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Integrating Artificial Intelligence into Creativity Education: Developing a Creative Problem-Solving Course for Higher Education

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Integrating Artificial Intelligence into Creativity Education: Developing a Creative Problem-Solving Course for Higher Education

by

Selma Yalazi-Dawani

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 2, 2023

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

ABSTRACT OF PROJECT

Integrating Artificial Intelligence into Creativity Education:

Developing a Creative Problem-Solving Course for Higher Education

This project aims to develop an introductory college course that integrates Artificial Intelligence (AI) to enhance the Creative Problem Solving (CPS) process. Drawing on best practices for teaching CPS and the latest research of AI, the project outcomes are prototypes of a Master Course Development Document, Student Syllabus, and Lesson Plan with accompanying PowerPoint slides. The course will equip students with the knowledge and skills to apply AI techniques to the CPS process. This project aims to begin to bridge the gap between AI and CPS education, preparing students for the demands of the modern workforce while fostering interdisciplinary thinking.

Keywords: Creative Problem Solving, Creativity, Artificial Intelligence, Generative AI, ChatGPT, Higher Education, Instructional Design, Future of Education, Future of Work

Your Signature

May 2, 2023

Date

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Associate Professor

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I dedicate this master's project to the part within each of us

that dares to believe that anything is possible.

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SECTION ONE: BACKGROUND TO THE PROJECT

Education is to prepare students for the world they will live in by engaging them in learning that is helpful and appropriate to them. However, the current education system is outdated and still based on the principles of preparing students for the industrial age. We instead have entered the Fourth Industrial Revolution, which is marked by the blurring of physical and virtual worlds (Schwab, 2018) and rapid advancements in technology. Artificial Intelligence (AI) is the latest disruptor, changing the way we work, learn, and communicate. OpenAI CEO, Sam Altman, has said that "education is going to have to change" (ABC News, 2023) to keep up with the dizzying pace. Moore's Law states that technology doubles in capability and power every two years. Since the launch of ChatGPT3 (an AI model that is a third-generation Generative Pre-trained Transformer) to the public on November 30th, 2022, AI capabilities have surpassed Moore's Law. Three months after the public launch, we have an improved version called ChatGPT4 (an AI model that is a Generative Pre-trained Transformer 4). It is more powerful than the former in reasoning, allows for longer entries, and now can interpret not only text but images and video (GPT-4, 2023). We are at a crossroads in the development of our society, and it is by far more important than ever to advocate for and introduce creativity education into our schools.

Creativity education is a gateway to learning and gaining other competencies (Ahmadi & Besançon, 2017) and it's essential for preparing students for the Fourth Industrial Revolution (Naidoo, 2021). By educating students not only in gaining knowledge but in recognizing their strengths and cultivating their creativity skills, we can help them thrive in uncertain conditions. Eminent creators rarely mention school as a source of inspiration, but they are known to remember individual teachers that were responsible for awakening, sustaining, and directing

their interest by first noticing the student, caring about their strengths, and offering individualized challenges based on their interests (Csikszentmihalyi, 2013). A teacher must help develop student interests and awaken the urge to dive deep into their selected domain knowledge. When a student feels competent their perceptions of self-efficacy, ability, academic competence, and control are predictors of engagement and achievement (Skinner & Pitzer, 2012). As educators, we must equip students with creative problem-solving skills so that they can handle the world's problems while feeling empowered to do so.

Creativity education is so much more than just learning a collection of steps, processes, tools, and cognitive and affective skills. It's a framework for life that allows a person to discover who they are and unleash their full potential. We are not just teaching creative problem-solving; We are reminding students who they were before they lost themselves in the classroom of standardized, cookie-cutter industrial age learning.

Project Purpose

During the class CRS 635 Creativity and Change Leadership we identified our mission and goals and explained what we wanted to do to take our work forward. I typed "empower others to be their authentic selves and reach their potential through creativity interventions, tools, and strategies." A few semesters later, I had the opportunity to teach an introductory college course in Creative Problem Solving (CPS) which allowed me to put my personal strategic vision into practice. The beautiful thing about teaching is that not only do you get to inspire and encourage others, but you also get the bonus of confronting and grappling with the intricacies of a subject, which prompts deep reflection on how to present information in a clear and meaningful way. Wrestling with the challenge of effective teaching granted me a newfound perspective on various topics, unearthing insights that would have otherwise remained obscure. Teaching not

only allowed me to inspire my students, but my students also inspired me. While I was living in inspired bliss, what I thought I had covered was disrupted by Generative Artificial Intelligence (GAI). I only had one more week of teaching so I couldn't incorporate this amazing tool just yet, but I saw an incredible opportunity to take my course to the next level, infusing it with cutting-edge technology and giving my students an edge on leveling themselves up in more ways than one. I needed to learn more about the capabilities of GAI and how it can help augment creative problem-solving.

As an instructional designer, I have always sought to make my learning materials relevant and useful. Creative Problem Solving is an essential life skill (Puccio et al., 2012) and the Education 4.0 Framework urges us to consider this along with other pertinent skills that will support our students to flourish in their environment (Naidoo, 2021). I found the introduction of this technology fascinating and I couldn't help but see the opportunities and possibilities AI coupled with creative thinking and creative problem-solving can open to students. According to Puccio et al. (2012), unleashing the creative potential of students should be the top priority of educators. By inspiring and guiding students towards the highest level of thinking, which is creation, we can equip them with the skills and tools to shape their futures and make a lasting impact in the world. As educators, it is our responsibility to nurture and foster creativity in our students and to give them the tools they need to thrive in a rapidly changing world.

For my master's project, I am preparing the foundational work to properly iterate my course, CPS 101 Introduction to Creative Problem Solving, so that I equip my students with tools and processes to navigate change in our fast-paced world - that means reconsidering how I teach creativity and creative problem-solving.

Key Data

The world is changing fast. AI is being used by organizations for a variety of use cases. We must also learn how we can incorporate that in our teaching as well as teach students how to use it to augment their capabilities.

Harnessing Technology: Artificial Intelligence

Generative Artificial Intelligence is a type of AI that can generate new and original content in the forms of text, images, audio, and video. At the first National Bureau of Economic Research conference called "Economics of Artificial Intelligence" in 2017, economists Iain Cockburn, Rebecca Henderson, and Scott Stern highlighted that AI "has the potential to change the innovation process itself," disrupting various fields but also revolutionizing the way we create and innovate (Agrawal et al., 2022).

AI has been used to personalize content on websites and apps, but GAI allowed us to get a chance to play with creative possibilities. GAI is changing every day with iterations and more powerful features being added at an unprecedented rate. There was DALL-E which allowed users to input text and the output was an image. Then OpenAI launched ChatGPT3 causing a massive reaction of awe, wonder, and curiosity allowing them to reach one hundred million active users in two months (Garfinkle, 2023). It took the telephone seventy-five years, the internet about eight years, four years for Facebook, and two years for Spotify to reach one hundred million users (Gould, 2015). The pace of change is dizzying, and what is even more dizzying is that after the launch of ChatGPT3, Microsoft launched their BING chat which has real-time access to the internet therefore improving search, then OpenAI launched GPT4 on March 14, 2023, which included improvements such as the ability to handle images as well as text, generate computer code for a website from a sketch (Kelly, 2023).

This rapid rate of advancement in AI technology exemplifies the nature of our volatile, uncertain, complex, and ambiguous world (Abidi & Joshi, 2018). So, it is natural to wonder: are we in the loom of a creativity crisis? Will AI be as creative as a human? How can we leverage AI to improve our creativity and creative problem-solving skills? These are important questions to consider as we grapple with the potential consequences of this powerful new technology. And this is even more important for me as an educator who is preparing students to embody creativity and creative problem-solving while working in an AI-driven world. It is clear to me that we must learn to adapt our problem-solving strategies and creative process to incorporate this disruptive technology. We need to learn how to effectively collaborate with AI to potentially unlock new levels of human creativity and innovation.

Integrating AI & Creativity Education

To prepare students for the world they will face, rather than our own, we need to learn about their world and what skills they need to succeed. Various resources have highlighted the importance of creative thinking, critical thinking, problem-solving, and communication skills, which are the main objectives of the 21st-century learning model. These 21st-century skills are known as the 4 C's - collaboration, creativity, critical thinking, and communication (Naidoo, 2021). Students must focus on building skills that are not easily replicated by AI. This means they should develop digital fluency, cultivate resilience and adaptability to navigate a dynamic environment (McNeilly, 2023).

Project Description

My master's project involves iterating my course by incorporating generative AI into the creative problem-solving process. By synthesizing the latest research on GAI and its potential to aid students' knowledge acquisition and application of CPS, I will incorporate ways to help

students use AI tools to augment their thinking and creation. This project is just the first step in re-creating my course. The final deliverable will be a Course Master Design Document and a Student Syllabus. Beyond the scope of this project will include materials I will develop that equip students with the skills they need to thrive in today's landscape, teaching them how to apply CPS principles to real-world problems and augment their creative capacities using GAI. This project represents a critical step in revolutionizing creative problem-solving education and empowering students to reach their full potential.

It is incredibly important to me to create a course that will leave students with a higher sense of creative self-efficacy, creative confidence, and knowledge of the creative problem-solving process so that they can apply it to their personal and professional lives. I want to design activities that will incorporate artificial intelligence so that students use technology that they will use upon graduating. It might not be the same technology due to the quick advances in technology, but it will allow them to enter the mindset of playing, optimize their learning, unlearning, relearning, and most importantly dealing with change. I will not know if I am successful in these big goals as they are beyond the scope of this project, but I thought that they were worth noting. We all need a big hairy goal and mine has always been to help people see the gifts inside themselves.

Personal Goals

Personal goals play a crucial role in fueling professional goals and especially in the case of this master's project because they provide the fuel to keep you going. I hope to achieve the following personal goals:

1. To uncover personal insights and a deeper understanding of how generative AI can enhance my personal creativity through exploring and examining its use in the creative problem-solving process. These insights will inform my course design.

2. Increase my confidence in using various generative AI tools for creativity and creative problem-solving.

Project Goals

My goal is to integrate generative AI into my creative problem-solving course to enhance students' learning and creativity.

For my master's project, I will:

1. Review the literature on how to support students' knowledge and application of CPS.
2. Develop a comprehensive plan (Course Master Design Document) for teaching CPS with GAI, including a Student Syllabus and a list of instructional materials.
3. Redesign my course based on the plan and the best practices from the literature (beyond the scope of this project).
4. Develop course materials (beyond the scope of this project).

This project will help me create an innovative course that prepares students for the real world by teaching them how to use GAI as a tool for solving problems and creating.

Rationale for Selection

In the past, there were debates on the use of calculators and computers in the classroom, and now we find ourselves at a similar crossroads with AI (ABC News, 2023). It would be a missed opportunity not to explore the intersection of creative problem-solving and AI. I have selected this project because I believe in preparing 21st-century learners with the tools to navigate an ambiguous, fast-changing world. Creative problem-solving is a fundamental skill that students must learn, and AI can augment their learning by teaching them how to approach problems creatively and innovatively.

Four reasons why this project is significant are:

It is Timely

GAI is a disruptive technology. It will change the way people work by helping people to be faster and more efficient. It is changing the way we create content which will challenge our traditional notions of creativity. We must understand this technology and learn how to use it to enhance our human capabilities.

It is Concrete and Innovative

During this master's project, I will use generative AI as my personal and sole collaboration partner during the CPS process, as well as use various types of AI to help me prototype instructional material, which in and of itself is a novel and innovative way of creating.

It is Practical and Prescriptive

The outcomes of this master's project will have a practical application because I will use my knowledge of creativity, creative problem-solving, and my expertise in instructional design to develop a comprehensive plan to move my iteration of my course forward.

It is a Personal Passion

Education, learning, creating, and technology have always been my passions. When I first tinkered with ChatGPT3, I was struck by awe - a rare and powerful feeling that I knew I had to tap into. During my studies in CRS 625 Current Issues in Creativity, I researched the effect of awe, wonder, and curiosity on interest development. Little did I know, I was setting myself up to recognize the wonder loop I would eventually experience with ChatGPT3. Since gaining access to the GPT-3 playground, ChatGPT3, BingChat, Midjourney, and ChatGPT4, I have been caught in a cycle of awe, wonder, and curiosity. The capabilities of artificial intelligence continue to astound me, and I am eager to explore the intersection of AI, creativity and creative problem-solving to prepare my students for 21st-century success.

SECTION TWO: PERTINENT LITERATURE

The literature review I present is not a typical one, as it reflects the constantly evolving landscape of teaching and learning in the digital age. In the domain of creativity and creative problem-solving education, the idea of integrating generative AI has emerged as a fascinating and innovative approach that captures my attention. This area is new and evolving daily and I am eager to uncover its potential through my research and course design. The literature review draws on a wide range of seminal and current literature from various disciplines, including creativity research, psychology, education, pedagogy, and artificial intelligence. By synthesizing this diverse body of knowledge and expertise, I aim to provide a strong foundation for the development of my course. My project is a testament to the importance of continuous learning, unlearning, and relearning in the face of rapid technological change and shifting paradigms. In the following sections, I will provide an overview of the key themes and areas of inquiry that will inform my course design, highlighting the dynamic and evolving nature of my literature review.

Current Insights and Developments

Having current information is critical for the continuous iteration of my course. I am using various tools to search for keywords and hashtags that relate to my project that will help me. The main database I am using is Google Scholar. Google Scholar is a search engine for academic articles, conference papers, and theses. It will allow me to find and access up-to-date information on the latest research, trends, and practices in the field of generative AI and creative problem-solving. I am also using social media sites such as Twitter and YouTube. Twitter is a valuable tool to help me learn about a variety of topics related to GAI, creativity, and CPS by connecting with experts and peers to stay up to date with the latest news and trends. Notable

people I am following for updates on GAI are @emollick, @LinusEkenstam, @carterleffen, @rileybrown_ai, @karpathy among many others. I am also following various hashtags such as #generativeai, #chatgpt3, #chatgpt4. YouTube is an excellent search engine to find tutorials from experts and AI enthusiasts on various use cases. Most importantly it is the source to find interviews with the leaders of AI and product demonstrations.

Best Practices in Creativity & Creative Problem-Solving Education

I have explored numerous studies that shed light on building creative confidence and teaching strategies for creative thinking in higher education. Lee (2020) drew from the Four-C model of creativity (Beghetto & Kaufman, 2007) and Amabile's (1998) motivation theory to design a course that nurtured students' creativity. The course was centered on teaching foundational knowledge and theories of creativity, exploring creative cases across various disciplines, and exploring various thinking tools to help students apply CPS to real-world problems. Lee et al. (2020) proposed a framework that used transformative learning to challenge commonly held assumptions and biases around creativity. The course included a balance of in-class activities, hands-on skill-building activities, instructor and peer-led presentations, and creative projects that addressed exploratory, individual, and group-based learning strategies.

Drawing on a seminal creativity scholar, Bull and Davis (1980) suggest best practices for teaching creativity, including active participation in creativity training, individual and group exercises, brainstorming, and creative dramatics. They also recommend topics for the course, including the creative personality, brainstorming, and other creative thinking techniques, as well as reviews of creativity training materials and strategies, creativity tests, and theories of creativity. Additionally, they suggest that students should be required to produce an art or handicraft project, creative writing, ideas for inventions, and a creative teaching method.

Davis and O'Sullivan (1980) proposed the AUTA model for teaching creativity in four stages: Awareness, Understanding, Techniques, and Actualization. The Awareness stage includes increasing awareness of the topic and aligning attitudes and personalities in a more creative direction. The Understanding stage involves a description and discussion of the creative person, the creative process, theories of creativity, and creativity tests. The Techniques stage includes basic cognitive abilities, personal creative thinking and problem-solving techniques, and well-known deliberate creative thinking techniques. The Actualization stage is an increase in one's self-actualization, which can be partly taught directly through exploring new interests, being open to new ideas and experiences, and developing and using one's capabilities to the fullest. These best practices can help educators design effective creativity courses that strengthen affective components of creativity, provide practical skills and techniques, and promote personal growth.

Caughron et al. (2011) provide an overview of various techniques used in creativity training courses and their effectiveness in promoting creativity, drawing on research by Torrance (1972), Rose and Lin (1984), and Scott et al. (2004). They found that creativity training can be classified into four groups: divergent thinking, problem-solving, creative performance, and attitudes toward creativity. The choice of a theoretical framework significantly influences the design, content, delivery, and media used in a course. Training based on a cognitive framework of creativity yielded consistently positive effects, with techniques such as problem identification, information organization, conceptual combination, and idea generation promoting divergent thinking, problem-solving, performance, attitudes toward creativity, and overall creativity. Realistic practice exercises, lectures, and case-based materials were highly effective in promoting problem-solving, creative performance, and attitudes. Cooperative learning materials

were effective in promoting problem-solving outcomes. Importantly, the Creative Problem-Solving method, stemming from the Osborn-Parnes model, has shown effectiveness in promoting creative problem-solving in children, young adults, and adults, supported by over fifty impact studies.

Treffinger's Creative Learning Model offers a framework that can enhance the effectiveness of a creative problem-solving course (Treffinger et al., 1983). The model is divided into three levels. Level one focuses on basic techniques that are essential for developing higher levels of creativity such as improving divergent thinking. Level two deals with complex thinking and feeling processes. Level three involves real-world challenges that require creative solutions.

Finally, drawing on foundational work of Torrance and Safter (1999), invaluable insights presenting the stages of the Torrance Incubation Model: Heightening Anticipation, Deepening Expectations and Extending the Learning. This format for creative teaching and learning can be integrated into a contemporary course to facilitate active engagement in the creative process, cultivate open-mindedness, and bolster confidence in creative expression.

Enhancing Human Creativity through AI Collaboration

A creative problem-solving course that augments creativity and problem-solving with AI can draw on several key findings from recent research. Hwang and Won (2021) found that participants generated more and higher-quality ideas when working with a chatbot, particularly those who are highly anxious. Lubart et al. (2021) discuss the potential of social robots to stimulate human creativity and highlight the importance of collaborative co-creation between humans and robots. Wingström et al. (2022) suggest that the concept of co-creativity, where the creativity of humans and AI blends, should be the focal point of future creativity research. Dr. Li Jiang (EO, 2023) emphasizes the need for teaching students how to work with and alongside AI

in a collaborative manner. Mollick (2023) suggests that generative AI can help people overcome their weaknesses in the creative process by generating many ideas, while Du Sautoy (2020) highlights how AI can assist humans in the creative process by providing new ideas and inspiration. Siemon et al. (2022) report that AI can help people be more creative and can also help the creative process and the environment where creativity happens. Anantrasirichai and Bull (2021) emphasize the importance of better collaboration between humans and AI to maximize benefits, and Siemens et al. (2022) discuss three main ways that humans and AI can work together: human-led, machine-led, and hybrid approaches.

The following table was created using ChatGPT4 (OpenAI, 2023). The prompt I used was, "Make a list of recommendations and insights from the following annotated bibliography, keep the correct citation, theme similar insights and put your recommendations in a bulleted list." I pasted an annotated bibliography (See Appendix A), then I copied and pasted the AI output to the table.

Table 1

Recommendation & Insights Generated by ChatGPT4

Recommendation / Insight	**Source**
Use AI to enhance creativity in corporate and entrepreneurial innovation activities, and consider the potential benefits of better collaboration between humans and AI in the creative industries	(Siemon et al., 2022; Anantrasirichai & Bull, 2021)
Focus on specific tasks and activities when considering the relationship between humans and AI, address ethical implications, and emphasize the importance of incorporating embodied, cognitive, and social dimensions of creativity and integrating technology in teaching and learning activities	(Siemon et al., 2022; Siemens et al., 2022; Creely et al., 2021)
Use computer-mediated team players like chatbots and social robots to enhance creativity and collaboration in idea generation, and encourage collaborative co-creation between humans and robots to expand human creativity	(Hwang & Won, 2021; Lubart et al., 2021)
Modify teaching methods to keep up with the times by ensuring students have a clear understanding of how AI operates, recognizing the limits of AI's capabilities, and	(EO, 2023; Mollick, 2023)

teaching students how to work with and alongside AI in a collaborative manner. Incorporate these suggestions into creative problem-solving courses to enhance their relevance	
Design creativity courses that focus on encouraging responsibility and freedom, deal with technical problem-solving and more complex creative processes, and have problems that are relevant to the real world. Incorporate instructional strategies such as reading textbooks, writing bi-weekly reflection journals, case studies, games, creative problem-solving, and knowledge management models to promote creative thinking and achievement among students	(Davis & O'Sullivan, 1980; Ritter et al., 2020; Bull et al., 1995; Davis & Bull, 1978; Caughron et. al, 2011; Valgeirsdóttir & Onarheim, 2017)
Build creative confidence by focusing on intrinsic motivation and interest, teach foundational knowledge and scholarship of creativity, and use a case-based approach to positively influence students' attitudes and beliefs about their own creative abilities and attitudes. Utilize a balance of instructor-led presentations, group discussions, and hands-on activities, including individual and team projects and examination of case studies from diverse real-world contexts. Incorporate opportunities for students to explore and practice creativity techniques, engage in self-reflection, and encourage creative projects that address exploratory, individual, and group-based learning strategies. Use a transformative learning approach that challenges assumptions and beliefs, leading to personal growth and an increase in creative confidence, and provide learning experiences that expand and reframe students' insights on creativity, leading to three frames of creative minds: creative dynamics, creative mindsets, and creative confidence. Incorporate authentic processes, such as composing a reflective portfolio or journal of creative work, into creative assignments	(Lee, 2020; Lee et. al., 2020)

I will take into consideration these suggestions as I prepare my Master Design Document.

SECTION THREE: PROCESS PLAN

Master Project Outcomes: Revising & Designing My Course

To achieve my goal of integrating AI into my CPS course, I need to fully understand how AI can aid students' knowledge acquisition and application of CPS. First, I plan to explore the use of AI in my own creative problem-solving process. Through this exploration, I can synthesize the insights and understanding gained and apply them to the innovative redesign of my course. This approach ensures that I am well-equipped to teach CPS augmented by AI in a way that is student centered.

I will be redesigning a course that lasts for sixteen weeks, with two classes per week for 1.5 hours each day. My course description and course objectives stated by GCC (*Genesee Community College*, 2023) are:

> Develops individual creative potential. Focuses on the interactive elements in deliberate creativity and innovation: the creative person, the creative process, the creative product, and the creative environment. Emphasizes application in personal and professional settings.
>
> 1. Explain theoretical creative problem-solving process principles.
> 2. Reframe the problem from multiple perspectives to improve creative thought processes.
> 3. Apply a variety of brainstorming tools to generate innovative and creative approaches to solve a problem.
> 4. Evaluate various approaches to the solving of a problem using pragmatic measures.
> 5. Identify characteristics of the creative person
> 6. Identify a personal creative cognitive style and describe how it manifests in everyday life.
> 7. Identify the characteristics of the creative environment.
> 8. Discuss the impact of environment on the creative person.
> 9. Discuss the intentional application of the creative process to the solving of a problem.

Deliverable Description: Course Master Design Document

The Outcome for this project will be a comprehensive Design Document which will consist of the following information: introduction, learning objectives, instructional strategies, instructional content, delivery methods, timeline and resources. I will also produce the prototype of a student syllabus.

Project Timeline

Figure 1 is a screenshot of the Gannt Chart I have created to manage this project.

Figure 1

Gannt Chart of Project

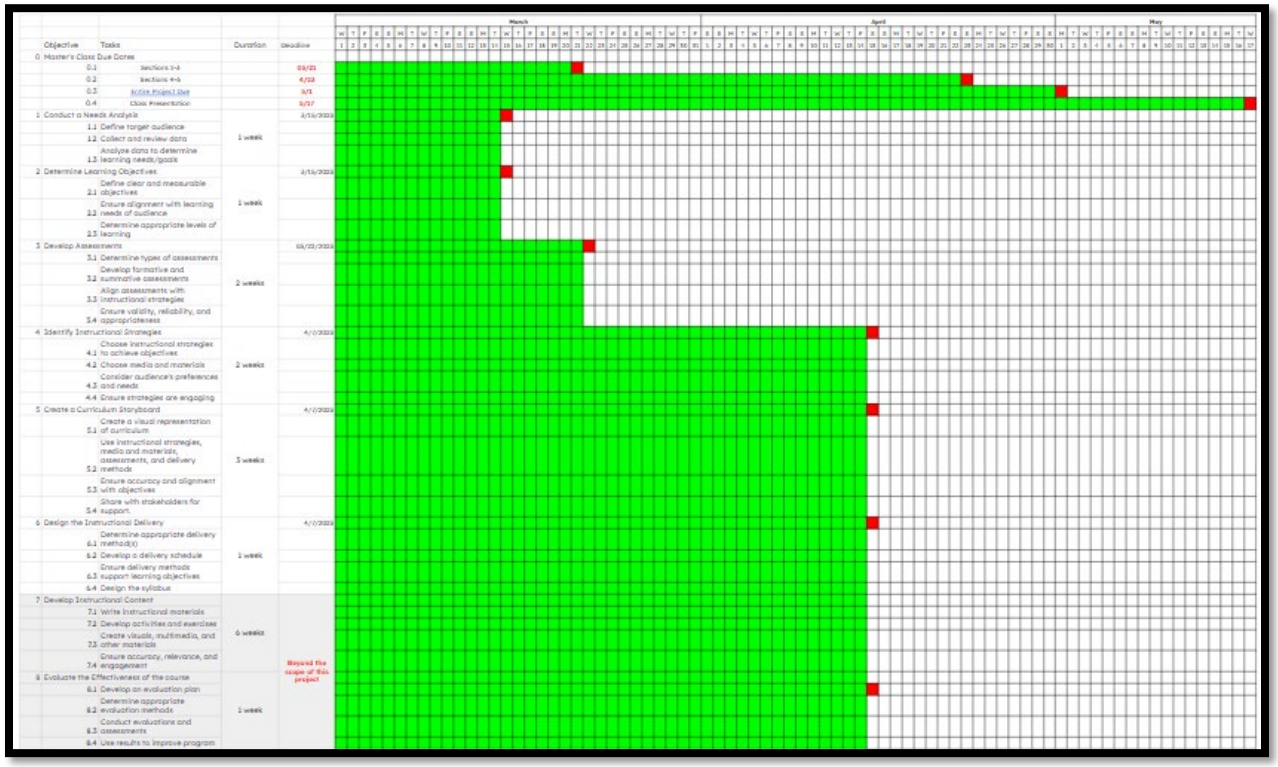


Table 2

Task Breakdown and Allotted Hours

Tasks	Number of Hours
Master's Class Due Dates Sections 1-3 Sections 4-6 Entire Project Due Class Presentation	30
Determine Learning Objectives Define clear and measurable objectives. Ensure alignment with learning needs. Determine appropriate levels of learning.	30
Develop Assessments Determine types of assessments. Develop formative and summative assessments. Align assessments with instructional strategies. Ensure validity, reliability, and appropriateness.	30
Identify Instructional Strategies Choose instructional strategies to achieve objectives. Choose media and materials. Consider student preferences and needs. Ensure strategies are engaging.	30
Design the Instructional Delivery Determine appropriate delivery method(s). Develop a delivery schedule. Ensure delivery methods support learning objectives. Design the syllabus.	30
Develop Instructional Content* Write instructional materials. Develop activities and exercises. Create visuals, multimedia, and other materials. Ensure accuracy, relevance, and engagement.	6 weeks (beyond the scope of this project) *
Evaluate the Effectiveness of the course* Develop an evaluation plan. Determine appropriate evaluation methods. Conduct evaluations and assessments. Use results to improve program.	15 hours (beyond the scope of this project) *
*Not counted towards master's project hours	150 hours

Evaluation Plan

Table 3

Project Goals and Success Criteria

Personal Goals	Success Criteria
To uncover personal insights and deeper understanding of how generative AI can enhance my personal creativity through exploring and examining its use in the creative problem-solving process.	• Document insights in journal. • Reflect on creativity level. • Track use of AI tools.
Increase my confidence in using various generative AI tools for creativity and creative problem-solving.	• Experiment with multiple AI tools. • Track proficiency in using AI. • Complete tasks successfully.
Project Goals	Success Criteria
Review the literature on how to support students' knowledge and application of CPS.	• Research literature. • Analyze Literature. • Identify best practices. • Synthesize findings.
Develop a comprehensive plan for teaching CPS with GAI, including a syllabus and list of instructional materials which results in a Course Master Design Document	• Identify effective teaching methods. • Select relevant instructional materials. • Develop a detailed syllabus. • Include generative AI tools. • Ensure alignment with GCC course objectives.
Develop the instructional material based on the plan and the best practices from the literature.	Beyond the Scope of this master's project
Build the course inside a Learning Management System	Beyond the Scope of this master's project
Master's Project Deliverable Goal	Success Criteria
Course Master Design Document and Syllabus	• Clarity, alignment, effective strategies, appropriate assessments, practicality, flexibility. • Course aligned to the Universal Design for Learning Framework, Taxonomy of Significant Learning, Blooms Taxonomy

SECTION FOUR: OUTCOMES

Process and Product Outcomes

The outcomes of my project demonstrate how Artificial Intelligence can augment and improve human thinking and productivity. The overarching goal of this master's project was to explore how AI can enhance my Creative Problem Solving (CPS) process and develop products and processes that can assist others in improving their creativity and CPS skills. Specifically, this project aimed to investigate the use of AI in teaching CPS in an introductory college course. The original outcomes for this project were a master design document and syllabus. Since my productivity increased due to the use of AI during the project process, in addition to the original outcomes, I also created a course mind map, course goal and learning objective analysis, and a prototype of a lesson which consists of lecture notes as well as PowerPoint slides.

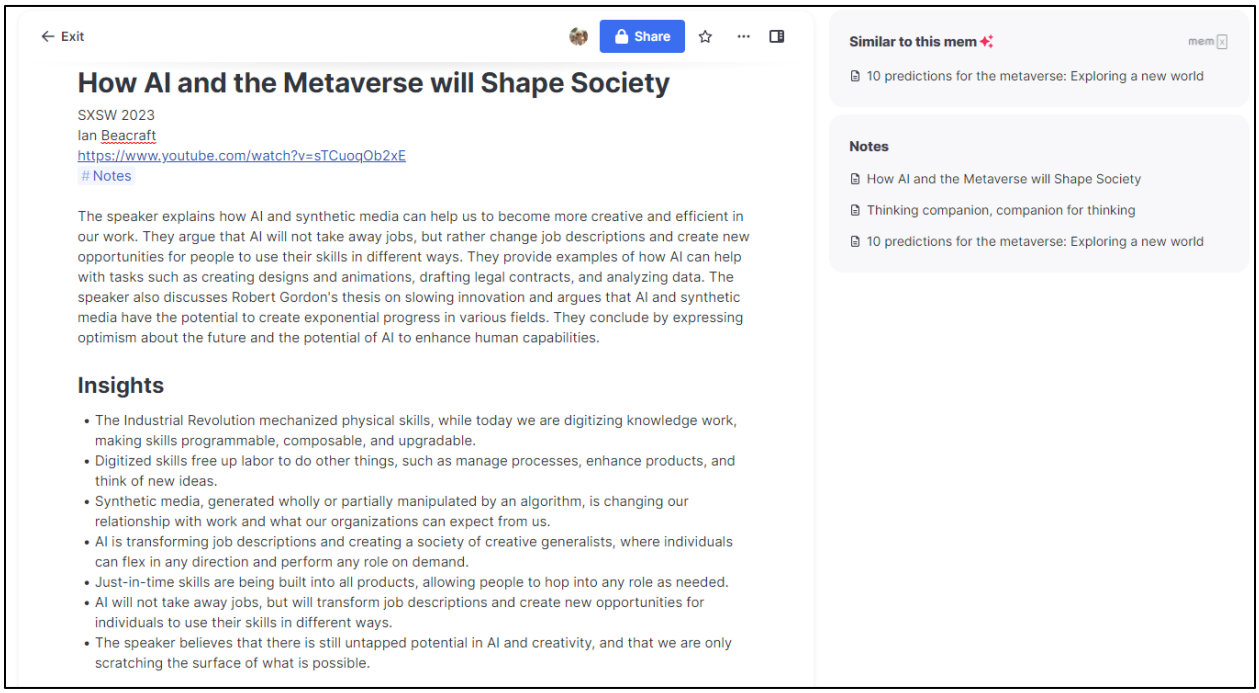
The project consisted of two main phases: research and product development. During the research phase, various AI tools and techniques were explored to identify how they can be used to augment CPS. This involved a review of the existing literature on CPS and AI, as well as an analysis of various AI tools and techniques. The findings from this research were then used to develop the products and processes in the second phase of the project.

Second Brain & Annotated Bibliography

During phase one of my project, I focused on research. As the field of AI is constantly evolving, I made it a daily practice to read about the latest developments. I developed a "second brain" system to keep track of my findings (Forte, 2022). The concept of a second brain recognizes that our minds are not equipped to remember everything, and that we need a reliable system for capturing and storing information. To accomplish this, I used the tool mem.ai to record my insights, make connections and identify areas where further research was needed. This

tool also integrates AI, so it helps to expand or reduce your thinking to manageable bites of information. Keywords are brought up in a sidebar, helping the user to connect to previous information see Figure 2. Keeping organized notes in my second brain also helped me to develop an annotated bibliography which can be found in Appendix A. I believe that personal knowledge management will be essential for success in the future of work, and tools like mem.ai can also be valuable for learning in a fast-paced environment.

Figure 2
Personal Mem.ai Screenshot of my Workspace



Mind Map

Knowledge management is a crucial element in my creative problem-solving process. However, it is not enough to simply have access to information; it is also essential to make sense of that knowledge and apply it effectively to solve challenges. I found myself inundated with a multitude of ideas and possibilities, which made it difficult to determine which ideas were most

relevant and useful for my project. That's when I decided to use a mind map to help me organize my thoughts. By visually mapping out my ideas in a non-linear way, I was able to gain a fresh perspective on my notes and extract key insights that could be applied to the project. I started to refine and develop my ideas, expanding on certain concepts and discarding others that were less relevant or useful for the project on hand. See Figure 3 for my mind map, which was an invaluable tool for organizing and planning my ideas about artificial intelligence and creative problem-solving.

Figure 3
Mind map of project

Learning Goals & Student Objective Analysis

A key outcome of this project involved applying Fink's Significant Learning (2013), Solo Taxonomy (Biggs & Collis, 2014), Blooms (Anderson et al., 2001), Knowledge dimensions by Krathwohl (2002) and Know Be Do Leadership models (U.S. Army, 2004) to analyze and align

the course learning goals provided by Genesee Community College (2023) with the instructional design of the course. By utilizing these models, I was able to assess the different levels of learning objectives and determine the appropriate strategies for achieving them. This analysis allowed me to make informed decisions which ensures that the course content and activities were engaging, relevant, and effective in helping students achieve the desired learning outcomes. Figures four, five and six show the analysis for objective one which is "Explain theoretical creative problem-solving process principles." By using multiple models to describe and facilitate learning, I can ensure that I am addressing a broad range of learning outcomes and promoting the development of diverse skills, since different models focus on different aspects of the learning process, from designing courses and curricula to developing learning objectives and assessments, to guiding leadership development.

Figure 4

Fink's Significant Learning

Category	Learning Goals and Objectives #1
Foundational Knowledge understanding and remembering information and ideas	• Identify the key principles of creative problem-solving processes.
Application skills, critical thinking, creative thinking, practical thinking, and managing projects	• Explain how creative problem-solving principles differ from other problem-solving approaches.
Integration connecting information, ideas, perspectives, people, or realms of life	• Evaluate the effectiveness of various creative problem-solving techniques.
Human Dimension learning about oneself and others	• Develop strategies for incorporating creative problem-solving principles into personal and professional contexts.
Caring developing new feelings, interests, and values	• Reflect on personal experiences with creative problem-solving and identify areas for improvement.
Learning How to Learn becoming a better student, inquiring about a subject, becoming a self-directed learner	• Become a self-directed learner by seeking out opportunities for practicing CPS Principles.

Figure 5

Knowledge Dimensions

	Factual	Contextual	Procedural	Metacognitive
Objective	In order to explain the theoretical principles of creative problem-solving, students would need to have some basic factual knowledge about the topic. This might include information about different types of problems, the steps in the problem-solving process, and the characteristics of creative problem-solvers. To address this dimension, you could include activities that require students to memorize key terms and concepts related to creative problem-solving.	To fully understand the theoretical principles of creative problem-solving, students would need to grasp the broader concepts and ideas that underlie the process. This might include understanding the role of divergent thinking, the importance of reframing problems, and the value of exploring multiple solutions. To address this dimension, you could include activities that ask students to analyze case studies or real-world examples of creative problem-solving in action.	In order to become proficient in creative problem-solving, students would need to develop procedural knowledge about the steps involved in the process. This might include learning how to define a problem, generate ideas, evaluate solutions, and implement a plan of action. To address this dimension, you could include activities that ask students to practice using different problem-solving strategies, such as brainstorming or mind mapping.	in order to become effective problem-solvers, students would need to develop metacognitive knowledge about their own thinking and learning processes. This might include reflecting on their problem-solving experiences, identifying areas of strength and weakness, and developing strategies for improvement. To address this dimension, you could include activities that ask students to reflect on their own creative problem-solving process, and to identify ways they could improve their skills.
Outcomes	• Students will be able to define key terms and concepts related to creative problem-solving. • Students will be able to identify different types of problems and the characteristics of creative problem-solvers.	• Students will be able to explain the role of divergent thinking in the problem-solving process. • Students will be able to analyze case studies of creative problem-solving and identify the underlying principles at work.	• Students will be able to use a variety of problem-solving strategies, such as brainstorming and mind mapping, to generate ideas and solutions. • Students will be able to evaluate potential solutions and select the most effective one based on criteria such as feasibility and impact.	• Students will be able to reflect on their own problem-solving experiences and identify areas of strength and weakness. • Students will be able to develop strategies for improving their creative problem-solving skills.
Possible Assessments	• Vocabulary quiz • Problem identification exercise • Case study analysis • Concept map • Group discussion	• Short answer exam • Essay question • Case study analysis • Group presentation • Peer review	• Group problem-solving exercise • Mock brainstorming session • Rubric for solution evaluation • Research paper on effective solutions • Debate on potential solutions	• Self-assessment quiz • Personal reflection essay • SWOT analysis of problem-solving skills • Goal-setting exercise • Peer feedback session

Figure 6

Bloom's Taxonomy & The Know-Be-Do Model

Bloom's Taxonomy Level	Learning Objective
Remembering	Students will be able to define key terms and concepts related to creative problem-solving.
Understanding	Students will be able to identify different types of problems and the characteristics of creative problem-solvers.
Applying	Students will be able to use a variety of problem-solving strategies, such as brainstorming and mind mapping, to generate ideas and solutions.
Analyzing	Students will be able to analyze case studies of creative problem-solving and identify the underlying principles at work.
Evaluating	Students will be able to evaluate potential solutions and select the most effective one based on criteria such as feasibility and impact.
Creating	Students will be able to develop strategies for improving their creative problem-solving skills. They will also be able to reflect on their own problem-solving experiences and identify areas of strength and weakness.

KNOW	BE	DO
Key terms and concepts related to creative problem-solving	Creative problem-solver characteristics	Use different problem-solving strategies
Different types of problems	Understand the role of divergent thinking	Define a problem
Steps in the problem-solving process	Importance of reframing problems	Generate ideas
Characteristics of creative problem-solvers	Value of exploring multiple solutions	Evaluate solutions based on criteria
		Implement a plan of action
		Reflect on own problem-solving experiences and identify areas of improvement
		Develop strategies for improving creative problem-solving skills

Master Design Document

The Master Design Document (MDD) is a comprehensive instructional design document that provides an overview of the logic and instructional choices made while planning the course. It serves as a roadmap for moving forward with the project. Throughout the design process, every component of instruction, including teachers, students, materials, and learning environment, is carefully thought out. The MDD provides a comprehensive overview of all these components and their relationships, helping to ensure that the instructional design is effective and aligned with the learning objectives. This document in its entirety can be found in Appendix B.

Syllabus

The syllabus provides an overview of the course modules, learning objectives, essential questions, and enduring understandings, which provide a framework for understanding the course content and how it relates to the broader context of the subject matter. A portion of the syllabus is included in Appendix C.

Prototype of a Lesson

The lesson plan is a comprehensive guide to a single class session, outlining the learning objectives, and instructional strategies. The accompanying slides provide a visual aid to the instruction, presenting key information and concepts in an engaging and accessible format. The lesson plan and slides are included in Appendices D and E of this report, respectively. A core reason for creating lesson plans is because I am using it to make teaching creative problem solving accessible to teachers who do not have expertise in creativity education.

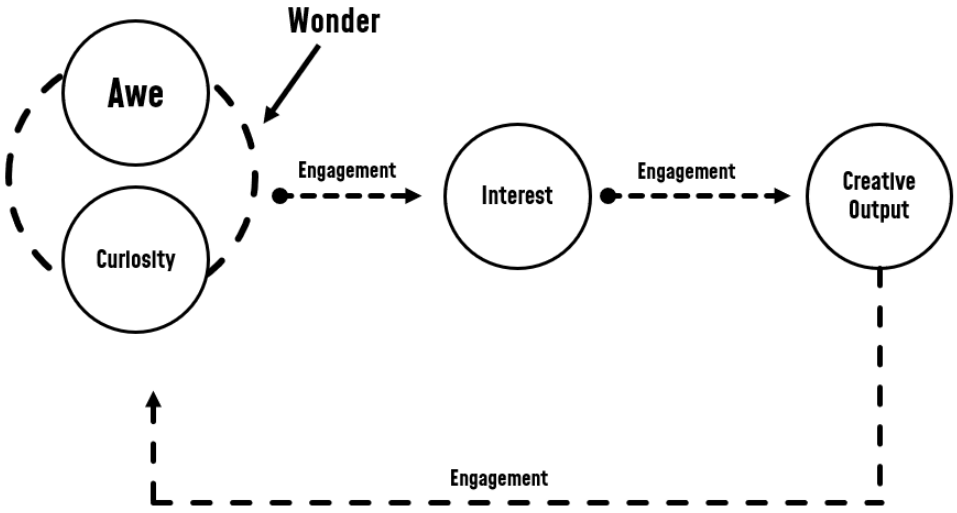
My master's project aimed to help me understand how I can teach Creative Problem Solving in the landscape where Artificial Intelligence will become more and more common. My goal was to understand how I can use AI to help me with not only my creative problem-solving process but with the actual creation of learning materials and then in turn redesign my course. The project involved two main phases: research and product development. The research phase involved exploring various AI tools and techniques to identify how they can be used to augment CPS. The findings from this research were then used to develop the products and processes in the second phase of the project. This project, thus far, has demonstrated the potential for AI to enhance CPS, augment my personal creativity and increase my productivity.

SECTION FIVE: KEY LEARNINGS

Following My Curiosities

The scope of my project was large. It started off with a deep dive in learning about a new technology (AI), applying that technology in my work and life, then learning about how I can apply it to augment my creative problem solving and creative process, finally taking my insights and adding them into the design of a course for creative problem solving. It seemed like it was all over the place, but it always made perfect sense to me. One of the most valuable things I learned was when indulging in a sense of wonder and play as I experimented with various AI tools. The tools had a learning curve but after understanding how to use language to extract the appropriate output, I was able to create more and faster than ever before. I learned so much about myself, confirming my hunch of how creation begins in awe, wonder, and curiosity (see figure 7).

Figure 7
Awe-Wonder-Curiosity Loop by Selma Dawani



When I first played with AI technology, I was floored by the emotion of awe. The technology frightened me and mesmerized me. This led me to wonder if we are facing a creativity crisis? If

AI can be as creative as humans? And if we could leverage AI to augment our creative abilities? I set out to learn and answer these questions by following my curiosities. I felt confusion, frustration, and fear as I worked through my project and moved through the cycle. By the end of the project, I had gained a deep understanding of the intersection of AI and creative problem-solving. My key learnings are my attempts to answer my original curiosities. This interest in researching and exploring the intersection of Artificial Intelligence and Creative Problem solving is just the beginning. I just scratched the surface. I am now engaged in this issue which will continue to be my work for the foreseeable future. The more we create the more we enter the virtuous cycle of awe, wonder and curiosity further moving us along the levels of creativity.

Are in the loom of a creativity crisis?

Artificial Intelligence is transforming the way we live and work which had me originally question whether we are in the loom of a creativity crisis. Drawing from Dr. Ruth Noller's formula, C=*f*a(K, I, E), creativity is a function of a person's attitude, driving their knowledge, imagination and ability to evaluate ideas (Parnes, Noller, & Biondi, 1977). In the case of generative AI, we know that it currently can only pull data that it was trained on, and the output is based on pattern recognition. There is no imagination, just knowledge. Knowledge is just a click away and with AI now knowledge can be personalized and explained to you until you understand. The quantity of information one possesses is going to be less significant in the future. Knowledge is easy to come by and even easier to understand thanks to AI. AI does hallucinate and give incorrect answers, but we are just at the beginning. This will be optimized as time goes on. Learning will change, knowing will be based on interest and just-in-time retrieval of information and skill will be acquired as needed to complete challenges. But creativity is not just a matter of knowledge and skill, but also of imagination and evaluation. AI can help with

knowledge; it can also help with evaluation, but it cannot help with attitude and imagination. Therefore, we are not in a creativity crisis. AI only augments human creativity it does not replace it. It just means that unsolved problems will get solved quicker and what we know as education will shift from lower levels of knowing to higher levels cultivating unique human traits and fostering interdisciplinary learning. We will pursue alternative forms of purpose and meaning with greater emphasis on creativity, exploration, self-actualization, and transcendence. Looking ahead, the impact of AI on human cognitive effort will continue to grow and evidence of learning lower-level knowledge and information retrieval will lessen. I predict the current system of standardized testing may become obsolete, replaced by more personalized and holistic approaches that focus on developing higher-level cognitive skills such as critical thinking, creativity, and problem-solving. This shift will place a greater demand on educators and learners to cultivate their abilities in these areas, while also leveraging the potential of AI to augment and enhance their efforts.

Will AI be as creative as a human?

AI might pass the Turing test sooner than later. The Turing Test is a measure of a machine's ability to exhibit intelligent behavior equivalent to, or indistinguishable from, that of a human. That could mean a lot of things which are beyond the scope of what I am currently working on. While I believe that AI may never reach the same level of creativity as humans, I still recognize the immense potential of AI in helping us create a better world that is equitable and sustainable. AI has the ability to make significant strides in fields such as medicine, environmental sustainability, and social justice, but it is up to humans to guide its development and use. I see AI as a tool that can assist us in achieving our goals, but ultimately it is human creativity, ingenuity, and empathy that will shape our future as a civilization.

AI democratizes tools. Wired Magazine editor, Chris Anderson said “When the tools of production are available for everyone, everyone becomes a producer” (2008). With AI, you have access to a junior developer, lawyer, content writer, business analyst at your fingertips, so the question isn’t what skills, knowledge or experience do you need but instead becomes what would you like to build or create? AI is incredible. For example, ChatGPT can have human like conversations, explain concepts, brainstorm ideas, generate code, write all types of texts such as emails, letters, essays, poetry, blog posts, tweets, captions, business plans, video scripts. The text is original and not plagiarized. It can organize text into tables and spreadsheets. And if it matters, OpenAI has a classifier to see if it is AI text or human generated which measures the amount of perplexity in the text. There are also image and video generators. It can do so much at this point it is the user that needs to harness it.

The skill needed to harness the power of AI tools is called prompt engineering. Prompt engineering is the art of crafting clear and concise input for AI to enable it to understand our intentions and provide accurate, relevant responses (Wikipedia contributors, 2023). It is the communication medium between humans and AI. Well-designed prompts increase efficiency and conversely, poorly designed prompts can cause confusion, frustration, and errors that undermine the usefulness of the system. The challenges of prompt engineering involve balancing specificity and creativity, addressing bias and fairness, and evaluating and optimizing prompt quality.

Optimizing prompts involves starting with a clear end goal and focusing on brevity, relevance, and clarity. Providing AI with examples or data can improve context and responses, while promoting creativity can lead to more inventive outcomes by prompting AI to blend varied data and avoid overused patterns. It is also crucial to choose the right words, including active or

passive voice, emotional, power, and sensory words. Additionally, providing context that accounts for specific contexts and target audiences, including style and tone, such as creative, technical, informative, conversational, and persuasive styles, and fun-serious, casual-formal, and relaxed-professional tones, can further improve the effectiveness of prompt engineering. Tools such as Bloom's Taxonomy action verbs (Anderson et al., 2001), and Plutchik's Wheel of Emotion (Karnilowicz, n.d.) can be used to assist in prompting parameters.

Other ways to improve prompt engineering include simulating expertise, challenging conventional narratives, brainstorming, and exploring unconventional and open-ended approaches, capturing writing styles for style guides, incorporating human-written techniques, multiple perspectives, different styles or tones, varied formats, and focusing on specific purposes or goals. Experimentation and innovation can also play a significant role in improving the effectiveness of prompt engineering. Since prompt engineering relies on human creativity for successful output, again, I want to emphasize that we must prioritize creativity and creative problem-solving education.

How can we leverage AI to improve our creativity and creative problem-solving skills?

To leverage AI, I believe it is important to support people at their core. AI holds the potential to enhance our self-determination. According to the Self-Determination Theory, achieving autonomy (which can be facilitated by not being solely driven by financial gain), human connection (through improved relationships, social structures, and paradigms), and competence (as we continue to challenge ourselves) are essential for our well-being (Ryan & Deci, 2000). It will be important to set up the societal structures to support this. Creativity and creative problem-solving education are important for competence. It is important to encourage public understanding of AI and foster a culture of adaptation to navigate the transformations. We

must move out of fear, uncertainty, doubt and move into a creative mindset. The time to prepare is now.

Once people understand what AI is, how it works, what its limitations and ethical considerations are we can move into leveraging AI to support CPS. We are still in the early stages of AI. I have seen so much improvement since I started my project four months ago. There are downfalls and amazing advancements in using AI to augment the creative problem-solving process.

During the clarification stage of CPS, AI can be used in many ways. If looking for relevant statistics or data, you can bypass google and access chatGPT4 and Bing Chat which can search the internet and get relevant information quickly without us having to sift through multiple results spanning pages. You can paste a comma delineated format of data and have chatgpt look for patterns, trends, and relationships and then give you a report of the insights found in the data.

During ideation, AI can enhance divergent thinking and idea generation. Just write a prompt describing the divergent thinking tool and chatgpt will implement the tool and give you more ideas. You can do the same with evaluation. AI can help you identify criteria, rank and choose the best ideas. It can help you think of various steps you might need to take; it can even help you to evaluate your plan and see where you might have an oversight.

During the development stage of CPS, AI can play a significant role in streamlining the process. When formulating challenges and exploring visions, AI tools such as ChatGPT-4 and Bing Chat can provide alternative perspectives and diverse points of view, promoting openness and curiosity. By generating multiple scenarios and visions, AI enables problem solvers to consider a broader range of possibilities and potential outcomes. As AI-supported curiosity and

engagement are fostered, creative problem solvers can better understand the context of the problem and generate more innovative solutions.

In the implementation stage of CPS, AI can assist with exploring acceptance and formulating a plan. By using AI to assess stakeholder perspectives, potential barriers, and resources, problem solvers can develop a well-rounded understanding of the factors influencing the success of their solutions. AI can help strategize and allocate resources effectively while also providing continuous feedback and suggestions for improvement. Through AI-enhanced collaboration and communication skills, problem solvers can better navigate the complexities of implementing their solutions. The integration of generative AI in these stages not only augments creative problem solving but also democratizes the process, making it more accessible to a wider range of individuals and teams.

Ultimately, the key to leveraging AI for creativity and creative problem-solving is to view it as a complement rather than a replacement for human ingenuity and insight. By combining the strengths of both humans and machines, we can create new possibilities and solutions that we could not have achieved on our own.

Besides augmenting your creative problem solving, generative AI has democratized the creation process. We are able to bring to the world what we can imagine using various AI tools. Generative AI levels the playing field where everyone can create software, mock-up products, and create music. All this creation begins with human creativity and prompt engineering. What a wonderful time to be alive!

SECTION SIX: CONCLUSIONS

My life has been a series of problem-solving situations. From my earliest memories, I have been clarifying, ideating, developing, and implementing at various levels. I inherently knew that creativity was a superpower with enormous transformative effects. As soon as I was able to comprehend that better thinking led to better results, I have been driven by a desire to harness the power of better creative and critical thinking skills. It was this experience with problem-solving that led me to pursue a career in creativity education and leadership, where I could help others develop these skills and make a positive impact in their own lives and communities.

I have been blessed to be involved with many creative leadership projects over the course of my career. From helping found an international school in Palestine to creating teaching resources through my business, The Blue Brain Teacher – I have directly seen the positive impact on prioritizing creativity education.

Helping form a school from the ground up was the most impactful experience. Under the leadership of many forward-thinking Palestinian leaders, I had the privilege of helping to create a learning environment that fostered creativity, innovation, and critical thinking. It was amazing to see firsthand how instructional design can really shape the learning experience.

The Blue Brain Teacher, my instructional design business, was a solution to help teachers improve their instruction. As I was supporting teachers in their classroom, I noticed that many teachers were eager to get their students prepared for the 21st century although bureaucratic barriers prevented this. I wanted to help teachers weave 21st century skills into their curriculum. I needed to upskill and deepen my learning about creativity so I entered the creative leadership program at SUNY Buffalo. Not only have I gained the skills and knowledge regarding creativity, but I have also been empowered as a leader in change and innovation.

This project is my first pivot towards become a creative change leader. Education seems to be resistant to change. I know that it is normal to resist change. We are a species that thrives on homeostasis and equilibrium. However, it is important to note that while resistance to change may be a common response, it is not an optimal one. With the rapid pace of technological change happening right now it is time for a paradigm shift. To effectively adapt to the rapid pace of change, we need to embrace the mindset of the creative. We need to be open to new ideas and ways of doing things, even if they challenge our current beliefs and practices. It is important to acknowledge that the ideas presented in this project reflect my thinking based on my knowledge and experience up to this point. As I continue to learn and gain new experiences, my views and perspectives will evolve and change. Nonetheless, I believe that my ideas can contribute to the larger conversation around the role of creativity in education and the impact of AI on human potential.

Artificial Intelligence will free us from mundane and repetitive tasks, enabling us to allocate our time and energy towards more meaningful and fulfilling pursuits. With AI tools democratizing the production process and personalized information, individuals can enhance their competence in other more meaningful ways. Pulling from Self Determination Theory, I believe that now, true competency lies in embracing our innate creativity and learning to improve it. By doing so, we can differentiate ourselves from the perfect, machine-like capabilities of AI. Furthermore, individuals should strive to build a sense of community and relatedness, recognizing that human connection is a fundamental need for personal growth and well-being. Together, a focus on creativity, personal growth, and community can help individuals lead fulfilling and satisfying lives in the age of AI.

To fully thrive in the age of AI, it is more important than ever to embrace what makes us human. AI will help us to better process information, help us see different perspectives, generate lots of ideas and perhaps point out flaws in our thinking but AI will never replace what makes us human. AI will augment a lot but it will never augment our emotions and our need for human to human connection. The next paradigm shift as humans we will be working to optimize what makes us individually unique and how each of us brings a puzzle to the interconnectedness of the whole of humankind.

To achieve this paradigm shift, individuals must cultivate a deep understanding of their own unique strengths and abilities. This requires a willingness to explore their passions and interests, take risks, and push beyond their comfort zones. By doing so, individuals can develop a strong sense of personal identity and purpose, which can in turn help them contribute to the greater whole. We need a bottom-up approach to life. We need to do the small things that make us happy and give us meaning and purpose and this will then form into something larger as opportunities present themselves. I think we have been conditioned to find our passion, to have it all figured out before we get started. This is mentally exhausting and stressful for no reason. We need instead to slow it down and start with what we have, where we are, create and do what we can. We can weed out what is unimportant to us and cultivate what nurtures our soul and in the end, when we look back at our life we will know that we have lived a life of purpose and meaning. We must also empower others to be aware of their own wonders, curiosities, and interests. We must empower others to be authentically themselves so that they can reach their potential to feel they have lived in meaning and contribution to society. We are moving away from the cookie cutter “perfect person” ideal to accepting who we are. We need to be perfectly imperfect. We are not AI and now we have AI to do all the things we need to get done that needs

to be accurate and perfect and we can embrace wholly what it means to be human. People need autonomy, competence, and relatedness. This is the niche I hope to carve while I have my time on earth.

During the course of this project, I have been affirmed that this is the direction that I want to take my work. I have gained a deeper understanding of my strengths, interests, and knowledge, and have been able to integrate these elements to set forth a new path. I have the confidence and abilities to continue building out my curriculum and my goal is that it is a starting point to bring creative education to the world. I want to empower people of all ages to be their authentic selves and make their personal contributions to society by supporting their learning of creativity and creative problem solving. This doesn not necessarily mean through traditional education models but through various mediums that will reach those who want it. I will do this through my current platform, The Blue Brain Teacher which helps students and educators and I will begin a new platform, The Art of an Idea which will reach a new demographic; higher education, entrepreneurs and small businesses.

What I see myself doing next is to continue building out stand alone topic lessons that can be customized to meet the needs of the learner. The topics of creativity will be able to be taught in-person, online, synchronysly and asynchronously. The application of problem solving is more interconnected than ever and those need to be done in inperson or virtual communities which I will create. My strengths are instructional design with a strong focus on learner needs. I create research based resources, where I think through the needs of the learner and breakdown topics from concrete to abstract. It is then the role of the instructer to take that work and adapt it to the needs of the learner.

The future is about collaborating and creating the future we want together. In order to continue my work, further research and development will be enhanced with the support of the SUNY Buffalo faculty and others passionate about creativity and creative leadership. I plan to apply for the first cohort of the Doctorate of Professional Studies program. I feel like I am just scratching the surface of the impact of AI in augmenting human creativity. As I move forward in my career, I am committed to staying curious, embracing new challenges, and expanding my understanding of the intersection between creativity, education, and technology. Ultimately, I hope that we can empower one another to achieve our dreams, embrace our passions, and make a lasting positive impact on the world.

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APPENDICES

Appendix A: Annotated Bibliography

Anantrasirichai, N., & Bull, D. (2021). Artificial intelligence in the creative industries: A review. *Artificial Intelligence Review*, *55*(1), 589–656. https://doi.org/10.1007/s10462-021-10039-7

The creative sector requires different levels of innovation and skill sets compared to routine tasks. AI relies on conformity of data, while creativity often relies on the human imagination to generate original ideas. While AI technologies have mostly been developed to assist and support humans rather than replace them, better collaboration between humans and AI can maximize benefits. The first painting created solely by AI was auctioned for $432,500 in 2018.

Beghetto, R. A., & Kaufman, J. C. (2007). Toward a broader conception of creativity: A case for "mini-c" creativity. Psychology of Aesthetics, Creativity, and the Arts, 1(2), 73–79. https://doi.org/10.1037/1931-3896.1.2.73

This article argues that a new category of creativity, called 'mini-c' creativity, is necessary to advance creativity theory and research. Mini-c creativity focuses on the creative processes involved in constructing personal knowledge and understanding, rather than on the end product. As mini-c creativity is particularly relevant for beginners in creative problem-solving, this article informs the development of a CPS course that emphasizes the importance of the creative process over the outcome.

Bull, K. S., Montgomery, D., & Baloche, L. (1995). Teaching Creativity at the College Level: A Synthesis of Curricular Components Perceived as Important by Instructors. Creativity Research Journal. https://doi.org/10.1207/s15326934crj0801_7

This study aimed to identify the components and perceived importance of creativity courses taught in college, as rated by teachers. The study found five dimensions for teaching creativity: social climate, personality characteristics, general theories and models, processes involved, and product variables related to end results. While teachers agreed on the importance of processes and product variables related to human interaction and a supportive social climate, there was no consensus on the general theories and models to use when teaching creativity. The study suggests that a course on creativity should focus on establishing a supportive climate that encourages students to explore their creative potential, promotes curiosity and innovation, and addresses blocks to creative thinking. Additionally, personality characteristics such as openness to experience, inquisitiveness, and self-confidence were deemed important in teaching creativity, while insight and innovation were the most significant product variables.

Caughron, J. J. , Peterson, David R. and Mumford, M. D. (2011) Creativity training. In: Runco, Mark A. and Pritzker, Steven R., (eds.) *Encyclopedia of creativity*. Amsterdam ; Boston: Academic Press/Elsevier, p. 481. ISBN 9780123750396

The article explores different techniques used in creativity training courses and their effectiveness in promoting creativity by examining previous research by Torrance in 1972, Rose and Lin 1984, Scott, Leritz, and Mumford in 2004. They synthesized the findings for creativity training that emphasizes that creativity training was classified into four groups: divergent thinking, problem-solving, creative performance, and attitudes towards creativity. When designing a course the theoretical framework chosen by the course designer will impact the outcome of the course and influences the design, content, delivery, and media used during instruction. A summary of the findings show that

training based on a cognitive framework of creativity was found to yield consistently positive effects. Techniques like problem identification training and information organization, conceptual combination, and idea generation were found to be beneficial for promoting divergent thinking, problem-solving, performance, attitudes towards creativity, and creativity on a general level. Realistic practice exercises, lectures, and case-based materials were highly effective in promoting problem-solving, creative performance, and attitudes towards creativity. Cooperative learning materials were found to be effective in promoting problem-solving outcomes. Most importantly, the iteration of the Creative Problem-solving method born out of the Osborn-Parnes model has "over 50 impact studies have been conducted on the use of this model in creativity training, providing a robust body of research suggesting it is effective for promoting creative problem-solving in children, young adults and adults."

Creely, E., Henriksen, D., & Henderson, M. A. (2021). Three Modes of Creativity. Journal of Creative Behavior, 55(2), 306–318. https://doi.org/10.1002/jocb.452

This new model of creativity considers the embodied, cognitive, and social dimensions of creativity, emphasizing technology and interdisciplinary perspectives. The article proposes a tri-modal model of creativity that includes three interconnected modes: the Visceral (embodiments), the Ideational (mind and conceptual), and the Observational (appreciation, critical, and evaluative). These modes are always present and experienced in any context where creativity is practiced or researched. This model can inform teaching by highlighting the importance of incorporating embodied, cognitive, and social dimensions of creativity, and integrating technology in teaching and learning activities. It

can also guide the development of curricula that support creative thinking and expression in various disciplines.

Davis, G. A., & Bull, K. S. (1978). Strengthening affective components of creativity in a college course. Journal of Educational Psychology, 70(5), 833–836. https://doi.org/10.1037/0022-0663.70.5.833

Davis and Bull's article examines the affective and personality-related dimensions of creative thinking, such as attitudes towards open-mindedness, values related to creativity, and interests and motivations towards becoming a more flexible, creative person. The authors emphasize the importance of active participation in creativity training, which involves individual and group exercises, brainstorming, and creative dramatics. The course's topics included the creative personality, brainstorming, and other creative thinking techniques, as well as reviews of creativity training materials and strategies, creativity tests, theories of creativity, and more. Additionally, the course required students to produce an art or handicraft project, creative writing, ideas for inventions, and a creative teaching method. The authors suggest that training in a college creativity course can strengthen affective characteristics associated with creativity to a measurable degree.

Davis, G., & O'Sullivan, M. (1980). Taxonomy of Creative Objectives: The Model AUTA. *The Journal of Creative Behavior*, *14*(3), 149–160. https://doi.org/10.1002/j.2162-6057.1980.tb00240.x

This paper discusses a taxonomy, called the AUTA model for teaching creativity in four stages: Awareness, Understanding, Techniques, and Actualization. The authors argue that the taxonomy can be used to design a course on creative thinking and problem-solving.

The Awareness stage includes increasing one's awareness of the topic and aligning one's attitudes and personality in a more creative direction. The Understanding stage includes a description and discussion of the creative person, the creative process, theories of creativity, and creativity tests. The Techniques stage includes basic cognitive abilities, personal creative thinking and problem-solving techniques, and well-known deliberate creative thinking techniques. The authors provide a list of books with exercises and techniques for strengthening visualization, memory, concentration, emotional control, and metaphorical thinking. The final stage, Actualization, is an increase in one's self-actualization, which can be partly taught directly through exploring new interests, being open to new ideas and experiences, and developing and using one's capabilities to the fullest.

Du Sautoy, D. M. (2020). The creativity code: Art and innovation in the age of AI. Belknap Press: An Imprint of Harvard University Press.

This book explains how AI can be used to create new forms of art and music that would not have been possible without it. AI can assist humans in the creative process by providing new ideas and inspiration. AI can be used to analyze and understand creative works, helping to identify patterns and trends that may not be obvious to humans. This book helps me to find connections of different ways I can use AI that during the process.

EO. (2023, March 2). Survival Strategies in the Era of AI Taught by Stanford | Stanford AIRE Director [Video]. YouTube. https://www.youtube.com/watch?v=ZA9K0JMrbWg

According to Dr. Li Jiang, educators need to modify their teaching methods to keep up with the times. With the abundance of information available to students today, the traditional approach to teaching that we may have experienced ourselves is no longer

effective. Instead, our focus should be on fostering innovation in our students. Dr. Li Jiang proposes three practical steps to achieve this goal. Firstly, we must ensure that students have a clear understanding of how AI operates. Secondly, we must establish the limits of AI's capabilities and recognize the areas where human intelligence surpasses that of AI. Finally, we must teach students how to work with and alongside AI in a collaborative manner. Incorporating these suggestions into a creative problem-solving course will enhance the relevance of this course.

Fox, R. L., & Fox, R. L. (2019). Exploring the Nature of Creativity. Van Haren Publishing.

This text is particularly useful for beginning classes and individuals who are new to the study of creativity. It is also the text assigned to my class from Genesee Community College. This book will support learners in understanding the foundational theories and concepts of creativity, enabling them to apply it in real-world contexts.

Hwang, A. H., & Won, A. S. (2021). IdeaBot: Investigating Social Facilitation in Human-Machine Team Creativity. Human Factors in Computing Systems. https://doi.org/10.1145/3411764.3445270

This article discusses the potential benefits of using computer-mediated team players to enhance creativity and collaboration in idea generation. The researchers looked at how people felt about working with a robot compared to a human, and how they talked to each other. They found that participants generated more and higher-quality ideas when working with a chatbot. People who are highly anxious demonstrated greater creative self-efficacy when interacting with a chatbot. This study shows that using computers to work together can be really helpful in idea generation.

Karwowski, M. (2015). Peer Effect on Students' Creative Self-Concept. Journal of Creative Behavior, 49(3), 211–225. https://doi.org/10.1002/jocb.102

The article discusses the importance of incorporating creative self-concepts in theorizing and research on creative potential and achievement. While creative self-concept variables are not as important as other elements such as creative personality, divergent thinking, and intrinsic motivation, they may reveal something new and important about creative potential and achievement. The study presented in the article is the first to test the effects of social comparison in class and school on middle-school students' creative self-concepts. It indicates that having more creative classmates or attending a "better" school translates into higher creative self-concept, contrary to the BFLPE phenomenon that classmates with higher achievement negatively influence each student's academic self-concept. The study suggests that more creative environments strengthen, rather than reduce, self-perceived creative potential. The study also highlights the need to focus on domain-specific creative self-concepts, especially creative self-efficacy and self-rated creativity in other domains. Finally, the article suggests that conditions improving creative self-concept should be optimized, including studying school and class climate as potential elements influencing creative self-concept, similar to the effects of teachers.

Knowlton, D. S., & Sharp, D. J. (2015). Students' Opinions of Instructional Strategies in a Graduate-Level Creativity Course. International Journal for the Scholarship of Teaching and Learning, 9(2). https://doi.org/10.20429/ijsotl.2015.090206

The paper investigates different instructional strategies used in a graduate-level university course to promote creative thinking and achievement. Reading the textbook and writing bi-weekly reflection journals were the most helpful strategies for enhancing creative

thinking according to students. The authors found that past research suggests the use of case studies, games, and other constructivist approaches but they found that Halpern (2010) suggest that students need help understanding the definition and potential applications of creativity. Crispin (2008) indicated that iPods can serve as a useful tool in enhancing creativity, Cheng (2011) found that utilizing creative problem-solving in a web-based cooperative learning format resulted in increased problem-solving performance and improved attitudes towards creativity among students. Similarly, Yeh and colleagues (2012) found that implementing a knowledge-management model, where students are responsible for both creating and sharing knowledge, is an effective approach in enhancing college students' creative abilities. The paper further explains that being creative requires several things from students. Firstly, students need to be able to write effectively to communicate the value of their ideas. Secondly, students should understand the different stages of creativity and how to use different types of thinking for each stage. Thirdly, being creative requires taking risks and being vulnerable. The author designed the course based on a natural critical learning environment that encourages students to struggle with an issue from their own perspective and articulate a position based on their struggles. The syllabus offers opportunities for students to transform themselves into more creative thinkers and doers. The textbook used was Carson (2010) brainsets which identifies a way of thinking during a stage of the creative process. The author suggests to integrate various thinking strategies, adopt journal writing and consider systems view of creativity to promote creative achievement among students.

Lee, J. S. (2020). Building creative confidence through an interdisciplinary creativity course: Changes in creative challenges and creative personal identity. Innovations in Education

and Teaching International, 59(3), 316–325.
https://doi.org/10.1080/14703297.2020.1835689

The course was built on the definition set forth by Runco (2003) where creativity is defined as the potential to develop thinking and interpretative abilities. Lee also drew from the Four-C model of developing students mini-c which distinguishes creativity as personal and interpersonal attributes of the process which leads to developing other levels of creativity was another factor (Kaufman & Beghetto, 2009). During the design of the course, Lee was also aware that people become most creative when they are motivated through interest, satisfaction, and the challenge of an activity itself (Amabile, 1998).

The focus of the course was to build creative confidence. Creative confidence plays a role in creative performance (Jaussi et al., 2007; Karwowski, 2016) and allows for nurturing of creative potential throughout life (Mathisen & Bronnick, 2009; Tierney & Farmer, 2011).

The creativity course focused on teaching foundational knowledge and scholarship of creativity, exploring creative case examples, and thinking tools across different disciplines, and helping students apply their creative processes to real-world problems and debunking creative myths. The course utilized a balance of instructor-led presentations, group discussions, and hands-on activities, including individual and team projects and examination of case studies from diverse real-world contexts. Additionally, students participated in product-making or story-making activities involving random sources. The learning experiences in this course inspired students to be aware and nurture their creativity. Students reported value from seeing the familiar in a new way, reframing failure, and collaborating especially when facing obstacles.

The course Lee drew from the work of Alencar, Amabile, Davis and the global survey report by Adobe studies (Alencar, 2001; Amabile, 1998; Davis, 2004; Adobe 2012) to compile the 13 creativity challenges that students overcame due to the creativity course, which were Internal factors such as self-doubt, fear of being judged, tools too difficult, lack of opportunity and external factors such as not enough time, inadequate funding (money), tools not accessible, competing personal obligations, competing work obligations, inadequate technology, information overload, finding others to support you, distance between resources.

Lee, J. S., Portillo, M., & Meneely, J. (2020). Insights Into Three Frames of Creative Minds: Igniting Perspective Transformation Among First-Year University Students. Journal of Transformative Education, 18(2), 138–162. https://doi.org/10.1177/1541344619893314

The long term goal of teaching creativity is teaching a way of being and a creative process which can apply and transfer to different domains. This study proposed a framework for building creative confidence through teaching strategies for creative thinking. Theories of creativity and transformative learning suggest that changing the way we think can lead to personal growth (Cranton, 2006; Csikszentmihalyi, 1996; Runco, 2003; Taylor & Laros, 2014). These changes involve rethinking our beliefs, perspectives, and behaviors by challenging commonly held assumptions (Cranton, 2006 Csikszentmihalyi, 1996; Fetherston & Kelly, 2007. The study found that the course activities expanded and reframed the students' insights on creativity, leading to three frames of creative minds: creative dynamics, creative mindsets, and creative confidence. By using the lens of transformative learning, the course authors were able to see personal identity shifts in their students. Transformative learning is a theoretical framework

developed by Jack Mezirow that describes how individuals undergo significant shifts in their beliefs, values, and perspectives through a process of critical reflection and questioning of their assumptions (Mezirow, 1991, 2000). In transformative learning an individual experiences a situation that goes against their assumptions and beliefs, which is known as a "disorienting dilemma," it can lead to a chain of emotional responses, introspection, and exploration of new roles. This process can ultimately result in the development of new skills and an increase in creative confidence. The course was designed to help students elaborate on existing frames of reference, learning new frames of reference, developing a new point of view, and transform habits of mind (Mezirow, 2000).

To challenge assumptions and biases around Mel Rhode's 4 p's of creative product, process, person, and press, the authors created a series of learning experiences. These experiences were designed around three educational components based on creativity and creative training literature: Theory and Research, Exploration of Creative Processes, and Application and Preparation. There was a balance of in class activities, hands-on skill building activities (Daly et al., 2016), instructor and peer led presentations.

The course was designed to incorporate foundational knowledge and theories of creativity which proved beneficial in shaping students' perspectives (Mathisen & Bronnick, 2009; Plucker & Dow, 2010). A case-based approach was used which positively influenced students' attitudes and beliefs about their own creative abilities and attitudes (Zampetakis et al., 2008). Case studies relating to the 4 p’s came from sources including Harvard Business Review and video clips on creators from a variety of disciplines. There were also opportunities for students to explore and practice creativity

techniques, such as idea generation methods or imagery training (Clapham, 1997; Scott et al., 2004; West et al., 2012). Students were given various opportunities to apply their learning and engage in self-reflection (Cheung et al., 2006; Davis, 2004; Mathisen & Bronnick, 2009). Creative projects that addressed exploratory, individual, and group-based learning strategies encouraged students to think about and improve their own creative processes across the course (Daly et al., 2016; Kind & Kind, 2007). Reynolds et al. (2013) found that students appreciated creative assignments focused on authentic processes, such as composing a reflective portfolio or journal of their creative work. Materials were drawn from the textbook Creativity is Forever by Davis (2004).

Lubart, T., Esposito, D., Gubenko, A., & Houssemand, C. (2021). Creativity in Humans, Robots, Humbots. Creat!Vity, 8(1), 23–37. https://doi.org/10.2478/ctra-2021-0003

The article discusses the intersection of robots or artificial intelligence (AI) with human creativity. The author examines three modes of interaction between humans and social robots: (1) robots as a support for human creativity, (2) humans as a support for robot creativity, and (3) collaborative co-creation between humans and robots. The article highlights the potential of social robots to stimulate human creativity, as well as the ability of robots to be creative agents themselves. The author also discusses the need for interdisciplinary research to address the problem of artificial creativity and the importance of incorporating computational creativity models into socially situated artificial agents. The article suggests that social robots can be designed to interact with humans engaged in the creative process and provide input that stimulates creativity. Collaborative creativity with human and social robot agents is a rich opportunity to

expand human creativity, as robots may explore unusual problem spaces and be less constrained by hidden rules.

Lunevich, L., & Wadaani, M. R. (2022). Creativity in Teaching and Teaching for Creativity: Modern Practices in the Digital Era in Engineering. CRC Press.

This book offers valuable insights on how to enhance creativity in learners through modern teaching practices and curriculum design. The book explores the impact of artificial intelligence, and how it will impact teaching and teachers in the classroom.

Miller, M. D. (2022). Remembering and Forgetting in the Age of Technology: Teaching, Learning, and the Science of Memory in a Wired World.

The author examines the impact of technology on memory and attention in the digital age. She provides concise explanations of major principles of memory and attention, and how they are changing in our technology-saturated world. Miller also offers practical ideas for teachers to handle and discuss technology in their classrooms and highlights the importance of memory for effective learning. She debunks cognitive myths surrounding the use of technology in learning. This will inform me on how we can adapt to these changes to enhance learning and retention.

Mollick, E. (2023, January 28). A prosthesis for imagination: Using AI to boost your creativity. https://oneusefulthing.substack.com/p/a-prosthesis-for-imagination-using

University of Pennsylvania Wharton School of Business professor, Ethan Mollick has state that he thinks AI is already more creative than humans. According to recent studies, AI is demonstrating greater creativity than humans based on many psychological creativity tests. AI has already produced impressive works of art, music, and stories. Generative AI can help people overcome their weaknesses in the creative process by

generating many ideas, even if most of them are initially unimpressive. “There is tremendous value in overcoming inertia, and often a small push is what we need to do it."

Puccio, G. J., Mance, M., & Murdock, M. C. (2010). Creative leadership: Skills that drive change (Second). SAGE Publications, Inc.

The authors introduce the concept of creative leadership and emphasize its importance in today's fast-paced environment. They present the Thinking Skills Model, a framework designed to help individuals develop cognitive and affective skills that facilitate the Creative Problem-solving (CPS) process. The book covers affective skills and cognitive skills, including critical thinking, divergent thinking, and convergent thinking, which are necessary for creative problem-solving. The book features case studies and real-world examples that illustrate the application of creative leadership skills and the Thinking Skills Model in diverse organizational settings, providing valuable insights into the challenges and successes associated with driving change through creative problem-solving.

Ritter, S. M., Gu, X., Crijns, M., & Biekens, P. (2020). Fostering students’ creative thinking skills by means of a one-year creativity training program. PLOS ONE, 15(3), e0229773. https://doi.org/10.1371/journal.pone.0229773

This article discusses a one-year creativity training program for higher education students, which aimed to enhance their creative thinking skills. The program was found to be effective in increasing ideation skills and cognitive flexibility, but not in significantly increasing originality. The training program was designed to foster creative thinking skills in learners and focused on enhancing ideation skills and cognitive flexibility. The program incorporated activities that allowed learners to break cognitive

patterns and overcome functional fixedness. Students were trained with the Six Step Cycle of Creativity applied to a wide range of problems. The steps include understanding the question, convergent thinking, divergent thinking, detached thinking, stop thinking, and sleeping, are explained in further detail below. The tools that were taught to the students were Simplify (reduce the complexity of questions), differentiate (wonder what is more and less important; what is the big picture and what are details), visualize (use real objects, make sketches, or imagine comparable processes from everyday life), tag the problem (link the problem to one of the five senses: sight, smell, sound, taste, touch). The authors state that the demand for creative thinking skills has exceeded the degree to which it is available and developed. Quote from the text "In most educational settings little attention is paid on developing students' creative thinking skills. There is a strong need for well-developed, domain-unspecific, scientifically tested creativity trainings that can be easily implemented in educational settings."

Sammet, J., & Wolf, J. (2022). From Trainer to Agile Learning Facilitator: How Teaching and Learning Works in Digital Times. Springer Nature.

The book discusses how digital learning methods are replacing traditional face-to-face teaching, and how this change is affecting the role of teachers. It provides guidance on the competencies that teachers need to be successful in the new digital learning environment and offers practical tips for modernizing their education programs. The book aims to help teachers become agile learning facilitators by providing both theoretical background knowledge and practical implementation possibilities. It is designed to assist teachers in navigating the digital "competence jungle" and adapting to the evolving landscape of learning.

Siemon, D., Strohmann, T., & Michalke, S. (2022). Creative potential through artificial intelligence: Recommendations for improving corporate and entrepreneurial innovation activities. Communications of the Association for Information Systems, 50, 241–260. https://doi.org/10.17705/1cais.05009

This article talks about how companies can use artificial intelligence (AI) to help them be more creative. The authors did two studies with entrepreneurs, innovation managers, and workshop facilitators to see how AI can help with creative processes. They found that AI can help people be more creative and can also help the creative process and the environment where creativity happens. They also learned that people see AI as a helpful partner. The authors have some ideas for how companies can use AI to be more creative, and they think more research should be done on how to use AI in the best way for creativity. This article explains how the environment is impacted positively with AI.

Siemens, G., Marmolejo-Ramos, F., Gabriel, F., Medeiros, K., Marrone, R., Joksimovic, S., & deLaat, M. (2022). Human and artificial cognition. Computers and Education: Artificial Intelligence, 3, 100107. https://doi.org/10.1016/j.caeai.2022.100107

There is debate about whether machines will be able to do things as complex as humans. It is important to consider how humans and AI can work together effectively in specific tasks and cognitive processes. Some researchers believe that specific parts of jobs will be automated, rather than entire job categories, and that human-machine interactions will involve collaboration and coordination. It is useful to think about AI in terms of specific tasks and activities rather than intelligence as a broad concept. There are three main ways that humans and AI can work together: human-led, machine-led, and hybrid approaches. It is important to consider the ethical implications of AI and address issues like bias and

the long-term impacts on individuals and society. This article supports my idea that AI is a tool to enhance not replace humans.

Valgeirsdóttir, D., & Onarheim, B. (2017). Studying creativity training programs: A methodological analysis. Creativity and Innovation Management, 26(4), 430–439. https://doi.org/10.1111/caim.12245

The paper proposes a methodological standard for studying creativity training programs based on the analysis of studies published after 2004. The focus is on the cognitive processes of divergent and convergent thinking, in addition to associational processes. Most creativity training programs aim to enhance individual creativity skills measured through divergent thinking tests. The most extensive review of creativity training programs is the seminal paper by Scott et al. (2004), which identified four common approaches to creativity training: cognitive, personality, motivational, and social interaction approaches. The researchers reviewed a variety of training programs, and their findings reinforce the findings of Scott et. al in 2004. The cognitive approach was found to be most consistently effective. The review suggests that effective creativity training programs should be built on a solid theoretical foundation about the cognitive basis of creativity, with detailed theoretical training forming a substantial part of the overall length of the training. Participants should apply their learning to solve a real-world case in a cooperative learning environment and be introduced to diverse exercises and tools to provide practice in using relevant strategies and heuristics. The cognitive processes associated with problem finding, conceptual combination, and idea generation had the strongest influence on effective creativity training. However, the question of what makes one effective program better than the other remains unanswered.

Vidal, R. (2010). Creative problem-solving: an applied university course. Pesquisa Operacional, 30(2), 405–426. https://doi.org/10.1590/s0101-74382010000200009

This paper presents the principles and contents of a creativity course for problem-solving. The author describes the purpose of the course as creating a space for students of any specialty to discuss, reflect, and experiment with creativity, creative processes, and creative tools relevant to problem-solving approaches. The course has been successfully, growing from only 8 students to where now more than 60 apply with a place of only 30. The course is designed using Action Learning (Revans, 1983), Action Research (Reason & Rowan, 1981), and Experiential Learning (Kolb, 1984). It's important for students to be motivated and choose the problems they want to solve and the methods they want to use. Creativity training should focus on encouraging responsibility and freedom, rather than just following rules. This means it should deal with both technical problem-solving and more complex creative processes that reflect real-world problems. The problems students solve should be relevant to the real world. The author says that learning is on the following levels "Learning to deal with real-life problems, learning about creative methods, Learning to work in groups, Learning about oneself, Learning to facilitate groups, and Learning to learn." Creativity can be found in three areas: humor (ha-ha), science (aha) and art (ah). The author states that the course is influenced by the work of Torrance, Maslow 1987, Miller 1989, Amabile 1983, Csikszentmihalyi (2001), Leonard & Swap (1999). First the group solves 4 puzzles that allow them to practice their divergent and convergent thinking skills. The next two weeks are workshop sessions; Future Workshop, Synectic's, Sociodrama, Storytelling, TRIZ, and Morphological Analysis. Finally the third part of the course is designing a creative product using

Creative Problem-solving. Students are said to enjoy and improve their creativity skills after completing the course.

Wingström, R., Hautala, J., & Lundman, R. (2022). Redefining Creativity in the Era of AI? Perspectives of Computer Scientists and New Media Artists. Creativity Research Journal, 1–17. https://doi.org/10.1080/10400419.2022.2107850

The article discusses the role of artificial intelligence (AI) in creativity and raises the question of whether creativity needs to be redefined in the era of AI. The article notes that AI has become more common in creative work because it performs well in tasks that are difficult for humans, such as analyzing and extracting big data, predicting outcomes, and even creating new content. The authors suggest that the concept of co-creativity, where the creativity of humans and AI blends, should be the focal point of future creativity research. Unlike the scientists, some artists considered their work with AI co-creative. The study demonstrates how the understanding of creativity may change in the era of AI. The authors encourage the development of AI that augments human creativity rather than replaces it. "The future possibilities of human-AI co-creativity are endless, and we are only beginning to explore them."

Appendix B: Prototype of a Master Design Document

A Master Design Document for a Higher Education Course in Introduction to Creative Problem Solving

Introduction

CPS 101 is a required course for students in the Entrepreneurship program at Genesee Community college. The goal of the course is to develop learners' creative problem-solving skills by providing them with theoretical principles, practical tools, and opportunities to identify their personal creative cognitive style, evaluate different approaches to problem-solving, and apply intentional and innovative thinking in various contexts. This Master Design Document outlines my strategy for iterating this course.

Background

The pace of change is accelerating faster than ever before, and it's particularly apparent in the field of technology. As an educator, I'm always striving to provide the best possible learning experience for my students, which is why I've decided to update my course. Specifically, I'm excited to incorporate the latest developments in Artificial Intelligence (AI), which I believe will transform the way we think about problem-solving.

CPS 101: Introduction to Creative Problem Solving

Course Description

Develops individual creative potential. Focuses on the interactive elements in deliberate creativity and innovation: the creative person, the creative process, the creative product, and the creative environment. Emphasizes application in personal and professional settings.

1. Explain theoretical creative problem-solving process principles.
2. Reframe the problem from multiple perspectives to improve creative thought processes.
3. Apply a variety of brainstorming tools to generate innovative and creative approaches to solve a problem.

4. Evaluate various approaches to the solving of a problem using pragmatic measures.
5. Identify characteristics of the creative person
6. Identify a personal creative cognitive style and describe how it manifests in everyday life.
7. Identify the characteristics of the creative environment.
8. Discuss the impact of environment on the creative person.
9. Discuss the intentional application of the creative process to the solving of a problem.

ANALYSIS

It’s crucial to have a deep understanding of both the learners and the context in which they'll be learning. In this analysis section, we'll be taking a closer look at both the learner and contextual factors that will shape the design of CPS 101.

Leaner Persona

The learner persona is fictional and was developed using Bing Chat (Microsoft 2023).:

Name: Emily
Age: 18
Major: Entrepreneurship
Background: Emily is a high school senior from Batavia, New York. She has always been interested in starting her own business and has taken several business classes in high school. She has also participated in a local entrepreneurship program for high school students.

Goals: Emily wants to learn more about entrepreneurship and how to start and run a successful business. She is excited to take classes at Genesee Community College and hopes to gain practical skills and knowledge that she can apply to her future business ventures.

Learning Style: Emily is a visual learner and enjoys interactive learning experiences. She likes to work on group projects and learn from her peers.

Challenges: Emily sometimes struggles with time management and can get overwhelmed with multiple assignments. She also finds it challenging to stay motivated when working on tasks that she finds less interesting.

Learner Persona Summary

Emily is a highly motivated visual learner who enjoys collaborating with peers but struggles with time management and staying motivated on less interesting tasks. Cost is also a factor in her educational decision-making. In course design, incorporating interactive and hands-on activities, clear deadlines, and breaking down projects into manageable tasks will be considered. Additionally, creating opportunities for collaboration and teamwork, and providing affordable options will be beneficial.

College Tuition Compare. (n.d.). Student population at Genesee Community College. Retrieved from https://www.collegetuitioncompare.com/edu/191339/genesee-community-college/enrollment/

College Factual. (n.d.). Genesee Community College financial aid & scholarships. Retrieved from https://www.collegefactual.com/colleges/genesee-community-college/paying-for-college/financial-aid/

Learner Analysis Summary

The learner is a student with an interest in entrepreneurship, who may come from a diverse background. They have some basic knowledge of business concepts but are looking to deepen their understanding of entrepreneurship and gain practical skills that they can apply to their own business ventures in the future. The learner may prefer interactive and experiential learning activities that allow them to apply what they've learned in a practical way. They may also be interested in collaborating with their peers and working in teams to develop their ideas and learn from one another. Time management and balancing coursework with other responsibilities may

be a challenge for some learners, and they may feel overwhelmed by the amount of information they need to learn.

Questions I still have about the learner:

What specific challenges do students with an interest in entrepreneurship face in terms of accessing opportunities, and how can these challenges be addressed in course design?

How do students with diverse backgrounds and levels of prior knowledge of business concepts approach learning about entrepreneurship, and what teaching strategies can be used to accommodate these different learning styles and backgrounds?

Contextual Analysis

Emily is an 18-year-old high school senior from Batavia, New York who has a strong interest in entrepreneurship. She has taken several business classes in high school and participated in an entrepreneurship program for high school students, indicating that she has some prior knowledge and exposure to practical skills related to entrepreneurship. Emily struggles with time management and staying motivated when working on tasks that she finds less interesting, which could impact her ability to succeed in a college-level entrepreneurship course. Emily is enrolled at Genesee Community College, which has a student population that is 62% female. She is also among the 82.0% of incoming students at Genesee Community College who receive some form of financial aid, indicating that cost is a factor in her educational decision-making. These contextual factors can impact Emily's experience as a learner and should be taken into consideration in designing courses and learning experiences that are relevant and effective for students like her.

Contextual Analysis Summary

The learner is enrolled in a community college, and cost may be a factor in their educational decision-making. In designing a course for students interested in entrepreneurship, the local entrepreneurship landscape and opportunities in the surrounding area should be taken into consideration. Providing practical skills and knowledge that students can apply to their own business ventures is important, and considering the financial constraints of students relying on

financial aid can be beneficial. Instructors can also consider the age and experience level of the learner in course content and teaching strategies.

Questions I still have about context:

What resources and opportunities are available in the local community to support students interested in entrepreneurship, and how can these be integrated into course content and activities to provide practical, real-world learning experiences?

How do financial constraints impact the educational decisions of students interested in entrepreneurship, and how can course design take these constraints into account to provide opportunities?

Learning Objectives

The course is designed to help students develop their skills in generating and evaluating innovative solutions to problems. The learning objectives are identified by Genesee Community College. The objectives are broad enough to encapsulate the most important aspects of creative problem solving while providing a working framework for students. To design the course to be significant and relevant to students' lives, the course integrates Fink's Taxonomy of Significant Learning, Solo Taxonomy, Bloom's Taxonomy and Krathwohl knowledge dimensions. By using these as a lens to design the course, students will develop cognitive skills and knowledge comprehensively.

Additionally, the course will incorporate the Torrance Incubation Model Creativity Objectives. The Torrance Incubation Model is used to encourage creativity while delivering academic content, which in this case is the teaching of creative problem-solving. Each topic in the course will focus on a creativity skill to present the information, using the skills from the Making the Creative Leap Beyond book. Each topic will have a clear purpose, identification of prerequisite knowledge or skills, enduring questions, and a creativity skill, all of which will be aligned with the overall learning objectives of the course. By incorporating the Torrance Incubation Model, the course will provide a comprehensive framework for teaching creative problem-solving that is both engaging and effective for students.

Fink's Taxonomy of Significant Learning (Course Overview)

Foundational Knowledge

- Explain theoretical creative problem-solving process principles.
- Identify characteristics of the creative person
- Identify the characteristics of the creative environment.
- Identify what makes a product creative/innovative.

Application

- Reframe the problem from multiple perspectives to improve creative thought processes.
- Apply a variety of divergent thinking tools to generate innovative and creative approaches to solve a problem.
- Apply a variety of convergent thinking tools to evaluate innovative and creative solutions to solve a problem.
- Discuss the intentional application of the creative process to the solving of a problem.

Integration

- Identify a personal creative cognitive style and describe how it manifests in everyday life.
- Discuss the impact of environment on the creative person.

Human Dimensions

- Use creative problem solving to gain resiliency and improved self-efficacy.
- Use creative problem-solving skills to contribute effectively to a team in personal and professional settings.

Caring

- Develop an increased sense of curiosity and wonder about the world and its possibilities.

- Recognize the importance of creativity and innovation in personal and professional settings.

Learning How to Learn

- Use artificial intelligence to improve learning and outcomes.

Course Student Learning Outcomes Based on Learning Objectives

Learning Objectives #1: Explain theoretical creative problem-solving process principles.

1.1 Students will be able to define key terms and concepts related to creative problem-solving.

1.2 Students will be able to analyze case studies of creative problem-solving and identify the underlying principles at work.

1.3 Students will be able to apply creative problem solving to a problem.

1.4 Students will be able to reflect on their own problem-solving experiences and identify areas of strength and weakness.

Learning Objectives #2: Reframe the problem from multiple perspectives to improve creative thought processes.

2.1 Students will be able to identify at least three different perspectives or lenses through which a problem can be viewed and solved.

2.2 Students will be able to reframe problems according to context.

2.3 Students will be able to reframe a given problem from at least two different perspectives and evaluate the effectiveness of each perspective.

2.4 Students will be able to use their understanding of motivation, persistence, and self-regulation to overcome barriers to creative thinking and problem-solving.

Learning Objectives #3: Apply a variety of brainstorming tools to generate innovative and creative approaches to solve a problem.

3.1 Students will be able to identify and name various tools that can be used for divergent and convergent thinking.

3.2 Students will be able to analyze and evaluate the strengths and weaknesses of different tools to choose the most appropriate approach for a specific problem.

3.3 Students will be able to develop a systematic approach to problem-solving that involves generating ideas, selecting the most promising ones, and refining them into actionable solutions.

3.4 Students will be able to reflect on their understanding and knowledge of various tools to generate innovative and creative approaches to problem-solving.

Learning Objectives #4: Evaluate various approaches to the solving of a problem using pragmatic measures.

4.1 Students will be able to define and differentiate between various pragmatic measures used to evaluate problem-solving approaches.

4.2 Students will be able to synthesize and compare the strengths and limitations of different pragmatic measures used to evaluate problem-solving approaches.

4.3 Students will be able to create and implement a plan to solve a complex problem using a systematic approach and evaluate the effectiveness of the plan using pragmatic measures.

4.4 Students will be able to monitor and regulate their own problem-solving strategies based on their self-awareness of their own biases, assumptions, and limitations and use pragmatic measures to evaluate the effectiveness of these strategies.

Learning Objectives #5: Identify characteristics of the creative person.

5.1 Students will be able to describe the traits and characteristics commonly associated with creative people.

5.2 Students will be able to evaluate how creativity can be fostered in different contexts and environments.

5.3 Students will be able to conduct research and gather data to identify characteristics of creative people.

5.4 Students will be able to set goals for developing characteristics of the creative person and monitor progress towards those goals.

Learning Objectives #6: Identify a personal creative cognitive style and describe how it manifests in everyday life.

6.1 Students will be able to explain the concept of cognitive style and its relationship to creativity.

6.2 Students will be able to explain the role of cognitive processes such as divergent thinking, convergent thinking, and analogical thinking in creative thinking and how they relate to personal cognitive style.

6.3 Students will be able to observe and analyze personal thinking patterns in everyday life to identify evidence of a creative cognitive style.

6.4 Students will be able to reflect on information from various sources about their cognitive style and approach to problem-solving.

Learning Objectives #7: Identify the characteristics of the creative environment.

7.1 Students will be able to explain how physical spaces, social contexts, and other factors contribute to the development of a creative environment.

7.2 Students will be able to explain how the various elements of a creative environment differ according to context.

7.3 Students will be able to develop a plan for creating a more supportive environment for their own creative work.

7.4 Students will be able to develop strategies for regulating their own learning process to intentionally create a more supportive environment for their own creative work.

Learning Objectives #8: Discuss the impact of environment on the creative person.

8.1 Students will be able to analyze and evaluate the ways in which the environment influences the creative process and output of an individual.

8.2 Students will be able to analyze how environmental factors, such as culture, history, politics, and social norms, influence the creative output of individuals.

8.3 Students will be able to identify and describe the ways in which environmental factors impact creativity.

8.4 Students will be able to reflect on their own creative process and how environmental factors have influenced it and use this awareness to engage in self-directed learning and creative development.

Learning Objectives #9: Discuss the intentional application of the creative process to the solving of a problem.

9.1 Students will be able to define and explain the steps involved in the intentional application of the creative process to problem-solving, using relevant examples and terminology.

9.2 Students will be able to critically evaluate the benefits and limitations of applying the creative process to problem-solving, in both personal and professional contexts.

9.3 Students will be able to apply the stages of the creative process to a given problem to generate innovative ideas and solutions.

9.4 Students will be able to reflect on their own problem-solving process, identify areas for improvement, and develop self-directed learning strategies to enhance their creative problem-solving skills.

CONTENT

The textbook I am using is Exploring the Nature of Creativity by Jon Michael Fox and Ronni Lea Fox. The overarching creativity skill for the course is getting glimpses of the future because I want students to see the real application of this course. That it is something that they will use in their personal and professional life.

Module 1: Principles of Creative Problem Solving

Students will highlight the essence by explaining theoretical creative problem-solving process principles. They will keep open to the possibilities of CPS's impact on their life. Main Takeaways for Learning Objective #1:

- Creativity is a trainable and measurable skill that everyone can learn to develop.
- Creative individuals possess traits such as openness, curiosity, and independence of thought.
- Overcoming internal barriers to creativity is important, and individuals can overcome strategic, value, perceptual, and self-image blocks to foster a climate of challenge, freedom, trust, openness, playfulness, and debate.
- The creative process involves preparation, incubation, illumination, and verification, and creativity can be cultivated by aiming for novelty and usefulness in our creative work.
- Using divergent and convergent thinking to generate and evaluate creative ideas is essential, and creativity can be measured by fluency, flexibility, originality, sensitivity to problems, and elaboration of ideas.

Module 2: The Creative Person

Students will explore the questions: How do you determine if a person is creative? Are there concrete measurable elements that can be observed and evaluated? Can a non-creative be creative? Then they will Break through and expand boundaries to explore, identify and cultivate personal creative cognitive styles and how they manifest in their life. The main takeaways for learning objectives #5 and #6 in this module include:

- Understanding the characteristics of a creative person, such as their openness to experience, willingness to take risks, and ability to see things in new ways.

- Identifying personal creative cognitive styles and strengths and how they manifest in everyday life.
- Recognizing that creativity is not limited to a certain type of person, and anyone can develop their creative potential.

Module 3: The Creative Press

Students will visualize and describe ideal creative environments by considering the impact of surroundings on the creative person and then use rich imagery and fantasy to explore possibilities of ideal environments. The main takeaways for learning objectives #7 and #8 in this module include:

- Understanding the characteristics of a creative environment, such as a climate of challenge, freedom, trust, openness, playfulness, and debate.
- Recognizing the impact of the environment on the creative person and how it can influence creativity.
- Using rich imagery and fantasy to explore possibilities of ideal environments.

Module 4: The Creative Process

Students will apply a variety of brainstorming tools to generate innovative and creative approaches (Produce and Consider Many Alternatives), evaluate various approaches using pragmatic measures (Elaborate-But Not Excessively), and reframe the problem from multiple perspectives (Look at It Another Way) to improve creative thought processes in problem-solving. The main takeaways for learning objectives #2, #3, and #4 in this module include:

- Reframing problems from multiple perspectives to improve creative thought processes.
- Applying a variety of brainstorming tools to generate innovative and creative approaches to solving a problem.
- Evaluating various approaches to solving a problem using pragmatic measures, such as elaborating but not excessively.
- Using divergent thinking tools to generate many alternatives and convergent thinking tools to evaluate and refine those alternatives.

Module 5: The Creative Product

Students will be aware of their emotions, be open to who they are as creative people, the creative process in order to develop a creative product/solution. The main takeaways for learning objectives #2, #3, #4, and #9 in this module include:

- Intentionally applying the creative problem-solving process to solve a problem and produce a creative product or solution.
- Being aware of emotions and being open to who individuals are as creative people during the creative process.
- Recognizing that the creative process involves intentionally applying CPS to a problem, generating and evaluating creative ideas, and producing a creative product or solution.

Module 6: Taking Your Work Forward

This module is designed to help students connect the dots between what they have learned in the course and how they can apply CPS principles to their personal and professional lives in the future. The main takeaways for this module include:

- Reflecting on the portfolio of work created throughout the course and identifying how CPS principles were applied to solve problems and generate creative solutions.
- Understanding how CPS principles can be applied to personal and professional settings and recognizing the benefits of using CPS to solve problems in these contexts.
- Learning how to continue to develop and improve creative problem-solving skills after the course ends.
- Exploring how to integrate CPS principles into everyday life and work and developing a plan for applying these principles in future projects and challenges.

DEVELOPMENT

Instructional Strategies

To effectively address the learning objectives, a range of instructional strategies will be used that can be adapted to the needs of both the instructor and the students. Recorded lectures will be created to provide an overview of key concepts and theories, allowing students to learn at their own pace and review material as needed. Discussion questions will be used to promote critical thinking and engagement with the material, while also encouraging students to share their perspectives and learn from one another. Case studies will be used to provide real-world examples of how creative problem-solving can be applied in different contexts. Brainstorming sessions and problem-based learning activities will be used to provide opportunities for students to practice generating and evaluating creative solutions to problems. Reflective writing prompts will be used to encourage students to reflect on their own learning process and how they can apply their new skills and knowledge in real-world situations. Group work and peer review will be used to enhance collaborative learning and encourage students to learn from one another. These strategies align with the learning objectives by providing students with opportunities to develop their communication, collaboration, and problem-solving skills, while also fostering a supportive and inclusive learning environment.

Instructional Materials

To support the instructional strategies and align with the learning objectives, a variety of instructional materials will be created and used. These include textbook activities, articles, videos, simulations, and interactive resources that provide learners with a broad range of perspectives on the concepts and theories being taught. Case studies will be developed to provide real-world examples of how creative problem-solving can be applied in different contexts. Problem sets and writing prompts will be developed to provide students with opportunities to practice applying their new skills and knowledge in real-world scenarios. Students will use artificial intelligence to help them learn and complete projects. These materials will be appropriately scaffolded to support learners' progression from basic to more advanced concepts, allowing students to build their skills and confidence over time.

Alignment

Once the instructional material has been developed, I can verify that there is balance, rigor, and a close alignment between the learning objectives, the topics, the structure, the instructional strategies, learning activities, and assessments. This alignment is crucial for ensuring that students can meet the intended learning outcomes and are adequately prepared for any assessments or evaluations that will be included. This alignment will create a meaningful and effective learning experience for all students.

IMPLEMENTATION

Method of delivery

The method of delivery is to make this course fully adaptive to the needs of the teacher and student. Therefore, the course will be created using a flipped learning model, which will consist of both asynchronous and synchronous sessions. Asynchronous sessions will involve pre-recorded videos, readings, and other materials that students can access at any time. These materials will be designed to cover the foundational concepts and skills that students need to master before the synchronous sessions. Synchronous sessions will be designed to allow for flexibility in delivery, based on the needs of the teacher and students. Teachers will have the option to conduct synchronous sessions in a face-to-face setting, or in a virtual environment, with alternative but equal activities available for both formats. This approach will allow for maximum flexibility and accommodate the needs of all learners.

During these sessions, students will have the opportunity to ask questions, work through problems, and collaborate with their peers, whether in-person or virtually. The synchronous sessions will be designed to build on the foundational knowledge gained in the asynchronous sessions, and to provide a dynamic and engaging learning experience. This approach will allow the teacher to differentiate instruction based on the needs of individual students. It will also allow courses and materials to be accessible to a diverse audience, including individuals with disabilities by incorporating features such as captions, transcripts, or adjustable font sizes into the content.

Structure of learning

This class will meet twice a week for 1.5 hours each session, for a total of three hours of instruction per week. The class will be structured to maximize engagement and learning outcomes, while accommodating the limited time available for in-class instruction. Each class session will begin with a creative thinking exercise, a brief review of the previous session's content, followed by a presentation on new material. This will be followed by interactive activities, such as small group discussions, problem-solving exercises, or case studies, which will allow students to apply the newly learned concepts in a practical setting.

Throughout the course, students will be given opportunities to work on independent or group projects, which will allow them to explore the material in greater depth and develop their critical thinking and problem-solving skills augmenting personal skills with Artificial Intelligence. These projects will be assigned and completed outside of class time but will be reviewed and discussed in class.

The structure of the class is as follows:

Creative Thinking Warm-Up

When students enter the classroom, they will have a creative thinking activity that is projected on the screen. The creative thinking warm up is an activity that students can do when they enter and as they are waiting for other students. It gets their brain primed for the class. Warmups do not relate to the topic content but are there just to get brains ready for learning. I will take ideas from lateral thinking, the theory of solving inventive problems (TRIZ), synectics, the method of 6 hats to find different creative thinking warm-ups.

Setting the Purpose & Class Intentions

After students have completed the activity, I will display a quote which will help set the tone for the class and in an indirect way introduce the day’s topic. I will ask a question to help them reflect and relate the quote to uncover the topic for today’s lesson. It is important for students to understand what they will work on for that lesson. To help them

scaffold their learning, as each new topic is introduced, I will show them how it fits on the mind map for the course to what they have already learned. I will also be weaving a creativity skill they will practice throughout the class based on Torrance's creative skills.

Heightening Anticipation

Each class will introduce the topic in a hands-on and exciting way. This is separate from the quote. This anticipatory set will serve to set the stage for the lesson and engage students' attention. The hook might take many different forms, depending on the topic we will cover in the class. For example, I might begin with a thought-provoking question, a surprising statistic, or a short video clip related to the topic.

Deepening Expectations

The second part of each class will be dedicated to exploring the topic in depth and building students' knowledge. This deepening section will provide opportunities to examine limitations, engage in CPS, and acquire new skills. Students will be encouraged to deliberately elaborate on their ideas, deal with incomplete information, and maintain openness to new perspectives. This section of the class will challenge students to think critically and creatively about the topic, building on their existing knowledge and skills to develop a deeper understanding.

Extending the Learning

Finally, the third part of each class will be devoted to extending the learning and encouraging students to think beyond the obvious. During this section, students will play with ambiguity, dream, and imagine, and look for connections to their own lives and future work. They will be encouraged to find appropriate sources of information and experiment with new ideas and most importantly make a plan to transfer their new knowledge.

EVALUATION

The Kirkpatrick's Model of Evaluation will be used to assess the effectiveness of the course, which consists of four levels of evaluation: reaction, learning, behavior, and results. Feedback will be collected from students at the reaction level to determine their satisfaction. Informal and formal assessments will be utilized at the learning level to measure the extent to which participants have acquired the intended knowledge, skills, and attitudes. To evaluate behavior change, metacognitive journaling will be implemented to assess whether students have applied what was learned. Finally, the results level will be assessed through student portfolios to determine whether the targeted outcomes have been achieved.

Appendix C: Prototype of the Syllabus (Partial)

CPS101 - Introduction to Creative Problem Solving
Fall 2022
Prerequisites: None
Credit Hours: 3

Instructor Information
Instructor: Instructor X
Email: instructorx@college.edu

Required Text
Fox, J. M., & Fox, R. L. (2019). Exploring the Nature of Creativity (4th ed.). Kendall Hunt Publishing. (must bring to class)

Minimum Technical Requirements
- Access to BrightSpace & Google Suite (Google Docs, Slides, Sheets, Form)
- Ability to record and upload video, Ability to take and upload a photo
- High Speed Internet
- Ability to upload files

You will also need
- Dedicated notebook (must bring to class)
- Optional: Post-it notes, index cards and markers (to practice at home & with friends)

Instructor Bio
Instructor X is a passionate advocate for creativity and innovation, with a master's degree in Creativity and Innovation from SUNY Buffalo.

Course Description (From Genesee Community College Catalog)
Develops individual creative potential. Focuses on the interactive elements in deliberate creativity and innovation: the creative person, the creative process, the creative product, and the creative environment. Emphasizes application in personal and professional settings.

Artificial Intelligence Policy
Students are expected to use AI tools, including ChatGPT and image generation tools in class and for most assignments unless told not to. Please be aware of ChatGPT's limitations and work on refining your prompts to obtain better results. You are responsible for verifying any information provided by the AI and responsible for correcting any errors. Whenever AI is used in an assignment, you are required to use APA guidelines to cite all AI tools. Failure to do so would violate academic honesty policies.

CPS101: TENTATIVE COURSE SCHEDULE FULL DETAILS IN BRIGHT SPACE

*The following course outline and schedule is provided for your information. NOTE: This IS subject to change.

WK Dates	Be prepared for class by:	Weekly Topic & Homework
Module 1: Principles of Creative Problem-Solving		
1 9/5-9/10		**Understanding the Nature of Creativity** What is creativity and how can we cultivate it? What is creativity and why is it important?
2 9/12-9/17		**Navigating the Creative Process** How does the creative process work? What are the stages of the creative process? What is the creative problem-solving process? How can we prepare for creative problem-solving? How can we generate and evaluate creative ideas?
3 9/19-9/24		**Introduction to Creativity & Creative Problem-Solving** How can we measure creativity? What are the different ways to measure creativity? What are the criteria for evaluating creative ideas? How can we apply the principles of CPS to personal and professional settings?
Module 2: The Creative Person		
4 9/27-10/1		**Characteristics of a Creative Person** What are the traits that define a creative person? How can we cultivate these traits in ourselves? What are some examples of highly creative individuals and their achievements?
5 10/3-10/8		**Personal Creative Cognitive Styles** What are cognitive styles and how do they relate to creativity? How can we identify our own creative cognitive style? How can we leverage our creative cognitive style to solve problems and generate new ideas? How do cognitive styles impact our lives?
6 10/10-10/15		**Developing Creative Potential** How can we overcome creative blocks and resistance to change? How can we cultivate our own creativity and that of others? How can we apply our creativity to various aspects of our lives?
Module 3: The Creative Press		
7 10/17-10/22		**Characteristics of a Creative Environment** What are the key features of a creative environment? How do different environments impact creativity? What are some examples of creative spaces and the impact they've had on the people who use them?
8 10/24-10/29		**Visualizing Ideal Creative Environments** How can we use rich imagery and fantasy to envision our ideal creative environment? What are the benefits of having a clear picture of our ideal environment?

		How can we incorporate elements of our ideal environment into our current surroundings? How can we create a climate of challenge, freedom, trust, openness, playfulness, and debate in our own environments?
Module 4: The Creative Process		
9 10/31-11/05		**Understanding the Creative Problem-Solving Process** What is the creative problem-solving process and how does it work? How can we apply the creative problem-solving process to solve real-world problems? How can we overcome obstacles and barriers to the creative problem-solving process?
10 11/7-11/12		**Reframing Problems and Multiple Perspectives** What does it mean to reframe a problem from multiple perspectives? How can reframing problems lead to more innovative solutions? What are some techniques for reframing problems? How can we apply these techniques to real-world problems?
11 11/14-11/19		**Divergent Thinking Tools for Idea Generation** What is divergent thinking and why is it important for creative problem-solving? What are some different divergent thinking techniques? How can we use these techniques to generate a large number of alternative solutions? How can we overcome common barriers to effective divergent thinking?
12 11/21-11/26		**Convergent Thinking Tools and Pragmatic Measures** What is convergent thinking and why is it important for creative problem-solving? What are some pragmatic measures for evaluating solutions, such as feasibility and impact? How can we use these measures to choose the best approach to a problem? How can we use divergent and convergent thinking to evaluate and refine alternatives?
Module 5: The Creative Product		
13 11/28-12/3		**Making Creative Products** What are some examples of using CPS to develop a creative product or solution? How can we develop and refine a creative product or solution that reflects our personal style and values?
14 12/5-12/10		**Failure, Iteration & Persistence** Should we do everything to avoid failure? How can we use feedback to improve and iterate on our creative products?
15 12/12-12/16		**Present the Culminating Project**
Module 6: Taking it Forward		
16 12/12-12/16		**Taking it Forward** How can we apply CPS principles to personal and professional settings? How can we continue to develop and improve our creative problem-solving skills?

Appendix D: Prototype of a Lesson

Module 4, Topic #, Lesson #

Introduction to the Brainstorming Technique

Purpose

The purpose of teaching brainstorming is to equip learners with a valuable tool for generating creative and innovative solutions to complex problems. Brainstorming helps individuals and teams tap into their collective knowledge, creativity, and diverse perspectives to generate a wide range of ideas, without judgment or criticism. By learning and practicing effective brainstorming techniques, learners can improve their ability to identify and solve problems, think outside the box, and collaborate with others to achieve common goals.

Prerequisite

Students must have been introduced to the creative process and creative problem-solving process before introducing the concept of brainstorming.

Learning Objective

1.1 Students will be able to define key terms and concepts related to creative problem-solving.
3.1 Students will be able to identify and name various tools that can be used for divergent and convergent thinking.
5.1 Students will be able to describe the traits and characteristics commonly associated with creative people.
7.1 Students will be able to explain how physical spaces, social contexts, and other factors contribute to the development of a creative environment.

By the end of class students will understand:

- What is brainstorming?
- Why it is useful?
- When to use it?
- How to use it?

Creativity Skill

The creativity skill for this lesson is "crossing out mistakes." This strategy encourages students to explore the content and make modifications to their skill and knowledge with new information. The way that I will employ this strategy is by introducing a brainstorming prompt, in this lesson it is about balloons. The student will be given the same prompt four times throughout this lesson. With each prompt the student will have more information on the brainstorming technique so they will be encouraged to reassess their knowledge and integrate new knowledge.

Materials

- PowerPoint Slides
- Lecture Notes

Pre-Class Activities

Exploring the Nature of Creativity Pages 150-171

Creative Thinking Warm-Up

Today's warm-up is incorporated into the lesson.

Setting the Purpose & Class Intentions

Students will read the quote and reflect on the question "where do you get ideas from?" After discussing the reflection question, we will mind map where "brainstorming" fits on the course mind map. We will read the objectives for the day, and I will answer any questions to clarify the purpose.

Heighten Anticipation

Students will engage in a brainstorming session without any prior knowledge or instruction on how to conduct a brainstorming session. They will generate ideas for "uses for a balloon." Have a group discussion to reflect on the effectiveness of the brainstorming session. What do they think could have improved the process? Tell them that today, we will dive into what makes for an effective brainstorming session.

Deepen Learning

Students will learn brainstorming techniques for generating innovative ideas, its advantages and disadvantages, and how to prepare for effective brainstorming sessions. Students will learn the importance of deferring judgment, seeking quantity and wild ideas, and building on others' ideas. After important concepts have been introduced and group discussions have taken place students will again engage in the balloon brainstorming session deepening their learning about the process. They will be presented with now the updated challenge statement “What might be all the ways to use a balloon?” and they will again generate more ideas this time following the rules they have learned. Finally, they'll explore individual and group brainstorming techniques, the role of a facilitator, and advanced brainstorming involving creative thinking and artificial intelligence tools. Students will attempt the balloon brainstorm with new found knowledge and the introduction of a the creative brainstorming technique called forced connections, to generate more ideas. Explain to students that during the course they will use the bolded tools Stick’em Up Brainstorming, Brainwriting, Forced Connections, Morphological Matrix, and SCAMPER. Finally, the students will be introduced to ChatGPT brainstorming technique and will use the chatbot to come up with more ideas.

Extend the Learning

We are using divergent thinking a lot during the day. We decide what is for dinner, what we will wear, and so on. When we learn the rules of brainstorming and we practice them. The rules will transfer to the way that we approach life. Have students reread the quote by Alex Osborn and discuss if it has a new meaning? Students will discuss how they will incorporate the new knowledge into their lives.

Lecture Notes

Creative power can be stepped up by effort, and there are ways in which we can guide our creative thinking.

—Alex Osborn, The Father of Brainstorming

What is brainstorming & Why it Matters

Brainstorming is a divergent thinking tool that is used in various capacities of the creative problem-solving process. Brainstorming is used when more than one idea is needed for a specific goal. Brainstorming is a powerful tool for generating new ideas related to problems, challenges, or opportunities. It involves coming up with radical ideas based on a set of assumptions or constraints, with the goal of breaking out of traditional patterns and recognizing that our brains sometimes limit our thinking. Although brainstorming is used at different stages in the creative problem-solving process, it is most often employed in the ideation stage. Its ultimate aim is to help individuals or teams generate innovative and unique ideas that may not have been possible to discover using traditional problem-solving techniques. It is one of the most used and misused idea generation techniques.

History

The concept of brainstorming was invented by advertising executive Alex Faickney Osborn in 1948. Osborn believed that "the best way to have a good idea is to have many ideas," and he developed the brainstorming technique to stimulate creative thinking in group settings. In the 1950s, Osborn and his colleagues used brainstorming with companies like General Motors, DuPont, and General Electric. Osborn's book Applied Imagination, published in 1953, popularized the term "brainstorming," which was originally called "think up." the invention of brainstorming by Alex Faickney Osborn has had a significant impact on problem-solving and creative thinking processes, and it remains a valuable tool for organizations and individuals seeking to generate innovative solutions.

When to use brainstorming

Brainstorming is useful when tackling complex or challenging issues that require a creative and innovative approach, and when a group needs to generate a large number of ideas. It can also build team cohesion and encourage collaboration.

Advantages of Brainstorming

Brainstorming has many advantages. The concept of brainstorming is easy to understand, and people can get on with it immediately, especially if being guided by a professional facilitator. Brainstorming also doesn't require many materials. All you need is something to write with and something to write on. With brainstorming you also generate a lot of ideas that can be used right away. The quick turnaround speeds up the process of getting new ideas. And finally, brainstorming is a democratic way of generating ideas. Everyone's ideas are given equal consideration which creates a sense of equality and inclusivity within the group that can help foster collaboration and teamwork.

Disadvantages of Brainstorming

Brainstorming, however, also has some disadvantages. The first disadvantage is that group dynamics can sometimes hinder creativity. People may feel uncomfortable or intimidated, which can limit their contributions to the brainstorming session. This can result in less diverse ideas and even groupthink, where people just agree with the dominant opinion. Another disadvantage of brainstorming is that it can be time-consuming. The effort put into generating ideas may not always justify the results obtained. Lastly, dominant individuals can limit discussion and control the direction of the brainstorming session, which can lead to a lack of creativity and diversity in ideas.

Setting Up the Environment - How to prepare for brainstorming

Team – Task – Rules - Time Table - Record

To ensure a successful brainstorming session, it is crucial to have a team that is well-versed in brainstorming techniques and has a clear understanding of the problem at hand. The task should be defined clearly, with a minimum target of generating 30 ideas. It is important to follow the

rules of divergent thinking to encourage idea generation and avoid premature judgment. The session should be allocated a specific timeframe, and every idea generated should be recorded to avoid overlooking potentially valuable ideas.

Brainstorming Rules

The first fundamental rule is to defer judgment, as criticism of ideas should be put on hold. Participants should focus on extending or adding to ideas, reserving criticism for the later critical stage of the process. By suspending judgment, participants will feel free to generate unusual ideas. The second rule is to go for quantity, as the assumption is that the greater the number of ideas generated, the bigger the chance of producing a radical and effective solution. The third rule is to welcome wild ideas. By looking from new perspectives and suspending assumptions, wild ideas can be generated, which can lead to better solutions. Lastly, combining and improving ideas is encouraged, as the building of ideas through association can lead to even more innovative solutions. For building on ideas, the “yes, and” versus “yes, but” mindset is important.

Defer Judgement

Avoid criticizing or praising ideas. It's hard to follow, but it helps generate more new ideas. Our brain needs time to process, so never backtrack or improve on previous ideas. All ideas are valuable, so keep facial expressions and feedback to a minimum. You will get a chance to evaluate ideas later in the process. The purpose of brainstorming is to just generate – evaluate later!

The Case of Stop and Go Thinking

If you constantly switch between divergent and convergent thinking without allowing enough time for each, it can be challenging to generate and evaluate ideas effectively. It's like driving a car at high speed and constantly slamming on the brakes, which can be both inefficient and exhausting. So, we do not judge ideas until later in the process. We defer judgement till it’s time to evaluate.

Go for Quantity

Brainstorming is a technique that emphasizes quantity over quality. The goal is to generate many ideas without any restrictions that could limit the creative process. The more ideas that are generated, the better the chances are of finding innovative solutions. It's also much easier to modify existing ideas than to come up with entirely new ones.

> **Quality of Ideas & Time**
>
> In brainstorming the aim is to get A LOT of ideas that are not necessarily good ideas. The time pushing through the drudgery to get out the basic ideas first is completely worth it. The more brainpower dedicated to generating ideas, the higher the likelihood of producing quality and usable ideas. It is crucial to persist and push through the process to find the best ideas.

Seek Wild Ideas

All ideas are welcome, even simple and obvious ones. Wild ideas can lead to creative solutions and should be encouraged. Group synergy and rapport can inspire practical ideas from seemingly crazy ones. Unusual ideas may be the best solution and using them as inspiration can lead to a practical solution.

> **Explore the Unbeaten Path**
>
> Finding innovative solutions to problems is like exploring the wilderness. You have to be willing to venture off the beaten path and explore new terrain to find the hidden gems. By seeking wild ideas and unconventional approaches, you can discover new solutions that may have been overlooked if you only stick to familiar routes.

Build on Other Ideas

By inspiring and encouraging each other, team members can come up with more creative and innovative ideas. When one person presents an idea, it serves as a starting point for others to build upon and improve. The original idea lends itself as a catalyst for associative thinking which leads to more ideas.

Mix, Match, and Add-on

Combining and improving ideas is like cooking a delicious meal. Just as a chef combines different ingredients to create a new and exciting dish, you can combine ideas from different sources to create innovative solutions. By using the "yes and" approach instead of "yes but", you build on ideas and add to them, creating something greater than the sum of its parts. This way, you can take a good idea and make it even better by incorporating the strengths of other ideas.

Success Factors

Alex Osborn emphasizes the importance of several factors for successful brainstorming, such as acting without waiting for inspiration, focusing on the task at hand, directing the group's attention to a specific mode of thinking, and persisting with concentration even if no ideas are forthcoming. He strongly emphasizes the need for diligent work, stating that nothing is more crucial for the session's success.

Brainstorming Workflow

Discuss graphic on slide.

Types of brainstorming

There are three types of brainstorming to be aware of. The first is an unstructured session where ideas are recorded as they pop into the head. It is called a “Brain Dump” or “Mind Sweep” and is usually in the format of a checklist or bullet form list. The second type is traditional brainstorming, which is a structured brainstorming session where rules are followed to generate as many ideas as possible. This type of brainstorming involves setting a specific goal or problem to solve and then encouraging all team members to share their ideas without judgment or criticism. The third type is Advanced Brainstorming, which is also a structured brainstorming session that involves creative thinking, specialized techniques, and new technologies. Various tools are integrated into the session to encourage creative thinking and generate unique solutions.

Methods of Brainstorming

Brainstorming can be done individually or within a group. Different situations will recover different techniques and tools to get the most out of the session.

Individual brainstorming is useful when one person needs to come up with new ideas or solutions. It allows for a private and uninterrupted thought process where the individual can explore different perspectives and generate ideas without external input.

Group brainstorming is useful when a team needs to generate ideas or solutions for a particular problem. It involves gathering a group of people and encouraging them to share their ideas and thoughts. This type of brainstorming can be done in a variety of formats, including open discussion, moderated discussion, or structured rounds.

Round Robin is a group brainstorming technique where participants take turns sharing their ideas in a structured and organized way. This method ensures that all participants have equal opportunity to contribute their ideas and prevents any one person from dominating the discussion.

Nominal Group Technique is another group brainstorming technique that involves generating ideas individually before sharing them with the group. Participants generate their ideas in silence, which helps to prevent groupthink and allows for a more diverse range of ideas. These ideas are then shared with the group, and a structured discussion is held to evaluate and build upon them.

Role of the Facilitator

For a quality brainstorming session, it is important for the facilitator to be well versed in the creative process, the creative problem solving process as well as the tools and techniques for brainstorming. Paradoxically, the more control over a brainstorming session the more effective at generating higher quality and more ideas. The facilitator guides the participants through the process and makes sure that everyone adheres to the ground rules as well as makes sure that all voices are heard and no one is dominating the session.

Advanced Brainstorming

Structured Brainstorming technique where individuals or a group of people follow a specific framework or structure to generate ideas. The goal of structured brainstorming is to help participants focus their thoughts and generate more ideas within a set time frame. In advanced brainstorming, creative thinking is involved, specialized techniques and new technologies are used. Creative thinking like random words, pictures, software and artificial intelligence tools.

Brainstorming techniques are used to generate new ideas and enhance creativity. These techniques can be categorized into traditional, creative, and visual methods. Traditional methods involve listing, grouping, and organizing ideas. Creative techniques encourage participants to think outside the box and use analogies and associations to generate new ideas. Visual methods involve using images and diagrams to create connections and relationships between ideas. By utilizing a combination of different brainstorming techniques, individuals or groups can explore different perspectives and generate a higher quantity and quality of ideas.

Artificial Intelligence Tools

When using artificial intelligence, such as a chatbot, to brainstorm, it is important to modify and adapt the technique to suit your needs. To ensure high-quality output, it is important to have a clear goal for your brainstorming session and be aware of the part of the creative problem-solving process you are in. Use open-ended questions to encourage the chatbot to be as creative as possible and suggest ideas that are out of the ordinary or even a bit crazy. You can also organize the output results in a specific way, such as in categories or rankings, or ask for its thoughts on the pros and cons of different ideas. Furthermore, you can ask the chatbot to take on different personas or act as a subject matter expert to generate ideas that meet specific needs and concerns. To expand on generated ideas, have the chatbot use different techniques. By following these tips, you can maximize the benefits of using artificial intelligence, such as chatbots, to brainstorm and generate innovative ideas.

Appendix E: Prototype of Lesson PowerPoint Slides

Traditional Methods of Brainstorming

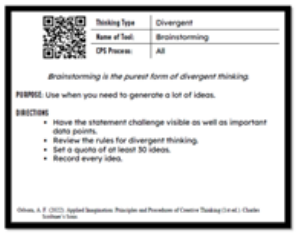
- Listing/Bulleting
- Mind Mapping
- Post-its
- Rapid Ideation

Role of the Facilitator

- Keep process going
- Make sure everyone adheres to the rules
- Chooses the right tool to expand ideas
- Prompts
- Confirming what has been said
- Play backs to help people build on idea

Role of the Facilitator

Process	Rules	Tools & Techniques	Prompts	Confirming	Playback
Where are we in the process?	Is everyone deferring judgment, striving for quantity, seeking wild ideas, and building on other ideas?	Which tool can be used to enhance this brainstorming session?	What else? Anything else? Keep them coming! Thank you! And? More, please? Another one? Yes! Who else? Anyone else?	It sounds like what you're saying is ... Is that right?	So, we've heard things like X, Y, and Z. What else is there? Let's see. We have A, B, C, D, E, F, G, and H. Great list so far, let's keep going!



Thinking Type	Divergent
Name of Tool:	Brainstorming
CPS Process:	All

Brainstorming is the purest form of divergent thinking.

PURPOSE: Use when you need to generate a lot of ideas.

DIRECTIONS

- Have the statement challenge visible as well as important data points.
- Review the rules for divergent thinking.
- Set a quota of at least 30 ideas.
- Record every idea.

Osborn, A. F. (1953). Applied Imagination: Principles and Procedures of Creative Thinking (1st ed.). Charles Scribner's Sons.

DIVERGENT THINKING RULES

- Defer Judgment
- Strive for Quantity
- Seek Wild Ideas
- Build on other ideas

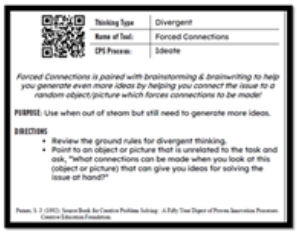
What might be all the ways to use a balloon?

How to use brainstorming?

(Advanced Brainstorming Tools & Techniques)

A Few Advanced Tools & Techniques... The Toolbox

Traditional Brainstorming	Creative Thinking	Visual Structures
Stick'em Up (Post Its)	**Forced Connections**	**Morphological Matrix**
Brainwriting	**SCAMPER**	Venn Diagram
Listing (Bullet Points)	Six Thinking Hats	Tree Diagram
	Synectics	T Diagram
	TRIZ	Spoke Diagram
	Liberating Structures	Star Bursting
		Mind Mapping



Thinking Type	Divergent
Name of Tool:	Forced Connections
CPS Process:	Ideate

Forced Connections is paired with brainstorming & brainwriting to help you generate even more ideas by helping you connect the issue to a random object/picture which forces connections to be made!

PURPOSE: Use when out of steam but still need to generate more ideas.

DIRECTIONS

- Review the ground rules for divergent thinking.
- Point to an object or picture that is unrelated to the task and ask, "what connections can be made when you look at this (object or picture) that can give you ideas for solving the issue at hand?"

Parnes, S. J. (1992). Source Book for Creative Problem Solving: A Fifty Year Digest of Proven Innovation Processes. Creative Education Foundation.

DIVERGENT THINKING RULES

- Defer Judgment
- Strive for Quantity
- Seek Wild Ideas
- Build on other ideas

How to use brainstorming?

(Success Factors)

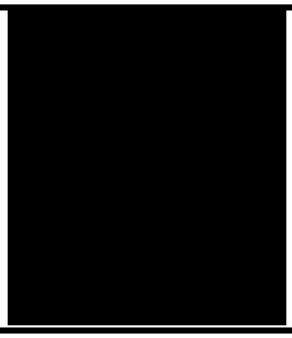
Success Factors:

- Pro-Action
- Focus
- Attention
- Concentration
- Effort

How to use brainstorming?

(Follow the Process)

Breaking Down the Brainstorming Process



Types of brainstorming

Brain Dump / Mind Sweep	Traditional Brainstorming	Advanced Brainstorming
Unstructured brainstorming session where ideas are recorded as they pop into the head.	Structured brainstorming where rules are followed to generate as many ideas as possible.	Structured brainstorming where rules are followed, creative thinking is involved, specialized techniques and new technologies are used.

Methods of brainstorming

Individual

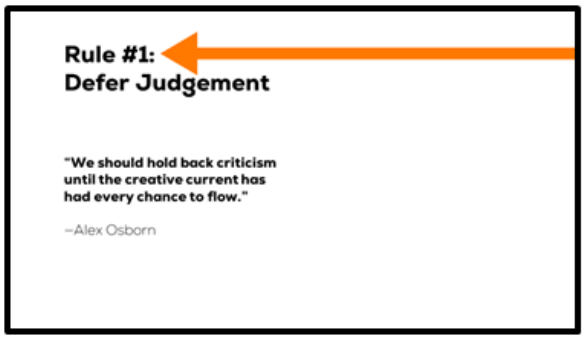
Group

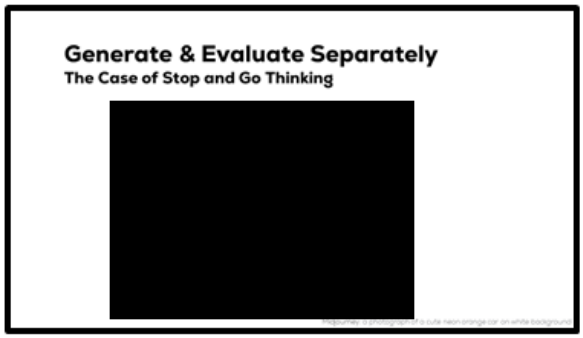
Methods of brainstorming

Different applications to brainstorming:

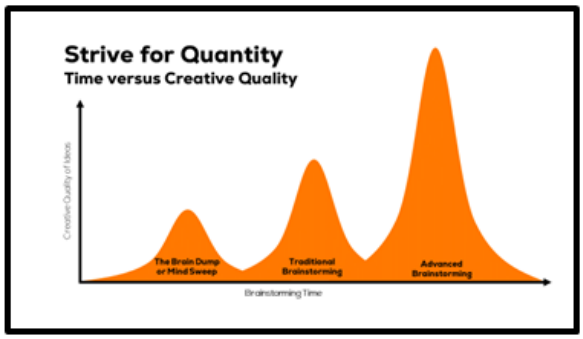
- Individual
- Group
- Round Robin
- Nominal Group Technique

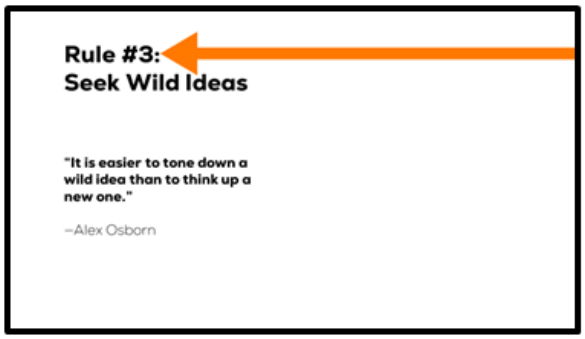
DIVERGENT THINKING RULES
• Defer Judgment
• Strive for Quantity
• Seek Wild Ideas
• Build on other ideas
(Applied Imagination, 1953)

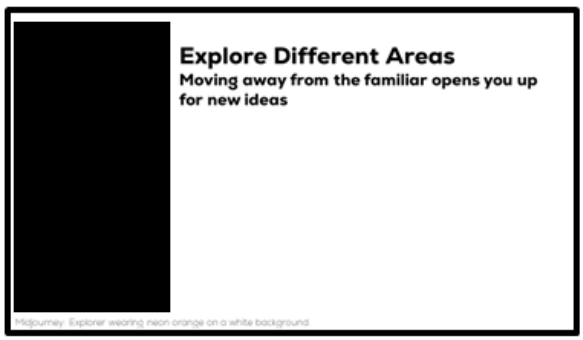

Rule #1:
Defer Judgement
"We should hold back criticism until the creative current has had every chance to flow."
–Alex Osborn


Generate & Evaluate Separately
The Case of Stop and Go Thinking

Rule #2:
Strive for Quantity
"We need to think up plenty of tentative ideas, because, in ideation, quantity helps breed quality."
–Alex Osborn


Strive for Quantity
Time versus Creative Quality
Creative Quality of Ideas
The Brain Dump or Mind Sweep
Traditional Brainstorming
Advanced Brainstorming
Brainstorming Time


Rule #3:
Seek Wild Ideas
"It is easier to tone down a wild idea than to think up a new one."
–Alex Osborn

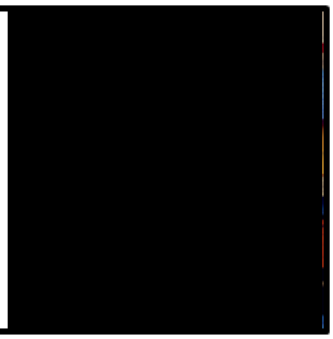

Explore Different Areas
Moving away from the familiar opens you up for new ideas
Midjourney: Explorer wearing neon orange on a white background

Rule #4:
Build on Other Ideas
"Most people have never learned ... that they do possess the gift of creative imagination."
–Alex Osborn

When to use brainstorming?

⬇

When you need to generate a large number of ideas!



Why brainstorming is useful?

Why it matters?

- Break traditional patterns, generate new ideas
- Lots of different ideas to expand boundaries

Advantages of Brainstorming

- Requires few material resources
- Results can be used immediately
- "Democratic" way of generating ideas
- Concept of brainstorming is easy to understand

- Group dynamics can hinder creativity, leading to intimidation or discomfort.
- Brainstorming can result in groupthink and less diverse ideas.
- Time-consuming; ideas may not justify effort.
- Dominant individuals can limit discussion.

How to use brainstorming?

(Setting Up the Environment)

Setting Up the Environment

Team – Task – Rules – Timetable - Record

- **Team**
  People who are versed in brainstorming & owner of problem.
- **Task**
  The problem and target desired number of ideas (minimum 30).
- **Rules**
  Review and follow rules for divergent thinking.
- **Timetable**
  How long the session will be.
- **Record**
  Record EVERY idea.

How to use brainstorming?

(Follow the Rules!)

What might be all the ways to use a balloon?

[redacted]

How to use brainstorming?

(Using Artificial Intelligence)

[redacted]

Using a Large Language Model

- Prompt chatbot for outside-the-box or wild ideas.
- Request chatbot to take on personas/expert roles for specific needs.
- Ask chatbot for more ideas or similar ideas.
- Get target audience ideas from chatbot.
- Develop an idea with chatbot, requesting more details.
- Combine two ideas for new ideas.
- Request chatbot to use tools & techniques to expand on generated ideas.
- Prompts must contain: AI Role, parameters, exceptions, specific task

ChatGPT Prompt

Good prompts contain: AI Role, parameters, exceptions, specific task

> You are a brainstorming chatbot. Create a chatbot that helps users brainstorm ideas for a specific topic. The chatbot should first ask the user to provide some basic information about the topic, such as what the topic is, what the goal is, and any specific requirements or constraints. The chatbot should then provide prompts and questions to help the user generate ideas and allow the user to revisit any ideas they come up with. The chatbot should be user-friendly and engaging, with a tone that encourages and supports the user's ideation process.
>
> Ask me: "What would you like help generating ideas for?"

What might be all the ways to use a balloon?

Chatbot Prompt via ChatGPT3.5

1. Create a DIY insect trap by placing a blown-up balloon over the opening of a jar with bait inside.
2. Use a balloon as a stylus on your smartphone or tablet.
3. Make a balloon-powered car by attaching a balloon to a straw or skewer and securing it to a cardboard base.
4. Use a balloon as a makeshift earplug in noisy environments.
5. Fill a balloon with water and freeze it to create an ice pack for injuries.
6. Inflate a balloon and attach it to a string to create a homemade fishing bobber.
7. Use balloons as inexpensive and disposable shoe covers in muddy or dusty environments.
8. Create a balloon garland by attaching inflated balloons to string or ribbon.
9. Use a balloon to create a DIY temporary grip on a slippery surface.
10. Make a water balloon launcher by attaching a balloon to a bungee cord and pulling it back to launch water balloons.
11. Use balloons as weights for exercising by filling them with water or sand and using them for resistance training.
12. Fill a balloon with air and use it as a windshield scraper to remove ice and snow from your car.
13. Create a balloon arch for a wedding or other special event.
14. Use a balloon as a makeshift pillow or cushion in a pinch.
15. Fill balloons with paint and use them to create abstract art.
16. Use a balloon to cushion fragile items in a package or during a move.
17. Inflate a balloon and use it as a stress ball.
18. Create a balloon-powered boat by attaching a balloon to a straw and securing it to a piece of foam or plastic.
19. Use balloons as DIY Christmas ornaments by painting them, filling them with confetti, or covering them with glitter.
20. Use a balloon to cover a broken car window until you can get it repaired.
21. Inflate a balloon and use it as a makeshift drum.
22. Fill a balloon with flour or cornstarch and use it as a homemade chalk ball for rock climbing.
23. Create a balloon sculpture by twisting and shaping balloons into different shapes and animals.
24. Inflate a balloon and use it as a bubble wrap substitute for packing fragile items.
25. Use a balloon as a cheap and easy way to create a makeshift pillow or seat cushion.

[redacted]

What might be all the ways to use a balloon?

what are some unusual uses for a balloon? Give me a list of 25 wild and crazy, novel ideas for uses for a balloon. Do not elaborate just give me the...

1. DIY humidifier
2. Emergency water storage
3. DIY bubble machine
4. Portable stress ball
5. Homemade fruit fly trap
6. DIY pom-pom maker
7. Balloon-powered car
8. DIY piñata
9. Emergency flotation device
10. DIY rocket launcher
11. Decorative party garland
12. Water balloon launcher
13. DIY musical instrument
14. Balloon-powered boat
15. Emergency shelter
16. DIY vacuum sealer
17. Balloon-powered windmill
18. Party game target
19. DIY hot air balloon
20. Balloon-powered parachute
21. DIY time capsule
22. Decorative light cover
23. DIY punching bag
24. Balloon-powered roller skate
25. DIY pinhole camera

Generate 10 unique and novel ideas for a balloon by forcing a connection with fruit. Just give me the title, do not elaborate unless I ask.

1. Fruit-Inspired Balloon Bouquets
2. Fruit-Infused Scented Balloons
3. Fruit-Shaped Balloons
4. Balloons with Fruit-Inspired Messages
5. Edible Fruit-Filled Balloons
6. Fruit-Printed Balloons
7. Balloons with Fruit-Flavored Confetti
8. Fruit-Inspired Balloon Animals
9. Balloons with Miniature Fruit Attachments
10. DIY Fruit-Decorated Balloons

Generate 10 unique and novel ideas for a balloon by forcing a connection with a giraffe. Just give me the title, do not elaborate unless I ask.

1. Giraffe-inspired balloon animal creations
2. Giraffe-print hot air balloons
3. Giraffe-shaped helium balloons for parties
4. Giraffe-inspired eco-friendly balloons
5. Balloon safari ride with giraffe-shaped balloon
6. Giraffe balloon photo booth prop
7. Educational giraffe balloon with anatomy labeling
8. Giraffe-themed balloon pop-up shop
9. Giraffe balloon sculptures for weddings/events
10. Giant giraffe-shaped balloon for outdoor advertising

List of AI Tools for Brainstorming

- OpenAI's ChatGPT (chatbot)
- BingAI (chatbot)
- https://whimsical.com/ (mindmapping with AI)

Creative power can be stepped up by effort, and there are ways in which we can guide our creative thinking.

–ALEX OSBORN

How will you incorporate your new skill?

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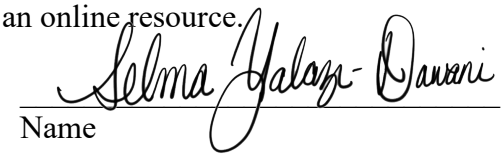
I hereby grant permission to the Department of Creativity and Change Leadership, Center for Applied Imagination at Buffalo State college permission to place a digital copy of this master's Project "Integrating Artificial Intelligence into Creativity Education: Developing a Creative Problem-Solving Course for Higher Education" as an online resource.



Name

May 2, 2023

Date