5-2023

Creative Problem Solving Using Visual Thinking

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Creative Problem Solving Using Visual Thinking

by

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An Abstract of a Project

In

Creativity and Change Leadership
Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Master of Science

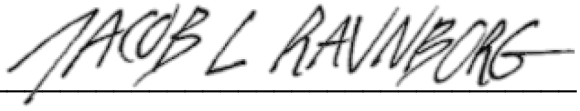
May 2023

Buffalo State University
State University of New York
Department of Creativity and Change Leadership

Creative Problem Solving Using Visual Thinking

This project explores the concept of visual and semantic thinking and how they can be incorporated into Creative Problem Solving sessions. Visual thinking is the ability to conjure mental images as part of the thinking process. This type of thinking is hard-wired into the human brain and can be seen in individual behavior and language. Meanwhile, semantic thinking is using language and grammar to convey meaning. It is a sequential process that depends on cultural and social references. The project argues that both types of thinking are essential and recommends specific guidelines for including visual thinkers in Creative Problem Solving sessions. These guidelines are based on the understanding that all individuals fall on a spectrum, from highly visual to highly semantic thinkers. We can all benefit from including visual thinking in problem-solving sessions.

Key terms:
Visual thinking
Semantic thinking
Creative Problem Solving



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Dates of Approval:

May 1st 2023 _____ _____

Dr. Susan Keller-Mathers
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May 1st 2023 _____ _____

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Dedication & Acknowledgment

I dedicate this project to Willum and Nova, my two loving children, hoping they may read this when they get older. I want to thank the entire TigerDog cohort for the support and good camaraderie. Thanks to the Buffalo State University, State University of New York, Department of Creativity and Change Leadership faculty for helping me get through this project and the educational program.

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SECTION ONE: BACKGROUND TO THE PROJECT

Purpose and Description of Project

Introduction

Homo Sapiens are visual creatures. Not only do we have a sense of vision, but we can also store, recollect and compare images in our minds. We can see images in front of our mind's eye. Our brain can analyze the visual input and draw necessary conclusions: "That is a tiger, run." This is, in essence, what we could call visual thinking. Not only important for the individual but central to developing human civilization, culture, and social construct.

The term visual thinking refers to a broad array of using images in a cogitative process. In this context, visual thinking creates mental images before the mind's eye by processing inputs from the sense of vision. We can all create more or less detailed images in our brains when closing our eyes. The ability to create images in the brain is shared with most animals. Even simple creatures like ants create images to navigate and find their way home (Madsen, 2019).

Humans use visual thinking for organizing, comprehending, or communicating complex data, information, and knowledge. The adage "A picture is worth a thousand words" encapsulates this notion perfectly.

Throughout history, humans have used images to communicate big feelings and emotions, navigate the globe, and map the universe. Visual thinking enables us to create drawings, graphs, or maps. However, more is needed.

Another human trait is our ability to use language. Communicate and obtain knowledge using letters, words, sentences, and grammar. Written or spoken out loud, humans heavily depend on languages. Semantic thinking is the brain's ability to process language (Gowan, 1972). It is a specialized ability that is only available for Homo Sapiens. Like visual thinking, this has helped humans build great civilizations, created the backbone of our culture, and helped form social bonds.

Finally, looking at creativity. The ability to think up new ways to solve complex problems. Humans can combine existing information in new and original ways, creating something novel and useful. Looking at Creative Problem Solving, as described by Osborn (1956) and Puccio et al. (2007), is an example of a creative process.

This project explores two distinct ways of thinking. Visual and semantic thinking when used in a creative context. They are heavily intertwined yet separate ways of thinking. Both run in parallel in our brains without us ever having to choose one over another. For some, one is dominant and, therefore, most likely more trained. For others, a delicate balance is obtained.

Hypophysis

For this project, a working hypophysis can be formulated as follows: How can visual thinking be used in a Creative Problem Solving session? Can the two ways of thinking be bridged by combining knowledge from the research into visual thinking and the newest version of Creative Problem Solving (Miller et al., 2011; Firestien, 2020)?

Context for Research

The context for this research and my motivation for taking on this project was my realization that Creative Problem Solving was widely based on a semantic tradition (Gowan, 1972). Being trained in a relatively more visional thinking tradition gave me insights into the differences and similarities between the two traditions and ways of thinking.

Trained and schooled as a designer, I experienced how my creativity flourished in silence when sitting at the drawing table or the computer for hours. Not only did I not need to speak a word, but I also did not need to think a word.

This research project aims to create the foundation for using visual thinking and visual artifacts such as sketches, models, or other physical objects in a predominantly semantic creativity process like CPS.

Methodology

This project compares and analyzes the newest version of Creative Problem Solving (Miller et al., 2011; Firestien, 2020) with contemporary research into visual

thinking and thinking artifacts. The research is believed to fit within the timeframe, the scope of the Department of Creativity and Change Leadership criteria for master's projects, and the resources available. All data will be in the form of articles and books. No quantitative data will be collected or analyzed, and no qualitative interview will be conducted. All citations of named people will be from public sources. To the extent that new materials in the form of books will be needed, funds for the accruement is available.

SECTION TWO: PERTINENT LITERATURE AND RESOURCES

The project focuses on the fields of visual thinking and creativity resources. A broad selection of seminal and contemporary literature forms the basis for this project. In addition, some supporting materials are included.

Seminal Literature

Rhodes, M. (1961). An analysis of creativity. *Phi Delta Kappan, 42*(7),305–310.

This is a seminal article and a foundation for understanding the general understanding of creativity. This article critically argues for a more comprehensive understanding of a purely semantic approach to creativity.

Arnheim, R. (1969). *Visual thinking*. University of California Press.

This seminal book lays the foundation for understanding visual thinking and the relationship to cognition and perception.

A selection of seminal texts summarizes the time's knowledge and thinking in relation to creative thinking.

Osborn A. F. (1953). *Applied imagination: Principles and procedures of creative problem-solving* (3rd ed.). Charles Scribner’s Sons.

This book created the foundation for what we know as Creative Problem Solving by dividing the creative process into divergent and convergent phases.

Contemporary Literature

Grandin, T. (2022). *Visual thinking: The hidden gifts of people who think in pictures. patterns and abstractions*. Penguin Random House.

A life story of living as a neuro-diverse, highly visual thinker and an academic review of visual thinking research. Covering the essentials of understanding the field and how to avoid the most common pitfalls. Grandin uses her experience as a designer as a common thread through the research into visual thinking.

Paul, A. M. (2021). *The extended mind: The power of thinking outside the brain.* Mariner Books.

This journalistic reporting from different studies of the relationship between the body and the mind reveals a surprising connection between the two then we think and create.

Puccio, G. J., Mance, M & Murdock, M. C. (2211). *Creative leadership: Skills that drive change* (2nd ed.). Sage.

A presentation of the newest thinking within Creative Problem Solving in relationship to leadership.

Tversky, B. (2019). *Mind in motion: How action shapes thought.* Basic Books.

In this book, Tversky summarizes decades of research into the field of thinking and using the body to think. She works with designers and tries to understand how they think while creating.

Supporting Literature

Barron, F. (1955). The disposition towards originality*. Journal of Abnormal and Social Psychology,* 51,478–485.

De Bono, E. (2007). *How to have creative ideas: 62 Exercises to develop the mind.* Vermilion.

Firestien, R. (2020). *Create in a flash: A leader's recipe for breakthrough innovation*. Green Tractor Publishing.

Gowan, J. C. (1972). *The development of the creative individual*. Robert Knapp.

Guilford, J. P. (1950). Creativity*. American Psychologist, 5*(9), 444–454.

Isaksen, S. G., Dorval, K. B., & Treffinger, D. J. (2000). *Creative approaches to problem-solving: A framework for change* (2nd ed.). Creative Problem-Solving Group.

Osborn A. F. (1956). *Applied imagination: Principles and* procedures *of* creative problem-*solving* (3rd ed.). Charles Scribner's Sons.

Runco M. A., & Jaeger G. J. (2012). The standard definition of creativity. *Creativity Research Journal, 24*,92-96.

Stein, M. I. (1953). Creativity and culture*. Journal of Psychology*, *36*, 311–322.

SECTION THREE: PROCESS PLAN

Plan to Achieve Goals and Outcomes

A broader understanding of creativity can be achieved by bridging the gap between Creative Problem Solving (CPS) and visual thinking processes. This project's final product will be a list of guidelines for using visual thinking in a CPS session.

If the goal of this research project is successful, it will challenge the perception of CPS as seen as a purely semantic and verbal creative process. This will create the foundation for further research into creativity with visual thinking and how it can be integrated into a process like CPS. This will influence how CPS is taught and used in the educational and commercial sectors.

Project Timeline

The timeline outlined below in Table 1 gives an overview of the development plan and milestones for the Master's Project.

Table 1

Master's Project Timeline

Activity	Week	Date	Hours	Deadlines/zoom calls
Work on concept paper proposal Finding literature	1	Jan.30 – Feb. 5	20	Class Zoom call
Work on concept paper proposal Listing and reviewing literature	2	Feb. 6 - 12	20	Class Zoom call
Finalize concept paper Build overview of content	3	Feb. 13 - 19	10	Deadline for concept paper
Sections 1-3 Seminal article research Sharping research focus	4	Feb. 20 - 26	20	Class Zoom call
Sections 1-3 Visual thinking article research	5	Feb. 27 - Mar. 5	20	
Sections 1-3 Sharping research focus	6	Mar. 5 - 12	20	
Sections 1-3 edit Sharping research focus on visual thinking and semantic creativity	7	Mar. 13 - 19	30	Class Zoom call

Complete Sections 1-3 Final edit, sharpening focus	8	Mar. 20 - 26	15	Deadline for Sections 1-3
Sections 4-6, Finalize research phase	9	Mar. 27 - Apr. 2	30	
Sections 4-6, Build main body of the project	10	Apr.3 - 9	20	
Sections 4-6, Create outcome	11	Apr.10 - 16	20	Class Zoom call
Submit sections 4-6 Pull the project together and edit	12	Apr. 17 - 23	15	Deadline for Sections 4-6
Pull the project together and edit	14	Apr. 24 - 30	25	
Submit final project	15	May 1 - 7	15	Project deadline
Make final presentation	16	May 8 - 14	15	Submission Digital Commons Final presentation

Evaluation Plan

This research project should be evaluated based on that the project demonstrates the following:

- A broad understanding of the seminal research and writings of creativity research related to the semantic tradition and visual thinking
- An understanding of the CPS process and the critical mechanisms it is based on
- A broad understanding of visual thinking, visual creation, and thinking artifacts and a novel and original approach to bridging it with CPS
- An ability to create a foundation for the development of a new CPS model

SECTION FOUR: OUTCOME

All individuals fall on a spectrum, from highly visual to highly semantic thinkers (Grandin, 2022). So even if there are no self-proclaimed visual thinkers, we can all benefit from this. The outcome of this project is a list of guidelines to be considered when conducting Creative Problem Solving sessions to include visual thinking.

In the following, a description of the two ways of thinking, visual and semantic, will create the foundation for comparative analysis.

The guidelines follow a short introduction to Creative Problem Solving and the thinking behind the process.

Visual Thinking

The term visual thinking covers several theories and a broad field of research (i.e., Grandin, 2022; Paul, 2021). The broad term visual thinking covers terms like visual-spatial intelligence, mind in motion, and neuro-diversity with a preference for visual learning. It has been defined from multiple historical, evolutionary, developmental, intelligence, and behavioral perspectives. All contribute to the foundation of understanding visual thinkers. Even in our language, we can see the use of visual thinking.

Historical

Visual thinking has traditionally been ascribed to painters, sculptures, and other visual artists (Galenson, 2006; Grandin, 2022). Being a visual thinker is often mistakenly confused with using the eye's vision, but it is broader than that. Its broadest definition is

simply that visual thinkers conjure up images in the front of the mind's eye as part of the thinking process (Grandin, 2022).

Evolutionary

A commonality for several lines of research into visual thinking is focusing on the ability to navigate in space (Tversky, 2019; Gardner, 1993; Grandin, 2022)—rats placed in a maze created images of the maze in their brains (Paul, 2021). Particular neurons are reserved for this purpose. By linking the images to a mental model of the maze, the rat can navigate and remember places of importance, where food is available, etc. This suggests that the ability to create mental images is not reserved Homo Sapiens and that, seen from an evolutionary perspective, this fare succeeds development of semantic thinking.

Developmental

A theory Grandin (2022) describes is that all individuals are born primarily visual thinkers, and we learn to use semantic thinking during our upbringing. At around twelve, we have fully developed our semantic thinking, and the visual play a secondary role for most neurotypical individuals. This could help explain why so many children stop drawing at that exact age (Grandin, 2022). Some neurodiverse individuals lack full development of semantic thinking and keep a high visual thinking style (Grandin, 2022). This helps explain why some individuals are high visual thinkers but are not the full explanation.

Intelligence

In seeking a unified Theory of Multiple Intelligence, Howard Gardner describes spatial intelligence (Gardner,1983) as the ability to build a mental model of the surrounding world and use this model to navigate in real space. It is a sensibility for colors, lines, shapes, and their relationship in space. This is not only a matter of storing and retrieving images to navigate; this is the ability to analyze and understand the relationship between image elements.

Behavioral

According to Tversky (2019), an essential part of visual thinking is using thinking artifacts. A thinking artifact is any physical object created or bodily movement used in the thinking process. When children use their fingers to count, a designer sketches ideas on a pad, or we gesture to explain the route to the nearest coffee shop, thinking artifacts are used. It is easy to confuse a designer's sketch with a creative output or product. Here it is essential to understand that the sketch is simply a byproduct of the thinking process and not a finalized creative product. Gestures are challenging to capture on paper and are more open for interpretation. Even a sketch on paper is open for interpretation.

Language

Visual thinking is used in language too. Not only when people try to describe actual physical space but also as a metaphor helping explain highly complex information (Tversky, 2019). Words like beside, above, around, over, and under are

used for situations that do not describe a physical relationship. “This is beside the point,” “Is it above you to do that?” or “Get over it.” Space and relative location are engrained in our language.

Summary

Visual thinking is a sensibility to shapes, lines, and colors: body language, art paintings on a wall, or navigation through any physical space. It would be reasonable to assume that visual thinking is an integrated part of human thinking and is hard-wired into our brains. All individuals are more or less visual thinkers. It is not something we can turn on and off. It can be seen in individual behavior and language. For some people, this is the predominant way of thinking and is essential for their communication and perception of the world.

Semantic Thinking

Semantic thinking is a broad research field covering many disciplines. It covers using syntactic structures, linguistic theory, and grammar (Chomsky, 1957). One of the most distinctive differences between Homo Sapiens and other species is the use of language, specifically grammar. This, combined with the belief that creativity is also a unique human trade (Park et al., 2016), could lead to the belief that the two are linked.

One of the brain's latest developments is using language and thinking semantically. Other species use sound to signal to each other. Different sound has different meanings and tricker different reactions. This is not considered language but simple signaling.

A common mistake is to misinterpreting our inner dialog or self-talk as thinking. This is what we ‘hear’ inside our heads then we think. Many other processes in our brain constitute thinking (Tversky, 2019).

With a few exceptions, reading is conducted in one and only one direction (Kazandjian and Chokron, 2008). Semantic thinking is sequential with a start, middle, and end. It is building words with letters, sentences with words, and paragraphs with sentences. All are guided by rules of spelling and grammar. Not to say that language is deterministic; it constantly evolves and morphs into a new construct. There are many ways to say the same thing.

Summary

Semantic thinking is linear and sequential in nature. It depends on social and cultural references and vocabulary capacity and is limited by language barriers. It is easy to use, and most literate people are trained thoroughly. Words only require a few tools besides pen and paper and do not leave a mess on the conference table. Most adults are trained in using words, and words are used worldwide in different variations in the form of languages.

Comparative Analysis of Visual and Semantic Thinking

An analysis of the similarities, differences, and potential synergies is needed to build the foundation for bridging semantic and visual thinking.

There are apparent similarities between the two kinds of thinking. They are both rational cognitive processes. In a neurotypical brain, the two kinds of thinking work parallel and support each other (Grandin, 2022). All individuals fall on a spectrum within the visual/semantic spectrum. This supports that all individuals can adapt to working primarily with one of two kinds of thinking for a shorter or longer period. On the other hand, all work or processes would benefit from including both kinds of thinking (Grandin, 2022).

From an evolutionary perspective, visual thinking is a precursor to semantic thinking locating the process in an earlier-developed part of the brain. We share visual thinking with most animals. We are most likely born natural visual thinkers and learn semantic thinking growing up (Grandin, 2022). This gives visual thinking a head start, and in working with kids, it should be considered.

Using a diverse input of thinking styles with generating and evaluating ideas will strengthen the outcome but prolong the creative process.

Creativity

Creativity has been defined in many ways, and several models have been suggested. From a historical perspective, Rhodes (1961) seminal research divides creativity into four areas: Product, Person, Process, and Press. Press representing the surrounding environment. A creative person creates a creative product using a creative process in a creative press (environment). A creative product/output will be defined by, *The Standard Definition of Creativity* by Runco and Jaeger (2012). They examined many definitions of creativity and how it developed over time. They conclude that originality and usefulness are central to understanding creativity. Both the historical works of Barron (1955) and Stein (1953) are central to the development of this definition.

In the wake of the growing scientific interest in creativity and, more specifically, the creative process over the last century, Creative Problem Solving (CPS) was introduced by Alex Osborn in his seminal book *Applied Imagination* (Osborn, 1953). According to Gowen (1972), this represents a cognitive, rational, and semantic approach to creativity.

Over the following years, CPS was developed by, among others, Parnes et al. (1977), Isaksen (1985), Isaksen et al. (2000), Puccio et al. (2007), and Miller et al. (2011), and development continues to this day.

Creative Problem Solving

Creative Problem Solving is a step-by-step creative process using divergent and convergent thinking (Miller et al., 2011). Each of the four steps in CPS has a divergent phase for exploring and a convergent phase for evaluation to create a creative product.

In CPS, clear digestion between roles in the process is made. Firstly, a client with a problem is identified. Secondly, a process facilitator is appointed, and a resource group to develop the ideas is selected. Each role is clearly defined and assigned tasks (Miller et al., 2011). In Creative Problem Solving, the problem is clarified, ideation is conducted, the idea is developed, and finally, the implementation is done.

The process is heavily based on a semantic foundation of questions designed to open up for idea generation and help evaluate ideas. Various tools are applied throughout the process, as described by Miller et al. (2011), primarily semantic and verbal in their nature.

Creative Problem Solving has changed significantly since its conception in the second third of the twentieth century (Osborn, 1953). Over time the steps have been consolidated, refined, and merged. The language of the instructions has changed with the surrounding society. Parallel to the development of CPS, many new complementary processes have been developed, and they, too, have evolved (VanPatter & Pastor, 2016).

Guide for Creative Problem Solving Using Visual Thinking

The following guide can be used in Creative Problem Solving to incorporate visual thinking into the creative process. The recommendations are based on broad semantic and visual thinking knowledge. Any client, facilitator, or resource group member will benefit from this.

The Use and Handling of Notes With Ideas

A central part of modern CPS is using and handling notes with ideas. In an ideation session, the resource group will generate ideas based on a prompt for the facilitator. Ideas are written down on notes that are then read aloud and placed on a board or the wall for everyone to see. During a session, notes will be reorganized and grouped for evaluation.

In the following, some recommendations will be given on handling this situation together with highly visual thinkers.

Space matters

Working with Post-it Notes (notes) is a blessing for the facilitator, but it can be problematic for the visual thinker. For visual thinkers, space between objects matters. Space indicates relationship. Moving a note with an idea changes the meaning and relationship to other ideas for the visual thinker. Some examples could be as follows: Having ”Idea #” and “idea &” close together indicates a close relationship, a dependency, or a sequence (See Figure 1 below).

Figure 1

Notes close together

By moving the two notes further apart, the relationship changes, the dependency diminishes, and the sequence is harder to see. (See Figure 2 below).

Figure 2

Notes further apart

This will change the perception of the ideas for the visual thinker. There is no fixed conclusion on the effect, just that there will be an effect.

How a note is placed on a board will also impact the visual thinker. If not done precisely, any deviation will influence the ideation of more ideas or evaluation of the ideas. (See Figure 3 below).

Figure 3

Placing of notes

The visual thinker must create a whole new image or map of the situation before engaging again. This tremendous effort takes energy and focuses away from the ideation or evaluation process.

Color, Shape, and Writing

Different colors of notes will signal different levels of importance to the visual thinker. Even the size and shape of the note will influence the evaluation of the idea on the note. “Idea %” will be more important here than “Idea €.” (See Figure 4 below).

Figure 4

Size of notes

The recommendation would be to use only one color, shape, and note size. This will help neutralize the visual thinkers' preferences and make it easier to evaluate the core of the idea on the merit of the idea, not the notes' physical appearance.

A client with a strong preference for visual thinking would need to have some visual way of framing and clarifying the problem. In the initial meeting between the facilitator and the client, some visual means of communication must be presented.

The Use of Visual Language

Our spoken and written language has plenty of words describing space (Tversky, 2019) and has many examples of using spatial language to indicate relationship, time, and importance. The recommendation would be to use worlds that led the visual thinker to operate in a metaphysical space.

Modern Creative Problem Solving has many fixed phrases (Miller et al., 2011). When turning problems into questions such as phrases like “How might we?” is strictly semantic in its wording. The visual thinker would feel more at home using spatial words and language. Phrases like: “ How might we see this….?” or “Looking at this, we might…?” bring a spatial element to the ideation.

Then building on ideas, space can be used like this: “*What idea do you see in between “idea #” and “Idea &”?”* Placing the two notes with some space in between. (See Figure 5 below)

Figure 5

Ideas in between notes

The visual thinker would generate ideas by playing with the distance, close or far, and the note's direction, up or down.

Thinking Artifacts

The use of thinking artifacts plays an essential part in visual thinking. To give thoughts and ideas a physical form is essential for the visual thinker. For the predominant semantic thinker, a simple note will do. This is where it gets potentially

more difficult. A mix of written and sketched ideas will not make a good ideation process and an evaluation almost impossible. Moreover, ideas in clay or metal mixed with notes of ideas will create chaos. So what to do?

A recommendation to train all participants in simple sketch drawing could be a way forward. This will lead to some discomfort among predominantly semantic thinkers. The notion that “I cannot draw” is not unheard of. This will take some convincing and training to get over. Like training in the CPS process, it takes time and effort to learn this new skill. It will not even out the playing field totally, but it will create some platform for the use of visual thinking artifacts.

An alternative is to bring in a graphical recorder/facilitator to help bridge the gap. This will comfort the visual thinker that someone is making a graphical recording of thoughts and ideas.

Gesticulation

Gesticulation is an integrated part of visual thinking (Tversky, 2019) and gives your speech physical support. Not only does it help you formulate a thought or idea, but it also strengthens your communication with the receiving partner. As a facilitator for a CPS session, the use of clear gesticulation will help guide the process for the visual thinker. Ensure everyone in the session can freely use their hands and arms. Our brains have specialized mirror neurons that will help spread the use of gesticulation to all group members.

SECTION FIVE: KEY LEARNING

The Learnings of the Project

The key learnings from this project fall into several sections. They include mapping and understanding the two kinds of thinking, analyzing the Creative Problem Solving process, and developing recommendations for including visual thinkers. Learning about project execution has been central to this project, and finally, reflecting on the past and projecting for the future.

Two Kinds of Thinking

Understanding strengths and weaknesses and bridging the different thinking styles has been a creative challenge. To think about thinking and writing about thinking has been hard. It has not been easy to balance between going deep into each kind of thinking and keeping the big picture clear. Therefore, only the tip of the iceberg has been presented here. It will take many years of research to unfold its true potential. Several other research fields can and should be included. Neurophysical aspects of visual and semantic thinking would have been a solid supplement to the descriptions of the two ways of thinking.

Creative Problem Solving Process

Any human-made process will be influenced by its developers, the social context, and the goals it focuses on solving. Any process, creative or not, will have its strengths and weaknesses, and Creative Problem Solving is no exception. Many reasons for CPS being a predominantly semantic process are rooted in the era and academic climate

when it was developed (VanPatter & Pastor, 2016). Through the research process, it became clear that an extensive and deep mapping of CPS would fall outside the project's scope.

Developing Recommendations

This endeavor moved the project onto a new meta-level. Now hands-on recommendations need to be developed. Time and resources did not allow prototyping, testing, and learning loops to be conducted. Relying on more than 20 years of facilitation experience and the new knowledge obtained, this was a fun but challenging part of the project.

Project Execution

Using primary semantic media to describe and unfold visual thinking has been a fun exercise. More freely interpreting the academic constraints on a project like this takes more courage than I had at the time. A more visual approach would be used if the project had to be done again.

Reflections

Seeing things in a new light is humbling. All the mistakes and misinterpretations over the years. All the misreading of people's frustrations and lack of engagement due to a lack of inclusion of visual thinkers. This project has made me a more robust facilitator of the creative process and strengthened my leadership capabilities.

The Projection for the Future

This project points forward to a future of inclusion and more diversity in Creative Problem Solving tools, facilitation of processes, and leadership of people. The research field into using neurodiverse thinkers in the creative process is wide open and goes way beyond the recommendations in the project.

SECTION SIX: CONCLUSION

This project has shown that adapting and adjusting the Creative Problem Solving process can create a bridge from semantic to visual thinking. By better understanding visual thinkers, they can be included, and their contributions can be valued on their own merits. The foundation of CPS is strong enough to incorporate neurodiverse thinkers from a broad spectrum of thinking styles. Visual thinkers can be incorporated and valued across the entire CPS process. Knowledge of visual thinking in general and visual thinking profiles is essential for understanding the differences and challenges of using visual thinkers in CPS.

The next step would be to prototype, test, and validate the project's recommendations in real-life CPS sessions. This includes building new and adjusting existing tools and instructions for clients, the facilitator, and resource group members. Hopefully, this paper will inspire more research into using visual thinkers in semantic creative processes.

An old joke goes: “How many psychologists does it take to change a light bulb? One psychologist is enough, but the lightbulb should also desire to change” The question I put forward is: How can input from other academic fields help include non-neurotypical thinkers in the Creative Problem Solving process?

References

Arnheim, R. (1969). *Visual thinking*. University of California Press.

Barron, F. (1955). The disposition towards originality*. Journal of Abnormal and Social Psychology, 51*,478–485.

Firestien, R. L. (2020). *Create in a flash: A leader's recipe for breakthrough innovation*. Green Tractor Publishing

Chomsky, N. (1957). *Syntactic structures.* Walter de Gruyter GmbH & Co.

Galenson, D. W. (2006). *Old masters and young geniuses: The two life cycles of artistic creativity*. Princeton University Press.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences.* William Heinemann Ltd.

Gardner, H. (1993). *Multiple intelligences: New horizons*. Basic Books

Grandin, T. (2022). *Visual thinking: The hidden gifts of people who think in pictures, patterns and abstractions*. Rider.

Guilford, J. P. (1950). Creativity. *American Psychologist, 5*(9), 444–454.

Guilford, J.P. (1967). *The nature of human intelligence*. McGraw-Hill.

Guilford, J.P. (1977). *Way beyond the IQ: Guide to improving intelligence and creativity*. Creative Education Foundation.

Gowan, J. C. (1972). *The development of the creative individual*. Robert Knapp.

Isaksen, S. G. & Treffinger, D. J. (1985). *Creative problem solving: The basic course*, Bearly Limited.

Isaksen, S. G., Dorval, K. B., & Treffinger, D. J. (2000). *Creative approaches to problem-solving: A framework for change* (2nd ed.). Creative Problem-Solving Group.

Kazandjian, S., Chokron, S. (2008).Paying attention to reading direction. Nat Rev Neurosci 9, 965. https://doi.org/10.1038/nrn2456-c1

Madsen, P. L. (2019) *Dr. Zukaroffs testamente version 2.0: En bog om menneskehjernen*, Gyldendal.

Miller, B., Vehar J., Firestien, R., Thurber, S. & Nielsen, D. (2011). *Creativity unbound: An introduction to creative process*. FourSight

Osborn, A. F. (1953)*. Applied imagination: Principles and procedures of creative problem-solving* (3rd ed.). Charles Scribner's Sons.

Parnes, S. J., & Harding, H. F. (1962). *A source book for creative thinking*. Charles Scribner's Sons.

Parnes, J. S., Noller, R. B. & Biondi, A. M. (1977). *Guide to creative action*. Charles Scribner's Sons.

Paul, A. M. (2021). *The Extended Mind: The Power of Thinking Outside the Brain*. Mariner Books

Park, S-H, Kim, K. K., Hahm J. (2016). Neuro-scientific studies of creativity, *Dement Neurocogn Disord 15*(4):110-114

Parnes, S., J. & Noller, R., B. (1973). *Toward supersanity: Channeled freedom*. D.O.K. Publishers.

Puccio G., Murdock M. & Mance M. (2007). *Creative leadership: Skills that drive change*. Sage Publications.

Rhodes, M. (1961). An analysis of creativity. *The Phi Delta Kappan, 42*(7), 305–310.

Runco, M. A. & Jaeger, G. J. (2012). The standard definition of creativity. *Creativity Research Journal*, *24*(1), 92-96

Stein, M. I. (1953). Creativity and culture*. Journal of Psychology*. 311–322.

Tversky, B. (2019). *Mind in motion - How action shapes thought.* Basic Books.

VanPatter, GK. Pastor, E. (2016). *Innovation methods mapping: De-mystifying 80+ years of innovation process design*. CreateSpace Independent Publishing Platform

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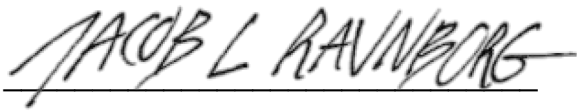

Name

May 1st 2023

Date