrepreneurial alertness or discover it using systematic search techniques. Prior knowledge, experience, passion and social networks were seen as enablers of either the recognizing or discovery of the opportunity (Ardichvili et al., 2003; Baron, 2004, 2006; Fiet, 2002; Fiet et al., 2004; Shane, 2003; Shane & Venkataraman, 2000). In a study of 1,686 owner/managers participants viewed opportunities as external and stable where the opportunity would exist for a sufficiently long period of time to allow discovery by the entrepreneur (Gartner & Shaver, 2004). Sarasvathy described this

as causal logic where it was assumed that future can be controlled by predicting it (Sarasvathy, 2001).

There is an emerging field of study in entrepreneurship that looks beyond Shane's nexus of entrepreneur and opportunity (Shane, 2003) where rather than the opportunity having objective existence awaiting recognition or discovery by the entrepreneur there is a duality rather than a nexus of entrepreneur and opportunity (Sarason et al., 2006). Sarasvathy's effectual logic suggested that we do not need to predict the future if we can control the future. The future is out there to be created not to be discovered. Effectual reasoning rather than starting with a predetermined goal, begins with a given set of means and allows the goals to emerge (Sarasvathy, 2001; Sarasvathy et al., 2003). Competent entrepreneurs are able to think well in both causal and effectual modes.

An extension of the use of effectual logic was a structuration view of how opportunities are created and then enacted. Sarason proposed a duality where the opportunity and the entrepreneur cannot be understood nor exist independently and that this interdependence must be part of the description of how opportunities were actualized. In the structuration view entrepreneurial ventures were seen as recursive processes that evolved as a result of the interface between the entrepreneur and the sources of opportunity as the entrepreneur engaged in the venturing process (Sarason et al., 2006). The actors (entrepreneurs) are said to create the entrepreneurial process while at the same time being created by the entrepreneurial process (Giddens, 1992). Structuration theory enables the study of the influence entrepreneurs exert on their environment to achieve the entrepreneur's purposes.

*Novelty and Newness*

Novelty and newness were seen as integral components in the entrepreneurial process (Amabile, 1997a; Ardichvili et al., 2003; Shane, 2003; Timmons & Spinelli, 2008). Some studies used the degree of innovativeness to discriminate among ideas generated by study participants - the more innovative the idea the better the idea (Basadur & Head, 2001; DeTienne & Chandler, 2004). Unfortunately the relationship between the worth of an idea was not as straightforward as it would appear at first glance. Strategists have pointed out that initiating a venture with a product or service that is new to the world requires the overcoming of significant resistance from users (Aldrich & Fiol, 1994; Bhave, 1994). Current research suggests that most patents (more than 85%) are filed as improvements on existing patents (Hisrich et al., 2006). Investing in blockbuster innovations can lead organizations to concentrate on a small number of opportunities while ignoring others, that if nurtured, have potential and that they may hold the kernel of an idea for follow on opportunities. The process of innovation needs to be culturally embedded across an organization not focused solely in product development. Kanter suggested a portfolio approach to innovation with a few major projects at the top which attract most of the investment, a larger number of ideas in the test stage at the middle of the pyramid and a large number of early stage ideas at the base of the pyramid. Within the portfolio there is a flow up and down as ideas are evaluated (Kanter, 2006).

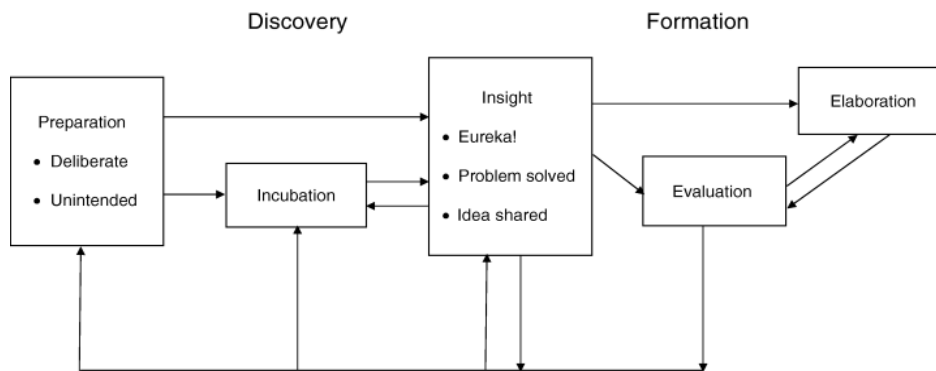
### *Role of Creativity*

Richard Florida's evangelical road show made creativity and the "creative class" part of the vernacular in economic development, where economic growth is fuelled by both the ability to attract the "creative class" as well as the ability to translate that

advantage into economic outcomes. Florida's Creativity Index (CI) was a mix of four equally weighted factors: the creative class share of the workforce; an index of high-tech industry; innovation, measured as patents per capita; and diversity, measured by the Gay Index as proxy for an area's openness to new ways of thinking (Florida, 2003; Lee et al., 2004).

The relationship between creativity and opportunity identification was established as the ability to rapidly understand the relationship between problems and their possible solutions by identifying novel associations or by utilizing available resources in a novel way (Hills et al., 1997; Lumpkin et al., 2004). Figure 2 below builds on the pre-vision, point of vision and elaboration model (Long & McMullan, 1984) described a staged and recursive opportunity recognition process with a discovery phase consisting of preparation, incubation, and insight, and a formation phase consisting of evaluation and elaboration (Lumpkin., 2005). Opportunity recognition employs a recursive process that is akin to the recursive nature of creativity. This matched well with Amabile's hierarchy of creativity leading to innovation leading to the creation of new ventures. Here entrepreneurial creativity is the implementation of novel, useful ideas to establish a new business or new program for delivery products or services (Amabile, 1997a). She makes the point that "entrepreneurship is a form of creativity and can be labelled as business creativity or entrepreneurial creativity because often new businesses are original and useful".





**Figure 2:** Venture formation process model (Lumpkin 2005, p. 458)

IDEO is a leading edge design firm based in Palo Alto California where they have found that the best ideas for creating or improving products come from keen observation of the interaction of users with their daily environment (Suri, 2005). This observation of how users interact with their environment leads to the identification of problems worth solving. The IDEO team then employs a brainstorming technique using divergent thinking skills to generate as many solutions as possible and in the process the brainstorming participants suspend judgment until it is time to use convergent thinking to choose among the alternatives generated (Kelley & Littman, 2001, 2005). One of the instruments used to measure divergent thinking is the RAT (Remote Associates Test) developed by Mednick. The RAT measures divergent and creative thinking by scoring the capacity of subjects to make associations between words that are not normally thought of as being associated. Higher RAT scores correlate with higher levels of creativity (Mednick, 1963; Mednick, Mednick, & Mednick, 1964). This instrument was used in Fong's study where it was found that being in a state of emotional ambivalence allowed subjects to make more novel associations (Fong, 2006).

Given that the ability to make unusual connections is deemed to be part of the creative process it is relevant to understand how these connections are made and may be

able to be enhanced. Pattern identification, signal detection theory and regulatory focus theory are posited as relevant perceptual and cognitive factors in opportunity recognition. Baron suggested that pattern recognition was a learned skill that could be used to increase alertness to opportunities (Gaglio & Katz, 2001) or could be used to discover opportunities through purposeful search (Fiet, 2002; Fiet *et al.*, 2004). Research on human cognition suggested that entrepreneurs identify opportunities by employing cognitive frameworks acquired through experience that then allow them to perceive connections between seemingly unrelated events or trends. It is the patterns they perceive that suggest ideas for new products or services. Pattern recognition is defined as the process through which individuals perceive complex and seemingly unrelated events and place them in identifiable patterns (Matlin, 2002).

In a study of experienced entrepreneurs (started more than four ventures) it was found that the active search process was restricted to areas in which they already possessed significant knowledge. In effect they were employing their existing cognitive frameworks and knowledge to arrange the stimuli provided by their environments into patterns that could allow them to perceive opportunities (Fiet *et al.*, 2004). It was likely that the experienced entrepreneurs were using one of two cognitive models – prototypical models where connections are sought between newly encountered events and existing idealized models or exemplary models where newly encountered events are compared with pre-existing and relevant concepts. It was Fiet's contention that his experienced entrepreneurs were accessing a robust set of exemplars (Fiet, 2002; Fiet *et al.*, 2004). Baron proposed that a pattern recognition perspective helped integrate into one basic framework - engaging in an active search for opportunities; alertness to them; and prior

knowledge of an industry or market. The interaction among the three factors is also informative, for example active search may not be required when alertness is very high. Prior knowledge broadens the field of view for the entrepreneur – hence they perceive more opportunities (Baron, 2004, 2006).

#### *Relevance to the Investigation - Training Issues*

In traditional classrooms students are taught a causal approach in the face of known practice – where causal logic starts with a pre-determined goal, a given set of mean and seeks to identify the optimal strategy to achieve the stated goal. It is Sarasvathy's assertion that while causal thinking may or may not involve creative thinking, effectual thinking is inherently creative (Sarasvathy, 2001; Sarasvathy et al., 2003). This problem was echoed in a study of two groups of master's students, one in engineering and one in business. The study identified the dissonance between the need for entrepreneurs to pursue novelty, innovation and creativity and the traditional academic demands for rigor and analysis (Berglund & Wennberg, 2006). Traditional educational methods such as testing, impact creativity because traditional testing requires convergent thinking where there is typically one right answer. In spite of this it is possible to adapt test instructions to encourage creative thinking and to design activities that are presented in permissive and game-like fashion. It is also possible for instructors to model creative behaviours resulting in a positive impact on teaching quality (Runco, 2004). The learning of opportunity recognition skills is best suited to the experiential style described by Kolb as a process that creates knowledge through the "transformation of experience" (Corbett, 2005; Kolb, Boyatzis, & Mainemelis, 2001).

Prior experience/knowledge enhanced the ability to identify new means ends solutions (Shane & Venkataraman, 2000). Opportunities do not exist as singular phenomenon but are idiosyncratic to the individual (Sarason et al., 2006). University learners are likely to have less prior knowledge of customer problems and paradoxically are likely to be more productive in their idea generation (Shepherd & DeTienne, 2005). Baron suggests that pattern recognition is a learned skill that could be used to increase alertness to opportunities and then discover opportunities through purposeful search (Baron, 2006; Fiet et al., 2004; Gaglio & Katz, 2001). Nascent entrepreneurs, which represents the bulk of the anticipated study participants, would benefit from building social networks and increasing their information base because this would enhance their success in identifying potentially valuable opportunities for new ventures (Lumpkin et al., 2004; Ozgen & Baron, 2007).

### **Instructional Literature**

The instructional literature was reviewed for strategies that supported the training in creative problem solving. The field of instructional design offered specific strategies for problem solving instruction (Smith & Ragan, 2004). Relevant strategies were also located in a formulary of active ingredients arising from 172 idea generation techniques (Smith, 1998). Pedagogical elements specific to enhancing entrepreneurial scripts were found in an article on Expert Information Processing Theory (EIPT) (Mitchell, 1995). A recurring theme was found in the literature related to creativity and post secondary education – business students have been perceived as less creative than other student populations (Cheung, 2003; Eisenman, 1969; Maier & Hoffman, 1961) while the dissonance between the traditional post secondary education and the tools needed to

identify venture ideas is discussed (Basadur & Head, 2001; Sarasvathy et al., 2003; Zampetakis & Moustakis, 2006). Success in enhancing creativity of university students using techniques of relatively short duration as been reported (Fong, 2006; Greer & Levine, 1991).

The investigation in this study hypothesized that instruction in creative problem solving would enhance the opportunity finding skills of entrepreneurial participants. Problem solving is defined as “the ability to combine previously learned principles, procedures, declarative knowledge and cognitive structures in a unique way to solve previously un-encountered problems”. This definition supports the construct of novelty (unique ways) and acts as a foundation for creative problem solving which includes problems that are frequently ill defined and unlike well defined problems, often have multiple solutions. Problem solving expends effort to identify strategies used by domain specific experts rather than attempting to identify generic skills. Four cognitive processing steps in problem solving have been identified: problem representation, solution planning, solution implementation and solution evaluation (Smith & Ragan, 2004). This investigation focused on problem representation. These four steps map directly onto the eight step model proposed by Basadur (Basadur et al., 1982).

Problem solving projects integrate learning and skills from a variety of areas, develop higher level thinking skills, provide self-assessment opportunities (the ability to enhance venturing scripts), and independent learning (a style of learning particularly suited to entrepreneurial learners). Extended problem solving projects are defined as broad in scope, dealing with poorly structured/fuzzy problems, having multiple solutions and typically students select their own problem which leads to higher levels of

engagement for the learner. Performance outcomes for extended problem solving projects may include the following areas: identifying and solving a problem, locating relevant resources, writing a report and describing the project, conducting an experiment, preparation of display materials, oral presentation and defense, effectiveness in group problem solving (Gronlund, 2004).

Three macro strategies for problem solving instruction held promise for the instructional design of the tutorial: the elaboration model which involved the presentation of carefully sequenced problem sets; anchored instruction which provided learners with meaningful context and realistic, interesting problems; and problem based learning (PBL) which, when well constructed should lead to high student interest and motivation (Smith & Ragan, 2004). Additional instructional strategies were identified from a formulary of active ingredients arising from 172 idea generation techniques. The search strategies of past experience, recalling past experiences relevant to the current problem (transfer analysis) and analogy, looking for things similar to the problem situation (Bionics), should actively engage the learner. Habit breaking strategies allow participants to identify and then challenge the assumptions and beliefs related to the problem they have identified (escape). Stimulation tactics include: personal experience, involving the learner experientially in solving the problem (experience kit); elaboration, enriching the context to provide idea generation material (story writing); and display, mapping ideas graphically (mind mapping). Motivational enablers such as personal involvement are likely to increase intrinsic motivation (systematized direct induction). Extra effort enablers like mass production will assist in generating lots of ideas (Crawford slip method) (Smith, 1998). Eisner identified expressive outcomes that provide a “fertile field

for personal purposing and experience”(Eisner, 1979). Inert knowledge is the consequence of students not connecting between and among the facts they learn in the classroom and their everyday lives. Activities that use expressive outcomes provide an experience where each student will be uniquely changed in some way. The common element in many of these strategies is the potential to appeal to the intrinsic motivation needs of the learner which has been shown to be central to motivating creative behavior (Amabile, 1997b).

Bloom’s taxonomy of educational objectives (Bloom, 1956) was augmented in 2001 to include a two dimensional framework focusing on knowledge and cognitive processes (Anderson & Krathwohl, 2001). The knowledge dimension has four constructs: factual, conceptual, procedural, and meta-cognitive knowledge. The cognitive process dimension consists of six constructs: remember, understand, apply, analyze, evaluate and create. The taxonomy defines higher order constructs as those that appear later in the list with meta-cognitive knowledge and the “create” cognitive process being the highest order skills. Meta-cognitive knowledge includes general strategic knowledge, knowledge about cognitive tasks and when to use them, and self-knowledge. The “create” cognitive process was described in terms (problem representation, solution planning, and solution execution) taken from the creative problem solving literature. It began with a divergent phase known as “generating” where learners attempt to understand the task and generate alternate solutions which are followed by a convergent phase resulting in a solution known as the “planning” phase. Finally the solution was constructed in the “producing” phase. In assessing creative tasks it was suggested that a clearly defined criteria for

judging the quality of the responses be given to the students in advance of assigning the task.

Expert entrepreneurs outperform novice entrepreneurs because they “recognize immediately that which novices require great effort to discover”. Expertise was seen as being domain specific and differences in performance fall along three constructs: willingness, opportunity/ability and arrangements. Opportunity/ability related behaviors include: identifying, capturing and protecting opportunities; possession of domain knowledge as well as industry scripts leading to venturing success; and possession of skills to solve new venture problems with new venture knowledge (Mitchell, 1995). The performance by novice entrepreneurs can be enhanced by: interrogation - the intense observation of experts in context to draw from them and their situation elements that can enhance the novice’s script or knowledge structure; instantiation – it required the novice to be exposed to multiple “instances” of the expert script using falsification to delete non functional elements from the expert script and verification to choose which script elements to retain. Additional suggestions from the field of simulation and gaming included writing or journalizing scripts following a participative activity and debriefing workshops to compare and contrast scripts. Similar discussions were found in the entrepreneurship literature when discussing the cognitive aspects of opportunity identification (Gaglio & Taub, 1992) or the role that pattern recognition plays in identifying opportunities (Baron, 2006). It is important to develop constructs that discriminate novices from experts, to identify strategies used by novices and experts and to look at the differences in performance between novice and expert participants.



An early study, on the impact of creativity training, drew groups from employees of large organizations, business administration students, students enrolled in a human relations (HR) course and students in an introductory psychology course. Creative solutions were found in descending order of frequency by the introductory psychology students, by those enrolled in the HR course, the business administration students and finally those employed in large organizations. The researchers interpreted the results as supporting the proposition that formal authority relations inhibit creative problem solving and that business may be attracting employees that work comfortably but not creatively in large organizations (Maier & Hoffman, 1961). In a follow on study it was hypothesized that those who are attracted to business studies are inherently less creative than those attracted to other, more creative disciplines. The results found statistically significant differences ( $p < .05$ ) and it was suggested that if relatively non-creative people are attracted to business then upon graduation it would be difficult to find leaders who support creativity in the workplace (Eisenman, 1969). More recently, the development of student's creativity during their university education, where duration and field of study may represent the educational effects were examined. The results indicated a trend of monotonic decline in creativity as students progressed through their university careers. As well it was found that there was a general superiority of verbal creativity among students enrolled in the humanities and social sciences whereas business students had the highest scores on self-assessed traits and products (Cheung, 2003).

As much as the writer, a faculty member in a school of business, may be rankled by Eisenman's assertion that business does not attract creative people, it does reinforce the need for research questions that look at differences in creative performance based on

program and year of study. It is likely that this legacy continues to manifest itself in both the organizations and business education of today, suggesting that the tutorial would need to surmount the natural inertia that would resist the ideational approach. In spite of these challenges successful outcomes have been reported in response to creativity training of relatively short duration for college students. In one study the relative effectiveness of three treatments (fantasy induction, intrinsic motivation induction and a combined fantasy/intrinsic motivation induction) on creative writing performance was examined (Greer & Levine, 1991) And in a more recent study the impact of emotional ambivalence on creativity was studied using induction techniques of short duration (Fong, 2006).

In this investigation participants worked with poorly structured/fuzzy problems and were asked to choose a problem they felt is worthy of solution. The use of techniques to increase the number of alternatives are appropriate and may involve searching past strategies, recalling past experiences, looking for analogies, among others. The tutorial increased engagement of the participants by involving participants authentic experiences thus appealing to their intrinsic motivational needs (Amabile, 1997b). Previous studies have reported success in enhancing creativity of university students using techniques of relatively short duration (Greer & Levine, 1991).

Storytelling is a powerful way of engaging participants and building the efficacy beliefs identified as one of the components of personal traits that contribute to entrepreneurial alertness (Ardichvili et al., 2003). A well told story can enable listeners to visualize from a story in one context what is involved in an analogous context. The audience is engaged by creating a scenario they can see themselves in, one of the basic tenets of enhancing self efficacy (Bandura, 1977, 1986, 1995; Zimmerman, 1995) which

allows entrepreneurs to persist at a task they may otherwise have given up on (Denning, 2000, 2005). Storytelling gives the participants permission to explore in unconventional ways (Kelley & Littman, 2005) and should increase the comfort level with divergent thinking and the attendant need to defer judgment.

#### *Relevance to the Investigation – Engaging the participant*

The investigator purposefully chose to engage participants in the subject matter of the tutorial. A fishing metaphor was embedded in the body of the tutorial and was incorporated in the name of the tutorial –“Going Fishing an opportunity Finding Tutorial”. The stimulus statement used in the pre-test and post test created personal context by asking subjects to “please think back for a moment over the events of the last 24 hours including classes, commuting, social interactions, work, family, in short any and all of your interactions including those with technology and appliances. In the tutorial subjects were asked to “take a moment to list and or describe the things that you enjoy doing, the things that give you energy” and to take a moment to list and or describe the things that you are good at. Things, others have complimented you on. These could be school related, hobbies, volunteer work etc.”. Subjects were asked to “Imagine a world without exams and term projects. Take a minute and in the space below list all the ways this might change your life. While doing, this don’t forget to use the BRAIN tool - defer your reality, defer your judgment, don’t let the current reality constrain your ideas”.

#### **Creativity Literature**

In the previous section the emphasis was on instructional strategies to support the training in creative problem solving while in this section the “creative” aspect of problem solving will be examined. An early taxonomy divided the study of creativity into the 4

“P’s” of product, person, process and press (environment) (Rhodes, 1961).

Entrepreneurship can be linked to its antecedents of innovation (the implementation of ideas generated by the creative process) and creativity (the production of novel and appropriate solutions) (Amabile, 1997a). Additional insights can be gained by looking at how creativity is nurtured or discouraged in organizational settings (Amabile, 1998, 2002; Lee & Venkataraman, 2006; Mauzy et al., 2003) and finally creative problem solving literature employing the Simplex<sup>©</sup> methodology is examined (Basadur, 1994; Basadur & Finkbeiner, 1985; Basadur et al., 1990a; Basadur & Head, 2001; Basadur, Runco, & A.Vega, 2000; Treffinger, Isaksen, & Dorval, 1994).

Rhodes analyzed definitions of creativity and identified four strands worthy of academic study that came to be known as the 4P’s of creativity: person - personality, intellect, traits, attitudes, values, and behavior; process - stages gone through when overcoming an obstacle or achieving an outcome which is both novel and useful; press - the relationship between people and their environment so that it is conducive to creativity; product - the characteristics of the artifacts that arose from the creative process (Rhodes, 1961). The study of creativity leads to the discovery of new and better ways to solve problems, , rapid growth of competition in business and industry, development of human potential beyond IQ and the enhancement of learning processes (Puccio, 1989; Puccio, 1997). Creativity may be thought of as consisting of three constructs: expertise - knowledge including technical, procedural and intellectual; creative thinking skills – including the flexibility and imagination with which problems are approached; and motivation – an inner passion (intrinsic motivation) to solve the problem at hand (Amabile, 1997b, 1998). If people are to become more creative it will take more than

extraordinary talent and ability, they will need to be motivated. Amabile's intrinsic motivation principle of creativity stated that "people are most creative when they feel motivated by the interest, enjoyment, satisfaction and challenge of the work itself". On the other hand extrinsic motivators (expected evaluation, surveillance, tangible rewards, competition, restriction of how to complete a task, and extrinsic orientation) tended to constrict creative efforts (Amabile, 1985). The search for what matters most to an individual helps revitalize their creative thought (Mauzy et al., 2003).

Products are said to be creative if they are: novel, serve to solve a problem and are able to be produced (MacKinnon, 1978). Innovation may be classified as falling into one of three modes: *by improvement* – of: process, quality, cost; *by extension* – new ways of: performing existing processes and *by creating new paradigms* – totally new ways of doing business, emerge following a paradigm shift (Grossman & King, 1990). Each of these modes of innovation tends to attract a different personality that is nurtured by differing cultural climates, has differing training needs and reacts differently to rewards based on performance.

Runco sees creativity as a tool for societal good. In a 2004 review of the creativity literature he found that creativity was expressed differently in different domains of knowledge. It is Runco's proposition that the number of domains-disciplines-fields in which creativity is examined has increased. Creative potential may be tied to things like: family background (middle born children tend embrace rebelliousness and non-conformity, especially when the older sibling is of the same sex); gender because females face unique barriers and hence need to make more of a conscious commitment to creativity, and the fact that relationships play a larger role in women's creativity. Problem

finding has grown as a field of enquiry since the last review in 1981 (Runco & Chand, 1994).

The first section of the literature review made the connection between opportunity recognition and the provision of an understanding of entrepreneurship (Ardichvili et al., 2003; Sarasvathy et al., 2003; Shane, 2003). If creativity is seen as an enabling pedagogy in the production of entrepreneurial ideas (Ardichvili et al., 2003; Hisrich et al., 2006; Lumpkin., 2005; Timmons & Spinelli, 2008) then it is important to understand the relationships between creativity, innovation and entrepreneurship. Creativity is the production of novel and appropriate solutions to any domain of human activity. Innovation is the implementation of the ideas generated in the creative process. Entrepreneurship can then be said to be a particular form of innovation that results in the creation of a new business, or a new initiative within an existing business. Entrepreneurial creativity can include ideas that may have to do with: products or services themselves, identifying a market, ways of producing or delivering, ways of obtaining resources (Amabile, 1997a).

Amabile's early work suggested that while intrinsic motivation is conducive to creativity, extrinsic motivation is detrimental (Amabile, 1983). Another author found that while straightforward aspects like technical quality were enhanced by extrinsic motivation the probability of novel responses will be dampened by extrinsic motivation (McGraw, 1978). Follow up work suggested a more complex relationship which Amabile describes as motivational synergy. She found that synergistic stage-appropriate motivators may serve a special function at each of the four stages of the creative process: problem identification – recognizing, defining, and understanding the opportunity;

preparation – gathering the resources and information necessary to pursue the opportunity; response generation – designing ideas for pursuing the opportunity; and validation/communication – evaluating ideas, selecting the best idea, and formulating the approach. Because novelty of the outcome is critical to problem identification, this stage “may require intrinsic motivation that is unencumbered by any significant extrinsic motivation” (Amabile, 1997a). Given that intrinsic motivation has the ability to unleash creativity the tutorial should invoke tasks that allow students to tap into their own interests.

The study of organizational creativity has provided insights into the factors that enhance or detract from creativity at the level of the individual. Organizations that choose to systemically nurture creativity created a culture that valued the small foundational ideas which ultimately lead to the huge creative triumphs. In these organizations creativity becomes an integral part of everyday operations but as part of the creative space creative dissonance often results. Dissonance arises because creative behaviors are often out of tune with the behaviors that make an organization efficient. In the educational system it is acknowledged that breaking the rules was what makes you smarter yet this behavior was not well received (Ardichvili et al., 2003; Hisrich et al., 2006; Kanter, 2006; Lee & Venkataraman, 2006; Lumpkin., 2005; Mauzy et al., 2003; Timmons & Spinelli, 2008). It was expected that study participants would experience dissonance as they practiced divergent thinking techniques that required them to take an extended time to generate ideas. Dissonance was expected because the normal coping strategy for university learners requires them to quickly solve the current problem, often

taking the first satisfactory solution, and then moving to the next problem that requires solution (Sarasvathy et al., 2003).

Returning to the componential theory of creativity (expertise, creative thinking skills, and motivation) it has been suggested that while investments in training of knowledge and creative thinking skills may have payoffs in the future, motivation can be increased considerably by even subtle changes in organizational climate. Six management practices that affect creativity are: challenge (matching people with the right assignments), freedom (giving people autonomy concerning the process), resources (time and money - creativity is often killed with fake deadlines), work group features (pay careful attention to the design of the teams – mutually supportive and diverse; homogeneous team dampen creativity), supervisory encouragement (for both successes and failures) and organizational support (by requiring information sharing and dealing with political problems immediately) . Clearly there is an affective component to creativity. Creativity may also be undermined in the workplace as businesses inadvertently design organizations that systematically crush creativity as they maximize business imperatives like coordination, productivity and control (Amabile, 1998).

In the postsecondary learning environment, time is a precious commodity. Although time pressure may drive people to increase the volume of what they produce in a given time frame, it generally causes them to think less creatively. In data collected from project teams in seven major American corporations it was found that there was a low likelihood of creative thinking under periods of low time pressure when employees felt they were on autopilot, lots of meeting and little encouragement from management. Under periods of high time pressure the study found a low likelihood of creative thinking



when people feel they are on a treadmill, highly fragmented work schedule, no sense of the importance of the work, experience lots of last minute changes. Alternatively the likelihood of high levels of creative thinking was enhanced under periods of low time pressure when people felt they were on an expedition showing a tendency to generate and explore ideas. Under periods of extreme time pressure creative thinking is more likely when people feel as if they are on a mission and can focus one activity for a significant part of the day and focus equally on identifying problems and generating or exploring ideas. The researchers observed a latency effect following days of high time pressure that dampened creative thinking even when the pressure was reduced (Amabile, 2002). The tutorial required high levels of exploration, idea generation and experimentation with new concepts which because they are complex cognitive processes, required time to complete, which suggested that the mission strategy (Going Fishing in this case) suggested by Amabile for enhancing creativity in periods of high time pressure was appropriate.

The foundations of CPS were laid out in Osborn's 1953 book that viewed imagination and judgment as essential contributors to creative productivity and affirmed the belief that all humans possess the potential be creative, if and when they choose, by nurturing their creative skills (Osborn, 1953). In fact Osborn's brainstorming technique, encouragement of a free flow of ideas while withholding judgment, became synonymous with CPS (Treffinger et al., 1994). Parnes joined Osborn and together they evolved a five step CPS model (Parnes, 1967) which, through the contributions of other authors led to a refinement of the model and the establishment of an academic program in CPS at both the graduate and undergraduate level (Noller, Parnes, & Biondi, 1976; Parnes, Noller, &

Biondi, 1977). During the 1970's and 1980's the applications for CPS were broadened to include a general audience (Noller, 1977), mathematics (Noller, Heintz, & Blaeuer, 1978), and gifted education (Noller & Treffinger, 1979). The CPS model was expanded to six stages by adding a mess-finding stage and clustering the six stages into three categories: understanding the problem, generating ideas and planning for action (Isaksen & Treffinger, 1985).

In the same time frame (1975-1985), the research and development group at Procter and Gamble appointed Dr. Min Basadur to lead problem solving sessions. This culminated in the completion of his award winning dissertation, *Training in creative problem solving: Effects on deferred judgment and problem finding and solving in an industrial research organization* (Basadur, 1979) and the publication of an article that delineates an eight step model versus previous linear CPS models that had three steps (Osborn, 1953), five steps (Parnes & Biondi, 1975) and six steps (Isaksen & Treffinger, 1985). Basadur's "complete" process model of creative problem solving incorporates divergent and convergent thinking within each of the eight steps (Basadur et al., 1982). Basadur represented his process model as a circular, continuous process with three stages; problem formulation, solution formulation and solution implementation. Within Basadur's three stages are eight steps: problem finding, fact finding, problem definition, idea finding, evaluation/ selection, planning, acceptance and action. Basadur has trademarked the name Simplex<sup>®</sup> to represent the commercial applications of his eight step model, which has been used in workplace settings to enhance the problem solving skills of organizational executives (Basadur, 1987, 1994; Basadur, Taggr, & Pringle, 1999).

Basadur hypothesized that attitudes toward ideational thinking are an antecedent behavior to actively practicing divergent thinking to identify opportunities and developed a 14 item questionnaire to measure it (Basadur et al., 1982). The final instrument contains six questions that test preference for ideation and six that test for tendency to premature critical evaluation. Validity and reliability were established for the preference for ideation construct. Ideation/evaluation is a separate, sequenced, two step thinking process. They suggested that training should first assess the existing attitudes toward ideation and then preferentially target the attitudes most in need of modification (Basadur & Finkbeiner, 1985). Ideation is defined as the generation of ideas without evaluation. During ideation, all rational, judgmental and algorithmic thinking is deferred while during evaluation the opposite is true (Basadur et al., 1982).

Later research extended this work by investigating the relationships between creative performance and: attitudinal acceptance of the ideation/evaluation process and behavioral skill in practicing ideation/evaluation. A field experiment with was conducted with 112 managers in a large international consumer goods manufacturing firm. Participants received 20 hours of training (two and a half days) in the Simplex® process and were asked to solve “real” problems. The Basadur 14 item inventory, using a 5 point Likert scale, was administered pre and post training. Quantity and quality were used as measures of ideational skills. The quantity of ideas (ideational fluency) was counted while quality scores (ideational originality) were derived from the number of original/unique ideas (given by only one participant). Evaluative skills were assessed by asking each participant to self-rate their ideas on a 7 point scale and then identifying the number of original ideas accurately identified. The study suggested that the training must

be of sufficient quality, duration and impact to effect real change in: attitudes, behavior and skill (Basadur et al., 2000). In the study participants were assigned a similar open ended task but each response was based on that participant's particular interests and values, making a direct comparison of little value as a measure of ideational originality.

The Creative Problem Solving Profile (CPSP) is an instrument that describes a learner's unique personal style and preference for problem solving. The CPSP inventory had 2 dimensions: the way knowledge is gained – direct, concrete and experiencing versus abstract detached thinking; and the way knowledge was used – for ideation (generating new possibilities) versus evaluation (possibilities). The inventory generates 4 primary preference quadrants that map onto the Basadur eight stage model: generators (quadrants 1&2) – preferred to act as problem starters and challenge finders, conceptualizers (quadrants 3&4) – preferred to define the essence of the problem or opportunity and generate ideas which may solve it, optimizers (quadrants 5&6) – preferred to be involved in well defined problems and organizing the steps necessary for implementation; and implementers (quadrants 7&8) – preferred to finish problems and are most comfortable in the later stages of creative problem solving. A test-retest approach was used to demonstrate that the CPSP would reliably produce the same result when administered to the same population one week apart. Validity was demonstrated by having respondents evaluate how accurately their profiles represent their problem solving styles. As part of this study it was hypothesized and found that a disproportionate number of the business students participating in the study would fall into the optimizer (37%) and implementer (33%) quadrants while only 13% fell into the generator and 17% into the conceptualizer quadrants (Basadur et al., 1990b). These results reinforce the

anticipated dissonance/discomfort (Cheung, 2003; Mauzy et al., 2003) of participants in the completion of the tutorial as they are required to use divergent thinking to generate options. The CPSP instrument was used to investigate differences in performance between those with different preferred creative problem solving styles.

An investigation of innovative performance of teams used the CPSP instrument to identify preferred problem solving styles and assign participants into one of three experimental groups: diverse /heterogeneous, partially homogeneous and completely homogeneous. The diverse/heterogeneous groups had superior levels of innovative performance yet reported lower team satisfaction levels (Basadur & Head, 2001). This suggested that while opportunity recognition requires high levels of ideational skill, the process of successful venture formation (Bhave, 1994; Long & McMullan, 1984), which calls on all of the 4 preferences identified in the CPSP, requires a team approach. The investigation in this dissertation extends the application context to include entrepreneurial learners who wish to enhance their ability to generate opportunities by identifying problems that have the potential to generate sustainable economic value.

Of particular interest to this investigation was the suggestion that “looking for golden eggs”, the process of diligently looking for problems worth solving is the key to creating opportunities. This construct was used as one of the three self-assessed measures of quality for the pre-test and post-test ideas – “for the idea you have chosen please answer the following question – the idea will solve a meaningful customer problem” (Appendix A). Basadur introduced the quality results equation which requires content plus process plus process skills to produce quality results. The tutorial design incorporated all three of these elements and identified Dr. Basadur as the subject matter

expert in CPS. The ideation-evaluation model was used to delineate three key process skills: diverging/ideating to generate options – where quantity matters, converging/evaluating to make choices – where quality matters and thirdly the ability to defer judgment until divergence/ideation phase is complete. This investigation examined the change in attitude toward the preference for ideation and tendency for premature critical evaluation of ideas, used quantity of opportunities generated as a measure during the diverging/ideation phase and quality of ideas as a measure during the converging/evaluation phase.

The literature revealed several frameworks for thinking about creativity and creative behaviour. Rhodes proffered the 4 P's of creativity: product, person, process, and press, which are analogous to the 4 P's of marketing, product, price, place and promotion (Rhodes, 1961). Amabile proposed a componential explanation where organizational creativity is a function of expertise, creative thinking skills and motivation (Amabile, 1997b) while Basadur built on earlier process models and suggested that fuzzy problems are best solved using Simplex<sup>®</sup> an eight step process model that begins with finding good problems to solve and ends with implementation (Basadur, 1994; Basadur et al., 1982). It was Amabile who then structured a model that made the connection between creativity - the production of novel and appropriate solutions; innovation – the implementation of solutions created through the creative process, and entrepreneurship – the formation of ventures arising from the innovative process (Amabile, 1997a). Being creative is often deemed an unnatural act and unless the organizational culture supports the divergent thinking that spawns creativity cognitive dissonance will result (Amabile, 1998, 2002; Mauzy et al., 2003). There was support for the positive impact of training in

creative of training in problem solving in fluency (number of solutions), literacy (quality of ideas) and attitudes toward divergent thinking (Basadur & Finkbeiner, 1985; Basadur et al., 1982; Basadur et al., 1986; Basadur & Head, 2001).

### **Summary**

The literature review examined the economic roots of entrepreneurship, the evolution of the entrepreneurial process, opportunity identification theory, issues arising from the organizing principles of opportunity identification theory, instructional techniques, and creativity creative problem solving. The constructs of personal traits, social networking, prior knowledge, entrepreneurial alertness and their interaction as well as their role dependent on type of opportunity pursued were discussed. Instruments used in the investigation were linked with existing literature including the Basadur 14 item questionnaire (to measure attitudes toward divergent thinking) and the Basadur Creative Problem Solving Profile (to measure preferred problem solving style).

Entrepreneurship is a key driver of economic activity and usually begins with an idea that may eventually turn into a commercial opportunity (Bhave, 1994; Long & McMullan, 1984; Lumpkin., 2005). Within this reality there are two differing views of how entrepreneurs recognize opportunities. Schumpeter described initiators who create instability (Schumpeter, 1936) while Kirzner suggested alert individuals who look for disequilibria (Kirzner, 1973). The importance of social networks was recognized and identified differences in opportunity recognition behaviors between solo entrepreneurs and network entrepreneurs (Hills et al., 1997; Lumpkin et al., 2004; Singh, 2000; Singh et al., 1999). Searching for opportunities relied as much on intuition and insight as it does

on purposeful search (Singh et al., 1999) supporting the choice of the researcher to have the training speak to the intrinsic motivational interests of the learner.

The classic research mantra is “where’s the pain?”. The purpose of this question is to find research problems worth solving and to then construct a method of enquiry that makes creates new knowledge about resolving the problem/pain. Finding worthwhile problems to solve that are connected to the learner’s passions and prior experience hold the greatest potential for recognizing opportunities that can be made venture ready. The Going Fishing tutorial asked subjects to “fish in the pool of your passion” and to “troll in the estuary of your experience” then “you are more likely to hook an opportunity worth holding”.

Problem solving is well represented in the instructional literature where problem solving is defined as “the ability to combine previously learned principles, procedures, declarative knowledge and cognitive structures in a unique way to solve previously un-encountered problems” (Smith & Ragan, 2004). The tutorial tasks required subjects to utilize the highest order of knowledge (meta-cognitive) and cognitive process (create) as defined in Anderson’s revision of Bloom’s seminal taxonomy of educational objectives (Anderson & Krathwohl, 2001; Bloom, 1956). The tutorial provided a stimulus in the pre and post-test that presents a fuzzy problem to be solved that requires subjects to choose a problem that has personal relevance, thus building engagement. During the training they learned techniques designed to increase the number of alternative solutions to a given problem.

The tutorial emphasized the process skills from Basadur’s Simplex<sub>o</sub> model (deferral of judgment, active divergence, active convergence). Basadur’s 14 item



questionnaire was used in the pre and post -test to quantify the change in attitude toward divergent thinking (Basadur et al., 1982). The Creative Problem Solving Profile (CPSP) was administered during the pre-test to assess the participant's preferred problem solving style (Basadur, 1989). The CPSP instrument was used as one of the measures to assess homogeneity of the treatment and control groups and in the analysis of the data to identify statistically significant differences in performance, based on differences in preferred problem solving style.

#### *Contribution to the Field of Study*

The investigation integrated prior research in creativity and creative problem solving with research in entrepreneurship and venture formation while incorporating appropriate instructional design principles. The resulting analysis connected the previously ill connected dots between these fields of inquiry. The researcher intends to publish the results in the practitioner stream of entrepreneurship research beginning with articles on practical guidelines for teaching problem solving skills. It is interesting to note that the venue for delivery of the CPS training is digital yet the contribution lies not in the method of delivery, but rather in the efficacy of the tutorial design. The learning objectives and skills identified by instructors as essential to student success (understanding of subject matter, critical thinking and problem solving skills and providing a stimulating learning environment) are resonant with the Going Fishing tutorial (Lukaweski, 2006).

## Chapter 3

### Methodology

#### **Introduction**

Chapter 3 discusses the approach that was taken in the investigation. Instructional objectives were set in the context of recognizing that this was an exploratory study for training that was of short duration set within a larger context for entrepreneurship education. Objectives were set for the tutorial using the knowledge and cognitive process constructs developed as an extension of Bloom's work on setting educational objectives (Anderson & Krathwohl, 2001). Dependent and independent variables are defined, research instrumentation described and a table is used to identify which instruments were used to collect data relating to specific variables. Recruitment of study participants is discussed and the need to protect this "vulnerable population" identified. Gagne's events of instruction framework is used to lay out tutorial elements (Gagne, 1977).

The study used an experimental design that randomly assigned entrepreneurial learners to either a treatment or a control group. Pre and post treatment data was collected and compared (t test and proportions z-test) looking for statistically significant differences within the treatment group and when compared to the randomly assigned control group (within group and between group design). Procedures that assured validity and reliability are described in this chapter. Table 12 identifies the data measures collected (dependent and independent variables) and the coding issues that arose. Ethical

issues are identified and the strategy used to receive approval from the Dalhousie Ethics Review Board (IRB equivalent for GSCIS) is laid out. Resource requirements are identified and the development milestones identified. This chapter then concludes with a summary of the methodologies that were employed.

### **Approach**

This was an exploratory study that examined the impact of online training in creative problem solving using three dependent, or outcome variables (Table 9): the number of ideas generated, attitudes towards ideation and the quality of the ideas generated. Table 7 below discriminates among three levels of instructional objectives – global, educational or instructional (Krathwohl & Payne, 1971). The researcher has provided current examples from his own environment to illustrate each of the three levels of instruction where the Entrepreneurial Skills Program (ESP) represents a multi year accreditation. Management 3907 is a single semester course within a 4 year undergraduate degree and the Going Fishing tutorial is a program element within the Management 3907 course. Each level of objective can then be thought of in terms of scope – broad moderate or narrow; time needed to learn – 1 or more years, weeks or months, hours or days; and purpose or function – provide vision, plan units of instruction, plan daily activities (Anderson & Krathwohl, 2001).

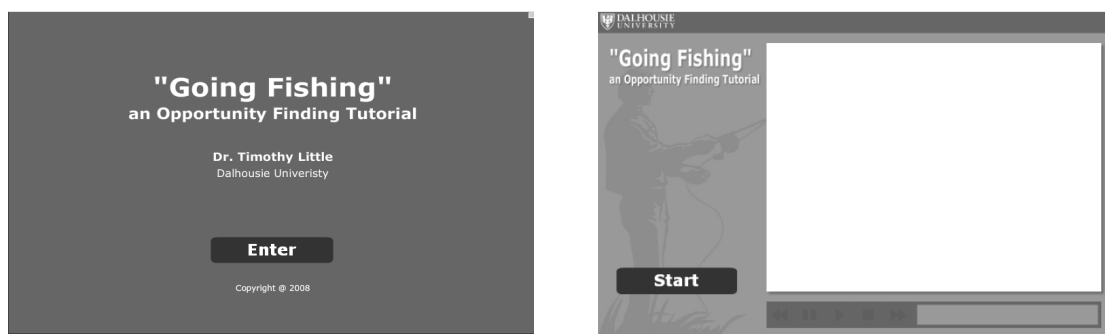
Table 7: Relationship of Global, Educational and Instructional Objectives

	<b>Level of Objective</b>		
	<u>Global</u> <i>ESP</i>	<u>Educational</u> <i>Management 3907</i>	<u>Instructional</u> <i>Going Fishing</i>
<b>Scope</b>	Broad	Moderate	Narrow
<b>Time Needed to Learn</b>	One or more years (often many)	Weeks or months	Hours or days

Table 7 Continued: Relationship of Global, Educational and Instructional Objectives

	<b>Level of Objective</b>		
	<u>Global</u> <i>ESP</i>	<u>Educational</u> <i>Management 3907</i>	<u>Instructional</u> <i>Going Fishing</i>
<b>Purpose or Function</b>	Provide vision	Design curriculum	Prepare lecture plans
<b>Example of Use</b>	Plan a multiyear curriculum	Plan units of instruction	Plan daily activities, experiences.

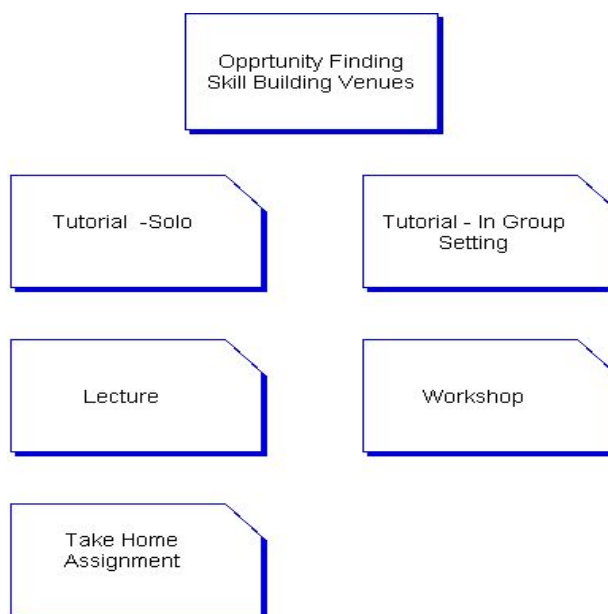
Going Fishing – an Opportunity Finding Tutorial, was an online multimedia tutorial available at a domain owned by the researcher ([www.tim-ed-nowhere.com](http://www.tim-ed-nowhere.com)), see Figure 3. The domain name was based on a thought experiment used by the researcher that allowed students to interpret the phrase “opportunityisnowhere” as either opportunity is nowhere or alternately opportunity is now here. The fishing metaphor was reinforced throughout the tutorial by the inclusion of a background image of a fly fisherman in the left hand panel of the tutorial screen. Tutorial participants were provided with a booklet that required them to complete six tasks that were prompted from within the multimedia tutorial (Appendix E).



**Figure 3:** First two screens of the “Going Fishing” online tutorial

When designing the tutorial the author envisaged the structure in Figure 4, where the tutorial was to be completed as a solo effort and be complemented with a lecture, a

workshop, a written assignment and assigned readings. Chapter 1 of this dissertation limits the findings of the investigation to the context of the tutorial. The interaction among the related venues (Fig 4) was left for later study. The tutorial will ultimately be one topic in a twenty six, ninety minute lecture cycle, within a single semester undergraduate course. The course will be one course of four required for an undergraduate certification known as the Entrepreneurial Skills Program (ESP).



**Figure 4:** Opportunity skill building venues

The tutorial had two separate audiences but one common purpose – enhancement of opportunity finding skills. Some students used the tutorial to generate an idea that they will then refine into a venture opportunity, external idea generation, while others already had a venture idea in mind. internal idea generation (Bhave, 1994). It has been the author’s experience that the students who already have an idea in mind resent being asked to slow down to ideate. The tutorial was positioned as an opportunity to practice Basadur’s divergent/ convergent cycle for creative problem solving (Basadur et al., 1982). For students without an idea this should be an opportunity to find one, while for

those who already have an idea it is an opportunity to refine an existing idea. For both audiences, the diverge/converge technique should serve them well when they encounter fuzzy problems they need to solve.

The instructional design asked students to generate ideas that connect with their own interests and passions. As noted in the instructional literature such tasks should lead to higher levels of engagement (Amabile, 1997b; Denning, 2005; Gronlund, 2004; Smith, 1998) and spoke to the personal domain of prior knowledge (Ardichvili et al., 2003; Sigrist, 1999). Table 8 lays out the instructional objectives using a four by six matrix that lists knowledge types on the vertical axis and cognitive process skills on the horizontal axis (Anderson & Krathwohl, 2001; Leach, 2006). The tutorial focused on the acquisition of procedural knowledge (shaded areas): the remembering of procedural knowledge, the understanding of procedural knowledge, the application of procedural knowledge, the analysis of meta-cognitive knowledge, the evaluation of output from the procedural knowledge and the use of meta-cognitive knowledge to filter output generated from the procedural knowledge. Procedural knowledge was given context by the objectives in the un-shaded areas which require: remembering of factual knowledge, understanding of conceptual knowledge, procedural knowledge needed to create a venture opportunity and the meta-cognitive knowledge that connected the venture opportunity to the passions of the entrepreneur.

Table 8: Idea Generation Tutorial: Placement of the objectives and Instructional Activity in the Taxonomy Table

The Knowledge Dimension ↓	The Cognitive Process Dimension →					
	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
Factual Knowledge	Definition of entrepreneurship as being opportunity centric. The stages of the venturing process. Singh's sources of venture ideas.					
Conceptual Knowledge	Venturing Process. Role of ideation and divergent thinking. Role of convergent thinking. Finding problems worth solving.					
Procedural Knowledge	Definition of brainstorming	Rules of brainstorming	Generate a list of venture ideas		Develop a set of criteria  Evaluate the idea	Develop the idea into a venture opportunity
Meta-Cognitive Knowledge				Reflect on the process used to generate ideas	Connect the evaluation process to learner's knowledge of self.	Ensure that the venture opportunity feeds into personal core values and interests

The researcher was responsible for the design of the project and the analysis of the data. A research assistant was employed to collect primary data, convert the data into anonymous form, supply the anonymous data to the researcher, and to safeguard the primary data. Cumulative grade point average (GPA) data was collected to identify differences between the treatment group and the control group on select descriptive data. Anonymity was preserved by having the research assistant receive data and then render the data anonymous before making them available to the researcher. A separate signature line was included in the consent form relating to the release of GPA data. Table 9 identifies the research instruments, variables measured and location in the appendix.

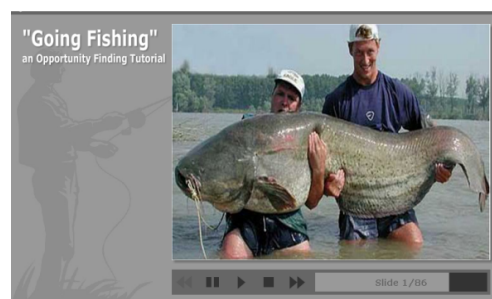
Table 9: Research Instruments: Variables Measured and Appendix Location

<b>Instrument</b>	<b>Variable</b>	<b>Appendix</b>
Baseline Questionnaire	Age, gender (male/female), program of study, cumulative grade point average, number of jobs held in last 3 years, previous involvement in the creation of a new venture, entrepreneurial intention, creativity self-assessment, entrepreneurial alertness, technology comfort level, prior knowledge and experience	Appendix D
Basadur CPSP Inventory	Preferred problem solving style	Appendix C
Basadur Ideation-Evaluation Preference Scale	Preference for ideation	Appendix B
Pre-test and Post-Test Output Document	Number of Opportunities Quality of Opportunity	Appendix A

Permission was obtained for the use of the two Basadur instruments, see Appendix F. The Basadur instruments (Appendix B & C) have previously been tested for validity (Basadur & Finkbeiner, 1985; Basadur et al., 1990a). The base line



questionnaire (Appendix D) was pretested for length and reliability. The tutorial, tutorial booklet Appendix G, H and I) and research instruments were reviewed by an expert panel. Table 10 identifies the panel members and the concerns they commented on. Based on their feedback grammatical and typographic errors were corrected, wording on the instruments was adjusted, and the tutorial introduction was amended to include a picture of a female fly fisherman (Figure 5). In discussion with the panel it was agreed that although fishing was often a male activity persons of both genders would have little trouble identifying with it and that there would be manageable impact in respect to cultural and ethnic diversity. The researcher accepted the panel's comments on the values of the student avatars and was faced with the choice of either revamping how the interactions occurred or removing them. In conversations with the developer both choices had significant cost and development time implications. Given that the impact was deemed neutral by the panel the researcher decided to leave the student avatars in place.



**Figure 5: Going Fishing Tutorial - Introductory Images**

Neither Rosson nor Dunn was familiar with Dr. Basadur's work. All three panelists recommended making the logic of the fishing analogy more visible to the study participants. The following wording was included in the booklets on the page prior to the instructions for completing the tutorial - "You are about to participate in a tutorial that uses fishing as a metaphor for opportunity finding" and "The tutorial leaders received training from Dr. Min Basadur in the Simplex © method of creative solving. Permission has been received from Dr. Basadur for use of the Creative Problem Solving Profile (CPSP) and Basadur Ideation-Evaluation Preference Scale".

Table 10: Expert Panel – Skills Sets and Commentary

<b>Expert</b>	<b>Skill Set</b>	<b>Comment</b>
Dr. Philip Rosson	Former dean of the Faculty of Management, holder of endowed chair in marketing and international business. Proponent of the use of design principles in the delivery of communication.	Dr. Rosson concentrated on the details and was able to spot spelling and grammatical problems but more importantly sequencing problems in the ordering of the slides in the tutorial. He also found the inclusion of the three student avatars as more "annoying" than helpful. Dr. Rosson asked questions about the Basadur Simplex method that assisted the researcher in making sure that choices consistent with the intended outcomes were made.
Dr. Mary Kilfoil	Doctorate in economics, employed as a senior economist, teaches research methods at the graduate level, published work studies entrepreneurs	Dr. Kilfoil acted as a sounding board for the background questionnaire and a number of small tweaks in wording were made. Her first observation was "where are the women, fishing looks like such a male thing?". Dr. Kilfoil also found the inclusion of the student avatars as neutral at best.
Paulette Dunn	MBA student, entrepreneur, ESP graduate, featured on CBC Fortune Hunters	Like Dr. Rosson Ms. Dunn focused on details spotting typos and sequences that seemed out of order. She also mentioned the "no women" issue as well as the student avatars.

A group of five subjects pre-tested the questionnaire. The participants were debriefed in a focus group format and self assessment questions such as creativity and alertness confirmed with the participants and compared across participants to ensure the instructions were consistently understood. Preliminary indications were that it would take 30 to 45 minutes to complete the initial data collection and pretest component, sixty to 70 minutes to complete the tutorial and booklet tasks and another 15 to 20 minutes to complete the post-test.

### *Technical Development*

Hadi Kharazi, a doctoral candidate in the school of computer science, Dalhousie University acted as head developer while Sepideh Ansari, a graduate of the Nova Scotia College of Art and Design (NSCAD) served as graphic designer, photo editor and animator. The tutorial was assembled from the storyboard in Appendix O and the animated power point slides supplied by the investigator. Initial recording of the narrative and resultant editing was done by the investigator and then passed along to the lead developer. This was an iterative, interactive process that took 135 hours of development time from the development team, and roughly doubles that from the investigator. Images were captured with a Sony Cybershot camera and subsequently manipulated in Adobe Photoshop. Audacity was used to capture and edit the narrative clips. The developers utilized ActionScript 2.0, Adobe Flash CS2 and various text editors in the development and debugging phases. Synchronization of the text, images and animations with the voice narratives was the most time consuming task for the developers.

### *Recruitment*

Of the roughly 200 participants recruited, 138 completed both the pre-test and post-test booklets and after data cleaning useable data was available from 117 subjects. The recruitment message stated that the study was looking for students who have an interest in starting their own venture. The message was of sufficient length and structure to attract students with an interest in traditional ventures as well as those with a social entrepreneurship agenda. The decision to recruit entrepreneurial learners is appropriate, because the investigation deals with training for entrepreneurship students.

Recruitment had 2 phases. The initial phase began in early March shortly after students returned from spring break. Notice Digest (an internal newsletter at Dalhousie University), inter university email lists and personal recruitment from colleagues' classes was used to identify potential participants. The recruitment was done by a teaching assistant. Response from colleagues was strong and 12 in class presentations were made at both the undergraduate and graduate level. Response was minimal – 15 to 20 respondents showing up for the pre-test session and only two making it to the subsequent post-test session. Phase two of the recruitment was done directly in the entrepreneurship classes and coffee, donuts, fruit or pizza provided depending on the time of day of the class. This resulted in a spike in completed questionnaires to twenty-five but this was still far short of the required numbers. In a distraught state the researcher, in his role of committee member for a master's thesis defense in the school of recreation shared his woes with his committee colleagues. Two of them, Dr. Jerome Singleton and Dr. Laurene Rehman were teaching leadership classes (total enrollment of 20) who they felt would benefit from the knowledge contained in the tutorial. Times were booked in the

computer lab and fifteen of the twenty agreed to participate in this study. These events reminded the researcher of another creative recruitment method used in a study of the impact of ambivalence on creative output where in Fong's experiment participants donated their study compensation to fraternal and other student organizations (Fong, 2006). Based on the success of this strategy the balance of the participants were recruited from two separate electrical engineering classes (20 and 25 students respectively), a small business class (11 students), an introduction to business class (10 students) and a summer session of commerce students enrolled in a management skills class (35-40 students).

Following a welcome and introduction from the research assistant where subjects received an overview of the project with emphasis on expected time commitments, nature of the data being collected, confidentiality of, and access to data, potential risks in participating, and potential benefits. After the initial presentation and the answering of questions potential participants were asked to sign a consent form. Subjects who did not wish to sign the consent form were excused, while those who remained completed the data collection and pre-test booklet. Random assignment to the control and treatment groups was accomplished by alternately distributing post-test tutorial and tutorial post-test booklets to those participating in that particular session.

### *Informed Consent*

Informed consent was obtained at the beginning of the pre-test meeting by the research assistant who asked participants to read the informed consent document and sign two copies – one copy to be retained by the researcher, one to be returned to the participant (see Appendix K, L, M and N) for the ethics training certification, IRB

consent checklist, informed consent documentation and recruitment message). The research assistant ensured that participants understood that participation in the study was voluntary and that they could choose to withdraw from the study at any time without penalty.

### *Subject Participation*

Subjects were told that they were assisting in the evaluation of an online tutorial and that they would be randomly assigned to one of two groups. The original recruitment plan envisaged that subjects would meet with the research assistant in groups of 25 (four groups in total for 100 subjects overall). As noted earlier this was not how events unfolded. The data collection venues were chosen to be geographically close to the where classes were normally held – Rowe Management building for business and recreation students, Bedford for Mount Saint Vincent students and Sexton campus for engineering students. At the pre-test meeting, the research assistant: described the project, reviewed the informed consent documentation, administered the Basadur Creative Problem Solving Profile (CPSP), administered the Basadur 14 item questionnaire, administered the Base Line Survey and collected the pre-test data (see Appendix B, C & D). The tutorial was completed in a computer lab booked by the researcher. The control group completed the post-test and then completed the tutorial while the treatment group completed the tutorial first then the post-test. The tutorial developer included a key stroke log function in the online tutorial that was automatically emailed to the researcher at the end of the tutorial (see Appendix O for a sample). Summaries of the research findings will be emailed to each participant by the research assistant.

### *Compensation*

The original plan called for participants to be paid an honorarium of \$10.00 for attending each of the pre-test and treatment-post-test sessions. While it was expected that participants would commit to attending both sessions, compensation would be paid to those who completed the study as well as those who choose to withdraw after the first session (\$10). The maximum compensation paid to a participant was to have been \$20.00. The researcher had to choose whether to use the limited resources at hand to complete the online component of the tutorial or to compensate participants. He chose to invest in completing the tutorial. As a substitute for direct compensation, discussions were held with the ethics officer at Dalhousie about using draws for prizes to encourage participation but the researcher was advised that this fell outside the boundary of ethical guidelines. Subjects were not offered economic compensation for their participation.

### *Tutorial Design and Content*

The tutorial was designed to support a lecture within a single semester course in entrepreneurship. Table 7 located the level of objective as instructional (global, educational and instructional), with a narrow scope, a time needed to learn of hours or days and a purpose of preparing a lecture plan. Table 8 placed the learning objectives within the knowledge and cognitive process dimensions of the revised taxonomy proposed originally by Bloom (Anderson & Krathwohl, 2001; Krathwohl & Payne, 1971).

The tutorial development began with a storyboard that included production notes with columns titled time per segment, elapsed time, module, activities, comments, connection to the events of instruction and sample screen shots which are included in Appendix J. Over 200 digital images were captured of the researcher, Dr. Tim Little, the

lead avatar and three students and concurrently digital recordings were made of the students repeating a variety of phrases. The researcher then built power point slides for each of the tutorial modules and inserted audio files to build a realistic prototype which, when fully edited was provided to the developer. The developer then built the alpha version of the tutorial which following edits and amendments was beta tested and revised before being used in the investigation.

### **Presentation of Results and Data Analysis**

Although some researchers have used a test, treatment, re-test protocol. (Basadur et al., 1990a; Basadur & Head, 2001; Basadur et al., 2000; Runco & Basadur, 1993) others have used an experimental model (Greer & Levine, 1991). The sample size of 117 is consistent with prior research into similar questions (Basadur & Head, 2001; Basadur et al., 2000; Greer & Levine, 1991). A minimum group size of 30 is recommended for experimental studies while group sizes as small as 15 have been used (Fraenkel & Wallen, 2005). This study had 52 subjects in the treatment and 65 subjects in the control group. Select descriptive data were used to identify statistically significant differences between the treatment and control groups.

Initial research designs envisaged the inclusion of two more treatments, a face-to-face lecture and a combination approach of lecture followed by an online workshop. Given the exploratory nature of the investigation the researcher chose to first determine if there was a statistically significant difference before and after training and between the trained experimental group and the control group. Then in subsequent research explore how different delivery methods impact the training. In this study an experimental design was used in which subjects were assigned randomly to either the treatment or control



group resulting in a randomized control group, pre-test-post-test design (Table 11). A questionnaire (Appendix D) was used to collect select demographic data as described in the approach section of this proposal.

Table 11: Experimental Research Design

<b>Group</b>	<b>Pre-test</b>	<b>Post-test Session</b>	
CPS Training	Obs <sub>1</sub>	CPS Training	Obs <sub>2</sub>
Control Group	Obs <sub>3</sub>	Obs <sub>4</sub>	CPS Training

The research design called for at least 50 sets of completed documents in each of the treatment and control groups. Experimental research in measuring the effect of creativity training has used similar sample sizes (Basadur & Head, 2001; DeTienne & Chandler, 2004; Fiet, 2002; Fong, 2006). Efforts were made to ensure that data from both the treatment and control groups were collected concurrently, to minimize the ability of either group to confer with the other. A pilot study was used to test data collection instruments and administration procedures and modifications were made as necessary. In the test study it was noted that subjects needed clarification on the inclusion of the two separate consent documents – one consenting to participate in the study and the other consenting to the release of GPA information. The other issue related to the fact that subjects did not understand the experimental design and in some cases chose not to complete the post-test instrumentation feeling that they had already done this in the pre-test session. Both of these issues were communicated to the research assistant and incorporated in the data collection procedures.

Four research questions were identified (Table 3). An independent samples t-test was performed on the variables with integer values while a proportions z-test was

performed on the variables with percentage values (gender, previous venture experience and CPSP - preferred problem solving style) to determine if there were significant differences between the control group and the treatment group. The student *t*-test was used to identify statistically significant differences in preference for ideation, number of opportunities identified and the quality of opportunities identified when compared to pre-intervention scores and when compared to an untrained control group (DeTienne & Chandler, 2004; Fong, 2006). The data was reported in aggregate form and it is the intention of the researcher to submit an article to one or more of the following journals: Academy of Management Learning and Education Journal, Journal of Small Business and Entrepreneurship or the International Journal of Engineering Education.

#### *Confidentiality & Anonymity*

In the consent form and at the initial meeting subjects were told that their responses would remain anonymous and confidential. A separate signature line was provided giving the researcher permission to access grade point data from the registrar. A buffer, in the form of a research assistant was placed between the researcher and the subjects. The researcher only received data that had been rendered anonymous by the research assistant. Response data will be stored on disk in a secure location for a period of up to 5 years. The physical data collected by the research assistant will be stored in a locked storeroom in the Management building. Electronic data will be stored in a password protected file. In both cases the data will remain unavailable to the researcher. Data was aggregated and no individual responses were identified.

## **Procedures**

The statements below identify and describe the procedures that facilitated the research objectives. Participants were told “the information being collected for this study seeks to determine the effectiveness of on-line tutorials for enhancing entrepreneurial skills. The results of this study are expected to assist entrepreneurs in identifying solutions for important problems”. Approval was received from the institutional review board at Nova Southeastern University as well as the social sciences and humanities research ethics board at Dalhousie University where the investigator is a faculty member. Participants were assured that their responses would be kept confidential. Anonymity in this setting was a larger concern than normal because students are deemed a vulnerable population. No academic incentives were offered for participation in the study.

### *Step 1 - Recruitment*

The research designed called for at least 140 participants to be recruited in the desire to end up with 100 useable data points once attrition was allowed for. Participants completed three instruments prior to the pre-test. A base line questionnaire gathered data on age, gender, program of study, cumulative grade point average, number of jobs held in last 3 years, previous involvement in the creation of a new venture, entrepreneurial intention, creativity self-assessment, entrepreneurial alertness and technology comfort level. Questionnaires used in prior training experiments form the foundation of the baseline questionnaire (DeTienne & Chandler, 2004; Fiet, 2002). The Basadur Creative Problem Solving Profile identified the participant’s preferred problem solving style while the Basadur 14 item preference questionnaire quantified the participants’ preference for ideation. (Basadur & Finkbeiner, 1985; Basadur & Gelade, 2003).

### *Step 2 – Collection of Pre-Test and Post-Test Data*

During the pre-test participants were asked to “think back over the events of the last twenty four hours including classes, commuting, social interactions, work, family, in short any and all of their interactions including those with technology and appliances and create a list any business/venture opportunities they had observed, listing any and all ideas that came to mind.” Quantity scores were obtained by counting the number of ideas that the participants listed. No attempt was made to remove similar or duplicate ideas. Subjects were asked to not evaluate the items in any way, just keep writing – “For the next 5 minutes please list below any business/venture opportunities you have observed. List any and all ideas that come to mind. If you need more room write on the back of the page. Do not try to evaluate the ideas in any way, just keep writing – don’t worry if you include problems that overlap or seem to be the same problem but said a different way, just keep writing.” A similar stimulus statement was used in a study of the impact of creativity training on university students (DeTienne & Chandler, 2004). When they had completed their list the participants were asked: “from the list of business/venture opportunities you have listed above, pick the one you like the best, circle it in the list above and then write it in the space below.” .

### *Step 3 - Treatment Development*

The idea generation tutorial was developed from knowledge/cognitive process objectives, Table 8 and the events of instruction in Appendix J. Both the knowledge-cognitive process objectives and the events of instruction were submitted for comment to three colleagues with experience in teaching idea generation and venture management principles. Revisions as necessary were made and the tutorial developed. Following

development the tutorials were returned to the same three colleagues for final comment (Table 10). Necessary revisions were made prior to implementation of the research.

The treatment was an online tutorial that, based on the keystroke logs generated during the investigation, took 60-65 minutes to complete. The investigator developed a booklet that was to be completed as participants made their way through tutorial. Physical copies of the booklet were distributed prior to commencement of the tutorial. The table of contents for the booklet is found in Appendix H and I while the booklet tasks that elicit a response can be found in Appendix E. To ensure that the navigation features of the tutorial were understood the booklet provided an exercise to familiarize participants as well as making sure that they knew they could either allow the slides to play automatically or go back to or ahead to slides based on their needs and preferences (Figure 6). In addition the booklet contained screen shots of module headings as well as the text titles of the topics covered in each module section. In the testing phase of the tutorial it was found that participants appreciated the ability to have a visual map of where they were as the tutorial unfolded.



### ***LISTEN TO INTRO – THEN HIT THE PAUSE BUTTON***

#### ***Navigation Buttons:***

*The tutorial is set to start at the beginning and present the slides in sequence. Should you wish to pause, go back or go forward there are five navigation buttons available to you at the bottom of the screen:*

1. *Go back*
2. *Pause*
3. *Play*
4. *Stop*
5. *Go forward*

*Take a moment to familiarize yourself with the navigation features.*

**Figure 6:** Going fishing tutorial – Navigation exercise

Previous studies have looked at the impact of creativity over a full single semester academic term for Masters in Business Administration Students (MBA) (DeTienne & Chandler, 2004), these included a 2 day seminar at the beginning of term for MBA students (Basadur & Head, 2001) and a series of lectures on opportunity discovery within a single semester course (Fiet, 2002). It was the researcher's contention that the Going Fishing tutorial would produce a stimulus strong enough to produce measurable results. This was based on the fact that the tutorial was but one element in a larger educational process and that only a limited number of specific skills would be trained. Initial indications from the development focus group and from the beta test group supported this contention. The tutorial was entitled Going Fishing – an Opportunity Finding Tutorial using the analogy of fishing to create a sense of familiarity and to make the point that when identifying opportunities you need to go fishing where the fish are (passions and prior experience) and use the right bait (alertness, personal traits and networking). The events of instruction methodology (Gagne, 1977; Gagne et al., 2004) was used as the pedagogical platform to introduce the topic, anchor the instruction in the work done by Basadur and present "the plan", introduce the tools for solving problems creatively, then use the post-test to have the participants apply their newly acquired skills, Appendix J.

The proposed tutorial materials were presented orally to a small group of students (4) and subject matter experts (3). In the focus group session the presenter used PowerPoint slides, oral dialogue and interactions to present the material. A trained facilitator was used to debrief the experience with the participants and subject matter experts (Appendix P). There was unanimous agreement that the material had value - in that it had practical applications in the work context and areas of study represented by the group. The physical presence of the facilitator was identified as incremental value beyond the content and the group identified ways to retain this value in the proposed multimedia format. It was suggested that the exercises should relate to generating realistic venture ideas and that ways be found to invoke the social elements of creativity found in group settings including faux interactions between the facilitator and digital personas. The video from IDEO was well received and was seen to represent a real time application of the principles. The group had reservations about being able to translate the interactivity of live presentation into a digital format.

Learning efficacy is enhanced when learners can see themselves in the learning (Smith & Ragan, 2004). For this reason the tutorial used three personas: Nanda a black male who is an aspiring entrepreneur, Sundari an Asian female who is a pre-aspiring entrepreneur and Stephen a white male who is an entrepreneur. These were current undergraduate students at Dalhousie and the proper releases were obtained. The tutorial was designed to be completed solo by the participant where there is no interaction with either the facilitator or other participants. Faux interactions between the personas and the tutorial leader were used to create a sense of presence for the participants. Faux interactions occurred when the personas: agreed or disagreed with the points being, stated

“tell me more”, provided examples, asked for clarification, or participated in tutorial activities. During the pre-testing of the tutorial both the expert panel and the student testers found that the personas did not add incremental value. In consultation with the developer the tutorial development was at point that removal of the personas would cause a significant time delay and would also add substantially to the development cost. Although the faux interactions did not add value neither did they detract from the presentation. For these reasons they remain a part of the tutorial.

An experienced multimedia developer, Hadi Kharazi was retained to build the tutorial. Kharazi is a doctoral student in computer science at Dalhousie working in the field of health informatics, holds a physician’s license and has extensive experience building tutorials in flash. In an effort to keep costs and development time down, the dominant deployment technique was audio files augmented with animations. The tutorial was beta tested with a panel of students and experts and revisions made. The researcher registered the domain name [tim-ed-nowhere.com](http://www.tim-ed-nowhere.com). Participants accessed the tutorial at [www.tim-ed-nowhere.com](http://www.tim-ed-nowhere.com).

#### *Step 4 - IRB/SSHREB Approval Issues*

It was the author’s experience that pitfalls in the ethics approval process can be minimized by managing the process leading up to submission. The ethics training course certification (Appendix K) had been obtained and a framework for the ethics application was crafted (Appendix L, M and N). Students are defined as a vulnerable population and in this application there were two important and separate areas of vulnerability – the potential for loss of anonymity leading to impact on the participants future academic performance; privacy issues relating to access to the participants grade point information.



The research plan asked students to fill out hard copy instruments and feedback sheets. The use of digital documents would be more consistent with the overall delivery of a multimedia product yet this induced additional vulnerability for the participants and required incremental diligence related to anonymity and protection of privacy.

During the preparation process and prior to submission, guidance was sought on the vulnerability issues from the respective directors of the ethics review process. A diligent effort was made to anticipate the concerns of those reviewing the document. The research proposal was submitted for ethics review to both institutions (Nova and Dalhousie). Approval was received from the researcher's home university, Nova southeastern and subsequently submitted to the researcher's university of employment, Dalhousie. Some changes were made during the review process including the phrase "You may experience some physical discomfort from sitting in front of a computer screen for two hours – irritation of the eye, stiffness in the legs, arms and fingers" under the category of possible risks. At the Dalhousie end there was some opposition to the inclusion of the requirement for review of records by the NSU-IRB – the concern being one of privacy of data being collected in Canada and potentially being viewed by an agency in a different country. The researcher was able to work with the ethics director at Dalhousie on this issue by pointing out that he was a doctoral candidate at Nova Southeastern.

#### *Step 5 - Instrumentation*

Instruments need to be both valid, measure, what they claim to be measuring and reliable, accurately measure the same constructs with different participants (Fraenkel & Wallen, 2005). The Basadur instruments (Appendix B & C) have previously been tested

for validity (Basadur & Finkbeiner, 1985; Basadur et al., 1990a). Prior research instruments were consulted in constructing measures of alertness (Fiet, 2002; Gilad et al., 1988; Kaish & Gilad, 1991), creativity (DeTienne & Chandler, 2004; Fong, 2006) and prior knowledge (Fiet, 2002; Shane, 2003). These measures were presented to an expert panel for input and validation. Table 12 below identifies the instrumentation used in the investigation along with the data collection and coding issues that arose.

Table 12: Measures - Data Collection and Coding

<b>Measure</b>	<b>Data Collection and Coding</b>
Preference for Ideation	Scores were obtained from the Basadur 14 Item Inventory
Preferred Problem Solving Style	Basadur's CPSP was used to establish one of 4 problem solving styles. This measure is seen to be more appropriate than the Kirton Adaption Innovation Inventory (KAI) used in previous research to measure the innovativeness of participants rather than their preferences (Kirton, 1985, 1989)
Number of ideas	A simple count of the number of ideas listed by each participant. Exact duplicates were not counted. No attempt was made to exclude alternate versions of the same idea.
Quality of Opportunities	Five point Likert scales were used to measure three constructs of quality: <ol style="list-style-type: none"> <li>1. The idea will solve a meaningful customer problem</li> <li>2. The idea is something I have a passion for. I can see myself doing this and loving it.</li> <li>3. I have done something like this before</li> </ol>
Questionnaire Variables	The questionnaire was pre-tested for length and clarity and changes were made where necessary.

In the Base Line Questionnaire (Appendix D), a potential threat to anonymity was addressed by removing questions that could identify the participant. This level of detail, although interesting was not central to exploring the relationship of the treatment to the

affective and effective skills in generating ideas. The Quality Assessment Rubric (Appendix A) is a new instrument that evaluates idea generation using criteria relevant to the earliest stages of the venturing process (Abelson & Black, 1986; Bhawe, 1994; Long & McMullan, 1984; Long & McMullan, 1984; Shane & Venkataraman, 2000; Timmons & Spinelli, 2008). Previous research has suggested that creativity plays a role in assisting entrepreneurs in the identification of opportunities related to their personal knowledge corridor (DeTienne & Chandler, 2004; Fiet, 2002). The stimulus statement was based on a study examining opportunity identification and its role in the entrepreneurial classroom (DeTienne & Chandler, 2004) and is consistent with classroom assignments used by the researcher as part of a course in new venture creation. The instrument included a set of instructions that allowed measurement of both the quality and quantity of ideas generated in response to the “what bugs you” stimulus. Input was sought from former students who have already completed the in class assignment and appropriate revisions made.

#### *Step 6 - Testing*

All instruments, including the Basadur 14 item questionnaire, the Basadur CPSP profile, and the two treatment protocols were be tested with a group of non-study participants. Efforts were made to find non-study participants who are representative of the future study participants – male/female, business/non-business, English-as-a-first language/English-as-a-second-language, and entrepreneurs/non-entrepreneurs. Testing addressed the following issues:

- a. Time Taken for Completion – the research plan calls for participants to complete the assigned tasks in 2, two hour sessions.

- b. Clarity of Instructions – a focus group discussion was conducted following completion of the instruments to assess how the instructions were interpreted and to probe for better phrasing.
- c. Study Delivery Protocols – the research assistant participated in the testing to allow them to build comfort with and have input into the protocols. The research assistant continued to practice the delivery of the protocols until the author was satisfied.
- d. Coding – as part of the post completion interview the coding rubrics were verified.
- e. Revision and Retest- where the testing procedure indicated the need for a revision, the revision was made and retested.

#### *Step 7 - Data Screening*

Data was screened before proceeding with analysis. As a first step descriptive statistics were examined looking for plausible means and standard deviations, and identifying outliers. Next the amount and distribution of missing data was evaluated on the assumption that the pattern of missing data held s more importance than the amount. Some of the missing data may be missing completely at random (MCAR) and be ignorable while other data may be missing not at random (MNAR) and require action. A missing values analysis (MVA) was run in SPSS to highlight patterns of missing data. Dependent on the circumstances, the cases containing missing data were dropped (if there were a small number of cases), a variable may be dropped if the missing data is concentrated in a single or small number of non-critical variables, but if the missing data were scattered throughout the sample then other action was required – estimation of the

data using prior experience or mean substitution. Outliers were analyzed to see if they resulted from one or more of the following causes: incorrect data entry, failure to specify missing value codes in the syntax for data analysis, the outlier was not a member of the intended sample population and finally the outlier may have been a member of the intended population but the distribution may be non-normal and consequently have extreme values. Upon completion of the outlier analysis transformation was considered to improve the normality of the distribution and to reduce the impact of the outlier on the analysis. As in the case of missing data, when the cases were linked to a variable, removal of the variable was considered as an option.

All data was entered by the researcher and a log book was kept during the data entry and data analysis phases of the investigation. Some examples of the data cleaning done prior to analysis, follow. All entries were checked to ensure that there was consistency in coding and where necessary revisions were made. New variables were created where appropriate. For instance a column was added to classify participants as either business or non-business students. Similarly a new column was created classifying participants as having ventured or not having ventured. Missing data was a problem. When it was possible an interpolation was done and where an interpolation was not possible the data was omitted. The data for the CPSP (Creative Problem Solving Profile) was entered in an excel spread sheet and if the row totaled to something other than 10 (1+2+3+4) or the total for all columns exceeded 120 (12 rows at 10 points a row) the researcher knew there was a problem. Some participants ignored the requirement that each column have only 1 first choice, 1 second choice, 1 third choice and 1 fourth choice. These instruments were not entered. Other participants missed an entry or two. The

researcher took an average of each of the columns and as long as the interpolated entry did not change the coding of the preferred style, the entry was made. Data for the Basadur 14 item questionnaire was only included if both the pre-test and post-test measurements were included. Similar to the CPSP example interpolation was done if there was one missing value using the entry from either the pre-test or post test for the same question – the result being a neutral impact on the difference score.

#### *Step 8 - Statistical Tests*

An independent samples t-test and proportions z-test was performed to identify differences on select descriptive variables between the treatment and control groups. Paired samples t-tests and independent samples t-tests were used to identify statistically significant differences in each of the three dependent variables (preference for ideation, number of opportunities identified and the quality of opportunities identified) when compared to pre-intervention scores and when compared to the untrained control group.

#### **Resource Requirements**

Table 13 lays out the cost of completing research. The project received a Research Development Fund grant of \$5,000. Research assistants were required to administer the instruments, collect the data and evaluate submissions at a cost of (\$2,000). The quality of the online tutorial benefited from the input of an experienced multimedia developer. The developer used the storyboards and instructional materials developed by the researcher and mounted them in a web enabled environment that engaged the learner. Sample screen shots are contained in Appendix H and I. The completed tutorial was alpha tested to ensure things worked as designed and then beta tested with a small group and revisions made as required.

Table 13: Project Budget

<b>Task</b>	<b>Hours</b>	<b>Rate</b>	<b>Cost</b>
Research Assistance	133	\$15	\$2,000
Tutorial Development	67	\$15	\$2,500
Focus Group Facilitation s			\$500
<b>Total</b>			<u><b>\$5,000</b></u>

The researcher relied on his personal network to identify experts to vet the instrumentation and to assist in the technical development of the tutorial. A colleague in the school of Electrical Engineering, Dalhousie University, agreed to act as the creative problem solving avatar for the online tutorial. The avatar was the subject matter expert whose face, voice and image is seen by the online tutorial participants. Research assistants were recruited from the masters programs at Dalhousie University.

### **Summary**

The study used a multi media tutorial as the treatment variable. The discussion in this chapter identified the objectives of the tutorial as instructional (narrow in scope, and hours in duration) as opposed to educational (moderate in scope, weeks or months in duration) or global (broad in scope, 1 or more years in duration)(Anderson & Krathwohl, 2001; Krathwohl & Payne, 1971). Figure 4 was used to delineate the skill building venues of which the tutorial is but one of five. The tutorial was designed to build generic skills in three areas – divergent thinking to generate more ideas, deferral of judgment to not make choices prematurely and convergent thinking to develop criteria to pick the best idea (Basadur, 1994). Table 8 used a template to establish learning objectives along both

the cognitive process and knowledge dimensions with an emphasis on higher order processes (evaluate, create) and higher order knowledge (procedural and meta-cognitive) (Anderson & Krathwohl, 2001). The Going Fishing tutorial used Gagne's events of instruction to stage the delivery of the content (Gagne, 1977). Techniques identified in the instructional literature that serve to engage the learner and activate their self efficacy were utilized (Denning, 2005; Gronlund, 2004; Smith, 1998; Smith & Ragan, 2004).

A pre-test/post-test experimental design randomly assigned participants to either the treatment or control group. The homogeneity of the two groups was verified by using an analysis of variance to identify statistically significant difference in independent variables such as gender, age, area of study, alertness and self assessment of creativity (DeTienne & Chandler, 2004). Statistically significant difference within group and between group were identified using the student t test on three measures: preference for ideation, number of opportunities identified, and quality of opportunities identified.

Validity and reliability were addressed. An initial focus group provided feedback on the content and instructional style of the proposed tutorial (Appendix P) Additional testing was done as the tutorial evolved through the development process to ensure that the strength and duration of the stimulus was sufficient to induce an effect and that the tutorial engaged the learner while providing training in the intended skills. An experienced web developer was engaged to build the tutorial. Basadur's 14 item questionnaire (preference for ideation) and preferred creative problem solving style (CPSP) are existing instruments with demonstrated validity and reliability measures (Basadur & Finkbeiner, 1985; Basadur et al., 1990a). The quality assessment rubric was



be vetted with three external experts. All instruments and procedures were tested and adjusted as needed prior to commencing data collection.

The research involved students, who are deemed a vulnerable population. Procedures for safeguarding confidentiality, recruitment, obtaining informed consent, secure storage of data and compensation discussed and the appropriate documents were included in the appendix. Nova Southeastern University required completion of the CITI course in the protection of human research subjects and the required certification is included in Appendix K. The study had a budget of \$5,000 Canadian.

## Chapter 4

### Results

Chapter 4 presents the findings of the investigation. Descriptive statistics are reviewed to gain a sense of the sample and data collected. Insights are gained and where appropriate, notes made for both this investigation and potential future research. Findings for each of the 4 research questions are presented, starting with the comparability of the control and treatment groups, followed by changes in attitudes toward divergent thinking, the fluency research questions (number of ideas) and finally the literacy research questions. Findings for the original research questions are provided and in the case of fluency an alternative measure for counting ideas is proposed. A summary of the findings is provided along with an introduction to chapter 5 where conclusions are reached, implications for practice in the field of entrepreneurship education are drawn and recommendations are made.

#### **Descriptive Statistics**

The data set for this investigation included 72 columns and 116 participants resulting in 8,352 potential data points (see the code book in Appendix Q). Variables were transcribed directly from the questionnaires (age, gender, pre-test ideas, preference for ideation etc.). Total quality scores and difference between pre-test and post-test ideas were calculated within the excel spreadsheet. The descriptive statistics section breaks the

analysis into related sets of data, comments on the findings in each set to highlight differences between the control and treatment group. Implications of differences between treatment and control groups are discussed and potential causes identified.

*Number, Age, Gender, Program of Study, Previous Venture Experience and Number of Jobs*

The sample data showed the following frequencies for programs of study: bachelor of arts 9, bachelor of business administration 4, bachelor of commerce 43, bachelor of electrical engineering 25, bachelor of management 16, bachelor of recreation 10, bachelor of science 7, MBA 1, and no degree entered 1, for a total of 116. The researcher observed that there was little analytical value in this coding and decided to convert the engineering, recreation, science and arts to the designation non-business while business administration, commerce, and management were converted to business. A similar problem existed with the previous venturing measure with only 27 of 114 having venturing experience – twenty students having started one venture, three having started two ventures and four having started three ventures ( $20+3+4 = 27$ ). The decision was made to code participants as either having ventured before or not which is compatible with the coding used in a similar setting (DeTienne & Chandler, 2004).

There were 52 participants in the treatment group and 64 participants in the control group. Members of the treatment group were on average 1.91 years younger, had the same male/female ration (57%/43%), had 11% fewer business students (52% versus 63%) and had been employed in .07 more jobs in the past 3 years that lasted at least 3 months (Table 12). Because these were undergraduate students with an average age of 23.63 years it is not surprising that they had a limited number of jobs, yet it must be

remembered that both the commerce and engineering programs (78/115) have a mandatory co-op requirement. The number of jobs for both groups at 2.42 was marginally lower than that reported in a similar study for MBA students (DeTienne & Chandler, 2004).

Table 14: Descriptive Statistics – Number, Age, Gender, Program of Study, Previous Venture Experience and Number of Jobs

<b>Groups</b>		<b>N</b>	<b>Age</b>	<b>Gender</b>	<b>Program of Study</b>	<b>% Venture Experience</b>	<b># Of Jobs</b>
Treatment	M	52	22.60	M 57%	B 52%	20%	2.46
	SD		6.02	F 43%	NB 48%	(10/50)	0.95
Control	M	64	24.51	M 57%	B 63%	26.56%	2.39
	SD		7.83	F 43%	NB 37%	(17/64)	1.06
Combined	M	116	23.63	M 57%	B 67	23.68%	2.42
	SD		7.09	F 49%	NB 48	(27/114)	1.01

*Creativity, Alertness, Network versus Solo Preference, Preferred problem Solving Style and Grade point Average (GPA)*

Creativity, entrepreneurial alertness and preference for network versus solo delineation of an opportunity are constructs that have been identified as fundamental to the opportunity recognition process (Ardichvili et al., 2003; Hills et al., 1997). In this investigation these variables are self assessed and the control group reported being slightly more creative (3.98 versus 3.79 for the treatment group), slightly more alert (3.53 versus 3.37 for the control group), but had a slightly lower preference for acting with the support of a network (3.07 versus 3.29 for the treatment group). Overall creativity scores were higher than those reported in a comparable study with MBA students – 3.90 for this

study versus 3.03 for the treatment group and 3.16 for the control group in the MBA study (DeTienne & Chandler, 2004).

The Creative Problem Solving Profile (CPSP) is an instrument that captures an individual's preferred problem solving style. Generators (quadrant I) are comfortable in the early stages of creative problem solving where identifying problems and potential opportunities is paramount. Conceptualizers (quadrant II) are problem definers and idea developers, Optimizers (quadrant III) are inclined to be involved in the practical resolution of well defined problems and are more comfortable in the later phase of creative problem solving. Implementers (quadrant IV) are most comfortable in the later phases of problem solving where they assume the role of problem finishers (Basadur et al., 1982). The treatment group had proportionately fewer generators (23% versus 34%) and proportionately more implementers (50% versus 32%) than the control group. In an earlier study with MBA students 37% and 33% fell into the optimizer (III) and implementer (IV) quadrants while 17% fell into the conceptualizer (II) quadrant and only 13% (I) into the generator quadrant (Basadur et al., 1990a). Given that the tutorial is intended to augment ideation skills at the early stages of opportunity identification there is likely to be a better match between the task at hand and the preferred problem solving style of the participants in the control group than in the treatment group.

Cumulative grade point averages (GPA) were obtained from the registrar's office of Dalhousie University and required participants to sign a separate release in the informed consent document, which 86 of the 116 participants completed. The mean GPA for the treatment and control groups were similar (2.93 and 2.92) and unlikely to be useful as explanatory variables in describing differences between the two groups.

Table 15: Descriptive Statistics – Creativity, Alertness, Network/Solo Preference, CPSP and GPA

<b>Groups</b>		<b>Creativity Self Report</b>	<b>Alertness Self report</b>	<b>Network Solo Preference</b>	<b>CPSP</b>	<b>GPA</b>
Treatment	M	3.79	3.37	3.29	I 23%, II 16%, III 11%, IV 50%	2.93
	SD	1.00	1.09	1.05		0.61
Control	M	3.98	3.53	3.07	I 34% , II 20%, III 14%, IV 32%	2.92
	SD	0.90	1.21	1.09		0.56
Combined	M	3.90	3.46	3.17	I = 29, II = 18 III = 13, IV = 40	2.93
	SD	.95	1.16	1.07		0.58

#### *Intention to Venture*

Participants were asked to rate their intention to venture, on a 5 point Likert scale, over four different time horizons: in the next 12 months, in the next 5 years, in the next 10 years and sometime in their lifetime. Table 16 below presents data on three of those time horizons. The treatment group had lower scores for venturing intention in all three categories in the next 12 months (2.88 versus 3.06), in the next 5 years (3.85 versus 4.25) and at some point in their lives (4.52 versus 4.48). It is interesting to note that the spread narrows and almost disappears as the time horizon expands. In a comparable study done with MBA students a similar relationship was found where the percentage intending to venture rose from a little under 20% in the 12 month time horizon to a little more than 70% within a lifetime (DeTienne & Chandler, 2004).

Table 16: Descriptive Statistics – Venturing Intention

<b>Groups</b>	<b>% Venturing In 12 Months</b>	<b>% Venturing In 10 Years</b>	<b>% Venturing In Lifetime</b>
Treatment (M/SD)	2.88/1.25	3.85/1.16	4.48/0.52
Control (M/SD)	3.06/1.28	4.25/0.99	4.52/0.96
Combined (M/SD)	2.98/1.26	4.28/0.97	4.50/0.94

### *Technology Comfort Level*

Because the tutorial was delivered in an online environment, the investigator assessed the technology comfort level of participants by asking three yes/no questions and used a 5 point Likert scale to assess comfort with accessing multimedia. In Table 17 below, all respondents were comfortable accessing the three forms of media. Mean scores on overall comfort with multimedia were greater than 4 with the treatment group scoring slightly higher than the control group (4.35 versus 4.25). Overall out of 116 participants three scored a 1, two scored a 2 and 17 a three. It was the investigators conclusion that technology was not a barrier in the delivery of the tutorial.

Table 17: Technology Comfort Level

<b>Groups</b>	<b>Access to Images</b>	<b>Access to Video</b>	<b>Access to Music</b>	<b>Comfort with Multimedia</b>
Treatment	Yes = 51 No = 0	Yes = 51 No = 0	Yes = 52 No = 0	4.35 0.98
Control	Yes = 64 No = 0	Yes = 64 No = 0	Yes = 64 No = 0	4.25 0.96
Combined	Yes = 115 No = 0	Yes = 115 No = 0	Yes = 116 No = 0	4.30 0.96

*Attitude towards Divergent Thinking*

Previous research has hypothesized that a change in attitude precedes a change in performance and that training in creative problem solving would help problem solvers to “separate divergent and convergent thinking and to deliberately apply divergent thinking” leading to enhanced ideation skills (Basadur et al., 2000). This study used the Basadur 14 item questionnaire to measure attitude toward divergent thinking before and after the training. The questionnaire measured two constructs: a preference for ideation and tendency to make premature critical evaluations. The preference for ideation scale had 6 items measured on a 9 point Likert scale with a maximum score of 54 (9 points times 6 items) while the tendency to make premature critical evaluations of ideas had 8 items with a maximum score of 72 (9 points times 8 items). In reading the data in Table 18 it is important to understand that an increase in preference for ideation is denoted by a positive difference between post-test and pre-test scores and a decline in tendency to make premature critical evaluation of ideas is indicated by a negative difference between post-test and pre-test scores. The treatment group had a mean increase in score for preference for ideation of 1.18 and a mean decrease in score for tendency to make premature critical evaluation of ideas of -9.10. The control group showed a mean decrease in preference for ideation of -.22 and a mean decrease in tendency for premature critical evaluation of ideas of -.16. In previous studies where the training had included the entire Simplex<sup>®</sup> method and had been a week long, statistically significant increases in preference for ideation and statistically significant declines in the tendency to make premature critical evaluation of ideas were noted (Basadur et al., 1982; Basadur et al., 1986; Basadur et al., 2000).



Table 18: Attitude toward Divergent Thinking (Mean/Standard Deviation)

<b>Groups</b>	<b>Preference for Ideation Pre-test Score</b>	<b>Preference for Ideation Post-test Score</b>	<b>Change in Ideation Score</b>	<b>Premature Critical Evaluation Pre-test Score</b>	<b>Premature Critical Evaluation Post-test Score</b>	<b>Change in Premature Critical Evaluation Score</b>
Treatment	39.40/6.56	41.05/6.98	1.18/5.94	44.48/10.85	33.88/13.85	-9.10/12.21
Control	38.84/7.43	39.06/7.99	-0.22/3.82	44.61/10.25	44.22/11.21	-0.16/5.38
Combined	39.09/7.03	39.90/7.60	0.37/4.85	44.55/10.47	39.86/13.35	-3.87/9.87

*Fluency Measures I – Increase in Number of Ideas from Pre-test to Post-test and from First Booklet Ideation Task to Second Booklet Ideation Task*

Fluency in idea generation refers to the ability of the entrepreneur to generate ideas. Fluency is said to increase when the number of ideas generated during the ideation process increases (Basadur et al., 2000). There were two fluency measures in this investigation. The original hypothesis developed during the propel stage of the dissertation suggested that there would be a statistically significant increase in the number of ideas generated in the post-test score for the treatment group as well as when compared to the post-test scores for the control group. In this investigation the mean increment in post-test score for the treatment group was .53 while the control group declined by .55. Following the acceptance of the dissertation proposal and prompted by feedback from the ethics review process at Dalhousie University, relating to maximizing the potential benefits and minimizing the potential harm to participants it was decided to have the control group complete the tutorial following the administration of the post-test.

This decision provided a second measure of fluency related to two ideation tasks contained within the Going Fishing booklet. Each task required participants to write

down all the uses they could think of for a bottle. The first ideation task took place at slide 56/85 in the brain booster section of the tutorial while the second ideation task took place at slide 62/85 in the same section after the Brain Booster tool had been explained. This task was completed by both the treatment and control groups and as a result there are no between group comparisons made. The mean increase in ideas for all participants was .68.

Table 19: Fluency Measures I (Mean/Standard Deviation and Max/Min)

<b>Groups</b>	<b>Pre-Test # of Ideas</b>	<b>Post-Test # of Ideas</b>	<b>Increment in Ideas: Post – Pre</b>	<b>First Bottles Task</b>	<b>Second Bottle Task</b>	<b>Increment in Ideas: Two - One</b>
Treatment	4.23/3.23 16/1	4.44/3.19 15/1	0.53/2.71 5/-7	5.33/2.33 13/2	5.92/2.16 12/1	0.78/3.11 11/-6
Control	4.48/3.39 18/0	3.91/3.14 16/0	-0.55/2.98 5/-14	6.63/2.89 15/2	7.25/3.32 16/3	0.60/2.85 8/-6
Combined	4.37/3.30 18/0	4.13/3.15 16/0	-0.08/2.90 5/-14	6.04/2.71 15/2	6.65/2.92 16/1	0.68/2.96

*Imagine a World without Exams and Term Projects Phenomenon*

There was a third task contained in the Going Fishing tutorial booklet (slide 71/85 in the deferral of judgment module) where participants were asked to “imagine a world without exams and term projects” and then list all the ways this would change their lives. Upon completion of this task they were then asked to “classify the list generated above into pleasant (good stuff) and unpleasant consequences”. As the investigator entered the booklet data he noted a recurring theme – many of the participants rather than simply classifying what they had written actually increased the number of ideas. This was an unexpected result because the total in the classified list should have been the same

as in the original list. To gain a more complete understanding of this phenomenon the investigator constructed the data in Table 20. There were 114 observations with a mean increment in ideas of 1.23 with a maximum increment of 11 and a minimum increment of -1.

Of the 114 observations half (58/114) showed a mean decrease in ideas of -.17. The other half (56/114) showed a mean increase of 2.86. This finding is suggestive of some underlying process worthy of future study. Perhaps there was something in the phrasing of the task that engaged the participants and allowed them to “see themselves in the situation and imagine their own future (Denning, 2000, 2005; Kelley & Littman, 2001, 2005). Alternatively some of the methods for engaging learners identified in Smith’s formulary of idea generation techniques might have been in play here such as habit breaking strategies that allow participants to identify and then challenge the assumptions and beliefs related to the problem they have identified (escape) or perhaps motivational enablers such as personal involvement are likely to increase intrinsic motivation (systematized direct induction) and finally extra effort enablers might have assisted in generating lots of ideas (Crawford slip method) (Smith, 1998).

Table 20: Imagine a World without Exams or Term Projects Phenomenon

	<b># of Ideas</b>	<b>Good</b>	<b>Bad</b>	<b>Difference: (Good + Bad) - # of Ideas</b>
N	114	108	105	108
M	4.58	3.64	2.23	1.23
SD	1.79	1.59	1.63	2.17
Max	13	9	8	11
Min	4	3	2	-1

Table 20 Continued: Imagine a World without Exams or Term Projects Phenomenon

	<b># of Ideas</b>	<b>Good</b>	<b>Bad</b>	<b>Difference: (Good + Bad) - # of Ideas</b>
<i>Negative Change</i>				
	Max/Min			0/-1
	Mean			-0.17
	SD			0.38
<i>Positive Change</i>				
	Max/Min			50
	Mean			11/1
	SD			2.86
				2.25

*Fluency Measures II – Number of New Ideas from Pre-test to Post-test and from First Booklet Ideation Task to Second Booklet Ideation Task*

The first measure of fluency above was calculated by subtracting the number of ideas listed in the pre-test from the number of ideas in the post-test and calculating the difference. As the investigator entered the pre-test and post-ideas into the study data base he noticed that many of the post-test ideas as well as the second bottle ideation task were different from the initial listing. The majority of the study participants are undergraduate students with limited job experience as well as limited previous experience. It was the investigator's contention that the study participants are in the very early stages of their venturing journey and that at this stage the listing of additional ideas has the potential to lead to the identification of alternate venture opportunities. This contention was supported under the extended effort principle where additional possible solutions/ideas are generated "beyond the first crop of ideas that come to mind" (Basadur, 1987). There has been empirical support for the extended effort principle where the number of good

ideas was greater in the latter two thirds of the idea generation time period than in the first third (Parnes, 1961).

Table 21 below provides descriptive statistics for the increment in the number of ideas post-test compared to pre-test and second bottle ideation task compared to first bottle ideation task. A comparison of the scores of the treatment group to the control group on the pre-test/post-test difference is appropriate because the treatment group completed the Going Fishing tutorial before completing the post-test, while the control group did not. The treatment group had a mean increase of 3.39 and a range of 13 to -2 for the increment from pre-test ideas. The control group had a mean increase of 2.57 and a range of 15 to -3 for the increment from pre-test ideas. Alternatively between group scores for differences between the first and second bottles ideation task because all participants completed both tasks as they completed the tutorial. The combined groups had an increase in mean scores from the first bottles ideation task to the second bottles ideation task of 5.97 and a range of 14 to zero.

Table 21: Fluency Measures II (Mean/Standard Deviation and Max/Min)

<b>Groups</b>	<b>Pre-Test # of Ideas</b>	<b>Total Unique Ideas</b>	<b>Increment From Pre- Test Ideas</b>	<b>First Bottles Task</b>	<b>Total Unique Ideas</b>	<b>Increment 1<sup>st</sup> Bottles Task</b>
Treatment	4.23/3.23 16/1	7.63/5.12 23/1	3.39/3.11 13/-2	5.33/2.33 13/2	11.00/3.77 22/5	5.72/2.48 12/0
Control	4.48/3.39 18/0	7.48/5.71 26/1	2.57/3.30 15/-3	6.63/2.89 15/2	12.88/4.76 28/5	6.18/2.83 14/0
Combined	4.37/3.30 18/0	7.54/5.43 26/1	2.93/3.23 15/-3	6.04/2.71 15/2	12.03/4.42 28/5	5.97/2.68 14/0

*Literacy Measures – Solves a Meaningful Problem, the Participant has a Passion for the Idea and They have done Something like this Before and Total Quality Score*

Literacy in idea generation refers to the ability of the entrepreneur to generate quality ideas. Literacy is said to increase when the quality of the ideas generated during the ideation process increases (Basadur et al., 2000). Previous studies have used a variety of metrics to assess quality including: the innovativeness of the idea (DeTienne & Chandler, 2004), the degree of relevance to the problem identified (Basadur et al., 1982), and the degree to which participants “identified the golden egg” - a high potential solution (Basadur & Head, 2001). In this study the investigator asked participants to first choose the best idea from the list that they had created in each of the pre-test and post-test tasks respectively. They were then asked: “for the idea you have chosen please answer the following questions (each of which had a 5 point Likert scale):

1. *The idea will solve a meaningful customer problem.*
2. *The idea is something I have a passion for. I can see myself doing this and loving it.*
3. *I have done something like this before.*

The investigator chose passion and prior experience because they have been delineated as antecedent skills that contribute to the “core process” of venture formation (Ardichvili et al., 2003; Shane, 2003) while solving meaningful customer problems is the central theme of many entrepreneurship texts (Hisrich et al., 2006; Kuratko & Hodgetts, 2003b; Timmons & Spinelli, 2008).

In slide 36/85 of the tutorial, participants were asked to reflect on their passions and what they are good at and then asked to: “Take a moment and list and or describe the things that you enjoy doing, the things that give you energy. Take a moment to list and

or describe the things you are good at. Things others have complimented you on. These could be school related, hobbies, volunteer work etc.”. When reading the scores in Table 22 below, it is important to remember that the control group only completed the training tasks related to quality after they had completed the post-test. The “solves meaningful problems” mean scores increased for the treatment group from 4.08 to 4.35, the “have a passion for the idea” scores declined slightly to 3.81 from 3.84, the “have done something like this before scores decreased from 2.38 to 2.30 and the total quality score (the sum of the previous three columns) increased to 10.46 from 10.30. The control group post test scores on the “solves meaningful problems” declined to 4.16 from 4.22, scores on the “have a passion for the idea” decline to 3.82 from 3.86, scores on “have done something like this before” decline very slightly to 2.55 from 2.56 and total quality scores decline to 10.56 from 10.64. Overall 31% of the participants chose the same idea for the post-test as they did for the pre-test (29% of the treatment group and 32% of the control group). Participants felt most strongly that their idea solved meaningful customer problems – mean scores greater than 4 and least strongly about their prior experience – mean scores of 2.5 or less. The low scores on prior experience may well be related to the youthfulness and relative inexperience of the undergraduate students who participated in the study.

Table 22: Literacy Measures

Groups	Pre-test	Post-test	Pre-test	Post-test
	Solves Meaningful Problems	Solves Meaningful Problems	Have a Passion for the Idea	Have a Passion for the Idea
Treatment	4.08/0.83	4.35/0.68	3.84/1.28	3.81/1.33
Control	4.22/0.86	4.16/1.08	3.86/1.43	3.82/1.42

Table 22 Continued: Literacy Measures

Groups	Pre-test	Post-test	Pre-test	Post-test
	Solves Meaningful Problems	Solves Meaningful Problems	Have a Passion for the Idea	Have a Passion for the Idea
Combined	4.15/0.84	4.24/0.94	3.85/1.35	3.82/1.37
Treatment	2.38/1.45	2.30/1.54	10.30/2.32	10.46/2.41
Control	2.56/1.47	2.55/1.51	10.64/2.49	10.56/2.80
Combined	2.47/1.46	2.45/1.52	10.48/2.40	10.52/2.64

### Qualitative Issues

Qualitative analysis was not incorporated as part of the research plan for this study yet there were a number of insights that arose as the investigator posted data. Table 23 captures representative commentary about jobs held, personal passions, prior experience and the post-test idea chosen sorted by three degree programs – commerce, electrical engineering and recreation. The commerce students have a mandatory co-op work term requirement and worked primarily in accounting and banking. The engineering students also have a mandatory co-op requirement worked in the department of defense, a nuclear power plant and for a software company. Recreation students worked as camp counselors, recreation therapists and healthcare workers. Engineering students viewed themselves as being good at technical skills and their post-test ideas typically incorporated technology in the solutions they chose. Recreation students viewed themselves as being good at the softer, non-technical skills and their post-test ideas included things like creating a society to dispel the stigma related to mental health and decreasing or preventing dementia in its early stages. The investigator observed that



there appears to be an interaction among degree choice, program of study, what participants viewed themselves as being good at and the idea they chose. Future research is needed to delineate the nature of these relationships.

The second observation has to do with the level of engagement of the participants as they reflected on their passions and interests. Anderson, in his revision to Bloom's taxonomy of learning suggested that meta-cognitive knowledge (knowledge about self) is the highest order of knowledge and that creating (as in founding a new venture) is the highest level of cognitive process (Anderson & Krathwohl, 2001; Bloom, 1956).

Amabile proposed an intrinsic motivation principle of creativity that stated: "people will be most creative when they feel motivated primarily by the interest, satisfaction and challenge of the work." (Amabile, 1998). The qualitative data suggested that participants were able to articulate their relevant meta cognitive knowledge and that by being engaged in the activity of looking for venture ideas were intrinsically engaged in the activity.

Table 23: Representative Commentary by Program of Study

<b>Program</b>	<b>Jobs Held</b>	<b>Passions</b>	<b>Good At</b>	<b>Post-Test Idea</b>
BCOMM	Bank – financial services manager	Hockey, problem solving, taking on challenging projects	Dealing with people to solve difficult problems	Restaurant
	Oil Service – accountant and accounts receivable manager	Music, event promotion, skateboarding	DJ'ing, skateboarding, event promotion	Information wall – weather news etc.
	Law firm – accounting clerk	Hockey, soccer, making money	Sports, work ethic, leadership	Grocery delivery

Table 23 Continued: Representative Commentary by Program of Study

<b>Program</b>	<b>Jobs Held</b>	<b>Passions</b>	<b>Good At</b>	<b>Post-Test Idea</b>
BENG	Defense – built sensor units	Reading science fiction, alternate history, walking drawing, engineers without borders	Visualization, drawing	Dough pounder for third world countries where women spend hours pounding food-stuffs
	Nuclear power plant – value engineering	Reading, playing any sort of game	Imagination, study well, painting, non-judgmental behavior	Luggage that changes size
	Software company – verification intern	Programming, fixing things, laughing, thinking	Adaptability, patience, focus, assisting others	Integrated keyboard and mouse
BREC	created therapeutic recreation programs	Recreation, family, traveling	Volunteering, working with seniors, sports	Decreasing-preventing dementia in early stages
	Healthcare office worker	Arts and crafts, scrapbooking, cooking, soccer, practicing skills	Scrapbooking, being creative, soccer skills, working with special needs children	Create a society that works to reduce the stigma related to mental health
	Clothing warehouse - picker	Sports, music	Being creative, good musical ear, hard work and effort, thinking on the fly, being open minded, funny	Making slides for presentations

The final qualitative observations have to do with comments by some of the outliers.

One participant in response to the pre-test stimulus wrote “I have not thought of any in

the last 24 hours” and in the post test wrote “no ideas I can think of”. This suggested that the respondent misinterpreted the stimulus and instead of using the experiences of the last 24 hours to stimulate ideation simply stated that they did not have any ideas in the last 24 hours. Another participant wrote “None? If I am unlikely to ever start a venture what are the odds I can get an idea from the last twenty four hours?”. The scores by this participant for creativity (2/5), alertness (1/5), venturing in the next 12 months (1/5), and venturing at some point in their lifetime (2/5), are supportive of this particular response. These scores suggest that the participant was not entrepreneurial and did not desire to be entrepreneurial.

Twenty-three participants made notations in the summary slides (83-85) demonstrating that they had internalized the key concepts incorporated in the lecture. If these comments are representative of the entire treatment group, it can be inferred that participants in the treatment group who completed the post-test did so having incorporated the content of the tutorial.

Table 24: Representative Notes from the Booklet Summary Slides

<b>Finding “Your Opportunity</b>	<b>Working the Plan</b>	<b>We Went Fishing</b>
<i>Ideas and opportunity, passions, experience, interest</i>	<i>Divergent, convergent, deferral of judgment</i>	<i>Familiar with area, know equipment, more likely to hook a good opportunity</i>
<i>Ideas arise from passion, experience, awareness. Solve a pain</i>	<i>Divergent thinking, deferral of judgment, convergent thinking</i>	<i>Choose from a number of ideas taken from your experience and passion</i>
<i>Use passions and experience for ideas</i>	<i>Tools – plan where to start. Divergent thinking, deferral</i>	<i>Know everything about your passion, full understanding</i>

## Research Questions

In this section the investigator will share the findings related to each of the 4 research questions. The initial research question looked for statistically significant differences between the treatment and control groups that might affect comparability. In previous studies it was demonstrated that a change in ideation behavior is preceded by a change in attitude towards divergent thinking (Basadur et al., 2000). The second research question identified statistically significant differences in attitudes toward divergent thinking within each of the groups as well as between the treatment group and the control group. The third research question identified statistically significant differences in fluency (number of unique ideas), within the treatment group and between the treatment and control groups. The final research question, however, did not identify statistically significant differences in literacy (the quality of ideas), within the treatment and control group and between the treatment and control group.

*1 Are there statistically significant differences between the untrained control group and the treatment group on select descriptive data?*

An independent samples t-test was performed on the variables with integer values while a proportions z-test was performed on the variables with percentage values (gender, previous venture experience and CPSP - preferred problem solving style) to determine if there were significant differences between the control group and the treatment group. Table 25 presents the means and standard deviations for both groups for thirteen independent variables. The investigator included variables that were consistent with a prior study including age, gender, number of jobs in the last 3 years, venturing experience creativity self report, venturing intention in the next

twelve months and venturing intention in their lifetime (DeTienne & Chandler, 2004). The initial list was expanded to include independent variables related to program of study (business or non-business) as prior research had found differences in creative performance between business and non-business students (Cheung, 2003; Eisenman, 1969; Maier & Hoffman, 1961); grade point average (GPA) as it had the potential to be a predictor of performance on both the fluency and literacy scores; entrepreneurial alertness and the network/solo preference because they were identified as antecedents of venture formation (Ardichvili et al., 2003); technology comfort level because Going Fishing was a multimedia tutorial accessed over the internet. There was no statistically significant difference between the treatment and control groups.

Table 25 Research Question 1: Comparison of Group Descriptive Statistics

<b>Independent Variable</b>	<b>Treatment Group</b>	<b>Control Group</b>	<b>t-Statistic</b>	<b>p-Value</b>	<b>Significant Difference Yes/No</b>
N	52	64			
Age (M/SD)	22.60/6.02	24.51/7.83	1.73	0.09	No
Gender	57% M 43% F	57% M 43% F	-0.46	0.65	No
Business/ Non-business	52% B 48% NB	63% B 37% NB	1.58	0.114	No
GPA (M/SD)	2.93/0.61	2.92/0.56	-0.00	1.00	No
Jobs held to date (M/SD)	2.46/0.95	2.39/1.06	-0.22	0.82	No
Venturing experience	20%	27%	0.692	0.49	
Creativity self-report (M/SD)	3.79/1.00	3.98/0.90	1.64	0.10	No
Entrepreneurial alertness (M/SD)	3.37/1.09	3.53/1.21	0.99	0.32	No
Network/solo Preference (M/SD)	3.29/1.05	3.07/1.09	-1.16	0.25	No
Venture in 12 months (M/SD)	2.88/1.25	3.06/1.28	0.75	0.46	No
Venture in Lifetime (M/SD)	4.48/0.52	4.52/0.96	0.00	1.00	No
Technology comfort level (M/SD)	4.35/0.98	4.25/0.96	-0.65	0.52	No

2 *Are there statistically significant differences in pre-test and post-test scores for preference for ideation in opportunity finding and tendency to make premature critical evaluations when compared to pre-intervention scores:*

(a) *For the treatment group?*

(b) *For the control group?*

(c) *Between the treatment group and the untrained control group?*

Table 26 Research Question 2: Preference for Ideation and Tendency to Make Premature Judgments

<b>Groups</b>	<b>Preference for Ideation Pre-test Score</b>	<b>Preference for Ideation Post-test Score</b>	<b>Change in Ideation Score</b>	<b>Premature Critical Evaluation Pre-test Score</b>	<b>Premature Critical Evaluation Post-test Score</b>	<b>Change in Premature Critical Evaluation Score</b>
Treatment						
N	50	40	39	50	40	39
Max	50	54	15	67	61	10
Min	23	30	-10	22	8	-37
Mean	39.40	41.05	1.18	44.48	33.88	-9.10
SD	6.56	6.98	5.94	10.85	13.85	12.21
Control						
N	63	54	54	64	55	55
Max	54	54	8	65	68	14
Min	21	18	-9	19	23	-12
Mean	38.84	39.06	-0.22	44.61	44.22	-0.16
SD	7.43	7.99	3.82	10.25	11.21	5.38

A paired sample t-test was used to test hypothesis 2a and 2b and while an independent samples t-test was used to test 2c. An increase in preference for ideation is denoted by a positive difference between post-test and pre-test scores and a decline in tendency to make premature critical evaluation of ideas is indicated by a negative difference between post-test and pre-test scores. Hypotheses 2a, 2b and 2c were not supported for the preference for ideation construct (p value = .19, .86 and .151). On the

other hand there was strong support ( $p = .001$ ) for hypotheses 2a and 2c while hypothesis 2b was rejected ( $p$  value = .71). These results are in contrast to those reported by Basadur who found that training in the Simplex<sup>®</sup> method of creative problem solving produced statistically significant and desired changes in both constructs (Basadur et al., 1982; Basadur et al., 1986; Basadur et al., 1990b).

Table 27 Research Question 2: t-test Results

<b>Within Group Differences</b>					
	<b>Mean Pre-test Score</b>	<b>Mean Post-test Score</b>	<b>t- Statistic</b>	<b>p- Value</b>	<b>Significant Difference Yes/No</b>
<b>Treatment Group</b>					
Preference for Ideation	39.40	41.05	-1.35	0.19	No
Tendency for Premature Critical Evaluation	44.48	33.88	4.60	0.00	Yes
<b>Control Group</b>					
Preference for Ideation	38.84	39.06	0.18	0.86	No
Tendency for Premature Critical Evaluation	44.61	44.22	0.38	0.71	No
<b>Between Group Differences</b>					
	<b>Mean Control Group Change</b>	<b>Mean Treatme nt Group Change</b>	<b>t- Statistic</b>	<b>p- Value</b>	<b>Significant Difference Yes/No</b>
Preference for Ideation	-0.22	1.18	-1.450	0.151	No
Tendency for Premature Critical Evaluation	-0.16	-9.10	4.020	0.000	Yes

3 *Are there statistically significant differences in pre-test and post-test scores for the number of opportunities identified when compared to pre-intervention scores:*

(a) *For the treatment group?*

(b) *For the control group?*

(c) *Between the treatment group and the untrained control group?*

There were two tasks that resulted in pre and post incidences of idea generation. One was the pre-test and post-test stimulus completed by both the treatment and control groups permitting both within group and between group comparisons. The second task was completed in the tutorial booklet by all participants with the result that only within group testing for all participants was possible. A paired sample t-test was used to test hypothesis 3a and 3b and while an independent samples t-test was used to test 3c. The investigator delineated a second measure of ideational fluency that compared the total number of unique ideas in the post phase to the pre phase of the two ideation tasks. Similar testing methodologies were used in the investigation of creativity training for MBA students and with industrial managers in where it was found that there was a significant and positive difference within groups that were trained as well as between the trained group and the untrained group (Basadur et al., 1982; DeTienne & Chandler, 2004). Other researchers have held the opinion that creativity training has the ability to increase the number of ideas generated (principle of extended effort) and this is more likely to result in the generation of better ideas (Osborn, 1953; Proctor, 1995).

Hypotheses 3a, 3b and 3c were rejected for the post-test/pretest ideation exercise (p value = .37 and .1643) and for the bottles 1/bottles 2 ideation task (p value = .02).

Because all participants completed the two bottle ideation exercises only within group statistics were calculated for each of the two bottles tasks. There was a statistically significant difference in the number of unique bottles ideas generated (p value = .00).

Table 28 Research Question 3: t-test Statistics for Number of Ideas Generated



<b>Within Group Differences</b>				
	<b>Mean/SD # of Ideas Increment from First Task</b>	<b>t-Statistic</b>	<b>p-Value</b>	<b>Significant Difference Yes/No</b>
Venture Ideas – treatment group	.39/2.71	0.90	0.37	No
Unique Ideas (post-test/ pre-Test) treatment group	3.29/3.06	6.63	0.00	Yes
Venture Ideas – control group	-.049/3.027	-1.08	0.29	No
Unique Ideas (post-test/ pre-Test) control group	2.62/3.36	5.23	0.00	Yes
Bottle Ideas – All participants	.68/2.96	2.36	0.02	No
Unique Ideas (Bottles #2/Bottles #1 )- All participants	5.98/2.66	16.01	0.00	Yes

#### **Between Group Differences**

	<b>Mean/SD # of Ideas Increment from First Task Control</b>	<b>Mean/SD # of Ideas Increment from First Task Treatment</b>	<b>t-Statistic</b>	<b>p-Value</b>	<b>Significant Difference Yes/No</b>
Venture Ideas	-0.55/2.98	.53/2.71	-1.403	0.1643	No
Unique Ideas	2.57/3.30	3.39/3.11	-0.9457	0.347	No

4 *Are there statistically significant differences in pre-test and post-test scores for the quality of opportunities identified when compared to pre-intervention scores:*

(a) *For the treatment group?*

(b) *For the control group?*

(c) *Between the treatment group and the untrained control group?*

Quality has been measured in previous studies by an increase in the number of ideas generated, (Basadur et al. 2000), the innovativeness of the idea (DeTienne & Chandler,

2004), the degree of relevance to the problem identified (Basadur et al., 1982), and the degree to which participants “identified the golden egg” - a high potential solution (Basadur & Head, 2001). In this study the investigator drew from the literature above and took into account the relative youth and inexperience (previous venturing experience and number of jobs) and chose passion and prior experience because they have been delineated as antecedent skills that contribute to the “core process” of venture formation (Ardichvili et al., 2003; Shane, 2003) while solving meaningful customer problems is the central theme of many entrepreneurship texts (Hisrich et al., 2006; Kuratko & Hodgetts, 2003b; Timmons & Spinelli, 2008).

Table 29 summarizes the findings for this research question for each of the 3 quality measures as well as the sum of all three measures (Total Quality). Hypotheses 4a, 4b and 4c were rejected for all four quality constructs (p value ranging from a high of 1.00 to a low of .09). This is in contrast to results reported in previous studies (Basadur et al., 1982; Basadur & Head, 2001; Basadur et al., 2000; DeTienne & Chandler, 2004). It was interesting to note that only 31% of the participants chose the same idea for the post-test as they did for the pre-test (29% of the treatment group and 32% of the control group). Scores on the solved meaningful customer problems were highest (4+) and prior experience lowest (2.5 or less).

Table 29 Research Question 4: Quality of Ideas Generated

<b>Groups</b>	<b>Post/Pre-test Difference Solves Meaningful Problems</b>	<b>t- Statistic</b>	<b>p- Value</b>	<b>Significant Difference Yes/No</b>	<b>Post/Pre-test Difference Have a Passion for the Idea</b>	<b>t- Statistic</b>	<b>p-Value</b>	<b>Significant Difference Yes/No</b>
<i>Within Group:</i>								
Treatment (Mean/SD)	0.09/.91	0.57	0.57	No	0.00/1.17	0.00	1.00	No
Control (Mean/SD)	.03/.0.80	0.198	0.84	No	0.28/1.01	1.72	0.09	No
Between Group: Treatment/Control		-0.32	0.75	No		1.06	0.29	No
<b>Groups</b>	<b>Post/Pre-test Difference Have Done Something Like This</b>			<b>Significant Difference Yes/No</b>	<b>Post/Pre-test Difference Total Quality Score</b>			<b>Significant Difference Yes/No</b>
Within Group: Treatment (Mean/SD)	0.15/1.62	0.54	0.60	No	0.24/1.92	0.73	0.47	No
Control (Mean/SD)	-0.15/1.60	-0.60	0.56	No	0.20/2.163	0.59	0.56	No
Between Group: Treatment/Control Mean/SD		-0.80	0.43	No		-0.09	0.93	No

## Summary of Results

Chapter 4 presented the findings of the investigation. The descriptive statistics suggested that the participants were young (mean age of 23.63), more male than female (57% male), roughly split between business and non-business undergraduate programs, had limited prior venture experience (20%) and limited work experience (mean 2.42 jobs). The control group were slightly more creative (mean scores 3.98/3.79), slightly more alert to entrepreneurial opportunities (mean scores 3.53/3.37) and preferred working solo (mean scores 3.07/3.29). Self reported creativity scores were higher than those reported in a previous study for MBA students (DeTienne & Chandler, 2004). These findings suggested that many of the participants would fall into either the pre-aspiring or aspiring categories of entrepreneurs. The treatment group differed from the control group in preferred problem solving style (CPSP) with fewer generators (23% versus 34%) and more implementers (50% versus 32%) suggesting that the control group is likely to be more receptive to CPS training. Participants in this study had more students in the in the generator quadrant than a previous study with MBA students - 29% versus 17% (Basadur et al., 1990a). The treatment group was also less likely to venture in the future. Both the control group and treatment group had similar grade point averages (mean 2.93 GPA versus 2.92) GPA and both groups rated themselves as comfortable with technology (115/116 used technology to download images, video and music) and multimedia with an average score of 4.30/5.00. Although outside of the research plan for this study the investigator observed that for electrical engineering and recreation students there seemed to be a connection between their passions and interests, their program of study and the ideas that they chose. Further research is needed to tease these relationships out more

completely. The investigator observed that participants were engaged by the several stimulus questions in the tutorial booklet – their passions and interests and the “imagine a world without exams and projects’. Such engagement both builds meta-cognitive knowledge and intrinsic motivation potentially leading to enhanced creative behaviour (Amabile, 1998; Anderson & Krathwohl, 2001). Notes written by students at the end of the tutorial suggested that participants successfully integrated the themes presented in the tutorial. An anomaly was noted in response to the “imagine a world without exams and projects” stimulus where half of the participants followed instructions and simply categorized their responses as having positive or negative consequences while the other half seemed to use the categorization activity as an opportunity to generate additional ideas.

There were no statistically significant differences between the treatment and control group on select descriptive statistics. Two measures of attitude toward divergent thinking were incorporated into the second research question. No statistically significant differences were found for the preference for ideation within the treatment group, within the control group or between the treatment group and the control group. Statistically significant differences, in tendency to make premature critical evaluations, were found within the treatment group, between the treatment group and the control group. There were no statistically significant differences found for the premature evaluation construct within the control group.

Fluency, the ability of the entrepreneur to generate ideas, was measured by calculating the incremental number of ideas generated in post-test ideation task and in the second uses for a bottle task. The third research question found statistically significant

differences in fluency for the post-test/pre-test measure within the treatment group as well as between the treatment and control group. Literacy refers to the ability of the entrepreneur to generate quality ideas. This investigation used 4 quality measures. Three were self assessed by the participants for the chosen idea in both pre and post-test modes while the fourth was the sum of all three. The fourth research question found no statistically significant differences for any of the 4 quality measures. In chapter 5 the investigator synthesizes the findings from chapter 4 and articulates conclusions drawn from the results, delineates implications for practice in the field of entrepreneurship education and makes recommendations for future research. There were no statistically significant differences found for the premature evaluation construct within the control group.

## Chapter 5

### Conclusions, Implications, Recommendations, and Summary

Chapter 5 interprets the results from chapter 4 and grounds them in the work of other researchers. In the conclusions section of this chapter the investigator assesses the extent to which the objectives of the study have been accomplished. In this same section alternative explanations for the findings are discussed and the strengths weaknesses and limitations of the study are articulated. The implications section identifies the contribution of this investigation to the field of study in terms of new knowledge and professional practice. Implications are set forth utilizing the lenses of existing and potential future research, the entrepreneurial classroom (both students and teachers) and practitioners (the entrepreneurs themselves and those who support them). Recommendations are then presented for improvements in methodology for future investigations, changes in academic practice, and changes in professional practice. Finally the investigation and the related findings are summarized.

#### **Conclusions**

Table 30 below summarizes the findings of the investigation. Independent sample t-tests, paired sample t-tests, and proportions z-tests confirmed that there were no statistically significant differences in composition between the treatment and control groups. There were statistically significant differences found in one of the two divergent thinking constructs –the tendency to make premature evaluations. Two measures of

ideational fluency were tested using paired samples t-tests for within group differences and independent samples t-tests for between group differences. No statistically significant differences were found for the first measure of ideational fluency – the number of ideas generated in post-test scores compared to pretest scores and the second bottles ideation task compared to the first bottles ideation task. There were statistically significant differences found in the second measure of ideational fluency – the increment in unique ideas generated in post-test scores compared to pretest scores and the second bottles ideation task compared to the first bottles ideation task. There were no statistically significant differences found in the 4 quality measures.

Table 30: Summary of Results of the Investigation of CPS Training

Research Question	Criteria	Statistically Significant Differences	
		Within Group	Between Group
Question 1 <i>Are there statistically significant differences between the untrained control group and the treatment group on select descriptive data?</i>	Treatment and Control group	No	NA
Question 2 <i>Are there statistically significant differences in pre-test and post-test scores for preference for ideation in opportunity finding and tendency to make premature critical evaluations when compared to pre-intervention scores?</i>	Ideation: Treatment Group	No	No
	Control Group	No	No
	Premature Evaluation Treatment Group	Yes	Yes
	Control Group	No	No



**Table 30 Continued: Summary of Results of the Investigation of CPS Training**

Research Question	Criteria	Statistically Significant Differences	
		Within Group	Between Group
Question 3			
<i>Are there statistically significant differences in pre-test and post-test scores for the number of opportunities identified when compared to pre-intervention scores?</i>	<i>Fluency – Number of ideas</i>		
	Treatment – Post/Pre	No	No
	Control – Pot/pre	Yes	No
	Bottles 1/Bottles 2	Yes/No*	NA
		(* p = .02)	
	<i>Fluency - Unique Idea Increment:</i>		
	Treatment Post/Pre	Yes	Yes
	Bottles 1/Bottles 2	Yes	NA
Question 4	<i>Treatment Group:</i>		
<i>Are there statistically significant differences in pre-test and post-test scores for the quality of opportunities identified when compared to pre-intervention scores?</i>	Solves problems	No	No
	Have a passion for it	No	No
	Prior experience	No	No
	Total quality scores	No	No
	<i>Control Group:</i>		
	Solves problems	No	No
	Have a passion for it	No	No
	Total quality scores	No	No

Although Qualitative analysis was not incorporated as part of the research plan a number of insights were gained through observation of the data. It appeared that for two of the programs of study (electrical engineering and recreation) there was an interaction among program of study, venturing ideas selected, passions and what they viewed themselves as being good at. Technical skills were front and centre for engineering students while recreation students viewed themselves as being good at the softer, non-

technical skills which led them often to solutions that served society. Future research is needed to delineate the nature of these relationships.

The self-reflective statements from the booklet tasks relating to passions, interests and imagining a world without exams suggested a high level of engagement by the participants. Meta cognitive knowledge is the highest order of knowledge and creating (as in founding a new venture) is the highest level of cognitive process (Anderson & Krathwohl, 2001; Bloom, 1956). Reflecting on meta-cognitive knowledge (knowledge about self) has the potential to build self-awareness resulting in entrepreneurs making choices that better fit with their passions and interests. High levels of engagement may well evidence in elevated level of intrinsic motivation that may lead to higher levels of creativity (Amabile, 1998).

The goal of the researcher was to explore the relationships between CPS training and the generation of entrepreneurial ideas. This objective was met in the context of a stand-alone tutorial. Previous work had examined the impact of training over a full semester (DeTienne & Chandler, 2004) or for a week long executive training (Basadur et al., 1982). The objective of future research would be to study the impact of training in creative problem solving when the tutorial is integrated with a lecture and assignment within a course.

#### *Strengths, Weaknesses and limitations of the Study*

The experimental design of this investigation coupled with random assignment to treatment or control groups was the best choice “for testing hypotheses about cause and effect relationships” where the premise is to try something, and systematically observe what happens” (Fraenkel & Wallen, 2005). The sample size of 116 was sufficient for

exploratory research but did require some independent variables like program of study to be condensed to business and non business due to the small size of groups within the subcategories.

Recruitment of participants was a major challenge, exacerbated by: the inability to offer compensation, the timing of initial recruitment at the end of an academic, inexperience on the part of the investigator, and the requirement to participate in two separate rounds of data collection – the pre-test data collection and the post-test tutorial data collection. Difficulty in recruitment of study participants, even when compensation was available, was identified as an ongoing problem by colleagues at Dalhousie University with the exception of the psychology department which has a pool of students willing to participate in experimental research in return for bonus marks. The resolution to this problem for the investigator was to find colleagues teaching courses for which the Going Fishing tutorial was a clear added value and who were willing to assign the tutorial as a course expectation with participation in the study being optional.

It is the investigator's opinion that lack of context diminished the impact of the CPS training. In many ways students were committing an unnatural act – material from a professor not their own, in subject matter that was disconnected from the lectures, assignments and readings that were part of the course syllabus. Systemic factors had the potential to dampen the results as well. In the educational system it is acknowledged that breaking the rules is what makes you smarter yet this behavior is not well received (Mauzy et al., 2003). It was anticipated that study participants would experience dissonance as they practiced divergent thinking techniques that required them to take extended time to generate ideas. The normal coping strategy for university learners

requires them to quickly solve the current problem, often taking the first satisfactory solution, and then moving to the next problem that requires solution (Sarasvathy et al., 2003). The stimulus (treatment) may have been of insufficient strength or duration to overcome these barriers.

Latency of any effects that resulted from the training, were not addressed in the study. There was no attempt to investigate the interaction among the various curriculum elements that would be present in a university course – lectures, discussion, assigned reading, quizzes, exams and projects. Similarly there was no comparison of technology moderated delivery modes with face to face modes.

Opportunity identification takes place over an extended period of time even though the point of vision may have been a distinct moment in time (Long & McMullan, 1984) suggesting that a single 60 minute training session is but one element contributing to a process of venture formation. Externally stimulated entrepreneurs already know they want to create a business and have an idea in mind prior to venture launch while internally stimulated entrepreneurs first find an idea and then consider starting a business. Because internally stimulated entrepreneurs have already chosen an idea it is likely that they would generate fewer ideas than externally stimulated entrepreneurs. This study did not discriminate between the two types of entrepreneurs because of the expected small number of students with prior venturing experience, 20% or less (DeTienne & Chandler, 2004).

While it may be possible to generalize some of the study findings the small sample size, the specific fields of study represented among those recruited, the specific

content of the tutorial and the ability/non-ability of the multi-media format to engage the learner may limit attempts to replicate the findings.

### **Implications**

Findings from this study support prior research on training in creative problem solving (Basadur et al., 1982; DeTienne & Chandler, 2004) while extending the field by integrating constructs from the field of opportunity recognition (Ardichvili et al., 2003) and instructional technique (Anderson & Krathwohl, 2001; Gagne, 1977; Gagne et al., 2004). Studies of creativity have suggested that business students are less creative than other students (Cheung, 2003; Eisenman, 1969; Maier & Hoffman, 1961) and that in the workplace creative behaviors are often out of tune with the behaviors that make an organization efficient. This produces cognitive dissonance (Mauzy et al., 2003). It was anticipated that participants would experience a similar dissonance, as they completed the divergent thinking exercises in the tutorial. The university experience is often at odds with the development of creative thinking skills (Zampetakis & Moustakis, 2006) indicating that the training in creative problem solving in this study has the potential to fill a meaningful void in entrepreneurship education..

The Going Fishing tutorial was a first step in training pre-aspiring entrepreneurs in the use of creative problem solving to identify venture ideas that connected with their passions and prior experience. This laid the groundwork for additional training rooted in the taxonomy laid out by Sarasvathy. Not all opportunities are formed in the same way and training in opportunity finding skills should take this into account. Supply and demand conditions dictate appropriate strategies. When supply and demand are both known, assisting entrepreneurs in improving their “recognition” skills by using causal

logic makes the most sense. When either supply or demand is known the enhancement of “discovery” skills is appropriate where the entrepreneur utilizes cues provided by their knowledge corridor. When neither supply nor demand is known enhancing enactment skills has utility where effectual reasoning is used by the entrepreneur to interact with the environment to create the opportunity (Sarasvathy et al., 2003).

It has been identified that there is a need to establish practitioner action guidelines arising from entrepreneurship research (Hindle et al., 2004) and opportunity recognition has been established as a beachhead (Hindle, 2004; Shane & Venkataraman, 2000). The literature review in this study has already led to a publication in small business journals in Canada and Australia/New Zealand establishing instruction based action guidelines for entrepreneurship teaching (Leach, 2007). The investigation holds the potential for a follow on article in the same two publications and the author plans to submit a second article to the academy of management learning and education journal. These publications coupled with conference presentations will encourage a dialogue for both practitioners (those who support entrepreneurs in the field) and researchers.

The intersection of educational theory and entrepreneurship theory provide rich opportunity for a synergistic cross fertilization of knowledge. It is the investigator’s observation that entrepreneurship educators are largely oblivious to techniques for problem solving instruction (Anderson & Krathwohl, 2001; Gronlund, 2004; Smith & Ragan, 2004), the techniques outlined by Smith in his formulary of active ingredients for idea generation, as well as Gagne’s events of instruction (Gagne, 1977; Gagne et al., 2004). Lukaweski has identified that the learning objectives and skills identified by instructors are essential to student success and lead to better understanding of subject

matter, enhanced critical thinking and problem solving skills. Clearly and appropriately stated objectives matched with engaging delivery materials have the potential to create a stimulating learning environment (Lukaweski, 2006).

### *Lessons Learned and Implications for Future Research*

This was an exploratory study conducted by an investigator in partial fulfillment of the requirements for a doctoral degree in computing technology in education. Many of the lessons learned were practical in nature, with recruitment of participants at the top of the list. In future studies the researcher proposes to integrate the treatment into the flow of course work rather than as a stand-alone. This will have two benefits: larger participant study pools and the opportunity to create relevant context for the treatment. The other significant lesson learned was that it is often the simplest of things that can impinge on the quality of the data being collected. For instance several of the CPSP profiles were rendered unusable when participants did not follow the instructions to rate each of the statements in a row from 1 to 4 and instead had multiples of 1 through 4 in a given row. This was in spite of the example provided in the instructions and the oral reminder from the research assistant.

Ensuring that the context of the tutorial resonates with, and is current for the intended audience is another research agenda. Denning has identified a springboard story as one that enables a leap in understanding that allows one to visualize from a story in one context what is involved in a large-scale transformation in an analogous context. Engagement occurs as a result of creating a scenario that people can see themselves in. Once engaged, the listener discovers idiosyncratic solutions for the specific challenges they face (Denning, 2000; Kelley & Littman, 2005). The Going Fishing tutorial used

fishing as an analogy for opportunity finding and relied on metaphors like Star Trek, and Superman in the unfolding of the “opportunity finding” story.

It has been suggested that creativity among university students decreases with years of study and that humanities and social science students have superior creative skills compared to science and technology students (Cheung, 2003). Studies have also found that business students and managers are not predisposed to creative thinking (Eisenman, 1969; Maier & Hoffman, 1961). Because of this there is a natural temptation to study the differences between business students and other disciplines relating to creativity. Given that the results in this study found that the intention to venture at some point in their lifetime is approximately equivalent for business and non-business students it is the researcher’s opinion the more valuable inquiry relates to identifying trainable skill differences between those who have ventured and those who want to venture at some point in their lifetime.

### **Recommendations**

Pfeffer identified a “knowing doing gap” and pointed out that knowing about a task does not translate into practical competence in performance of the task (Pfeffer & Sutton, 1999). Entrepreneurship is a contact sport where the players (the entrepreneurs) will benefit from enhancement of skills like opportunity finding. It is recommended that inert knowledge gained in the classroom be converted to practical knowledge through the use of instructionally sound pedagogy that engages learners through authentic experiences (Gagne et al., 2004; Smith, 1998).

It has been the author’s experience that current entrepreneurship texts present opportunity recognition as a one dimensional piece rather than a richly textured



taxonomy where the role of creativity and the entrepreneur is dependent on the knowledge about supply and demand (Sarasvathy et al., 2003). Creativity training for entrepreneurs should assist learners in matching opportunity identification strategies with the prevailing supply/demand conditions.

Alternative measures should be developed for evaluating both fluency (ideational quantity) and literacy (ideational quality measures). In the descriptive statistics a phenomenon relating to enhanced ideation was identified relating to the “imagine a world without exams and term projects stimulus”. A small and representative sample, which examined themes arising from the “thick descriptive” data provided from questionnaires, and interviews should shed light on these topics (Fraenkel & Wallen, 2005; Leedy & Ormrod, 2005). Once an understanding has been gained of the ideational processes it would be a matter of choosing elements supported in the entrepreneurship and opportunity recognition literature and then testing the measures for validity.

Prior studies investigating the impact of creative problem solving were couched within a larger frame of reference – a single semester university course and a week-long industrial training (Basadur et al., 1982; Basadur & Head, 2001; DeTienne & Chandler, 2004). The current study tested the results of a single, hour-long tutorial with participants who had little or no context to connect the training to. Replicating the current study within the framework of an entrepreneurship course would provide a useful contrast to the current study. Furthermore it would be useful to replicate the study in conditions where it was connected to a relevant course framework that also included lecture material, readings and a related assignment. Although latency was not examined in this study, future studies could look at the divergent thinking attributes and see if the change

was still significant in 3 months, 6 months a year. In other words, was the change transitory or did it continue over time.

Structuration theory proposes that the entrepreneur and the opportunity exist as a duality where the opportunity and the entrepreneur cannot be understood nor exist independently and that this interdependence must be part of the description of how opportunities are actualized (Sarason et al., 2006). The actors (entrepreneurs) are said to create the entrepreneurial process while at the same time being created by the entrepreneurial process (Giddens, 1992). Borrowing from structuration theory the researcher found that he simultaneously “created” the research plan for the study and was “created” by it. Creating future experiments to test training pedagogy have the potential to inform the field of opportunity recognition, strengthen the rigour of training as well as the quality of the trainers.

### **Summary**

Entrepreneurial behavior is endemic within our society with estimates ranging from 20% (Reynolds & White, 1997) to 50% (Aldrich & Zimmer, 1986). 2.5 million Canadians have identified themselves as self-employed and 64% of private sector employment is accounted for by small and medium sized enterprises (SME's) which have contributed a disproportionately to the creation of net new jobs (*Key Small Business Statistics*, 2007). A 34 country study found that 9.3% (73 million people) of the population aged 18-64 were either nascent entrepreneurs or the owner/manager of a new business and that the phenomenon was not gender specific (Acs et al., 2004) Many ventures do not survive beyond startup, decreasing the pool of entrepreneurship talent (Timmons & Spinelli, 2008).

Opportunity recognition is embedded in the definition of entrepreneurship (Stevenson & Jarillo, 1990; Timmons & Spinelli, 2008). Entrepreneurs need to be creative thinkers and there is support for the notion that creativity can be learned or enhanced (Timmons & Spinelli, 2008). CPS literature has been cited in entrepreneurship texts in chapters dealing with innovation, creative thinking and opportunity recognition (Hisrich et al., 2006; Kuratko & Hodgetts, 2003a, 2003b; Timmons & Spinelli, 2008) and personal traits such as efficacy and creativity have been identified as antecedents to entrepreneurial alertness (Ardichvili et al., 2003). The improper delineation of opportunities contributes to venture failure (Fiet et al., 2004; McKnight, 2004; Shane, 2003). The goal of the researcher in this study was to explore the relationships between CPS training and the generation of entrepreneurial ideas. It is the researcher's observation that such linkages are still in the formative stage in both the literature and in the entrepreneurial classroom.

An experimental design was used to assign participants randomly to control and treatment groups. Participants completed a pre-test, a background questionnaire, the Basadur 14 item questionnaire for attitudes in divergent thinking and an instrument that measured preferred creative problem solving style – the Basadur creative problem solving profile (CPSP). Participants assigned to the treatment group then completed the Going Fishing tutorial and the associated booklet tasks. Upon completion of the tutorial participants completed the post-test ideation task and the Basadur 14 item questionnaire. The control group completed the post-test ideation exercise and Basadur 14 item questionnaire before completing the tutorial and associated booklet tasks.

It was hypothesized that there would be no statistically significant differences on select descriptive statistics between the treatment and control groups, that there would be statistically significant and positive differences within the treatment group and between the treatment group and the control group on measures of: attitude toward divergent thinking, fluency (number of ideas generates) and literacy (quality of ideas generated). Independent sample t-tests, paired sample t-tests, and proportions z-tests confirmed that there were no statistically significant differences in composition between the treatment and control groups. There were statistically significant differences found in one of the two divergent thinking constructs –the tendency to make premature evaluations. Two measures of ideational fluency were tested using paired samples t-tests for within group differences and independent samples t-tests for between group differences. No statistically significant differences were found for the first measure of ideational fluency for the number of ideas generated in post-test scores compared to pretest scores. There was a potentially statistically significant difference found in the second bottles ideation task compared to the first bottles ideation task. There were statistically significant differences found in the second measure of ideational fluency – the increment in unique ideas generated in post-test scores compared to pretest scores and the second bottles ideation task compared to the first bottles ideation task. There were no statistically significant differences found in the 4 quality measures.

An interaction among degree choice, program of study, what participants viewed themselves as being good at and the idea they chose was observed. Engineering students had embedded technical skills in their passions, interests, prior experience and venturing ideas. On the other hand recreation students assessed themselves as being competent in

the softer skills of working with others and this was manifested in post-test venture ideas like creating a society to dispel the stigma related to mental health and decreasing or preventing dementia in its early stages. Future research is needed to delineate the nature of these relationships.

Meta-cognitive knowledge (knowledge about self) is the highest order of knowledge and that creating (as in founding a new venture) is the highest level of cognitive process (Anderson & Krathwohl, 2001; Bloom, 1956). “People will be most creative when they feel motivated primarily by the interest, satisfaction and challenge of the work.” (Amabile, 1998). Participants appeared to be engaged as they reflected on their passions and interests suggesting that participants were able to articulate their relevant meta-cognitive knowledge and that by being engaged in the activity of looking for venture ideas were intrinsically engaged in the activity.

Recruitment of participants was cited by the author as significant challenge and it was proposed that future researchers find a mechanism to incorporate treatments into the context of an existing course covering material that is a complement to the treatment. It was recommended that future studies refine the measurement of both ideational fluency and ideational literacy. Experiments like the one in this study have the potential to form the foundation for additional practitioner action guidelines in the field of entrepreneurship while at the same time incorporating proven instructional principles.

This study extends prior work in creative problem solving training by making the linkages between creativity literature, entrepreneurship literature and instructional literature and incorporating it within a multi-media tutorial delivered in an online environment. It was recommended that future research should first replicate the study by

placing the tutorial within the context of an entrepreneurship class and then subsequently test the hypotheses when the tutorial is connected with appropriate readings, lecture material and assignments.

The goal of the researcher in this study was to explore the relationships between CPS training and the generation of entrepreneurial ideas and this goal was met. Not surprisingly the researcher found that the experimental design and the collection and interpretation of the data enriched his capacity as a researcher and as a teacher. The completion of the study has encouraged the author to continue his exploration of improved training methodologies for entrepreneurs. It has been a journey of discovery and enlightenment for the author.

## Appendix A

## Quality Assessment Rubric

Please think back for a moment over the events of the last 24 hours including classes, commuting, social interactions, work, family, in short any and all of your interactions including those with technology and appliances. For the next 5 minutes please list below any business/venture opportunities you have observed. List any and all ideas that come to mind. If you need more room write on the back of the page. Do not try to evaluate the ideas in any way, just keep writing – don't worry if you include problems that overlap or seem to be the same problem but said a different way, just keep writing.

**NOTE: Once you have completed this task complete the “Evaluation of Your Idea” instrument.**

From the list of business/venture opportunities you have listed above, pick the one you like the best, circle it in the list above and then write it in the space below.

---



---

For the idea you have chosen please answer the following questions:

The idea will solve a meaningful customer problem

1	2	3	4	5
Disagree	Moderately Disagree	Neither Agree nor Disagree	Moderately Agree	Agree

The idea is something I have a passion for. I can see myself doing this and loving it.

1	2	3	4	5
Disagree	Moderately Disagree	Neither Agree nor Disagree	Moderately Agree	Agree

I have done something like this before

1	2	3	4	5
Disagree	Moderately Disagree	Neither Agree nor Disagree	Moderately Agree	Agree

Appendix B  
Basadur 14 Item Inventory



***BASADUR IDEATION-EVALUATION PREFERENCE SCALE***

Name: \_\_\_\_\_  
Dept: \_\_\_\_\_  
JOB TITLE: \_\_\_\_\_  
DATE: \_\_\_\_\_

***INTRODUCTION***

Following is a series of questions which are designed to increase understanding of how people approach ideas and problem solving. None of these questions are meant to evaluate you in any way. There are no right or wrong answers.

Please answer each question as naturally and honestly as you can. Your best description of the world as you view it is what is wanted. Please write what you think.

**Instructions**

Listed on the back are several statements concerning various situations. Read each statement carefully and indicate the extent to which you agree or disagree with the statements by circling the number which corresponds.



1	2	3	4	5	6	7	8	9
Strongly Disagree	Disagree	Moderately Disagree	Slightly Disagree	Neither Agree Nor Disagree	Slightly Agree	Moderately Agree	Agree	Strongly Agree

1. I should do some pre-judgment of my ideas before telling them to others.

1      2      3      4      5      6      7      8      9

2. We should cut off ideas when they get ridiculous and get on with it.

1      2      3      4      5      6      7      8      9

3. I feel that people at work ought to be encouraged to share all their ideas, because you never know when a crazy-sounding one might turn out to be the best.

1      2      3      4      5      6      7      8      9

4. One new idea is worth ten old ones.

1      2      3      4      5      6      7      8      9

5. Quality is a lot more important than quantity in generating ideas.

1      2      3      4      5      6      7      8      9

6. A group must be focused and on track to produce worthwhile ideas.

1      2      3      4      5      6      7      8      9

7. Lots of time can be wasted on wild ideas.

1      2      3      4      5      6      7      8      9

8. I think everyone should say whatever pops into their head whenever possible.

1      2      3      4      5      6      7      8      9

9. I like to listen to other people's crazy ideas since even the wackiest often leads to the best solution.

1      2      3      4      5      6      7      8      9

10. Judgment is necessary during idea generation to ensure that only quality ideas are developed.

1      2      3      4      5      6      7      8      9

11. You need to be able to recognize and eliminate wild ideas during idea generation.

1      2      3      4      5      6      7      8      9

12. I feel that all ideas should be given equal time and listened to with an open mind regardless of how zany they seem to be.

1      2      3      4      5      6      7      8      9

13. The best way to generate new ideas is to listen to others then tailgate or add on.

1      2      3      4      5      6      7      8      9

14. I wish people would think about whether or not an idea is practical before they open their mouths.

1      2      3      4      5      6      7      8      9

## Appendix C

### Creative Problem Solving Profile

Basadur Simplex<sup>®</sup>

# CREATIVE PROBLEM SOLVING PROFILE<sup>™</sup>

A METHOD TO HELP LEARN ABOUT ONE'S OWN  
UNIQUE APPROACH TO HANDLING PROBLEMS,  
AND HOW TO BLEND IT WITH OTHERS.



This is a research based instrument developed  
from fundamental theory and empirical data from  
a large sample of people working  
in a broad cross section of organizations.

NAME: \_\_\_\_\_  
 DEPT.: \_\_\_\_\_  
 JOB TITLE: \_\_\_\_\_  
 DATE: \_\_\_\_\_

## CREATIVE PROBLEM SOLVING INVENTORY

This inventory is designed to describe your method of problem solving. The aim of the inventory is to **describe how** you solve problems, **not to evaluate** your problem solving ability. You may find it hard to choose the words that best describe your problem solving style because there are no right or wrong answers. Different characteristics are equally good.

### Instructions:

Eighteen rows of four words are listed horizontally below. In each row assign a "4" to the word which best characterizes your problem solving style, a "3" to the word which next best characterizes your problem solving style, a "2" to the next most characteristic word, and a "1" to the word which is least characteristic of you as a problem solver. Be sure to assign a different number to each of the four words in each horizontal row. Do not make ties. Scoring instructions to follow.

	Column 1	Column 2	Column 3	Column 4
1.	___ Alert	___ Poised	___ Ready	___ Eager
2.	___ Patient	___ Diligent	___ Forceful	___ Prepared
3.	___ Doing	___ Childlike	___ Observing	___ Realistic
4.	___ Experiencing	___ Diversifying	___ Waiting	___ Consolidating
5.	___ Reserved	___ Serious	___ Fun-loving	___ Playful
6.	___ Trial & Error	___ Alternatives	___ Pondering	___ Evaluating
7.	___ Action	___ Divergence	___ Abstract	___ Convergence
8.	___ Direct	___ Possibilities	___ Conceptual	___ Practicalities
9.	___ Involved	___ Changing Perspectives	___ Theoretical	___ Focussing
10.	___ Quiet	___ Trustworthy	___ Responsible	___ Imaginative
11.	___ Implementing	___ Visualizing	___ Describing	___ Zeroing In
12.	___ Hands On	___ Future-oriented	___ Reading	___ Detail-Oriented
13.	___ Physical	___ Creating options	___ Mental	___ Deciding
14.	___ Impersonal	___ Proud	___ Hopeful	___ Fearful
15.	___ Practicing	___ Transforming	___ Thinking	___ Choosing
16.	___ Handling	___ Speculating	___ Contemplating	___ Judging
17.	___ Sympathetic	___ Pragmatic	___ Emotional	___ Procrastinating
18.	___ Contact	___ Novelizing	___ Reflection	___ Making Sure

## CREATIVE PROBLEM SOLVING PROFILE

Post your total scores for each column on the appropriate axis below.

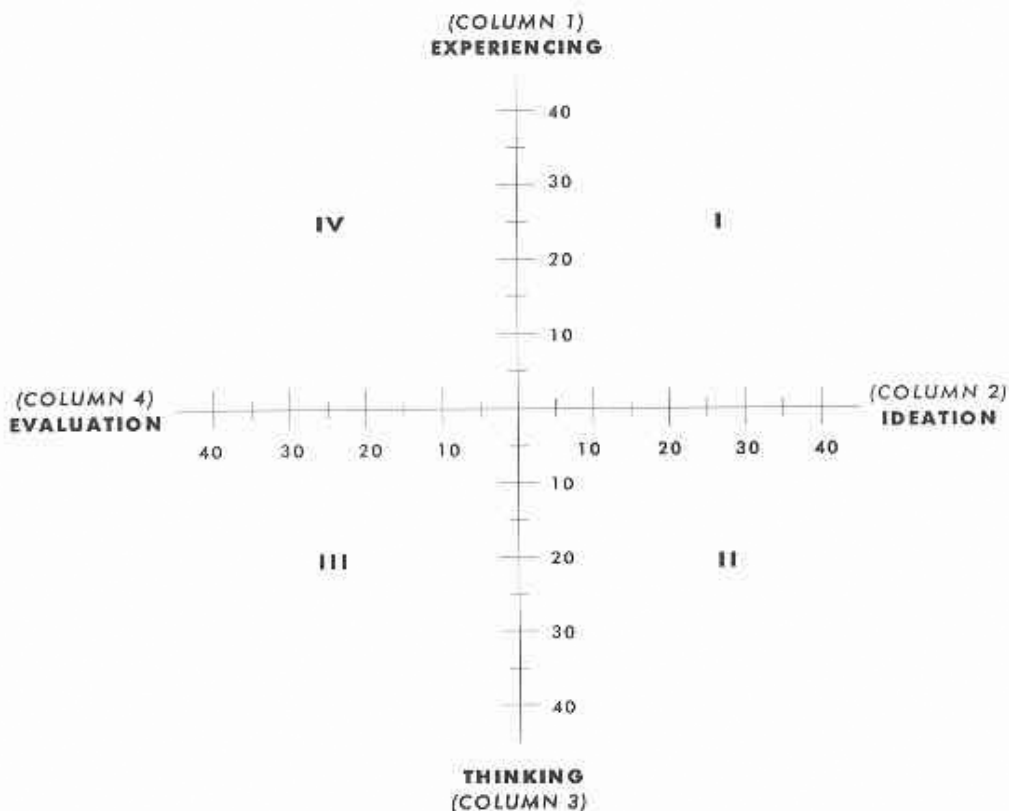
### LEGEND:

Column 1 scores indicate the orientation to gaining knowledge for solving problems by **Experiencing**. (Direct personal involvement)

Column 2 scores indicate the orientation to solving problems by **Ideation**. (The generation of options without judgment)

Column 3 scores indicate the orientation toward gaining knowledge for solving problems by **Thinking**. (Detached abstract theorizing)

Column 4 scores indicate the orientation toward solving problems by **Evaluation**. (The application of judgment to options)



To develop your personal creative problem solving profile, simply connect the 4 points in sequence with 4 curved lines to make a distorted or "warped" circle accordingly. (If you have identical column scores, you will have a perfect circle. This is unlikely.) The quadrant in which your profile is most dominant indicates your strongest orientation. The other quadrants represent secondary styles accordingly. Your profile is your own unique blend of the four quadrants.

## CREATIVE PROBLEM SOLVING PROFILE INTERPRETATION

### INTERPRET YOUR PROFILE ACCORDING TO YOUR UNIQUE BLEND OF THE FOLLOWING QUADRANT STYLES

#### QUADRANT 4 - IMPLEMENTER

If your profile falls most strongly in the fourth quadrant, your dominant style is likely to be **Implementer**. This person tends to use direct experience and evaluation in problem solving. His/Her greatest interest lies in **getting things done**, carrying out plans and experiments and becoming involved in new experiences. They tend to "try things out" rather than "mentally test". Implementers tend to excel in those situations where they must adapt themselves to specific immediate circumstances and "make things work somehow". A complete understanding is not necessary for this person to proceed. Thus, he/she may be more of a risk taker than people with the other three styles. In situations where the theory does not fit the facts, they will most likely discard the theory. Implementers are enthusiastic and at ease with people, but are sometimes seen as impatient or even "pushy" as they try to make plans and ideas into realities. They will try as many different approaches as necessary until they find one that is sufficiently acceptable to those people affected. They will "follow-up" and "bird-dog" as necessary to assure the new procedure will "stick". This quadrant suggests interests in **Gaining Acceptance and Implementation**.

#### QUADRANT 1 - GENERATOR

If your profile falls most strongly in the first quadrant of the cycle, your dominant style is likely to be **Generator**. This person tends to use direct experience and ideation in problem solving. His/Her greatest interest lies in **getting things started** by getting involved, gathering information, questioning, imagining possibilities and sensing all kinds of new problems and opportunities. He/She likes to view concrete situations experienced from different perspectives. A person with this style performs better in situations that call for generating options and divergence than in evaluation, selection or convergence. Generators tend to be interested in people's problems and see relevance in almost everything. They can think of good and bad sides to almost any fact, idea or issue. They dislike becoming too organized or delegating the complete problem, but are willing to let others take care of the details. They are "string savers" in a sense, in that anything they come across is seen as a potential solution to a future problem as yet undiscovered. Generators tend to revel in ambiguity and are hard to "pin down". Every solution they come up with suggests several new problems to be solved. This quadrant suggests interests in **Problem Finding and Fact Finding**.

#### QUADRANT 3 - OPTIMIZER

If your profile falls most strongly in the third quadrant, your dominant style is likely to be **Optimizer**, favoring thinking abstractly and evaluation in problem solving. This person's greatest interest lies in **turning abstract ideas into practical solutions and plans**. They do considerable ongoing "mental testing" of ideas. This problem solving style is called "Optimizer" because a person with this style seems to do best in those situations where there is a single correct answer or optimum solution to a structured, defined, question or problem. His/Her knowledge is organized in such a way that, through hypothetical-deductive reasoning, he/she can focus it on specific problems. They are able to sort through large amounts of data and pinpoint "what's wrong" in a given situation. Optimizers tend to be relatively unemotional and thorough, preferring to deal with things rather than people. They tend to be quite confident of their ability to make a sound, logical, evaluation and select the best option or solution to a problem. Thus, they tend to lack patience with ambiguity and dislike too much "dreaming" about additional ideas, points of view, or how different problems relate to one another. They tend to believe they "know what the problem is". This quadrant suggests interests in **Idea Evaluation and Selection and Action Planning**.

#### QUADRANT 2 - CONCEPTUALIZER

If your profile falls most strongly in the second quadrant, your dominant style is likely to be **Conceptualizer**, favoring thinking abstractly and ideation in problem solving. His/Her greatest interest lies in **putting ideas together**. They form quick relationships, associations and insights, define problems, and conceptualize new ideas, theoretical models, opportunities and benefits. They excel in inductive reasoning, in distilling seemingly unrelated observations into an integrated explanation. Conceptualizers are quite concerned with understanding. It is important for them that the theory be logically sound and precise. They tend to not want to proceed until they have a sound understanding of the situation or until the problem or main idea is well defined. They would prefer not to have to prioritize, implement or agonize over decision-making among good or not fully understood alternatives. They have a high sensitivity and appreciation of ideas and are often not too concerned with moving to action. This quadrant suggests interests in **Problem Definition and Idea Finding**.

## Appendix D

### Base Line Questionnaire

**Introduction**

The research you are participating is concerned with entrepreneurship. As part of this research it is helpful to gather base line information about you, your entrepreneurial experience and your educational experience.

**Instructions**

You will encounter several types of questions in the questionnaire that follows. Some will require you to circle a choice (Does your family own a business Yes/No). Others will ask you to enter specific information – your age, year of study in university etc. Finally several questions are open ended questions asking for your opinion or experience. None of these questions are meant to evaluate you in any way. Remember there is no right answer. The researchers are interested in how you see yourself as described in your own words.

All questionnaires will be assigned a number to create anonymity and the contents will be kept confidential.

## Base Line Questionnaire

**Subject #** \_\_\_\_\_

### Demographic

Gender: Male \_\_\_ Female \_\_\_ Please list your age in years \_\_\_\_\_

Please list your current program of study (BA, BSC, Bcomm Bmgmt, etc) \_\_\_\_\_

### Background

#### Entrepreneurial

Entrepreneurship has been defined as the pursuit of opportunity without regard to the resources currently controlled. In this section we would like to learn about your past entrepreneurial experiences, current entrepreneurial experiences and future intentions.

Use the table below to list your previous employment history indicating any jobs you have had in the past 3 years that lasted more then 3 months.

Example	Job Title	<i>Description</i>
<i>Landscaping</i>	<i>Crew Boss</i>	<i>Supervised a crew of three</i>

Type of Employer	Job Title	<i>Description</i>

List the number of businesses you have started (by yourself or with others) that created new wealth \_\_\_\_\_ (If none that is fine, simply say "0")

The statement that follows is intended to measure how actively you look for new ideas.

*I find myself constantly discovering business ideas in my daily activities.*

Use the scale below to rate how well the statement describes you:

1	2	3	4	5
Disagree	Moderately Disagree	Neither Agree Nor Disagree	Moderately Agree	Agree

Please indicate how creative you feel you are:

1	2	3	4	5
Disagree	Moderately Disagree	Neither Agree Nor Disagree	Moderately Agree	Agree

What is the likelihood that you will be involved in the creation of a new venture sometime –

-In the next 12 months?

1	2	3	4	5
Highly Unlikely				Highly Likely

-In the next 5 years?

1	2	3	4	5
Highly Unlikely				Highly Likely

-In the next 10 years?

1	2	3	4	5
Highly Unlikely				Highly Likely

-Sometime in your lifetime?

1	2	3	4	5
Highly Unlikely				Highly Likely

### Technology

I have access to a computer and software that are able to run multimedia applications that allow me to:

View Images Yes/No

Listen to Music Yes/No

View Video Yes/No

Use the scale below to rate your general comfort with using multimedia tutorials. If you have not used a multimedia tutorial before then rate your expected comfort level based on your current experience set. (Circle one)

Very Uncomfortable	Somewhat Uncomfortable	Neutral	Somewhat Comfortable	Very Comfortable
-----------------------	---------------------------	---------	-------------------------	---------------------



## Appendix E

### Booklet Tasks for the Going Fishing Tutorial

#### 1. Your Turn – Theory of Opportunity Finding

##### *Networking*

Some entrepreneurs obtain their ideas from their social networks while others develop ideas on their own without reference to social networks (Ardichvili et al., 2003; Hills et al., 1997; Orwa, 2003; Singh, 2000).

Please reflect on your personal preferences and then using the 5 point scale below circle the number that best describes your preference for generating business/venture ideas where 1 indicates a preference for doing it on your own, three indicates no preference and 5 indicates a preference for using your social networks.

1	2	3	4	5
Solo Preference				Network Preference

##### *Your Passion – The Things You Enjoy Doing*

Take a moment to list and or describe the things that you enjoy doing, the things that give you energy.

---



---



---

##### *What You are Good at*

Take a moment to list and or describe the things that you are good at, things, others have complimented you on. These could be school related, hobbies, volunteer work etc.

---



---



---

## Your Turn – Cooking With a Bottle

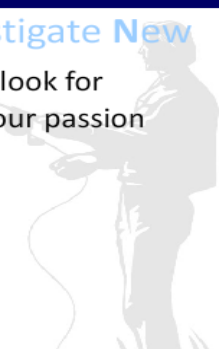
In one minute write down all the uses you can think of for a bottle in the space below.

### Brain Booster - Blitz

**Blitz** Rearrange Add Investigate New

Blitz – a quick sustained attack – look for opportunities by attacking your passion

I like cooking... so:



1. \_\_\_\_\_

9. \_\_\_\_\_

2. \_\_\_\_\_

10. \_\_\_\_\_

3. \_\_\_\_\_

11. \_\_\_\_\_

4. \_\_\_\_\_

12. \_\_\_\_\_

5. \_\_\_\_\_

13. \_\_\_\_\_

6. \_\_\_\_\_

14. \_\_\_\_\_

7. \_\_\_\_\_

15. \_\_\_\_\_

8. \_\_\_\_\_

16. \_\_\_\_\_

## Your Turn – Uses for a Bottle

You have an infinite supply of bottles. Using the Brain Booster Tool, write down all the uses you can think of for a bottle in the space below.

**Brain Booster**

**Blitz Rearrange Add Investigate New**

B – Blitz the idea 

R – Rearrange your thinking 

A – Add or subtract 

I – Investigate 

N – New and wild 

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- |          |           |
|----------|-----------|
| 1. _____ | 9. _____  |
| 2. _____ | 10. _____ |
| 3. _____ | 11. _____ |
| 4. _____ | 12. _____ |
| 5. _____ | 13. _____ |
| 6. _____ | 14. _____ |
| 7. _____ | 15. _____ |
| 8. _____ | 16. _____ |

# Brain Booster Quiz

- B \_ \_ \_ \_ \_
- R \_ \_ \_ \_ \_ \_ \_ \_
- A \_ \_ or S \_ \_ \_ \_ \_ \_ \_ \_
- I \_ \_ \_ \_ \_ \_ \_ \_ \_ \_
- N \_ \_ and W \_ \_ \_ \_

## Your Turn – Defer Your Judgment

Imagine a world without exams and term projects. Take a minute and in the space below list all the ways this might change your life. While doing, this don't forget to use the BRAIN tool - defer your reality, defer your judgment, don't let the current reality constrain your ideas.

---



---



---

### Classifying Your List

Classify the list generated above into pleasant (good stuff) and unpleasant consequences of having a world with no exams.

<b>Good Stuff</b>	<b>Bad Stuff</b>
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____
6. _____	6. _____

## Appendix F

### Permission for Use of Basadur Materials

-----Original Message-----

**From:** Min Basadur [mailto:basadur@mcmaster.ca]

**Sent:** Friday, July 02, 2004 12:18 PM

**To:** 'eleach'

**Subject:** RE: Permissions for Use

Dear Ed

All OK. Please proceed full speed ahead.

Min

-----Original Message-----

**From:** eleach [mailto:Ed.Leach@dal.ca]

**Sent:** Monday, June 28, 2004 3:38 PM

**To:** 'Min Basadur'

**Subject:** Permissions for Use

Dear Min:

I have been making progress on my dissertation having received approval of my Idea Paper in February I submitted the first draft of my preliminary dissertation proposal in April and hope to second the back the revisions later this week. As part of this process I have been asked to obtain an email/letter from you giving me permission to use some of your materials in my dissertation. This would include:

1. The instrumentation – 14 item questionnaire and CPSP profile
2. Logos and images from - the Basadur Applied Creativity web site, your promotional materials, your seminar materials
3. Building of the on line Tutorial - selected images and text from the Basadur Applied Creativity Web site relating to Simplex and the CPSP profile

While at ASAC in Quebec City I spoke with a couple of your colleagues from McMaster and they had good things to say about you and your work. Trusting all is well at your end.

All the best,

Ed

## Appendix G

## Data Collection and Pre-test Booklet Table of Contents

<b>Participant Name:</b>	
<b>Email Address:</b>	
<b>Phone Number:</b>	
<b><i>Banner Number:</i></b>	
<b><i>Participant Number:</i></b> <b><i>(To be Assigned by RA)</i></b>	

# "Going Fishing"

an Opportunity Finding Tutorial

Dr. Timothy Little  
Dalhousie University

**Enter**

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## Table of Contents

### 1. Informed Consent

- a. Introduction
- b. Purpose of the Study
- c. Study Design
- d. Who can participate in the study
- e. Who will be conducting the research and contact information
- f. What you will be asked to do
- g. Possible risks and discomforts
- h. Compensation
- i. Questions
- j. Summary
- k. *Signatures*

### 2. Data Collection

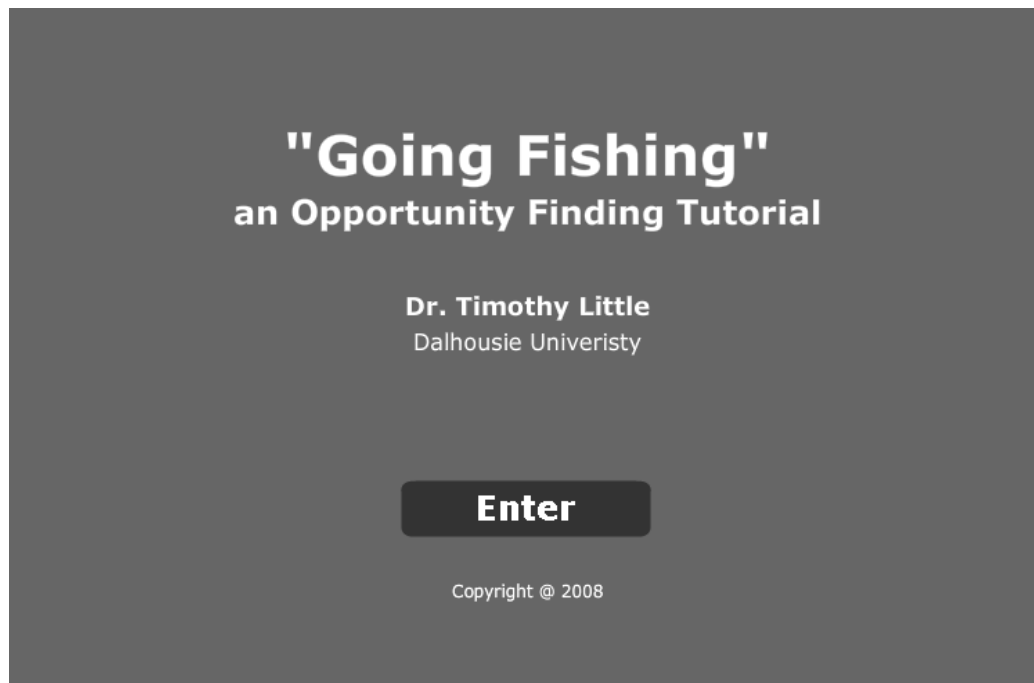
- a. Background Questionnaire
- b. Creative Problem Solving Profile (CPSP)
- c. 14 Item Questionnaire
- d. Idea Generation Exercise
  - i. Evaluation of Your Ideas



## Appendix H

## Tutorial and Post-test Booklet Table of Contents

<b>Participant Name:</b>	
<b>Email Address:</b>	
<b>Phone Number:</b>	
<b>Computer IP Address:</b>	
<b><i>Banner Number</i></b>	
<b><i>Participant Number: (To be assigned by RA)</i></b>	



## Table of Contents

### 1. The Tutorial

- a. The Fishing Metaphor
- b. Dr. Min Basadur
- c. Enter
- d. Start
- e. Listen to Intro Clip & Experiment with Navigation
- f. Introduction
  - i. Overall Intro
  - ii. Fuzzy Problems
  - iii. The Plan
  - iv. Theory of Opportunity Finding
- g. Your Turn – Theory of Opportunity Finding
- h. Tools
  - i. The Plan
  - ii. Diverge
  - iii. Brain Booster
  - iv. Your Turn – Brain Booster
  - v. Deferral of Judgment
  - vi. Your Turn – Defer Your Judgment
  - vii. Converge
- i. We Went Fishing for Opportunities
  - i. Finding “Your” Opportunities
  - ii. Working the Plan
  - iii. We Went Fishing...
  - iv. Your Turn – The Last Time
  - v. Evaluation of Your Ideas

### 2. Data Collection

- a. Idea Generation Exercise
  - i. Evaluation of Your Ideas
- b. 14 Item Questionnaire

## Appendix I

## Post-test and Tutorial Booklet Table of Contents

<b>Participant Name:</b>	
<b>Email Address:</b>	
<b>Phone Number:</b>	
<b>Computer IP Address:</b>	
<b>Participant Number:</b>	
<b>Banner Number</b>	

**"Going Fishing"**  
an Opportunity Finding Tutorial

Dr. Timothy Little  
Dalhousie Univeristy

**Enter**

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## Table of Contents

### 1. Data Collection





- a. Idea Generation Exercise
  - i. Evaluation of Your Ideas
- b. 14 Item Questionnaire

### 2. The Tutorial



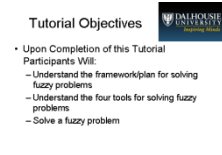

- a. The Fishing Metaphor
- b. Dr. Min Basadur
- c. Enter
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- e. Listen to Intro Clip & Experiment with Navigation
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  - i. Overall Intro
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  - iv. Theory of Opportunity Finding
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- h. Tools
  - i. The Plan
  - ii. Diverge
  - iii. Brain Booster
  - iv. Your Turn – Brain Booster
  - v. Deferral of Judgment
  - vi. Your Turn – Defer Your Judgment
  - vii. Converge
- i. We Went Fishing for Opportunities
  - i. Finding “Your” Opportunities
  - ii. Working the Plan
  - iii. We Went Fishing...
  - iv. Your Turn – The Last Time
  - v. Evaluation of Your Ideas


## Appendix J

### Tutorial Production Notes


Time	Total Time	Module	Activities	Comment	Gagne	Slides
				The first web site provides some interesting ideas for structuring the tutorial, the second web site is a summary of the nine events of instruction while the third web site connects the events of instruction to the relevant cognitive processes.	<a href="http://ide.ed.psu.edu/idd/e/tree/treef.asp?start=1">http://ide.ed.psu.edu/idd/e/tree/treef.asp?start=1</a> ; <a href="http://ide.ed.psu.edu/idd/e/9events.htm">http://ide.ed.psu.edu/idd/e/9events.htm</a> ; <a href="http://www.learningguru.com/articles/art3_3.htm">http://www.learningguru.com/articles/art3_3.htm</a>	 Solving Fuzzy Problems Creatively Tutorial 1 of 8 Solving the Right Problem   
15	15	Introduction		Note that I have proposed changing the title and focus of the tutorial to solving fuzzy problems. The intent is to provide tools for all problem solvers regardless of orientation and program of study but... the context of the examples will be entrepreneurial/business in nature		





Time	Total Time	Module	Activities	Comment	Gagne	Slides
		Shopping Cart	video - Need some audio from Tim in front of this to explain what it is, how it supports the tutorial and a prompt that it will be used as a touchstone for each of the plan and each of the tools.	The IDEO video is useful here but we need to be careful not to confuse the concepts - product development, Simplex and the content of the this tutorial	Gain Attention	 <p>Problem Solving Tutorial 1 Solving Fuzzy Problems Creatively</p>
		Context of Problem Solving		This works well for establishing the theme of the tutorial as a problem solving tutorial.	Stimulate Recall of Prior Learning	 <p>Solving Problems Are you a problem solver? Would you like to be a better problem solver? Would you like to solve better problems? Stay tuned to this station!</p>
				I like the idea of explaining the historical significance of the test pattern as a diagnostic tool. Indian head may be historical but I still like it. We can cross check it during testing of the tutorial for relevance.		 <p>Solving Problems</p>

Time	Total Time	Module	Activities	Comment	Gagne	Slides
		Avatar	Audio Challenge - "Are you a problem solver? I bet you are. I want you to stop and think about problems you have worked on recently - would you like to be a better problem solver? Would it help if you spent your scarcest resource, time. Solving better problems? This tutorial will.....	The "HOST WITH THE MOST" - This is in keeping with the entertainment (sty tuned theme) and puts a face to the tutorial and should aid with providing context. It also neatly ties to the Ted Koppel ABC story on IDEO. I have created a place holder for the topic in the power point slides.		 
		The Plan for Tutorial By end of the Tutorial ...			Inform Participants of the objectives	 
15	30	The Plan				



Time	Total Time	Module	Activities	Comment	Gagne	Slides
		Basadur System	Avatar video - Remember that I told you we would revisit the shopping cart .... The IDEO group had a plan for solving their fuzzy problem.	As I work my way through the tutorial I am torn between making the connection to Basadur's creative problem solving here, making it later or not making it at all. A solution to this may be to create a link to a page that talks about Min, the evolution of the system (8 spoked wheel and the diverge converge continuum. Might also include a brief video clip of Min while at the seminar in Halifax.		




Time	Total Time	Module	Activities	Comment	Gagne	Slides
30	60	Tools	<p>I have suggested a revision in the order of the slides such that we identify the tools, lay out the model for diverging and converging, introduce the theme of having as many good options to choose from as possible and the need to defer judgment. In this setting it would make sense to introduce the brain booster tool before doing the converge?</p>			 <p>The Tools</p> <ul style="list-style-type: none"> <li>Deferral of Judgment</li> <li>Brain Booster</li> <li>Divergent Thinking</li> <li>Convergent Thinking</li> </ul>

Time	Total Time	Module	Activities	Comment	Gagne	Slides
		<b>Deferral of Judgment</b>	Avatar audio/video - don't think we need a direct clip from IDEO here but... Tim could use this time to reinforce the need to defer judgment. I have repositioned the tool to follow the converge tool as deferral of judgment seems coupled with the diverging and might even be better to be talked about first?		Present New Content Provide Guidance	 
		<b>Diverge</b>	Avatar audio/video - Remember that I told you we would revisit the shopping cart ... As part of their plan		Present New Content Provide Guidance	 

Time	Total Time	Module	Activities	Comment	Gagne	Slides
			<p>IDEO needed to generate lots of ideas</p>			
		<p><b>Brain Booster</b></p>	<p>Avatar audio/video - creating options takes work and a plan the brain booster tool</p>			

Time	Total Time	Module	Activities	Comment	Gagne	Slides
			.....			
		<b>Converge</b>	Avatar audio/video - Remember that I told you we would revisit the shopping cart .... As part of their plan IDEO needed to have a technique for choosing the best ideas from the pool of ideas generated		Present New Content Provide Guidance	
20	80	<b>Finding Good Problems</b>	Avatar audio/video - Maybe the final presentation of the shopping cart and "guidance" on	This is a chance to knit the pieces together - quick flashback to the front to the tutorial and the simplex process and the tools.	Present New Content Provide Guidance	

Time	Total Time	Module	Activities	Comment	Gagne	Slides
			what we have accomplished and what we will do next.			
		Elicit response	"I want you to think back over the last 24 hours.....and write down all the problems you can think of. The avatar can be used to prompt them to use the brain booster process and the other tools to guide them through the process"	This accomplishes several objectives - it integrates the stimulus into the tutorial; it asks the participants to use what they have learned to find a good problem and positions this as a first step of eight in solving fuzzy problems.	Elicit Responses- Performance	
10	90	Conclusion and Summary			Assess Learning Generalize the Experience	

## Appendix K

## Ethics Training Course Certification

**CITI** Course in The Protection of Human Research Subjects

Monday, June 6, 2005

**CITI Course Completion Record  
for Ed Leach**

To whom it may concern:

On 6/6/2005, *Ed Leach* (username=edleach; Employee Number=999121023) completed all *CITI Program* requirements for the *Basic CITI* Course in The Protection of Human Research Subjects.

**Learner Institution:** *Nova Southeastern University*

**Learner Group:** *6. SCIS*

**Learner Group Description:** *School of Computer Sciences Faculty and Students*

**Contact Information:**

Gender: Male

Department: School of Computer and Information Science

What is Your Area of Research: Social & Behavioral Investigator Course Only

Role in human subjects research: Student Researcher

Mailing Address:

6380 Young Street

Halifax

NS

B3L 2A1

Canada

Email: leachedw@nova.edu

Office Phone: 902-494-1816

Home Phone: 902-454-9324

	<b>Date completed</b>
<b>The Required Modules for 6. SC/IS are:</b>	
Introduction	06/06/05
History and Ethical Principles - SBR	06/05/05
Defining Research with Human Subjects - SBR	06/05/05
The Regulations and The Social and Behavioral Sciences - SBR	06/05/05
Assessing Risk in Social and Behavioral Sciences - SBR	06/06/05
Informed Consent - SBR	06/06/05
Privacy and Confidentiality - SBR	06/06/05
Internet Research - SBR	06/06/05
Nova Southeastern University	06/06/05
<b>Additional optional modules completed:</b>	<b>Date completed</b>

**For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.**

Paul Braunschweiger Ph.D.  
 Professor, University of Miami  
 Director Office of Research Education  
 CITI Course Coordinator

## Appendix L

### Nova Southeastern University IRB Informed Consent Checklist

This form must be completed by the researcher and submitted with the research protocol and informed consent form. Failure to do so will cause review of your protocol to be deferred.

Informed consent is one of the primary ethical requirements for research with human subjects; it reflects the basic principle of respect for persons. No principal investigator may involve a human being as a subject in research, as defined in the Nova Southeastern University Institutional Review Board Policy and Procedure Manual for Research with Human Subjects, unless the investigator has obtained the subject's informed consent. The process of informed consent is constituted on two essential elements: (1) the subject has the information he or she requires to make an effective decision, and (2) the subject's participation is not coerced, i.e. his or her consent is voluntary.

The checklist below is provided to ensure that each of the following components is included in your Informed Consent form. Please check N/A next to those items that are not applicable to the protocol being submitted.

This checklist is intended for the following consent form:

Included	N/A	Component
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Informed Consent form is written in a language understandable to the subject or his/her legal representative.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Informed Consent form is written in a consistent voice, preferably second with the exception of the Voluntary Consent section, which is written in the first person.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Each page of the Informed Consent form is on original Nova Southeastern University letterhead, except in cases of collaborative projects when the letterhead from a hospital, university, etc. is acceptable
<input type="checkbox"/>	<input checked="" type="checkbox"/>	If the research is externally funded, the funding agency is listed under funding source.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The title of the study and the name, address, and telephone number of the investigator(s) is listed.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	If the principal investigator is a student, the address and phone number of his/her advisor(s), clinical Supervisor(s) are listed. Site information (address) of where research will be collected or research activities will occur with subjects if this information is different than the address of investigator/co-investigator or there are multiple sites.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The phone number 954-262-5369 and email: <a href="mailto:IRB@nsu.nova.edu">IRB@nsu.nova.edu</a> for the IRB Office are listed.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A statement that the study involves research and an explanation of the purpose of the research is included.



<input checked="" type="checkbox"/>	<input type="checkbox"/>	A concrete description of the study procedures, including the amount of time subjects are being asked to contribute and the nature of the questions or data to be collected, is included. Any procedures which are experimental are identified and any alternative procedures disclosed. Information about financial agreements with the investigators must be discussed. Audio and Video tape information (if applicable) in keeping with the paragraphs provided in the model forms.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A description of any risks and possible discomforts to the subjects, if any, is included.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A description of any benefits to the subjects is included. If no benefits are expected, this is stated.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	If subjects will be compensated for their participation, a statement has been included addressing this.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A statement describing the extent to which confidentiality will be maintained is included in addition to a clause that states that all information obtained is strictly confidential unless disclosure is required by law.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	As a part of the confidentiality section, a statement that the NSU-IRB and other regulatory agencies may review research records.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	A statement regarding the use, or non-use, of Protected Health Information (PHI) if the study involves PHI.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A statement regarding the use, or non-use, of information from student records if the study involves student records.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A statement that participation is voluntary, that refusal to join the study or to leave the study involves no penalty, and that the subject may discontinue participation at any time. This statement must be followed by an explanation of how data collected will be managed if a participant decides to leave (e.g., destroyed at any time, except in situations that violate state and/or federal laws and regulations, kept until the conclusion of the study, etc.).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A statement indicating who the subject can contact for any questions about the study.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Informed Consent contains no language through which the subject is made to waive any of his/her legal rights or which releases the investigator, the sponsor, or the institution from liability for negligence.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The entire paragraph under Section VI-Voluntary Consent on the Informed Consent form appears in boldface and reads "I have read the preceding consent form, or it has been read to me, and I fully understand the contents of this document and voluntarily consent to participate. All of my questions concerning the research have been answered. I hereby agree to participate in this research study. If I have any questions in the future about this study they will be answered by (fill in name). (If applicable: I also voluntarily agree to the release of my PHI as described in this document.) A copy of this form has been given to me. This consent ends at the conclusion of this study."
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A space for the subject's signature, the date, the signature of a witness is provided, the date. Space is also provided for the signature of an authorized representative, date, and the basis for that representation if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	An assent form is included for subjects 7-17 years of age. This may be either a child assent, an adolescent assent, or both (depending on the age range of subjects).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Flyers, brochures, advertisements, or other recruitment materials are attached. Recruitment material must have Nova Southeastern University on them.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	If the language of the Informed Consent Form is other than English, a certified copy of the Informed Consent Form in that language is included or the investigator may wait until notified by the IRB to have the consent form translated.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	All consent pages are numbered. All non-final pages contain a blank space for initials and date.

## Appendix M

### Informed Consent Document

#### Introduction

We invite you to participate in a research study entitled *an investigation of training in creative problem solving and its relationship to affective and effective idea generation of entrepreneurial learners*. This study is being completed in partial fulfillment of the requirements for the degree Doctor of Philosophy in Computing Technology in Education and the primary investigator for the study will be Ed Leach, a faculty member in the School of Business Administration, Faculty of Management, Dalhousie University. Your contact person during the research project will be Paulete Dunn, a research assistant.

Your participation in this study is voluntary and you may withdraw at anytime without consequence to your evaluation in other course work. Should you choose to withdraw you may request that any data collected be destroyed. If you do not ask for the data to be destroyed it will be held in a secure location as described below. To ensure anonymity the research assistant will act as a buffer between you, the subject, and the researcher. No identifying information will be provided to the researcher and the data collected by the research assistant will be stored independently from that used by the researcher. To ensure anonymity you will not meet nor talk with the researcher at any point during the research.

This consent form, a copy of which has been given to you, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask Katie Puxley. Please take the time to read the consent form carefully as well as any accompanying information.

#### Purpose of the Study

The proposed study seeks to determine the effectiveness of on-line tutorials for enhancing idea generation skills, while at the same time exploring the relationships between training and skill enhancement. The results of this study are expected to assist educators in helping entrepreneurs to identify and develop innovative solutions for important problems.

#### Study Design

The project will be conducted in the form of an experiment. Participants will be recruited and assigned randomly into two groups. One group will be a control group

module and the other group will complete an idea generation tutorial. As part of the study we will be examining the relationship between general academic grade point and impact of the training. You will be asked to provide permission to allow the research assistant to access your grade point information from the Registrar. This information will be held in strictest confidence by the research assistant and will be available anonymously to the researcher.

#### Who Can Participate in the Study

You may participate in this study if you are a full-time or part-time student at Dalhousie. You must be available for two sessions spaced roughly one week apart. We will make two different times available for each session. If you are unable to commit to attending these sessions then you will be excluded from the study.

#### Who Will be Conducting the Research and Contact Information

Dr. John Scigliano, Graduate School of Computer and Information Science Nova Southeastern University will be supervising the research. Ed Leach, School of Business, is the researcher for the study. Paulette Dun will act as research assistant and will be your sole point of contact and they may be reached at: [Paulette.dun@dal.ca](mailto:Paulette.dun@dal.ca) or at 902-444-7067. Additional contact information is provided in the table below.

Dr. John Scigliano Graduate School of Computer Information Science Nova Southeastern University Room 4120 DeSantis Building 3301 College Ave. Ft. Lauderdale FL 33314 <a href="mailto:scigl@nsu.nova.edu">scigl@nsu.nova.edu</a>	Ed Leach Room 5113 Rowe Management Building Dalhousie University Halifax NS 902-494-1816 <a href="mailto:Ed.Leach@dal.ca">Ed.Leach@dal.ca</a>
Human Research Ethics Administration Dalhousie University Patricia Lindley (902) 494-1462 <a href="mailto:Patrica.Lindley@dal.ca">Patrica.Lindley@dal.ca</a>	Institutional Review Board (IRB) Nova Southeastern University 954-262-5369 <a href="mailto:IRB@nsu.nova.edu">IRB@nsu.nova.edu</a>

#### What You Will be Asked to Do

In the initial session you will complete a baseline questionnaire, a Creative Problem Solving Profile and a 14 item questionnaire probing your preference for divergent thinking when solving problems. You will complete a document that will measure your skill level prior to completing the tutorial. Following the initial session you will be randomly assigned into either the control group or the idea generation group.

In the subsequent two-hour session you will meet with the research assistant and your fellow participants and complete a tutorial on idea generation. During the session you

will also complete instruments that will measure your skill level following completion of the tutorial.

#### Possible Risks and Discomforts

To minimize the chance that your participation in the study may influence other course work a Research Assistant, Paulette Dunn, will act as a buffer between you and the researcher. No identifying information will be provided to the researcher and the data collected by the research assistant will be stored independently from that used by the researcher. To ensure anonymity you will not meet nor talk with the researcher at any point during the research. You may experience some physical discomfort from sitting in front of a computer screen for two hours – irritation of the eye, stiffness in the legs, arms and fingers.

#### Possible Benefits

The idea generation methodology has been part of class room teaching for the past 5 years. Anecdotally students have experienced an augmentation of their understanding of the processes underlying idea generation. If the projects intentions are realized there is the potential that you may benefit in the same way.

#### Compensation

It is the responsibility of the researcher to safeguard the anonymity of the participants in the project and the confidentiality of the information they provide.

#### Confidentiality and Anonymity

It is the responsibility of the researcher to safeguard the anonymity of the participants in the project and the confidentiality of the information they provide.

*Anonymity* – At time of recruitment participants will be assigned a three digit identification number by the Research Assistant. The Research Assistant will act as a buffer between the researcher and the participants. The researcher will only have access to data identified with the three digit identifiers and there will be no contact between the researcher and the subject. All contact with the subject will be through the Research Assistant.

*Confidentiality* – Data will be aggregated and no response will be directly attributed to a subject. In other words it will be impossible for a reader to attribute a response to a subject.

*Data Retention* -Physical files will be kept in a locked filing cabinet and digital information will be kept in a password protected file for 5 years post publication. The identifying information prior to assignment of the three digit code will be kept physically separate from the other information and will not be available to the researcher.

#### *Potential Access by NSU-IRB*

The Institutional Review Board of Nova Southeastern University and other regulatory agencies may review the research records.

Initials \_\_\_\_\_

Date \_\_\_\_\_

### Questions

During the pre-test and treatment meetings the research assistant will answer any questions you may have. If the questions require additional clarification the research assistant will contact the researcher for guidance and then respond to your question. Participants will be provided any additional information that may effect their decision to participate in the study on a timely basis.

### Summary

You will be asked to devote a total of four hours to the project composed of two, two-hour sessions. The initial session will be used to explain the project and collect initial data. The second session will see you complete a one-hour on-line tutorial and respond to a post tutorial assessment.

### Problems or Concerns

In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Patricia Lindley, Director of Dalhousie University's Office of Human Research Ethics Administration for assistance: (902) 494-1462, [patricia.lindley@dal.ca](mailto:patricia.lindley@dal.ca).

### Signature for Project

**I have read the preceding consent form, or it has been read to me, and I fully understand the contents of this document and voluntarily consent to participate. All of my questions concerning the research have been answered. I hereby agree to participate in this research study. If I have any questions in the future about this study they will be answered by Ed Leach. A copy of this form has been given to me. This consent ends at the conclusion of this study.**

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Witness Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Research Assistant's Signature

\_\_\_\_\_  
Date

Initials \_\_\_\_\_

Date \_\_\_\_\_

Signature for Grade Point Information (Dalhousie Requirement)

**I have read the preceding consent form, or it has been read to me, and I fully understand the contents of this document and voluntarily consent to participate. All of my questions concerning the research have been answered. I hereby agree to participate in this research study. If I have any questions in the future about this study they will be answered by Ed Leach. A copy of this form has been given to me. This consent ends at the conclusion of this study. I hereby consent to provide access to my academic grade point average.**

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Witness Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Research Assistant's Signature

\_\_\_\_\_  
Date

## Appendix N

### Recruitment Message

#### **In Class Recruitment**

Good morning/afternoon/evening my name is Xxxx Yyyy. I am a research assistant for a project being conducted by Ed Leach, Faculty of Management. I am here today to ask for your assistance in a research project investigating the effectiveness of on-line tutorials for enhancing skills. The results of this study are expected to assist educators in helping entrepreneurs to identify and develop innovative solutions for important problems. By participating in the study you will not only assist in the project objectives but also have the potential to gain or augment your skills.

You will be asked to devote a total of four hours to the project composed of two, two-hour sessions. The initial session will be used to explain the project and collect initial data. The second session will see you complete a one-hour on-line tutorial and respond to a post tutorial assessment. If you are interested in participating in this study, please provide your contact information on the form being circulated or email me at [Xxxx.Yyyy@dal.ca](mailto:Xxxx.Yyyy@dal.ca).

I want to thank you for giving me this opportunity to speak to you today. I also want you to remember that your participation in this study is strictly voluntary.

#### **e-Mail Recruitment Direct to Potential Participants**

Subject: Invitation to Participate in a Research Project

Dear Jane/Tom etc

My name is Xxxx Yyyy. I am a research assistant for a project being conducted by Ed Leach, Faculty of Management. I am writing to ask for your assistance in a research project investigating the effectiveness of on-line tutorials for enhancing skills. The results of this study are expected to assist educators in helping entrepreneurs to identify and develop innovative solutions for important problems. By participating in the study you will not only assist in the project objectives but also have the potential to gain or augment your skills.

You will be asked to devote a total of four hours to the project composed of two, two-hour sessions. The initial session will be used to explain the project and collect initial data. The second session will see you complete a one hour on-line tutorial and respond to a post tutorial assessment. If you are interested in participating in this study, please provide your contact information on the form being circulated or email me at [baileyp@dal.ca](mailto:baileyp@dal.ca).

Participation in the study is voluntary. Please respond to this message confirming your interest in participating in the study.

**e-Mail to Professors**

Subject: Invitation to Participate in a Research Project

Dear Sunny:

I am investigating the effectiveness of on-line tutorials for enhancing skills. I would like to discuss the possibility of Xxxx Yyyy, research assistant, recruiting subjects from your class. The scripts for in class and email recruitment are attached.

Best,

Ed

**Notice Digest**

Subject: Invitation to Participate in a Research Project

Ed Leach, Faculty of Management, is investigating the effectiveness of on-line tutorials for enhancing skills. We wish to recruit participants from the Dalhousie student community. If you are interested in allowing students to be recruited, from your classes please contact Xxxx Yyyy at [Xxxx.Yyyy@dal.ca](mailto:Xxxx.Yyyy@dal.ca). This research is being funded by a Research Development Fund Grant and has received approval from the Social Sciences and Humanities Research Ethics Board.



## Appendix O

### Sample Keystroke Log

-----Original Message-----

From: Online Tutorial [mailto:eleach@hfx.eastlink.ca]

Sent: July 16, 2008 3:19 PM

To: eleach@hfx.eastlink.ca

Subject: Going Fishing Tutorial

MAIN.AS: (2008-07-16 14:14:02) Config file set to: main\_config.xml

MAIN.AS: (2008-07-16 14:14:02) Main initiated

MAIN.AS: (2008-07-16 14:14:02) Creating the welcome...

MAIN.AS: (2008-07-16 14:14:30) Creating the interface...

MAIN.AS: (2008-07-16 14:14:32) Playing slide: 0

MAIN.AS: (2008-07-16 14:15:00) Playing slide: 1

MAIN.AS: (2008-07-16 14:15:02) Playing slide: 2

MAIN.AS: (2008-07-16 14:15:04) Playing slide: 3

MAIN.AS: (2008-07-16 14:16:43) Playing slide: 4

MAIN.AS: (2008-07-16 14:17:09) Playing slide: 5

MAIN.AS: (2008-07-16 14:17:17) Playing slide: 6

MAIN.AS: (2008-07-16 14:17:34) Playing slide: 7

MAIN.AS: (2008-07-16 14:18:03) Playing slide: 8

MAIN.AS: (2008-07-16 14:18:46) Playing slide: 9

MAIN.AS: (2008-07-16 14:19:08) Playing slide: 10

MAIN.AS: (2008-07-16 14:19:44) Playing slide: 11

MAIN.AS: (2008-07-16 14:20:38) Playing slide: 12

MAIN.AS: (2008-07-16 14:22:14) Playing slide: 13

MAIN.AS: (2008-07-16 14:22:16) Playing slide: 14

MAIN.AS: (2008-07-16 14:22:27) Playing slide: 15

MAIN.AS: (2008-07-16 14:22:39) Playing slide: 16

MAIN.AS: (2008-07-16 14:22:59) Playing slide: 17

MAIN.AS: (2008-07-16 14:23:18) Playing slide: 18

MAIN.AS: (2008-07-16 14:23:44) Playing slide: 19

MAIN.AS: (2008-07-16 14:24:02) Playing slide: 20

MAIN.AS: (2008-07-16 14:24:35) Playing slide: 21

MAIN.AS: (2008-07-16 14:24:38) Playing slide: 22

MAIN.AS: (2008-07-16 14:25:26) Playing slide: 23

MAIN.AS: (2008-07-16 14:26:03) Playing slide: 24

MAIN.AS: (2008-07-16 14:26:16) Playing slide: 25

MAIN.AS: (2008-07-16 14:26:18) Playing slide: 26

MAIN.AS: (2008-07-16 14:26:51) Playing slide: 27  
MAIN.AS: (2008-07-16 14:28:05) Playing slide: 28  
MAIN.AS: (2008-07-16 14:28:35) Playing slide: 29  
MAIN.AS: (2008-07-16 14:29:31) Playing slide: 30  
MAIN.AS: (2008-07-16 14:29:34) Playing slide: 31  
MAIN.AS: (2008-07-16 14:30:09) Playing slide: 32  
MAIN.AS: (2008-07-16 14:31:21) Playing slide: 33  
MAIN.AS: (2008-07-16 14:32:02) Playing slide: 34  
MAIN.AS: (2008-07-16 14:33:45) Playing slide: 35  
MAIN.AS: (2008-07-16 14:37:31) Playing slide: 36  
MAIN.AS: (2008-07-16 14:37:53) Playing slide: 37  
MAIN.AS: (2008-07-16 14:38:20) Playing slide: 38  
MAIN.AS: (2008-07-16 14:38:22) Playing slide: 39  
MAIN.AS: (2008-07-16 14:38:24) Playing slide: 40  
MAIN.AS: (2008-07-16 14:39:03) Playing slide: 41  
MAIN.AS: (2008-07-16 14:40:45) Playing slide: 42  
MAIN.AS: (2008-07-16 14:41:25) Playing slide: 43  
MAIN.AS: (2008-07-16 14:41:46) Playing slide: 44  
MAIN.AS: (2008-07-16 14:41:48) Playing slide: 45  
MAIN.AS: (2008-07-16 14:42:09) Playing slide: 46  
MAIN.AS: (2008-07-16 14:42:59) Playing slide: 47  
MAIN.AS: (2008-07-16 14:43:32) Playing slide: 48  
MAIN.AS: (2008-07-16 14:44:05) Playing slide: 49  
MAIN.AS: (2008-07-16 14:44:50) Playing slide: 50  
MAIN.AS: (2008-07-16 14:45:02) Playing slide: 51  
MAIN.AS: (2008-07-16 14:45:05) Playing slide: 52  
MAIN.AS: (2008-07-16 14:47:13) Playing slide: 53  
MAIN.AS: (2008-07-16 14:47:30) Playing slide: 54  
MAIN.AS: (2008-07-16 14:48:47) Playing slide: 55  
MAIN.AS: (2008-07-16 14:51:29) Playing slide: 56  
MAIN.AS: (2008-07-16 14:53:11) Pressed - Play Slide  
MAIN.AS: (2008-07-16 14:53:18) Pressed - Next Slide  
MAIN.AS: (2008-07-16 14:53:19) Playing slide: 58  
MAIN.AS: (2008-07-16 14:53:21) Pressed - Prev Slide  
MAIN.AS: (2008-07-16 14:53:22) Playing slide: 57  
MAIN.AS: (2008-07-16 14:55:24) Playing slide: 58  
MAIN.AS: (2008-07-16 14:57:01) Playing slide: 59  
MAIN.AS: (2008-07-16 14:59:28) Playing slide: 60  
MAIN.AS: (2008-07-16 15:01:29) Playing slide: 61  
MAIN.AS: (2008-07-16 15:02:04) Playing slide: 62  
MAIN.AS: (2008-07-16 15:02:52) Playing slide: 63  
MAIN.AS: (2008-07-16 15:02:55) Playing slide: 64  
MAIN.AS: (2008-07-16 15:03:52) Playing slide: 65  
MAIN.AS: (2008-07-16 15:04:42) Playing slide: 66  
MAIN.AS: (2008-07-16 15:05:41) Playing slide: 67  
MAIN.AS: (2008-07-16 15:05:52) Pressed - Pause Slide

MAIN.AS: (2008-07-16 15:07:16) Pressed - Play Slide  
MAIN.AS: (2008-07-16 15:07:41) Playing slide: 68  
MAIN.AS: (2008-07-16 15:08:25) Playing slide: 69  
MAIN.AS: (2008-07-16 15:09:17) Playing slide: 70  
MAIN.AS: (2008-07-16 15:11:02) Playing slide: 71  
MAIN.AS: (2008-07-16 15:11:58) Playing slide: 72  
MAIN.AS: (2008-07-16 15:12:16) Playing slide: 73  
MAIN.AS: (2008-07-16 15:12:18) Playing slide: 74  
MAIN.AS: (2008-07-16 15:13:03) Playing slide: 75  
MAIN.AS: (2008-07-16 15:13:52) Playing slide: 76  
MAIN.AS: (2008-07-16 15:14:51) Playing slide: 77  
MAIN.AS: (2008-07-16 15:15:43) Playing slide: 78  
MAIN.AS: (2008-07-16 15:16:03) Playing slide: 79  
MAIN.AS: (2008-07-16 15:16:39) Playing slide: 80  
MAIN.AS: (2008-07-16 15:17:12) Playing slide: 81  
MAIN.AS: (2008-07-16 15:17:15) Playing slide: 82  
MAIN.AS: (2008-07-16 15:17:50) Playing slide: 83  
MAIN.AS: (2008-07-16 15:18:19) Playing slide: 84  
MAIN.AS: (2008-07-16 15:18:45) Playing slide: 85  
MAIN.AS: (2008-07-16 15:19:06) Ending the tutorial...

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IP address = 129.173.136.86

## Appendix P

### Focus Group – Facilitator’s Notes – November 30, 2006

**Value** – The group was in unanimous in their agreement that the material covered was of value. The information was perceived as being relevant, applicable in the varied arenas of work and study represented by the group, and practical. Although the intrinsic value of the material was acknowledged the group quickly identified the added value of the presenter and the social interaction amongst observers. The group then moved to a discussion of how that value might be maintained should the presentation format be shifted to multimedia rather than live instruction.

**Content** – The group felt that the content was understandable, struck a good balance between academic legitimacy and practical application, and was conceptually useful. The group emphasized the importance of the examples used as a clarification and immediate application of the concepts. The example of the bequeathed ribbons was felt to be too difficult or perhaps too restrictive especially with respect to the add and subtract portion of the Brain Booster. A modified example could be more successful. The other topic for discussion here was again with respect to the transfer of formats from live to multimedia. The group felt that the value of the examples was greatly enhanced by the instructor but equally by the other students in the room. The consensus of the group was that the maintenance of the interactive element was essential to deriving maximum benefit from the presentation and added significantly to the understanding of the concepts. One of the group members made the specific observation that creativity is a social process and teaching concepts in the absence of such interaction leaves a significant void. Numerous mechanisms for incorporating virtual interaction were discussed including chat rooms, live real-time presence of an on-line instructor, and even the development of “faux” students imbedded in the software to artificially produce the social dimension.

The video shown at the end received high praise as an opportunity to see the concepts in a real-world setting. Suggestions did emerge with the thought of further integrating the video with the presentation by incorporating the icons used to link the content back, or in

fact splitting the video up into smaller segments that each corresponded to the various tools described in the presentation.

**Delivery Method** – While intended as a separate discussion item this topic was quickly subsumed under the other items. In fact the conversation centered on this in terms of the transformation of what the observers took part in at that time and a virtual delivery of the same. As observed the group felt that the presentation was engaging, clear, and of practical value, however, the group expressed numerous reservations with respect to the successful conversion from this format to the proposed delivery method.

**Conclusions:** From the results of this focus group it can be concluded there is perceived value in this product, and in the model upon which it is based. Group members felt able to relate to the material and find application to their particular field of interest. However, the role of the instructor was also given heavy weight as adding significant value to the presentation. The instructor's ability to engage with the audience, his own passion for the material, and the way in which he facilitated interaction were all viewed as integral to the success of the presentation in its current form. In addition the group also identified the opportunity to interact with one another as beneficial in working with, and more fully understanding, the concepts presented. This appeared to be the reason that the group shifted so quickly to the discussion of possible impediments to providing the same quality of experience on-line. All quickly and readily acknowledged that in its current form it was very high quality, the unavoidable question that remained was how then to shift mediums and not lose those things vital to replicating the very successful demonstration. A number of group members commented on the uniqueness of web-delivery.

**Recommendations:**

1. Keep going – this is information that has value and broad application. This is a go forward proposition.
2. Maintain as much social context and interaction, faux or not, as is allowable by the software. This is a subject area that is social in nature and requires that element to heighten effectiveness.
3. Replace the ribbons example with a more common and multi-faceted object (A chair and a pen where subsequently generated as possibilities.).
4. A second focus group is indicated to view the proposed multimedia version of the tutorial only, without a live instructor. This group would also be asked more specific content questions with respect to font, symbols, colour etc.
5. Although the video was very well received a more thorough integration with the presentation was advocated. One method suggested was to break the video up into segments that capture specific aspects of the model and link those clips with the concept when it is presented.

**Below are the Questions asked as part of the facilitated de-brief.**

1<sup>st</sup> Question: General Impressions – Overall

## **Value**

Was there value here? Go or no go

Try to parse out how much of that value rested with the presenter and how much was intrinsic in the material

Can this be used in your life? Does it have practical value?

What is the most valuable part of the presentation?

## **Content**

What will you be taking home with you?

What are the major messages/objectives?

What might be added? Are there questions that are left unanswered? Do you have direction going forward?

Academic level – too high or too low. The balance between legitimacy and practicality

Terms – intuitive, common sense, clarity

## **Delivery Method**

Level of engagement/Boring factor

Possible value of this material as a single use multi-media presentation (i.e. web-based delivery) Value added of presenter. Degree of impact of group interaction

## Appendix Q

**CODE BOOK**  
**GOING FISHING INVESTIGATION**

<b>Column</b>	<b>SPSS Label</b>	<b>Description</b>
A	NUMBER	Code #
B	PRETEST	Pretest
C	POSTTEST	Post-test
D	IPADD	IP Address
E	GROUP	Treatment = 1 Control = 0
F	PRE14YN	Completed 14 Item Pretest 1 = yes 0 = no
G	POST14YN	Completed 14 Item Posttest 1 = yes 0 = no
H	PRE14ID	Preference for Ideation Pre-test
I	PST14ID	Preference for Ideation Post-test
J	DIF14ID	Difference in Preference for Ideation
K	PRE14PCE	Premature Critical Evaluation Pretest
L	PST14PCE	Premature Critical Evaluation Posttest
M	DIF14PCE	Difference in Premature Critical
N	BCKMF	Gender 1 = Male, 2 = female
O	BCKAGE	Age
P	BCKDEG	Program
Q	BCKBNB	Business or Non Business
R	BCKGPA	GPA
S	BCKEMP	Employment
T	BCKJOB#	# of Jobs Listed
U	BCKVEN#	# of Ventures
V	BCKVENYN	Venture Experience Y/N
W	BCKDSCID	Discover Ideas
X	BCKCREAT	Creative
Y	BCEKVEN12	New Venture? 12 months
Z	BCEKVEN5	New Venture? 5 years
AA	BCEKVEN10	New Venture? 10 years
AB	BCEKVEN99	New Venture? Sometime
AC	BCKMEDIM	Media - Images y/n
AD	BCKMEDVD	Media -Video y/n
AE	BCKMEDMC	Media -Music y/n
AF	BCKMEDCF	Multi Media Tutorial Comfort
AG	CPSPSTYL	CPSP Preferred Style x= invalid

AH	PREID#	Pretest # of Ideas Pretest
AI	PREIDEAS	Pre-test Ideas
AJ	PREIDPCK	Pre-test Idea Chosen
AK	PREPROBM	Pre-test Solve meaningful problems pretest
AL	PREPASS	Pretest Passion for Pretest
AM	PREEXPCE	Pre-test Done before Pretest
AN	PRETOTAL	Pre-test Total Evaluation Score Pretest
AO	PSTID#	Post-test # of ideas
AP	PSTIDEAS	Post-test Ideas
AQ	PSTIDPCK	Post-test Idea Chosen
AR	PSTPROBM	Post test Solve meaningful problems post-test
AS	PSTPASS	Post-test Passion for Pos-test
AT	PSTEXPCE	Post-test Done before post-test
AU	PREPSTDF	Pre-Post Difference
AV	PREPST#	Post-test Total # of distinct ideas
AW	PREPSTNW	New Idea Increment
AX	PREPSTDX	Pre-Post Index
AY	PSTTOTAL	Post-test Total Evaluation Score post-test
AZ	PSTSAME	Post-test Same idea as pretest = 0; different
BA	BKNETWRK	Network-Solo
BB	BKPASS	Passion
BC	BKGOODAT	Good At
BD	BKBOT1#	# of Ideas
BE	BKBOT1ID	Description
BF	BKBOT2#	Difference Bottle 1 and Bottle 2
BG	BKBOT2ID	Description
BH	BKBOTDFC	Difference Bottle 1 and Bottle 2
BI	BKBOTUNQ	Unique Ideas for Bottles
BJ	BKBOTNEW	New Idea Increment Bot1 Bot2
BK	BKBOTDX	Bot2/ Bot1 Index
BL	BKBRNYN	Completed 1 = yes; 0 = no
BM	BKBRN#	# Right
BN	BKEX#	# of Ideas
BO	BKEXTHM	Themes
BP	BKEXGOOD	# Good
BQ	BKEXBAD	# Bad
BR	BKEXDIFF	Difference from # of ideas
BS	BKEXNOTE	Notes



## Reference List`

- Abelson, R. P., & Black, J. B. (1986). *Knowledge Structures*. Hillsdale, NJ: Lawrence Erlbaum Associates Inc.
- Acs, Z. J., Arenius, P., & Minnitti, M. (2004). *Global Entrepreneurship Monitor: 2004 executive report*. Boston, London: Babson College, London Business School.
- Aldrich, H. E., & Fiol, C. M. (1994). Fools rush in? The institutional context of industry creation. *Academy of Management Review*, 19(4), 645-670.
- Aldrich, H. E., & Zimmer, C. (1986). Entrepreneurship through social networks. In D. L. Sexton & R. W. Smilor (Eds.), *The Art and Science of Entrepreneurship* (pp. 3-23). Cambridge, MA: Ballinger.
- Amabile, T. M. (1983). Social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, 45(2), 357-376.
- Amabile, T. M. (1985). The personality of creativity. *Brandeis Review*, 5(1), 5-8.
- Amabile, T. M. (1997a). Entrepreneurial creativity through motivational synergy. *Journal of Creative Behavior*, 31(1), 18-26.
- Amabile, T. M. (1997b). Motivating creativity in organizations: On doing what you love and loving what you do. *California Management Review*, 40(1), 39-58.
- Amabile, T. M. (1998). How to kill creativity. *Harvard Business Review*, 76(5), 76-87.
- Amabile, T. M. (2002). Creativity under the gun. *Harvard Business Review*, 80(8), 52-61.
- Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives (Abridged Edition)*. New York: Longman.

- Ardichvili, A., Cardozo, R., & Ray, S. (2003). A theory of entrepreneurial opportunity identification and development. *Journal of Business Venturing, 18*(1), 105-123
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.
- Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Upper Saddle River, NJ: Prentice Hall.
- Bandura, A. (1995). Exercise of personal and collective efficacy in changing societies. In A. Bandura (Ed.), *Self-Efficacy in Changing Societies* (pp. 45). Cambridge UK: Press Syndicate University of Cambridge.
- Baron, R. A. (2004). Opportunity recognition: Insights from a cognitive perspective. In E. B. John (Ed.), *Opportunity Identification and Entrepreneurial Behavior*. Greenwich, CT Information Age Publishing.
- Baron, R. A. (2006). Opportunity recognition as pattern recognition: How entrepreneurs "connect the dots" to identify new business opportunities. *Academy of Management Perspectives, 20*(1), 104-119.
- Basadur, M. S. (1979). *Training in creative problem solving: Effects on deferred judgment and problem finding and solving in an industrial research organization*. Unpublished doctoral dissertation, The University of Cincinnati, Cincinnati.
- Basadur, M. S. (1987). Needed research in creativity for business and industrial applications. In S. G. Isaksen (Ed.), *Frontiers of Creativity Research: Beyond the Basics* (pp. 390-416). Buffalo NY: Bearly Limited.
- Basadur, M. S. (1989). *Technical Manual for the Creative Problem Solving Profile (CPSP)*. Ancaster ON: Center for Research in Applied Creativity.
- Basadur, M. S. (1994). *SIMPLEX: A Flight to Creativity*. Buffalo NY: The Creative Education Foundation.

- Basadur, M. S., & Finkbeiner, C. T. (1985). Measuring preference for ideation in creative problem-solving training. *Journal of Applied Behavioral Science*, 21(1), 37-49.
- Basadur, M. S., & Gelade, G. (2003). Using the creative problem solving profile (CPSP) for diagnosing and solving real-world problems. *EMERGENCE*, 5(3), 22-47.
- Basadur, M. S., Graen, G. B., & Gren, S. G. (1982). Training in creative problem solving: Effects on ideation and problem finding and solving in an industrial research organization. *Organizational Behavior and Human Performance*, 30, 41-70.
- Basadur, M. S., Graen, G. B., & T.A.Scandura. (1986). Training effects on attitudes toward divergent thinking among manufacturing engineers. *Journal of Applied Psychology*, 71, 612-617.
- Basadur, M. S., Graen, G. B., & Wakabayashi, M. (1990a). Identifying individual differences in creative problem solving style. *The Journal of Creative Behavior*, 24(2), 111-131.
- Basadur, M. S., & Head, M. (2001). Team performance and satisfaction: A link to cognitive style within a process framework. *Journal of Creative Behavior*, 35(4), 227-248.
- Basadur, M. S., Runco, M. A., & A.Vega, L. (2000). Understanding how creative thinking skills, attitudes and behaviors work together; A causal process model. *Journal of Creative Behavior*, 34(2), 77-100.
- Basadur, M. S., Taggr, S., & Pringle, P. (1999). Improving the measurement of divergent thinking attitudes in organizations. *Journal of Creative Behavior*, 33(2), 75-111.
- Basadur, M. S., Wakabayashi, M., & Graen, G. B. (1990b). Attitudes toward divergent thinking before and after training: Focusing upon the effect of individual problem solving styles. *Creativity Research Journal*, 3, 22-32.

- Basadur, M. S., Wakabayashi, M., & Takai, J. (1992). Training effects on the divergent thinking attitudes of Japanese managers. *International Journal of Intercultural Relations*, 16(3), 329-345.
- Baumol, W. J. (1968). Entrepreneurship in economic theory. *The American Economic Review*, 58(2), 64-71.
- Berglund, H., & Wennberg, K. (2006). Creativity among entrepreneurship students: comparing engineering and business education. *International Journal of Continuing Engineering Education and Lifelong Learning*, 16(5), 366-379.
- Bhave, M. (1994). A process model of entrepreneurial venture creation. *Journal of Business Venturing*, 9(3), 223-242.
- Bloom, B. S. (Ed.). (1956). *Taxonomy of Educational Objectives: Handbook I: Cognitive Domain*. New York: David McKay.
- Cheung, C. K. (2003). Creativity of university students: What is the impact of field and year of study? *Journal of Creative Behavior*, 37(1), 42-63.
- Cooper, A. C., Folta, T. B., & Woo, C. (1995). Entrepreneurial information search. *Journal of Business Venturing*, 10(2), 107-120.
- Corbett, A. (2005). Experiential learning within the process of opportunity identification and exploitation. *Entrepreneurship Theory & Practice*, 29(4), 473-491.
- Denning, S. (2000). *The Springboard: How storytelling Ignites Action in Knowledge-Era Organizations*. Boston: Butterworth-Heinemann.
- Denning, S. (2005). *The Leader's Guide to Storytelling: Mastering the Art and Discipline of Business Narrative*. San Francisco: Jossey-Bass.

- DeTienne, D. R., & Chandler, G. N. (2004). Opportunity identification and its role in the entrepreneurial classroom: A pedagogical approach and empirical test. *Academy of Management Learning and Education*, 3(3), 242-257.
- Drucker, P. F. (1985). *Innovation and Entrepreneurship: Practices and Principles*. New York: Harper and Row.
- Eisenman, R. (1969). Creativity and academic major: Business versus english majors. *Journal of Applied Psychology*, 53(5), 392-395.
- Eisner, E. W. (1979). *The Educational Imagination: On the Design and Evaluation of School Programs*. New York: MacMillan.
- Fiet, J. O. (2002). *The Systematic Search for Entrepreneurial Discoveries*. Santa Barbara, CA: Quorum Books.
- Fiet, J. O., Clouse, V. G. H., & Norton, W. I. (2004). Systematic Search by Repeat Entrepreneurs. In E. B. John (Ed.), *Opportunity Identification and Entrepreneurial Behavior*. Greenwich, CT: Information Age Publishing.
- Florida, R. (2003). *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community, and Everyday Life*. New York: Perseus Books.
- Fong, C. T. (2006). The effects of emotional ambivalence on creativity. *Academy of Management Journal*, 40(5), 1016-1030.
- Fraenkel, J. R., & Wallen, N. E. (2005). *How to Design and Evaluate Research in Education* (6th ed.). New York: McGraw Hill.
- Gaglio, M., & Katz, J. A. (2001). The psychological basis of opportunity identification: Entrepreneurial alertness. *Small Business Economics*, 16(2), 95-111.
- Gaglio, M., & Taub, R. P. (1992). Entrepreneurs and opportunity recognition. *Frontiers of Entrepreneurship Research*, 12, 136-147.

Gagne, R. M. (1977). *The Conditions of Learning* (3rd ed.). New York: Holt Rineheart and Winston.

Gagne, R. M., Wager, W. W., Golas, K., & Keller, J. M. (2004). *Principles of Instructional Design* (5th ed.). Boston: Wadsworth Publishing.

Gartner, W. B., & Shaver, K. G. (2004). Opportunities as attributions: The enterprise serving bias. In E. B. John (Ed.), *Opportunity Identification and Entrepreneurial Behavior* Greenwich, CT: Information Age Publishing.

Giddens, A. (1992). *Modernity and Self-Identity*. Cambridge: Polity Press.

Gilad, B., Kaish, S., & Ronen, J. (1988). The entrepreneurial way with information *Applied Behavioral Economics*, 2, 480-503.

Good, W. S. (2003). *Building a Dream: A Canadian Guide to Starting Your Own Business*. Toronto: McGraw-Hill Ryerson.

Greer, M., & Levine, E. (1991). Enhancing creative performance in college students. *Journal of Creative Behavior*, 25(3), 250-255.

Gronlund, N. E. (2004). *How to Write and use Instructional Objectives*. Upper Saddle River, NJ: Merrill Prentice Hall.

Grossman, S. R., & King, M. J. (1990). Eagles, otters and unicorns: Three species of innovation. *Industry Week*, 239(5), 30-32.

Higgins, L. F. (1996, Jan 3-6). *A comparison of scales for assessing personal creativity in IS*. Paper presented at the Twenty-ninth Hawaii International Conference on Systems Sciences, Hawaii.

Hills, G. E., Lumpkin, G. T., & Singh, R. P. (1997). Opportunity recognition: Perceptions and behaviors of entrepreneurs. *Frontiers of Entrepreneurship Research*, 17, 168-182.

- Hindle, K. (2004). A practical strategy for discovering, evaluating, and exploiting entrepreneurial opportunities: Research-based action guidelines *Journal of Small Business & Entrepreneurship*, 17(4), 267-276.
- Hindle, K., Anderson, R. B., & Gibson, B. (2004). From what we know to how we use it: Five principles for turning entrepreneurship research into practitioner action guidelines *Journal of Small Business & Entrepreneurship*, 17(4), 261-266.
- Hisrich, R. D., Peters, M. D., Shepherd, D. A., & Mombourquette, P. S. (2006). *Entrepreneurship: Canadian Edition*. Toronto: McGraw-Hill Ryerson.
- Industry-Canada. (2002a). Canada's innovation strategy. Retrieved from Industry Canada: <http://www.innovationstrategy.gc.ca>
- Industry-Canada. (2002b). Canada's innovation strategy - Achieving excellence: Investing in people, knowledge and opportunity (Executive Summary) Retrieved from Industry Canada: <http://www.innovationstrategy.gc.ca>
- Isaksen, S. G., & Treffinger, D. J. (1985). *Creative Problem Solving: The Basic Course*. Buffalo NY: Bearly.
- Kaish, S., & Gilad, B. (1991). Characteristics of opportunities search of entrepreneurs versus executives: Sources, interests, general alertness. *Journal of Business Venturing*, 6(1), 45-61.
- Kanter, R. M. (2006). Innovation: The classic traps. *Harvard Business Review*, 84(11), 72-83.
- Kelley, T., & Littman, J. (2001). *The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm*. New York: Doubleday.
- Kelley, T., & Littman, J. (2005). *The Ten Faces of Innovation: IDEO's Strategies for Defeating the Devil's Advocate and Driving Creativity Throughout Your Organization* New York: Doubleday.

- Key Small Business Statistics*. (2007). Retrieved. from Industry Canada  
[http://strategis.ic.gc.ca/epic/site/sbrp-  
 rppe.nsf/vwapj/KSBS\\_Jan2007\\_Eng.pdf/\\$FILE/KSBS\\_Jan2007\\_Eng.pdf](http://strategis.ic.gc.ca/epic/site/sbrp-<br/>
  rppe.nsf/vwapj/KSBS_Jan2007_Eng.pdf/$FILE/KSBS_Jan2007_Eng.pdf).
- Kirton, M. J. (1985). Adaptors, innovators and paradigm consistency. *Psychological Reports*, 57, 487-490.
- Kirton, M. J. (1989). A Theory of Cognitive Style. In M. J. Kirton (Ed.), *Adaptors and Innovators: Styles of Creativity and Problem Solving* (pp. 1-36). New York: Rutledge.
- Kirzner, I. M. (1973). *Competition and Entrepreneurship*. Chicago: University of Chicago Press.
- Kirzner, I. M. (1979). *Perception, Opportunity and Profit: Studies in the Theory of Entrepreneurship*. Chicago: University of Chicago Press.
- Kolb, D. A., Boyatzis, R. E., & Mainemelis, C. (2001). Experiential learning theory: Previous research and new directions. *Perspectives on thinking, learning, and cognitive styles. The educational psychology series*, 227-247.
- Krathwohl, D. R., & Payne, D. A. (1971). Defining and assessing educational objectives. *Educational Measurement*, 2, 17-45.
- Krueger, N. F., & Brazeal, D. V. (1994). Entrepreneurial potential and potential entrepreneurs. *Entrepreneurship: Theory & Practice*, 18(3), 91-104.
- Krueger, N. F., & Dickson, P. R. (1994). How believing in ourselves increases risk taking: perceived self-efficacy and opportunity recognition. *Decision Sciences*, 25(3), 385-400.
- Kuratko, D. F., & Hodgetts, R. M. (2003a). Developing creativity and understanding innovation. In *Entrepreneurship: Theory, Process and Practice* (2nd ed., pp. 137-160). Mason OH: South-Western.



- Kuratko, D. F., & Hodgetts, R. M. (2003b). *Entrepreneurship: Theory, Process and Practice* (2nd ed.). Mason OH: South-Western.
- Kuratko, D. F., & Welsch, H. P. (2003). *Strategic Entrepreneurial Growth* (2nd ed.). Mason OH: South-Western.
- Leach, C. E. (2000). *Entrepreneurial Skills Program (ESP): Foundation course curriculum document*. Halifax, NS: Centre for Entrepreneurship Education and Development.
- Leach, C. E. (2006). Instruction-based action guidelines built on Bloom's revised framework: Setting objectives for entrepreneurship training. *Small Enterprise Research, 14*(2).
- Leach, C. E. (2007a). Instruction-based action guidelines built on bloom's revised framework: Setting objectives for entrepreneurship teaching. *Journal of Small Business and Entrepreneurship, Jan.*
- Lee, J.-H., & Venkataraman, S. (2006). Aspirations, market offerings, and the pursuit of entrepreneurial opportunities. *Journal of Business Venturing, 21*(1), 107-123.
- Lee, S. Y., Florida, R., & Acs, Z. J. (2004). Creativity and entrepreneurship: A regional analysis of new firm formation. *Regional Studies, 38*(8), 879 - 891.
- Leedy, P. D., & Ormrod, J. E. (2005). *Practical Research: Planning and Design* (8th ed.). Saddle River NJ: Merrill Prentice Hall.
- Little, T. A., & Leach, C. E. (2002, May 28-29). *A funny thing happened on the way to the business school*. Paper presented at the ASAC Annual Conference, Winnipeg.
- Long, W., & McMullan, W. E. (1984). Mapping the new venture opportunity identification process. In J. A. Hornaday (Ed.), *Frontiers of Entrepreneurship Research* (pp. 567-590). Wellesley MA: Babson College.

- Lukaweski, R. (2006). Technology and student success in higher education: A research study on faculty perceptions of technology and student success (Vol. 5). Toronto: McGraw-Hill Ryerson.
- Lumpkin, G. T., Hills, G. E., & Schrader, R. C. (2004). Opportunity recognition. In H. P. Welsch (Ed.), *Entrepreneurship: The Way Ahead* (pp. 73-90). London: Routledge.
- Lumpkin., G. T. (2005). The role of organizational learning in the opportunity-recognition process. *Entrepreneurship: Theory and Practice*, 29(4), 451-473.
- MacKinnon, D. W. (1978). *In Search of Human Effectiveness*. Buffalo NY: Creative Education Foundation.
- Maier, N. R. F., & Hoffman, L. R. (1961). Organization and creative problem solving. *Journal of Applied Psychology*, 45(5), 277-280.
- Matlin, M. W. (2002). *Cognition* (5th ed.). Fort Worth TX: Harcourt College Publishers.
- Mauzy, J., Harriman, R., & Arthur, K. A. (2003). *Creativity Inc.: Building an Inventive Organization*. Boston MA: Harvard Business School Press.
- McGraw, K. O. (1978). The detrimental effects of reward on performance: A literature review and a prediction model. In M. R. Lepper & D. Greene (Eds.), *The Hidden Costs of Reward* (pp. 33-60). Hillsdale NJ: Erlbaum.
- McKnight, T. K. (2004). *Will It Fly?* : Financial Times Prentice Hall.
- Mednick, M. T. (1963). Research creativity in psychology graduate students. *Journal of Consulting Psychology*, 27, 265-266.
- Mednick, M. T., Mednick, S. A., & Mednick, E. V. (1964). Incubation of creative performance and specific associative priming. *Journal of Abnormal Psychology*, 69, 84-88.

- Mitchell, R. K. (1995). Enhancing entrepreneurial expertise: Experiential pedagogy and the entrepreneurial expert script. *Simulation & Gaming, 26*(3), 288-306.
- Noller, R. B. (1977). *Scratching the Surface of Creative Problem Solving: A Bird's Eye View of CPS*. Buffalo, NY: DOK.
- Noller, R. B., Heintz, R. E., & Blaeuer, D. A. (1978). *Creative Problem Solving in Math*. Buffalo, NY: DOK.
- Noller, R. B., Parnes, S. J., & Biondi, A. M. (1976). *Creative Actionbook*. New York: Scribners.
- Noller, R. B., & Treffinger, D. J. (1979). *It's a Gas to be Gifted: CPS for the Gifted and Talented*. Buffalo, NY: DOK.
- Orwa, B. (2003, Aug. 13-15). *An examination of factors influencing entrepreneurial opportunity identification process*. Paper presented at the Annual UIC research symposium on marketing and entrepreneurship, Chicago.
- Osborn, A. F. (1953). *Applied Imagination : Principles and Procedures of Creative Problem-Solving*. New York: Scribner and Sons.
- Ozgen, E., & Baron, R. A. (2007). Social sources of information in opportunity recognition: Effects of mentors, industry networks, and professional forums. *Journal of Business Venturing, 22*(2), 174-192.
- Parnes, S. J. (1961). Effects of extended effort in creative problem solving, *Journal of Educational Psychology 52*(3), 113-122.
- Parnes, S. J. (1967). *Creative Behavior Guidebook*. New York: Scribners.
- Parnes, S. J., & Biondi, A. M. (1975). Creative behavior: A delicate balance. *Journal of Creative Behavior, 9*, 149-158.

- Parnes, S. J., Noller, R. B., & Biondi, A. M. (1977). *Guide to Creative Action*. New York: Charles Scribner's Sons.
- Pfeffer, J., & Sutton, R. (1999). *The Knowing Doing Gap: How Smart Companies Turn Knowledge Into Action*. Boston: Harvard Business School Press.
- Proctor, T. (1995). *The Essence of Management Creativity*. London: Prentice Hall.
- Puccio, G. J. (1989). The rationale for the study of creativity: A review and summary. In T. Rickards & S. Moger (Eds.), *Creativity and Innovation Yearbook* (pp. 13-26). Manchester UK: Manchester Business School.
- Puccio, G. J. (1997). Why study creativity. In M. Joyce & S. Isaksen (Eds.), *An Introduction to Creativity* (2nd ed., pp. 43-50). Acton, Mass.: Copley Publishing Group.
- Reynolds, P. D., & White, S. B. (1997). *The Entrepreneurial Process*. Greenwich, CT: Greenwood Publishing Group.
- Rhodes, M. (1961). An analysis of creativity. *Phi Delta Kappan*, 42(November), 305-310.
- Runco, M. A. (2004). CREATIVITY. *Annual Review of Psychology*, 55(1), 657-687.
- Runco, M. A., & Basadur, M. S. (1993). Assessing ideational and evaluative skills and creative styles and attitudes. *Creativity and Innovation Management*, 2, 166-173.
- Runco, M. A., & Chand, I. (1994). Problem finding, evaluative thinking, and creativity. In M. A. Runco (Ed.), *Problem Finding, Problem Solving and Creativity* (pp. 40-76). Norwood NJ: Ablex.
- Sarason, Y., Dean, T., & Dillard, J. F. (2006). Entrepreneurship as the nexus of individual and opportunity: A structuration view. *Journal of Business Venturing*, 21(3), 286-305.

- Sarasvathy, S. D. (2001). Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review*, 26(2), 243-288.
- Sarasvathy, S. D., Dew., N., Velamuri, R., & Venkataraman, S. (2003). Three Views of Entrepreneurial Opportunity. *Handbook of Entrepreneurship Research*, 156. Boston MA; Kluwer Boston Inc.
- Schoonhoven, C. B., & Romanelli, E. (Eds.). (2001). *The Entrepreneurship Dynamic: Origins of Entrepreneurship and the Evolution of industries*. Stanford CA: Stanford University Press.
- Schumpeter, J. A. (1934). *The Theory of Economic Development*. Cambridge, MA: Harvard University Press.
- Schumpeter, J. A. (1936). *The Theory of Economic Development* (2nd ed.). Cambridge, MA: Harvard University Press.
- Schumpeter, J. A. (1942). *Capitalism, Socialism and Democracy*. New York: Harper & Brothers.
- Shane, S. A. (2003). *A General Theory of Entrepreneurship: The Individual-Opportunity Nexus*. Cheltenham, UK: E. Elgar.
- Shane, S. A., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *The Academy of Management Review*, 25(1), 217-227.
- Shepherd, D. A., & DeTienne, D. R. (2005). Prior knowledge, potential financial reward, and opportunity identification. *Entrepreneurship Theory and Practice*, 29(1), 91-112.
- Sigrist, B. (1999). *Entrepreneurial opportunity recognition*. Paper presented at the UIC/AMA symposium at Marketing/Entrepreneurship Interface, Sofia-Antipolis, France.

- Singh, R. P. (2000). *Entrepreneurial Opportunity Recognition Through Social Networks*. New York: Garland Publishing Inc.
- Singh, R. P., Hills, G. E., & Lumpkin, G. T. (1999, Jan 14-17). *New venture ideas and entrepreneurial opportunities: Understanding the process of opportunity recognition*. Paper presented at the USASBE Annual National Conference: Sailing the Entrepreneurial Wave into the 21st Century, San Diego.
- Smith, G. F. (1998). Idea-generation techniques: A formulary of active ingredients. *Journal of Creative Behavior*, 32(2), 107-133.
- Smith, P. L., & Ragan, T. J. (2004). *Instructional Design* (3rd ed.). New York: John Wiley & Sons.
- Stevenson, H. H., & Jarillo, J. C. (1990). A paradigm of entrepreneurship: Entrepreneurial Management. *Strategic Management Journal*, 11, 17-27.
- Suri, J. F. (2005). *Thoughtless Acts? Observations on Intuitive Design*. San Francisco: Chronicle Books.
- Swedburg, R. (Ed.). (2000). *Entrepreneurship the Social Science View*. New York: Oxford University Press.
- Teach, R. D., Schwartz, R. G., & Tarpley, F. A. (1989). The recognition and exploitation of opportunity in the software industry: A study of surviving firms. In R. H. Brockhaus, W. C. Churchill, J. Katz, B. A. Kirchoff, K. H. Vesper & W. Wetzel (Eds.), *Frontiers of Entrepreneurship Research* (pp. 383–397). Wellesley, MA: Babson College.
- Timmons, J. A., & Spinelli, S. (2008). *New Venture Creation: Entrepreneurship for the 21st Century* (8th ed.). New York: McGraw-Hill/Irwin.
- Treffinger, D. J., Isaksen, S. C., & Dorval, K. B. (1994). Creative problem solving: An overview. In M. A. Runco (Ed.), *Problem Finding, Problem Solving and Creativity* (pp. 223-236). Norwood NJ: Ablex.

Valery, N. (1999, February 18th). Industry gets religion. *The Economist*.

Vesper, K. H., & Gartner, W. B. (1997). Measuring progress in entrepreneurship education. *Journal of Business Venturing*, 12(5), 403-421.

Zampetakis, L. A., & Moustakis, V. (2006). Linking creativity with entrepreneurial intentions: A structural approach. *The International Entrepreneurship and Management Journal*, 2(3), 413-428.

Zimmerman, B. J. (1995). Self efficacy and educational development. In A. Bandura (Ed.), *Self-Efficacy in Changing Societies* (pp. 45). Cambridge, UK: Press Syndicate University of Cambridge.