Examining the INTERSECTION of HUMOR & CREATIVITY

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ABSTRACT

It is no secret that comedic improvisation takes a quick mind, active listening skills, and a willingness to explore the unexpected. The same skills are at the heart of ideation and innovation. In this paper, we review the current literature on the use of humor as an ideation tool and examine the crossroads of humor, innovation, and creativity.

To begin, it is important to examine the concept of creative confidence as defined by IDEO founders David and Tom Kelley (2013). Creatively confident individuals are willing to take risks, fail, and work at the edges of their comfort zone in order to find creative solutions to problems. Creative confidence builds on the social cognitive theory of psychology which states that social interactions are an important part of how people learn new skills. One core tenet of this theory is guided mastery, a process by which one is moved from phobia to a state of self-efficacy. Self-efficacy is a belief that one is capable of completing a task and affecting change.

Both innovation and humor rely on an ability to make unusual connections and see things in a different light. Incongruity theory of humor provides an approach for better understanding the commonalities between humor and innovation. In design-thinking sessions, stakeholders come from a variety of backgrounds and social standings. This creates an environment that can be filled with fear of the unknown and a general discomfort with freedom that creative problem solving requires. We propose that humor is the key to creating a level and open playing field where the voices of all stakeholders can be heard.

An experimental-design solution was implemented to answer the question "Can a set of guided improv exercises increase the quantity of ideas generated during a group ideation session?" Using an experimental-design format, a sample of 94 community college students participated in three brainstorming activities of increasing difficulty as part of a three-session creative-thinking module. The control group received standard instruction for each activity. The improv group received the same instruction with the addition of one comedic improv-inspired activity during two of the sessions. Data was collected through pre and post study questionnaires, contemporaneously created artifacts, and video recordings. Data was coded and analyzed using design-thinking methods.

We found that participating in improv games as part of a creative-thinking curriculum did increase individual participants' creative self-concept and ability to generate ideas. The increased creative-thinking abilities did not seem to translate to collaborative brainstorming activities, however. In the case of group ideation, the most influential factors appear to be the preexisting group dynamics and environmental constraints such as room size and seating configuration. These findings suggest further research on the effect of improv games on collaboration in groups, both newly formed and preexisting, is needed.

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The most exciting phrase to hear in science,
the one that heralds the most discoveries,
is not 'Eureka! I found it!' but 'that's funny'.

~ Isaac Asimov

INTRODUCTION

Innovation and creativity go hand-in-hand, two sides of the same coin. In Creative Confidence, Tom and David Kelley (2013) stated that "in the business world, creativity manifests itself as innovation" (p. 3). Noted psychologist Mihaly Csikzentmihalyi (2015) identified creativity as "any act, idea, or product that changes an existing domain, or that transforms an existing domain into a new one" (p. 28). Creative director Stefan Mumaw (2013) identified creativity as solving a problem with novelty and relevance. Creativity requires a sense of play, and lightness, a willingness to try and fail, then try again; a commitment to the solution, and the flexibility to see it through (Csikzentmihalyi, 2015). Successful idea generation for innovation involves a group willing to explore unusual possibilities to find novel solutions. Therefore, it is imperative for design-thinking practitioners to empower these traits in the stakeholders with whom they work. Furthermore, the process of identifying something as creative takes time because, at first, the new idea may be rejected outright, then experiences some qualified acceptance before widespread adoption takes place (Bandura & Zeiss, 2003).

The most important innovations in history are largely successful due to some degree of novelty. This novelty is often in the form of the application of existing technology in a new and different way – a use that is incongruent with the item's usual and customary form. In design thinking, practitioners often seek alternate uses to spark innovation. Perhaps the most important innovation of all time, the printing press, resulted when Johannes Gutenberg used a screw press, traditionally a tool for making wine and olive oil, along with moveable type, ink, and paper, to create a more efficient way of printing. Humor often relies on this same type of incongruence to "find the funny." There are several noted improv theaters in the country, including Second City in Chicago, The Brand New Workshop in Minneapolis, and New York City's Magnet Theater, that teach comedic improv skills in relationship to creativity and innovation (Gee & Gee, 2011; Scinto, 2018). Anecdotally, there is a link between humor and innovation. However, there is limited academic research on the relationship between humor and creativity or how it best informs design thinking.

To be an effective design-thinking practitioner, it is important to empower a group of stakeholders to be open to the unexpected and to resist the rush to obvious solutions. One reason for this tentativeness may be related to the tendency to self-censor and prematurely reject ideas due to a fear of judgement (Hatcher et al., 2018), which might be mitigated by fostering a sense of play, humor, and self-efficacy. Creativity has been transformed into a special skill for certain people resulting in individuals believing they are not creative thinkers (Mumaw, 2013), manifesting as a lack of creative confidence. Yet creative confidence is vital during a design-thinking session. As participants are asked to step outside of their comfort zone and enter a state of serious play while generating creative solutions with an eye toward innovation, they must be willing to expand their thinking. As domains become more specialized and problems become more complex, enabling a diverse group of stakeholders to shake off their usual roles so they can see problems with fresh eyes increases in importance. Could humor create an atmosphere that fosters creativity and moves participants toward self-efficacy and creative confidence?

DEFINITION OF TERMS

Affinity Clustering

Affinity Clustering is a design-thinking strategy that seeks to reveal patterns by grouping similar data points, looking for commonality (LUMA Institute, 2012).

Benign Violation Theory

Theory that humor depends on an incongruity between something dangerous, outside of social norms, or untoward happening (i.e., a violation) concurrently with or resulting in something safe, normal, or acceptable (McGraw & Warner, 2014).

Creative Confidence

Creative confidence is a deep-seated self-assurance in one's creative ability. The phrase was coined by IDEO's co-founders David and Tom Kelley. Creative confidence is a skill that can be developed and strengthened (Kelley & Kelley, 2013).

Creative Matrix

Creative matrix is a design-thinking strategy that employs a grid as a catalyst for ideation. Stakeholders are challenged to find solutions in the intersections of each row and column. The strength of this technique lies in the unique combinations of categories that might not otherwise be considered (LUMA Institute, 2012).

Design Thinking

Design thinking is defined as an interdisciplinary methodology to advance empathy-based solutions to seemingly unsolvable, or wicked, problems. Through a series of steps including actively working to understand problems, ideation, rapid prototyping, frequent testing, and multiple iteration cycles, practitioners seek to engage a full complement of end-users throughout the process as they work toward innovative solutions.

Guided Mastery

Guided mastery is a therapeutic methodology that utilizes a set of increasingly difficult tasks designed to move one toward self-efficacy (Bandura, 2003).

Improv

The practice of extemporaneous storytelling using a given prompt as the starting point. Primarily used in the theater, improv activities are generally structured as games.

Incongruity Theory

A theory that identifies an origin of humor as the juxtaposition of expectations and patterns with unexpected actions and occurrences (Morreall, 2012). Incongruity theory explains why unexpected punchlines are funny.

Osborn's List

Tool for divergent thinking developed by Alex Osborn in 1953. The list contains questions to prompt additional ideas during a brainstorming session. The mnemonic SCAMPER was applied to the list by Bob Eberle.

SCAMPER

Acronym developed by Bob Eberle for the brainstorming prompts codified as Osborn's List: Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Rearrange.

Self-efficacy

Self-efficacy is one's belief that he or she is capable of affecting a result. Self-efficacy is a primary tenet of psychologist Albert Bandura's Social Cognitive Theory (Bandura, 1994).

Social Cognitive Theory

Social cognitive theory is a theory of psychology that posits that the process of learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behavior (LaMorte, 2018).

LITERATURE REVIEW

Self-Efficacy and Guided Mastery

Albert Bandura's guided mastery process for obtaining self-efficacy informs the guided play methodology in this study. Self-efficacy is a person's belief that he or she is able to reach goals, providing the commitment necessary to keep at a task in spite of failure or setbacks. The theory revolves around four key components: *mastery experiences, vicarious experiences, social persuasion,* and *psychological response*. *Mastery experiences* are the accomplishment and acknowledgement of completing a task, even if completed in small chunks. *Vicarious experience* involves observing others complete the task, which leads to a sense of seeing and believing it can be done. *Social persuasion* is the encouragement and feedback provided by others as new tasks are attempted. *Psychological response awareness* is being aware of and able to explain psychological reactions to stress and finding ways to manage them by modifying behaviors. Research shows that by increasing an individual's self-efficacy, groups work more effectively (Bumann & Younkin, 2012).

This process of guided mastery involves graduated experiences that move people from phobia toward mastery of an activity. The earliest guided mastery experiments were designed to help people overcome their fear of snakes, but the process has been shown to be effective in many other domains (Bandura & Zeiss, 2003). Self-efficacy and guided mastery are core tenets of the social cognitive theory of psychology. One aspect of our research will focus on helping participants gain what Tom and David Kelley (2013) termed creative confidence through a series of graduated activities to increase participants' sense of self-efficacy.

Facilitation is essential to design thinking, with stakeholders being selected and activities planned by a trained facilitator. One of the core tenets of facilitation is the power of experiential learning (Berta et al., 2015). This same tenet is at the core of the self-efficacy theory and guided mastery therapies. Berta et al. (2015) stated that the goal of facilitation is to "support a sustainable evidence-informed practice change" (p. 7). Likewise, guided mastery practices make graduated changes based on evidence both that the participant is ready to advance, and that their fears or concerns are unfounded (Bandura & Zeiss, 2003). Guided mastery is a collective activity with team members reinforcing and encouraging, as new skills are learned and refined (Berta et al., 2015). The collective nature of the activity encourages trust and minimizes the consequences of failure.

Once individuals have reached self-efficacy, the belief that they can accomplish a goal, their belief, rather than their competence at the task, will influence how hard they try and how much effort they exert on the project. This is an important motivational factor as the evidence indicates that the belief informs the effort. Furthermore, creative self-efficacy is a determining factor in one's willingness to seek creative outcomes (Haase, Hoff, Hanel, & Innes-Ker, 2018). It stands to reason that individuals who identify as "not creative" may benefit from guided mastery activities to move them toward creative self-efficacy. This assertion underpins the study.

Incongruity Theory and Innovation

Both innovation and humor share a fondness for incongruity. In terms of innovation, incongruity is often the catalyst for a new application of an existing technology. Because humor and creativity are both forms of mental play, it stands to reason that some level of common ground might exist. In the article "Philosophy of Humor," John Morreall (2012) noted that there is no clear attribution for the identification of incongruity theory. He adds, however, that the writings of Cicero make mention of jokes, which we would today identify as incongruous. Essentially, incongruity theory explains why jokes with punchlines are funny. The set-up of the joke leads us to one assumption, but the conclusion does not follow suit. Instead, the punchline leads in an unexpected direction. The misdirection, which is incongruous to our expectations, is the source of the humor.

Managing incongruence is a tricky feat. Although it is paramount to both innovation and humor, it must be managed with care. In terms of humor, when incongruity crosses the line, the joke ceases to be funny. As Dr. Peter McGraw identified in his benign violation theory, humor happens when incongruency crosses the line without going too far. The same theoretical construct can be

applied to innovation. When an innovation goes too far, it is difficult, if not impossible, for it to achieve widespread adoption (Noseworthy, Di Muro, & Murray, 2014). Innovations should drive curiosity, but if the innovation is too incongruous with consumer expectations, the solution becomes taxing, inducing aversion. Consumers benefit greatly from innovative products; however, products that vary from expectation too much are destined to fail (Jhang, Grant, & Campbell, 2012). There is a direct correlation between heightened arousal (curiosity) and incongruence in innovation (Noseworthy et al., 2014). It is important to use incongruity as a catalyst to innovation, but not an end point. It is often necessary to pull back from absurdity to the sweet spot of novelty (Mumaw, 2013).

Creativity, Humor, Innovation

Richard Dino (2015) of Innovation Quest suggested that research into creativity and innovation has traditionally been siloed, studied in isolation. As such, little is known about the interaction of these domains, which are studied at the personal and organizational level. In spite of their siloed existence within academia, these domains are inexorably linked because innovation is the manifestation of creativity within a business environment. As such, any attempt at innovation requires an intention of creativity. This expectation is known as *creative requirement* (Pundt, 2015). Organizational leadership styles can affect creative requirement either positively or negatively, setting the tone for innovation within an organization. Social interaction plays a large role in innovativeness (Hurmelinna-Laukkanen, Atta-Owusu, & Oikarinen, 2016).

Creativity and fun are closely linked (Csikzentmihalyi, 2015), as are humor and fun (Hurmelinna-Laukkanen et al., 2016). Current research shows a clear correlation between positive affect and creativity (Amabile & Pratt, 2016). Those who have a sense of humor tend to be more innovative (Pundt, 2015) and humor makes it easier to balance the roles of various stakeholders during innovation activities (Hurmelinna-Laukkanen et al., 2016). Leaders who use positive humor empower employees in tasks that require a large amount of creativity; however, inauthentic humor can have a negative effect (Pundt, 2016). In summation, humor can level the playing field, acting as a "lubricant" for creative activities (Hurmelinna-Laukkanen et al., 2016), but only when it is positive and genuine.

Implications for Idea Generation and Design Thinking

The design-thinking toolbox contains a multitude of activities that seek to move participants towards idea generation that leads to innovative solutions to wicked problems. Moving participants from discomfort to self-efficacy may benefit from guided experiences. In addition to comedic improv activities that would lessen the differentiation between stakeholders and allow them to be fully present with one another, participants may benefit from exposure to analogical and metaphorical reasoning activities. These reasoning strategies are shown to increase creativity and extend thought processes into novelty and incongruence (Choi & Kim, 2016).

Design thinking seeks to find user-centered solutions. By focusing on the user experience, the emotions of the user are also of concern (Ahola, Aro, & Vuorela, 2016). Humor, playfulness, and fun are key components of the creative process. By integrating play and humor into the design-thinking experience, participants are more able to tap into their emotions, resulting in more enjoyable communication. Humor, however, works better in some business contexts than others, and the type of humor, positive or negative, plays a role as well.

One of the characteristics of design thinking includes relatively fast sessions, often lasting no more than 15 minutes. New research shows that these sessions may result in a better quantity and quality of ideas, if they are structured as several short blocks of time rather than one long block (So, Jun, & Nah, 2016). This echoes the methods of graduated experience indicated by Bandura's guided mastery technique. Schulz, Geithner, Woelfel, and Zrywinski (2015) found that the more play-like the activities, the better the outcomes for ideation and innovation were. Their study revolved around using toys for prototyping rather than traditional craft supplies. They found their participants were more readily able to advance to storytelling, which allowed for more robust explanations and solutions.

Research about the relationship between comedic improvisation and idea generation is limited. Very few researchers have considered the possibility of comedic

improvisation as a method for generating ideas. Hatcher et al. (2018) proposed a method for "design improv" that shows promise as a tool for idea generation. The method is developed through a series of iterative workshops. One of the key findings was that when the "design improv" method was used successive times with the same group of participants, the quantity and quality of ideas generated increased, implying that participants were gaining a level of self-efficacy and creative confidence. However, the authors pointed out that the primary limitation of their methodology is that it is, at this point, only theory. It has not been tried in experimental conditions and, because it focuses on a sole modality, comedic improv, it may not work for all groups depending on factors like personality, diversity, and climate. Hatcher et al's. (2018) proposed "design improv" is explored as a form of guided play within the study.

The literature review establishes that people can be moved from insecurity to confidence in their skills through a process of guided mastery (Bandura, 2003). As self-efficacy is attained, creative confidence is developed and strengthened with repeated successes (Hatcher et al., 2018). Furthermore, the review indicates that the incongruities in humor and the leaps of innovation are similar (Noseworthy, Di Muro, & Murray, 2014). The purpose of this study is to examine humor in the form of improv and creativity through the lens of self-efficacy to determine if participating in a guided improv session prior to ideation improves the quantity of ideas generated and increases the creative confidence of the participants.

METHODS

The research was conducted in several phases. The initial phase consisted of qualitative analysis of data collected from a questionnaire completed by the sample. This study sought to determine if a subject's self-identification as creative and funny influenced his or her ability to generate ideas for the alternative uses of a common household object. The study then moved into an experimental-design phase in which study participants engaged in a series of activities and group ideation sessions. The activities followed the guided mastery technique to move participants from easy ideation activities to more complex challenges. Each challenge was a stand-alone activity, designed using the principles of guided mastery to move participants toward creative self-efficacy. Study participants were assigned activities between sessions to reinforce the new concepts that had been introduced. Finally, the study concluded with a post-test questionnaire of the study participants to assess any changes in their self-perception and idea generation abilities.

The Sample

This study used a convenience sample of students at Pikes Peak Community College enrolled in the course AAA 109: Advanced Academic Achievement. The college catalog describes the course as an examination of theories and practices associated with successful learning to enhance

college success. Recommended for new and returning students, the course study areas include education and career planning, effective communication, personal management, critical and creative-thinking, development of community and awareness of diversity, leadership, and techniques for successful academic performance. The students in this course exemplify typical demographic categories allowing for a study that can be more easily generalized. Pikes Peak Community College is located on the southern edge of Colorado Springs, Colorado on land adjacent to the United States Army's Fort Carson. The neighboring communities Security-Widefield and Fountain also make up integral parts of the Pikes Peak Community College student body. Appendix A provides a comparison of the demographic makeup of the sample, compared with the Pikes Peak Community College as a whole, surrounding communities, and the United States as a whole. The enrollment at Pikes Peak Community College is predominately between the ages of 18-34 (71%). Military veterans represent 23% of the student body. The above average percentage of military veterans can be attributed to the school's proximity to a military base, along with the large number of military bases in the Colorado Springs area. The sample consisted of a total of 121 students across nine sections, with 94 students completing all three sessions. Some of the attrition can be attributed to weather and illness, as the data collection period coincided with several severe weather events and the peak of the flu season. The sample comprised five sections assigned to the improv group, and four sections assigned to the control group. The assignment was made with a web-based random group generator. The sample was more ethnically diverse than both the school and the general population of the United States, however females were underrepresented (see Figure 1). The workshop starting times ranged from 8:00 am to 5:30 pm with the improv group workshops tending toward earlier starting times. Seven of the selected sections met on the Centennial Campus located adjacent to Fort Carson. Two sections met at the Rampart Range Campus on the city's northside near the United States Air Force Academy. The sections were selected in conjunction with the Division Deans and Department Chairs. This sample was selected because the purpose of the study, to identify a set of guided play activities that increase the quantity and quality of ideas generated by a group, aligns with the

student learning outcomes for the course, including (a) communicating effectively, (b) integrating critical and creative-thinking in all activities, and (c) demonstrating an awareness of community and diversity.

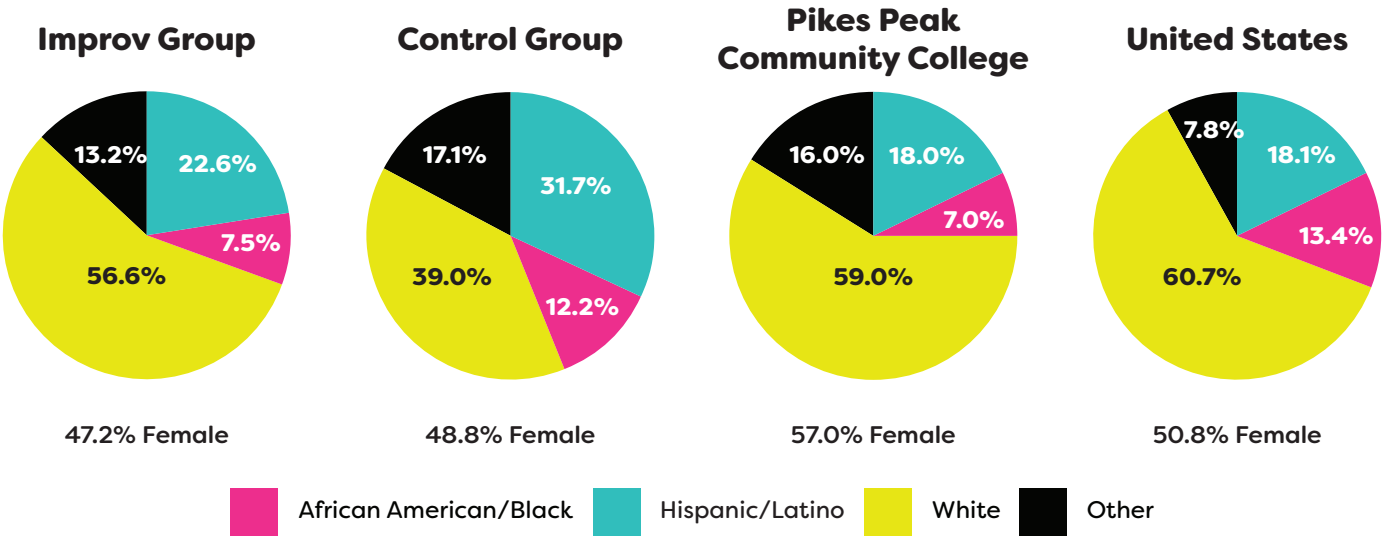
The Instruments

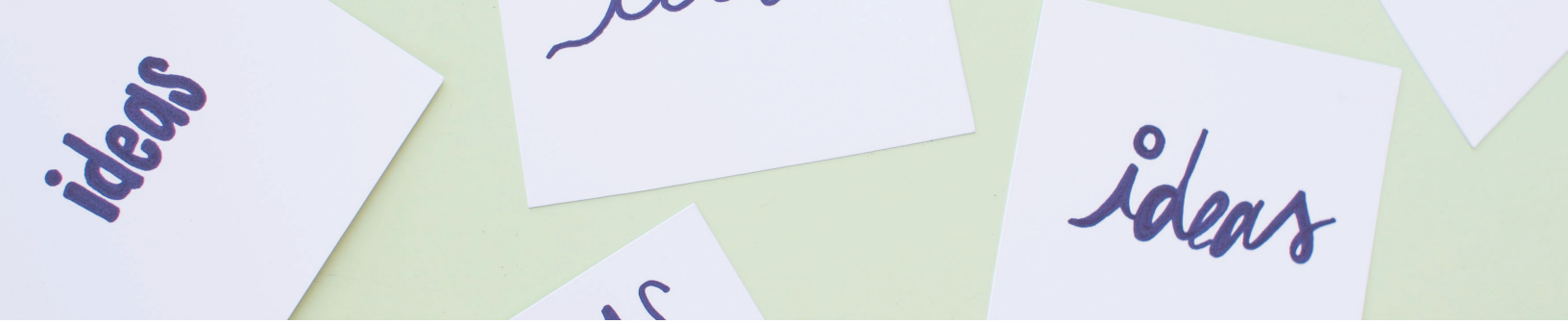
Each participant was randomly assigned a nickname to use for the duration of the study (see Appendix C). Participants began completing an entry questionnaire and an alternative uses exercise. The questionnaire (see Appendix D) provided basic demographic information for each participant. Paired with the alternative uses exercise, an individual baseline of divergent-thinking skills and creative self-concept for each participant was established. The questionnaire was delivered in paper form. The instrument consists of four demographic questions, two open-ended questions paired with a Likert-scale, and the Kaufman Domains of Creativity Scale (K-DOCS), a 50-question self-report questionnaire. The K-DOCS was selected because it measures participants' perceptions of their own creativity, rather than creative achievement or creative behaviors. This is in line with the study's focus on self-efficacy and creative confidence. The K-DOCS was developed by J. C. Kaufman (2012) and validated by McKay, Karwowski, and Kaufman (2017). The participants also completed an alternative uses test. They were given a sheet to list all of the uses they could for a paper clip (see Appendix E). The exercise was timed and minimal instructions were given. The student researcher developed the ideation exercise based on information obtained through the literature review.

During the experimental portion of the study, participants completed two different group ideation exercises of increasing difficulty. The sessions were recorded by video for analysis. Ideas generated were collected in the form of Post-it note categories for each activity along with artifacts the homework activities returned during the study. The homework activities consisted of a worksheet that recapped the session one SCAMPER lecture and asked students to brainstorm additional words that could be used as catalysts for idea generation like SCAMPER (see Appendix F) and a worksheet that challenged participants to observe incongruity in their daily lives and record their observations on a data collection sheet designed by the student researcher (see Appendix G).

At the conclusion of the final session, participants completed a 5-minute alternative uses test (see Appendix H) before completing an exit questionnaire to identify changes in their creative self-efficacy and idea generation ability (see Appendix I). The questionnaire contained three long answer questions and the K-DOCS.

FIGURE 1: Demographic Comparison of Study Sample, School, and General Population





The Procedure

The study was conducted at Pikes Peak Community College in a face-to-face classroom environment during the Spring 2019 semester. Data collection took place over a period of 3 weeks beginning during week seven of the semester and ending during week nine of the semester.

A general overview of the study sessions including differentiation is provided in Table 1.

TABLE 1: Session Activities CONTROL Group Vs. IMPROV Group

	CONTROL GROUP	IMPROV GROUP
SESSION 1	Study Description & Consent	
	Select Nicknames (Appendix C)	
	Entry Questionnaire (Appendix D)	
	Alternative Uses: Paperclip	
	Brainstorming and SCAMPER Presentation	
HOMEWORK	SCAMPER Worksheet (Table 3)	
SESSION 2	Introductions – Nicknames only	IMPROV ACTIVITY: Nickname Game
	Short Discussion of SCAMPER Homework	
	Ideation activity using SCAMPER	
	Incongruity Presentation	
HOMEWORK	Incongruity Worksheet (Table 4)	
SESSION 3	Short Discussion of Incongruity Homework	
	The Matrix Presentation - New Technologies and the Creative Matrix	
		IMPROV ACTIVITY: Yes, And, If, Then
	Introduction of prompt: How might we reimagine education for the 21st century?	
	Creative Matrix Activity	
	Alternative Uses: Rubber band	
	Exit Questionnaire	

Session 1

The first part of the study was conducted during one class period with one homework activity assigned to be completed before the next session. Prior to completing any of the questionnaires or exercises, all participants signed consent forms (see Appendix B). The student researcher emphasized that participation in the study was voluntary. Any student who did not want to participate was offered an alternate activity and allowed to leave class prior to the study commencing. The facilitator explained that for confidentiality purposes, the participants would be asked to use nicknames provided to them. The classroom instructors passed name tags with a nickname (see Appendix C) out to the participants. These names were used in all correspondence, on all forms, and in conversation.

During the introductory session, the study facilitator administered the entry questionnaire (see Appendix D) to all participants in the sample. Then participants completed the Alternative Uses exercise (Figure 2) also in paper form. After the Alternative Uses challenge, the facilitator gave a short presentation to introduce the participants to the work of Alex Osborn, the inventor of brainstorming (see Appendix J). Osborn's most useful questions were codified as Osborn's List. The list utilizes the acronym SCAMPER, short for Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Reverse (Mind Tools, 2016). The participants discussed their responses to the Alternative Uses challenge in relation to the SCAMPER prompts.

Session 1 Homework

At the close of the session, each participant received a worksheet (Figure 3) that recapped the SCAMPER prompts and was instructed to come up with at least five other words or phrases that could be used as inspiration for brainstorming in addition to or in place of SCAMPER, for example, *extend*, *elevate*, or *deconstruct*. The purpose of the homework was to help study participants solidify their new knowledge by providing a mastery experience. Participants recorded their words on the provided worksheet and returned them at the next session.

SESSION 1 SCHEDULE

Study Description & Consent	30 min.
Select Nicknames	5 min.
Entry Questionnaire	20 min.
Alternative Uses - Paper clip	5 min.
Brainstorming/SCAMPER Presentation	5 min.
SCAMPER Homework Assigned	5 min.

FIGURE 2: Alternative Uses: Paperclip

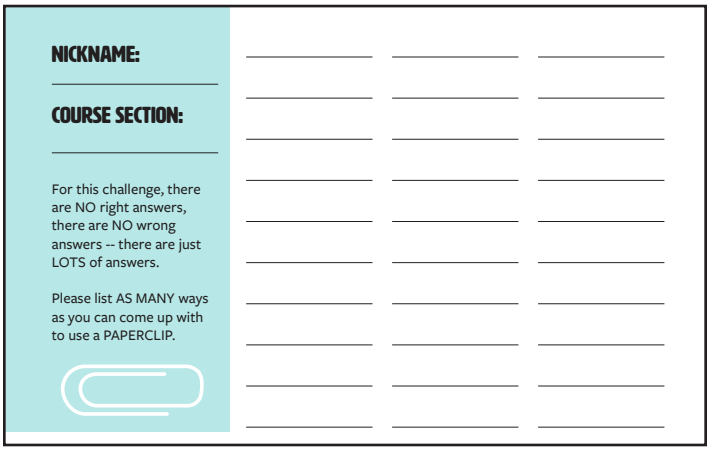
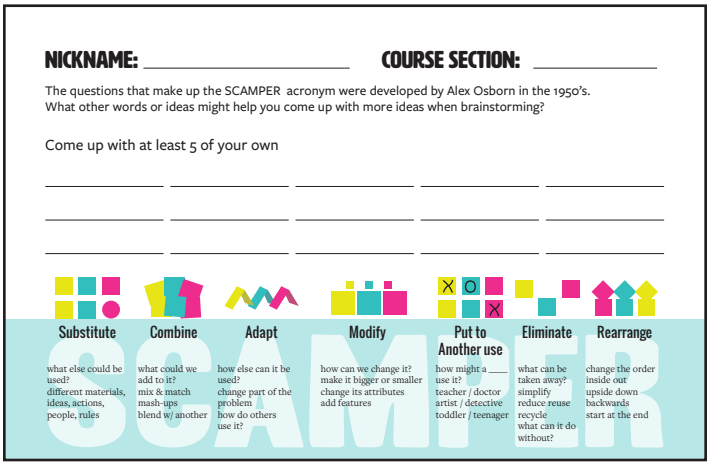


FIGURE 3: SCAMPER Homework Worksheet



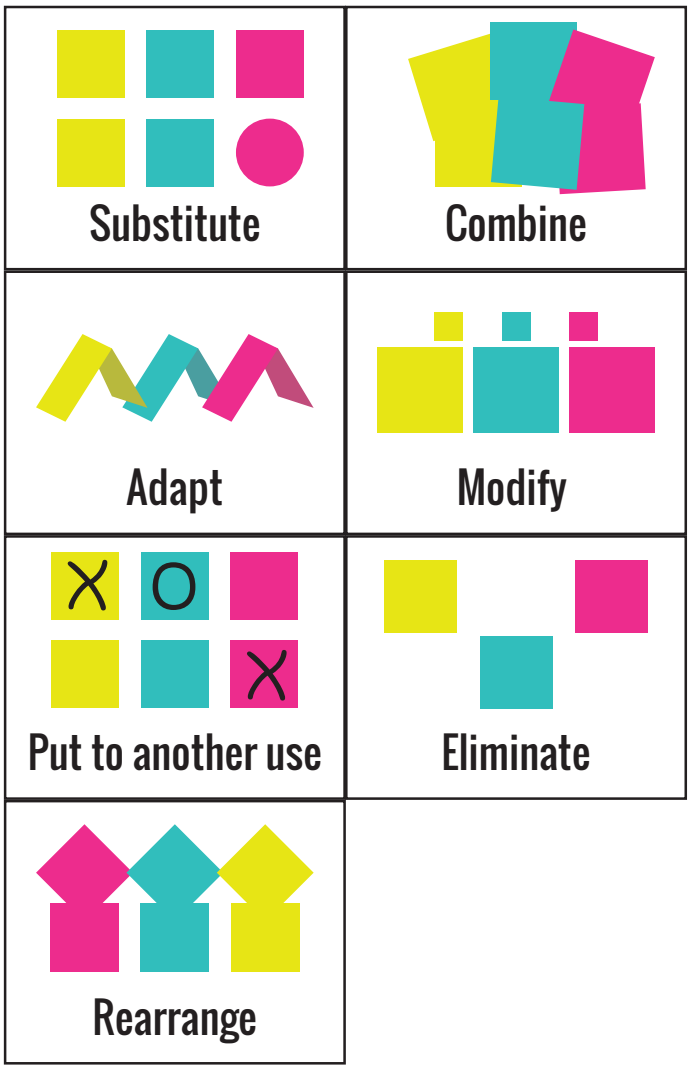
SESSION 2 SCHEDULE - CONTROL

Introductions ..... 15 min.
Brainstorming/SCAMPER Presentation
..... 10 min.
Curriculum Based Ideation ..... 30 min.
Homework Assignment ..... 5 min.

SESSION 2 SCHEDULE - IMPROV

Nickname Game ..... 30 min.
Brainstorming/SCAMPER Presentation
..... 10 min.
Curriculum Based Ideation ..... 30 min.
Homework Assignment ..... 5 min.

FIGURE 4: SCAMPER Placards



Session 2

At the beginning of the second face-to-face session, the facilitator reminded participants that the nicknames they were assigned in the previous session were being used to keep their identities confidential. Then, the participants reviewed the SCAMPER homework assignment and engaged in 5 minutes of discussion to determine which of the new words have the most promise for idea generation. The purpose of this activity is to affirm the students' increasing self-concept as creative individuals prior to engaging in a new, more difficult brainstorming activity.

Next, the participants were asked to introduce themselves using the nickname they received during the first session. The control group introduced themselves using their new nicknames, which they received in the first session, and told something unique about themselves. The improv group was instructed to introduce themselves by telling a story about how they got their assigned nickname. They were encouraged to make this story as outlandish as possible. This activity, The Nickname Game, is used at IDEO to reduce hierarchy and limit self-censoring (Kelley & Kelley, 2013). Introductions took 5 minutes for the control group and 15 minutes for the improv group.

Next, the facilitator directed the participants' attention to a series of placards hung around the room. There was one placard (see Figure 4) for each of the SCAMPER prompts: Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, and Rearrange. The participants were given the prompt "How might I be a more successful student?" Participants were asked to generate as many ideas surrounding the prompt as possible. Participants were instructed to consider the first placard Substitute and to first write their idea on a Post-it note, then to speak it aloud to the group as they placed it on the wall near the placard. As the ideas of the group slowed, the facilitator prompted with questions based on Osborn's List (see Appendix K) to encourage additional idea generation. The facilitator then directed the participants' attention to the next placard Combine. The process was repeated until all of the SCAMPER prompts were addressed. This activity was limited to 30 minutes. At the conclusion of the session, the investigator collected the Post-it notes by category and retained them for recording, counting, and analysis.

Session 2 Homework

At the close of the session, the investigator gave a short presentation (see Appendix L) about oxymorons, incongruity, and its role in both humor and innovation. Following the presentation, participants were asked to conduct observations of the world around them to identify and record the incongruities they observe on the provided worksheet (see Figure 5). The worksheet was returned to the student researcher at the beginning of Session 3.

FIGURE 5: Incongruity Worksheet

INCONGRUITY

NICKNAME: _____

COURSE SECTION: _____

DUE DATE:

Definition:
when things don't match as they are expected to, being out of place, ludicrous, absurd, lacking harmony

Examples:
A dozen clowns get out of a tiny car
A politician tells the truth

Instructions:
Over the next few days pay attention to where incongruity appears in the world around you.

Note where you were, what was happening, and why it was incongruent. If you run out of space, use the back of this sheet, or additional papers.

DATE/TIME: _____

WHERE: _____

WHAT: _____

_____

DATE/TIME: _____

WHERE: _____

WHAT: _____

_____

SESSION 3 SCHEDULE - CONTROL

Homework Debrief ..... 5 min.
The Matrix Presentation ..... 15 min.
Creative Matrix Activity ..... 25 min.
Alternate Uses - Rubber Band ..... 5 min.
Exit Questionnaire ..... 10 min.

SESSION 3 SCHEDULE - IMPROV

Homework Debrief ..... 5 min.
The Matrix Presentation ..... 15 min.
Yes, And, Identify, Heighten Activity ..... 15 min.
Creative Matrix Activity ..... 25 min.
Alternate Uses - Rubber Band ..... 5 min.
Exit Questionnaire ..... 10 min.

Session 3: Control Group

The facilitator welcomed the participants and engaged them in 5 minutes of discussion about the incongruities that they observed in the world around them. The purpose of the activity was to affirm the students' increasing self-concept as creative individuals prior to engaging in a new, more difficult brainstorming activity.

Participants viewed a short PowerPoint presentation with videos about emerging technologies: Project Soli from Google Advanced Technology Group, DuoSkin from MIT Media Lab, Sixth Sense technology, the Muse headband, Tilt Brush, and Voxel Printing (see Appendix M). Participants were then introduced to the Creative Matrix and asked to consider how these technologies might be used in education. Then the control group participated in the Creative Matrix exercise using a predefined matrix (see Appendix N) and the prompt "How might we reimagine education for the 21st century?" Participants were instructed to come up with ideas that fit in the intersections of the matrix. Participants wrote their ideas on Post-it notes and placed them in the appropriate cell. They were encouraged to discuss their ideas and to stand near the board to collaborate with one another throughout the activity. At the conclusion of the activity, the facilitator collected all of the Post-it notes for analysis.

After the Creative Matrix activity concluded, participants completed another Alternative Uses test, this time focusing on uses for a rubber band, for 5 minutes (see Appendix H). Ideas were recorded individually on a paper form. To conclude the study, the control group completed an exit questionnaire (see Appendix I) in paper format. This questionnaire contained three open-ended questions, an individual ideation prompt, and the K-DOCS. The exit scores were compared with the entry scores to look for changes.

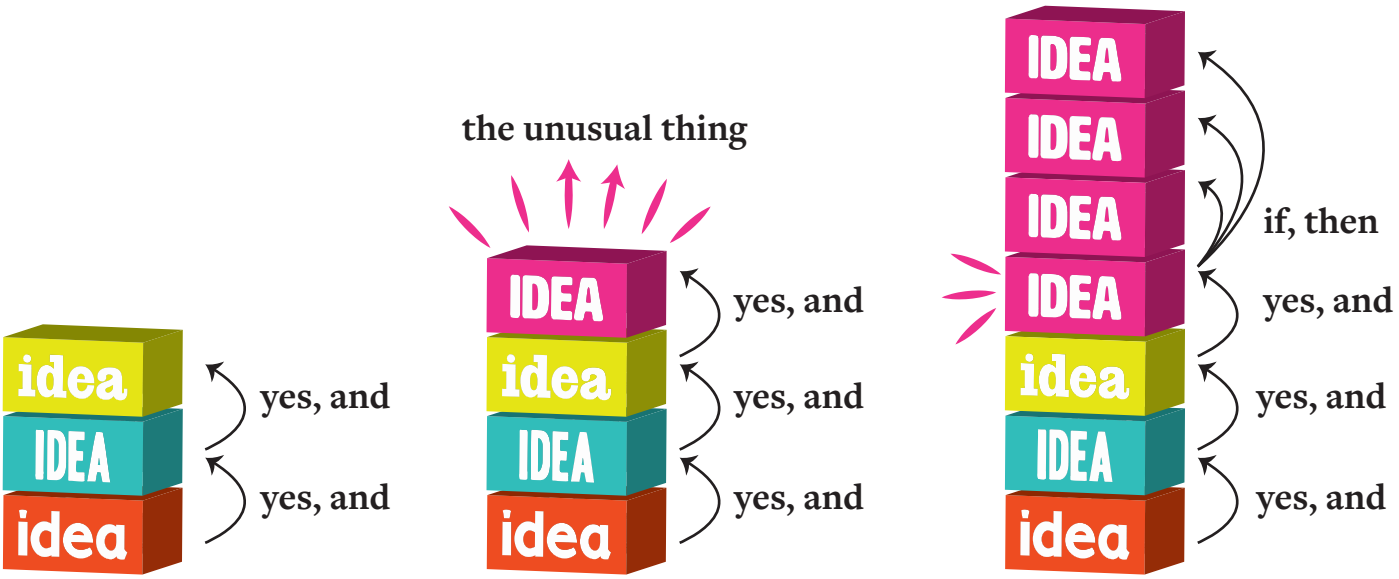
Session 3: Improv Group

As with the control group, the facilitator welcomed the participants and engaged them in 5 minutes of discussion about the incongruities that they observed in the world around them. The purpose of the activity was to affirm the students' increasing self-concept as creative individuals prior to engaging in a new, more difficult brainstorming activity.

Participants viewed a short PowerPoint presentation with videos about emerging technologies: Project Soli from Google Advanced Technology Group, DuoSkin from MIT Media Lab, Sixth Sense technology, the Muse headband, Tilt Brush, and Voxel Printing. Participants were then introduced to the Creative Matrix and asked to consider how these technologies might be used in education.

The improv group then participated in an improv game that consisted of three parts: *Yes, And, Identify the Unusual Thing, and Heightening* (see Figure 6). To prepare the participants for the game, the investigator primed the audience by having them answer "Yes" to a series of questions. Then, the investigator had them answer "No" to a series of questions to demonstrate how saying "No" ends the activity immediately. During the game, the participants helped to create a story about a dog who went to college. Each participant added at least one idea to the story during the Yes, And stage. Each participant used the same structure of Yes (previous idea) and (new idea), generating as many ideas as possible. During the Identify the Unusual Thing phase, the facilitator lead the participants in a discussion to find the idea they thought was the most unusual, or the most surprising.

FIGURE 6: The Yes, And, Identify, Heighten Activity modified from Hatcher et al. 2019



This idea served as the starting point for the Heightening phase. During the Heightening phase, the facilitator instructed the participants to consider what else might be true about the "Unusual Thing." Participants further developed the "Unusual Thing" by following the protocol of "If the unusual thing is true, then (this is also true)." Unlike in the first step, where each participant must respond to the previous answer, in the Heightening phase, each participant responds to "If the unusual thing is true," with his or her own then statement. Each participant came up with a response during the Heightening phase at least one time.

Then the improv group was redirected to the Creative Matrix exercise using a predefined matrix and the prompt "How might we reimagine education for the 21st century?" Participants were instructed to come up with ideas that fit in the intersections of the matrix. Participants wrote their ideas on Post-it notes and placed them in the appropriate cell. They were encouraged to discuss their ideas and to stand near the board to collaborate with one another throughout the activity. At the conclusion of the activity, the facilitator collected all of the Post-it notes for analysis.

After the Creative Matrix activity concluded, participants completed another Alternative Uses test, this time focusing on uses for a rubber band, for 5 minutes. Ideas were recorded individually on a paper form (see Appendix H). To conclude the study, the improv group completed an exit questionnaire (see Appendix I) in paper format. This questionnaire contained three open-ended questions, an individual ideation prompt, and the K-DOCS. The exit scores were compared with the entry scores to look for changes.

Humor is by far
the most significant activity
of the human brain.
~ Edward de Bono

RESULTS

Study Sample Demographics

The study sample represented students in nine sections of AAA 109. A total of 94 participants fully participated in the study by completing both the entry and exit questionnaires and both alternative uses activities.

The improv group consisted of 53 participants: 25 men, 25 women, 1 non-binary participant, and 3 participants who declined to answer the gender question. The majority of the participants in the improv group (33) were between the age of 18-25. Eleven participants were between the ages of 26-35. Eight participants were between the ages of 36-54. One participant declined to provide an age.

The control group contained 41 participants consisting of 20 men and 20 women. The majority of the participants (23) were between 18-25 years of age. Of the remaining participants, 11 were between 26-35 years of age, three were between 36-54 years of age, and one participant was over age 55. Three participants declined to provide an age.

Whereas the control and improv groups were fairly well matched in terms of age and gender distribution, the same could not be said of race and ethnicity. The participants in the improv group predominately identified as White (30), with fewer Hispanic/Latino (12), African American/Black (4), and Asian (1) participants. Six participants marked other or declined to answer. The participants in the control group were more ethnically diverse with 16 participants identifying as White, 13 Hispanic/Latino, 5 African-American/Black, and 2 Asian. The remaining 5 participants in the control group marked other or declined to answer.

Entry Questionnaire

Study participants completed an entry questionnaire that included four demographic questions, two Likert scale questions paired with long answer questions, and the K-DOCS. The K-DOCS was administered to establish a baseline of each participant's creative self-concept.

Are you Creative?

The first of the Likert questions was "*Are you creative?*" Participants rated their current level of creativity on a scale of *1-No, Not Really* to *5-Absolutely.* The average rating for the control group (3.51) was slightly higher than the average rating for the improv group (3.36). As Figure 7 shows, both groups had a similar proportion of participants rate themselves either a 4 or 5, but the improv group had a larger proportion of participants rate themselves as a 1 or 2.

Along with this question, participants were asked to give their definition of the word "creativity." These responses were compiled into a single document for analysis. A total of 117 responses were provided by the study participants. The investigator read through the responses seven times. The first reading was to get a sense of the consistent themes in the answers. The investigator then reread the responses six additional times to mark the document by highlighting phrases for the themes that emerged in the original reading:

- Imagination, thinking out of the box (59 responses)

FIGURE 7: Are You Creative Responses

FIGURE 8: Creativity definitions grouped into the themes that emerged

- Innovative, new, unique, original, unknown (33 responses)
- Problem-solving, solutions (31 responses)
- Transformation (17 responses)
- The arts, artistic (16 responses)
- Open-minded (12 responses)

The highlighted phrases were grouped using a variation of the Affinity Clustering method (see Figure 8) into three categories that emerged through the coding process: Thinking, Doing, and Being.

How Funny Are You?

The second Likert questions was "*Are you funny?*" Participants rated how funny they perceived themselves on a scale of *1- No, Not Really* to *5- Absolutely*. The average rating for the control group (3.56) was noticeably higher than the average rating for the treatment group (3.04). As Figure 9 shows, both groups had a similar proportion of participants rate themselves a 3, but the control group had a much larger proportion of participants rate themselves as a 4 or 5.

Along with this question, participants were asked to give their definition of the word "humor." These responses were compiled into a single document for analysis. A total of 107 responses were provided by the study participants. The investigator read through the responses seven times. The first reading was to get a sense of the consistent themes in the answers. The investigator then reread the

FIGURE 9: Are You Funny Responses

responses six additional times to mark the document by highlighting phrases for the themes that emerged in the original reading:

- Laugh, laughter, joy, happy (84 responses)
- Actions, external forces (71 responses)
- Fun, funny, play (38 responses)
- Attitude, internal, a way of being (34 responses)
- Intelligence, wit, jokes, comedy (25 responses)
- Value judgment - positive or negative (17 responses)

The highlighted phrases were grouped using a variation of the Affinity Clustering method (see Figure 10) into six categories that emerged through the coding process: Attitude, External Influences, Internal Influences, Value Judgments, Play, and Comedy.

Alternative Uses Test - Paper Clip

The study participants then completed an Alternative Uses test in which they were given 5 minutes to come up with as many ways to use a paper clip as they were able. The participants were given minimal instruction as to how to complete the task, just the challenge to come up with as many answers as they could. Only the tests of the 94 participants who attended all three sessions were analyzed to ensure that the comparison between beginning and ending results were valid. The control group performed better on the initial challenge, averaging 10.59 ideas per participant. The improv group generated an average of 9.66 ideas per participant. These ideas were not evaluated for quality, only for quantity, as volume is the primary goal in the early stages of ideation.

Analysis of Session 1 Data

Some interesting limitations to the study presented themselves from the first session. The participants in the control group self-identified as more creative (3.51) and

FIGURE 10: Humor Definitions grouped into the themes that emerged

more funny (3.56) than the participants in the improv group (3.36 creative/3.04 funny). The control group also had a higher baseline average on the alternative uses test with 10.59 ideas compared to the improv group's 9.66 ideas per participant.

There were statistically significant relationships between how students viewed themselves and their performance on the K-DOCS and Alternative Uses exercise. Results of the Pearson correlation indicated that there was a significant positive association between self-assessed creativity and self-assessed funniness, ($r(92) = .51$, $p = <.0001$). Students who considered themselves creative were also likely to consider themselves funny.

Results of the Pearson correlation indicated that there was a significant positive association between self-assessed creativity and performance on the initial alternative use test, ($r(92) = .21$, $p = .04$). Results of the Pearson correlation indicated that there was a significant positive association between self-assessed creativity and the compiled K-DOCS score, ($r(92) = .49$, $p = <.0001$). The higher a participant's creative self-concept was, the more ideashe or she was able to generate during the initial alternative uses test. This confidence also effected the participant's K-DOCS score.

Results of the Pearson correlation indicated that there was a significant positive association between self-assessed funniness and performance on the initial alternative use test, ($r(92) = .25$, $p = .01$). Results of the Pearson correlation indicated that there was a significant positive association between self-assessed funniness and the compiled KDOCs score, ($r(92) = .27$, $p = .008$). The funnier participants felt they were, the more ideas they were able to generate during the initial alternative uses test. Students who perceived themselves as funny also scored higher on the K-DOCS.

Interestingly, the results of the Pearson correlation indicated there was not a significant positive association between performance on the initial alternative uses test and the compiled K-DOCS score, ($r(92) = .07$, $p = .49$). A high score on the K-DOCS test did not translate to an increase in idea generation on the alternative uses test.

Session 2

The second workshop focused on introductions and brainstorming using the SCAMPER technique. The improv group participated in an improv activity "The Name Game" in which they came up with a story about how they received their assigned nickname prior to the SCAMPER exercise. The control group introduced themselves using their nicknames and shared something unique about themselves.

Each workshop was tasked with coming up with as many ideas as they could one category at a time on the prompt "How might I be a more successful student?" to correspond with the curriculum the participants were currently focused on within the standard course. Each participant was given a stack of Post-it notes to complete the activity and headings for each prompt were placed around the room. Approximately five minutes was allotted for each of seven the SCAMPER categories.

TABLE 2: SCAMPER Idea Generation Results

SECTION	PARTICIPANTS	IDEAS GENERATED	AVERAGE PER PARTICIPANT
Improv 1 (T1)	10	299	29.9
Improv 2 (T2)	12	287	23.9
Improv 3 (T3)	10	292	29.2
Improv 4 (T4)	9	393	43.7
Improv 5 (T5)	12	154	12.8
Control 1 (C1)	6	255	42.5
Control 2 (C2)	12	138	11.5
Control 3 (C3)	14	627	44.8
Control 4 (C4)	9	182	20.22
IMPROV AVG.	**53**	**1425**	**26.9**
CONTROL AVG.	**41**	**1202**	**29.3**

For the purpose of analysis, the total number of ideas per section was divided by the number of participants per class, resulting in an average number of responses per participant (Table 2). The improv group averaged 26.9 ideas per participant, the control group averaged 29.3 ideas per participant.

For this activity, several environmental factors likely affected the results. Several of the classrooms were very crowded, making it hard for participants to get up and move around the room for the activity. The results were also affected by the existing chemistry of the group as the groups who were more boisterous and jovial with one another performed the best in this task. It is interesting to note that the sections that generated the most ideas per person were the sections with male classroom instructors. Additionally, in the sections with the highest number of ideas generated, the classroom teachers adopted a nickname for the duration of the study as well.

Session 3

During the final workshop, participants watched a PowerPoint with six short videos about new technologies that are in development. Then participants generated ideas around the prompt "How might we re-imagine education for the 21st century?" using a Creative Matrix.

The improv group played an improv game "Yes, And, If, Then" to tell a story about a dog that went to college prior to completing the Creative Matrix activity.

Creative Matrix

For the Creative Matrix activity, participants were given Post-it notes and asked to brainstorm ideas "at the intersections" of a series of ideas. The intersections were created by using row and column headers to create a grid as shown in Appendix M. The grid was constructed using headers that were attached to a whiteboard in each classroom. Participants were encouraged to talk amongst the group and to get up and stand near the board that the grid was placed on. They were challenged, at a minimum, to come up with at least one idea for each intersection. Participants were given 25 minutes to complete the challenge.

For the purpose of analysis, the total number of ideas per section was divided by the number of participants per class, resulting in an average number of responses per participant (Table 3). The improv group averaged 3.9 ideas per participant and the control group averaged 4.4 ideas per participant.

TABLE 3: Creative Matrix Results

SECTION	PARTICIPANTS	IDEAS	AVERAGE PER PARTICIPANT
Improv 1 (T1)	10	26	2.6
Improv 2 (T2)	12	66	5.5
Improv 3 (T3)	10	51	5.1
Improv 4 (T4)	9	29	3.2
Improv 5 (T5)	12	34	2.8
Control (C1)	6	27	4.5
Control 2 (C2)	12	55	4.6
Control 3 (C3)	14	57	4.0
Control 4 (C4)	9	40	4.4
IMPROV AVG.	**53**	**206**	**3.9**
CONTROL AVG.	**41**	**179**	**4.4**

For this exercise, there does not appear to be any relationship between the groups and their per capita idea generation capabilities. The groups with the highest results, T2 (5.5) and T3 (5.1) were members of the improv group. These groups scored in the lower half of the results for the SCAMPER activity with T2 coming in sixth and T3 coming in fifth. The next two finishers, C2 (4.6) and C1 (4.5) were members of the control group. These groups finished ninth and third respectively, in the SCAMPER activity.

Alternative Uses Test - Rubber Band

The study participants then participated in an Alternative Uses test in which they were given 5 minutes to come up with as many ways to use a rubber band as they were able. The participants were instructed to remember the

activities they had participated in, including SCAMPER and the Creative Matrix, before completing the task. The improv group was also instructed to remember the *Yes, And, If, Then* activity as well. Additionally, they were reminded that the goal was quantity rather than quality. The improv group performed better on this challenge, averaging 11.62 ideas per participant. This represents an increase of 20.31% over the initial Alternative Uses test conducted during Session 1. The control group generated an average of 11.49 ideas per person, an increase of 8.53% over the initial Alternative Uses test. The improv group experienced growth at a rate of 138.1% of the control group. Again, these ideas were only evaluated for quantity.

A paired-samples t-test was conducted to compare before and after alternative use test scores for both the improv and control groups. There was a significant difference in the scores for improv before (M = 9.66, SD = 4.21) and after (M = 11.62, SD = 5.61) conditions; t (104) = -2.04, p = 0.02. There was not a significant difference in the scores for the control group before (M = 10.59, SD = 5.51) and after (M = 11.49, SD = 5.25) conditions, t (80) = -0.76, p = 0.23. These results suggest participating in improv games does have an effect on idea generation abilities. Specifically, our results suggest that when participants play improv games as part of an ideation process, their ability to generate ideas increases.

Favorite Activity

The participants were asked to complete an Exit Questionnaire that consisted of three long answer questions and the K-DOCS.

The responses to the first two questions "Which activity that was part of this study did you like best?" and "What did you like about it?" were compiled into a single document for analysis. A total of 95 responses were provided by the study participants. The investigator read through the responses three times. The first reading was to get a sense of the consistent themes in the answers. The investigator then reread the responses and coded the activities that participants indicated were their favorites (see Table 4).

TABLE 4: Favorite Activity by Group

ACTIVITY	IMPROV	%	CONTROL	%
Teamwork/ Collaboration	9	13.8%	2	4.4%
Alternate Uses/ Paper Clip/ Rubber Band	2	3%	10	22%
Creative Matrix	28	43%	15	33%
SCAMPER	9	13.8%	13	29%
Improv games	14	21.5%		
Incongruities	2	3%	2	4.4%
Brainstorming	1	1.5%	3	6.7%

The investigator read the answers a third time looking for themes that emerged in the provided reasons. The prevalent themes included freedom from being right or wrong, being more engaged in the content, being challenged in new ways, and expanding tools for thinking. A word cloud (see Figure 11) was generated to confirm the investigator's understanding.

These themes were echoed in the final question of the questionnaire: "Do you feel more creative than you did at the beginning of the study? Please explain your answer." The investigator compiled the answers to the final question and read them through three times. The first reading was to get a sense of the recurring themes in the answer. During the second reading (see Figure 12), the investigator coded the responses for Yes or Affirmative answers (37 improv/9 control), Somewhat or "Yes and No" answers (6 improv/10 control), and No or Negative answers (10 improv/5 control.)

During the third reading, the investigator focused on the explanations provided by the participants for their response. The majority of the responses focused on having new tools in their toolbox and being able to strive for quantity over quality. One participant stated that the study felt like "oil to the gears in my head." Another stated that before the study the individual "would tell myself that

the idea I had was ludicrous. Now I don't think that. I just go with the flow of ideas."

Kaufman Domains of Creativity Scale

The final piece of data collected during this study was the K-DOCS. Participants completed this 50-question Likert scale instrument at the beginning of the study and again at the conclusion. The instrument was scored for each participant. Entry scores for each participant were compared with their exit scores. Although some participants in each group saw a decrease in scores, the majority of participants (75.5%) saw an increase in their K-DOCS scores, with a larger percentage of the improv group (77.4%) seeing an increase than the control group (73.1%). The control group scores increased an average of 15.08 points across the 5-category scale. The improv group scores increased an average of 17.09 points across the same scale, representing an increase of 13% over the control group.

FIGURE 12: Do you feel more creative? Responses

FIGURE 11: Favorite Activity Reasoning

DISCUSSION

Creative Self-Concept and Applied Creative Thinking

As society moves toward widespread automation, the need for a flexible, innovative workforce is becoming readily apparent. Unfortunately, this comes at a time when our educational institutions have struggled to keep up with the pace of technology. This is a situation that has only been amplified by the onslaught of standardized testing that has become so prevalent. This educational environment is directly at odds for a scoeity's need for creative, divergent thinkers who can imagine what's next. The findings of this study reinforce the effectiveness of the design improv method proposed by Hatcher et al. (2018) and further extend the validity of the method by testing it in an experimental environment at the community college level.

Teaching critical-thinking skills has long been the hallmark of a liberal arts education. Teaching creative-thinking skills has become even more important and is no longer being viewed as extracurricular. Unfortunately, for many, being creative, that is, being capable of creative-thinking, has somehow become synonymous with possessing artistic skills. The findings of this study were clear about the need for creative-thinking curriculum in the community college classroom. Over the course of the study, the majority of participants (75.5%) saw an increase in their creative confidence as measured by an increase in their before and after K-DOCS scores. This shows an increase in their creative self-concept, the way they see themselves as a creative or not creative person. A larger percentage of the improv group (77.4%) experienced an increase than the control group (73.1%), although both groups overall did see an increase in the way they viewed their own creativity. While the majority of both the control and improv groups' K-DOCS scores increased, the improv group experienced more growth, 113% of the increase that the control group experienced. This shows that creativity can be taught and that participating in improv games was beneficial to the growth experience.

But creative self-concept is only a portion of the equation. Although there is a definite link between one's belief that he or she is creative and the ability to complete creative tasks, this study also shows that improv games were beneficial to a participant's ability to applyhis or her new creative framework. In an interesting twist, which proved to be a substantial limitation to the study, the improv group was naturally less creative than the control group at the outset of the study. This was evidenced by the first alternative uses test in which participants were tasked with coming up with as many uses as they could for a paper clip. The improv group was able to come up with an average of 9.66 ideas per person compared to the 10.59 ideas per person of the control group. At the conclusion of the study, the results were the opposite. The improv group averaged 11.62 ideas per person, an increase of 20.31%. The control group averaged 11.49 ideas per person, an increase of 8.53%. These results indicate that the improv group experienced more than twice the growth as the control group. These were individual metrics based on each participant's own view of his or her creativity and the ability to apply the skills learned to the alternative uses tests. Like in Hatcher et al. (2018), there was a consensus among study participants in the improv group that they felt freer to come up with absurd ideas, and less likely to self-censor. When quantity of ideas is the goal, the value of improv to foster a creative environment is an important revelation.

Group Dynamics and Collaboration

The findings of this study were unable to show that improv games were beneficial to group ideation tasks, however. In the case of each group collaboration activity, SCAMPER and the Creative Matrix, the control groups performed better, but there are a number of variables that can account for these results. Not only did the control and improv groups begin with different levels of proficiency, the size of the rooms, and seating arrangements therein, had an effect on the group dynamics. Three of the four control groups were in classrooms with sociopetal seating configurations (facing one another), whereas only two of the improv groups were in similar arrangements.

Further analysis of the relationship between classroom size, crowding, and seating arrangements was very revealing (see Table 5). When the groups were ranked based on performance in each of the two collaboration

TABLE 5: Comparison of Room Size, Seating, and Collaborative Output

SECTION	PARTICI-PANTS	ROOM SIZE IN SQ FT	SQ FT PER PERSON	SCAMPER	CREATIVE MATRIX	SCAMPER RANK	MATRIX RANK	COMBINE* RANK	SEATING
C1	6	787	131.2	42.5	4.5	3	4	7	sociopetal
T2	12	1209	100.8	23.9	5.5	6	1	7	sociofugal
T3	10	606	60.6	29.2	5.1	5	2	7	sociopetal
C3	14	738	52.7	44.8	4	1	6	7	sociopetal
T4	9	787	87.4	43.7	3.2	2	7	9	sociopetal
C4	9	688	76.4	20.22	4.4	7	5	12	sociopetal
C2	12	469	39.1	11.5	4.6	9	3	12	sociofugal
T1	10	573	57.3	29.9	2.6	4	9	13	sociofugal
T5	12	952	79.3	12.8	2.8	8	8	16	sociofugal

* calculated by adding SCAMPER rank and MATRIX rank

tasks, all of the groups in classrooms with sociofugal arrangements, like a traditional classroom, were the lowest performers, with one exception. In the case of T2, the group was arranged in sociofugal seating, however the group had one of the largest classrooms (100.8 square feet per person) and participated in the improv activities, which encouraged collaboration.

Additionally, the existing dynamics of the group seemed to dictate the volume of ideas the participants were able to generate. The groups who readily interacted with one another, and who were willing to get up and be in close proximity to one another at the board, were the groups that came up with the largest quantity of ideas. One group in particular, C3, was the largest group in the study. They were also the most boisterous, at times bordering on chaotic. They were an evening class, beginning at 5:30 pm. Their male instructor utilized a nickname throughout the study and was a gregarious presence in the classroom. During the SCAMPER activity, they generated 627 ideas. They were happy to riff off one another and that willingness to collaborate in a playful manner was beneficial. This underscores the findings of Hurmelinna-Laukkanen et al. (2016) in that when humor relies on incongruity, it is more effective within internal groups rather than when working with outsiders.

In a somewhat unusual finding, the classes that were the most productive during the SCAMPER activity all happened to have male classroom instructors. Whether this is more than coincidence is unclear. It is possible that there was a lower perceived risk of offending someone or stepping out of bounds with this activity in the classrooms with male instructors. Holding back at the risk of offending someone during brainstorming and collaboration presents an interesting avenue for further research.

The Creative Matrix activity was the most challenging activity undertaken during the study; however, it was also the activity that the largest number of the study participants identified as their favorite, with 43% of the improv group indicating it as their favorite, compared with 33% of the control group. This could imply that the improv games fostered a sense of grit and persistence in the improv group. This is an area for future study.

The relationship between creative self-efficacy and the application of creative thinking skills remains flexible. Haase et al. (2018) asserted that this is a factor of the nature of self-efficacy as one's belief that he or she is capable of completing a task is separate from actual ability. When examining the exit K-DOCS scores for study participants who initially identified as not creative (by

selecting a one or a two on the entry questionnaire), the results reinforced this assertion. The participants who selected a one saw an average increase in their K-DOCS composite of 25 points. Participants who selected two saw an average increase of 21 points. This did not translate to increases in their alternative use results, however.

Emergent Theme: Intellectual Freedom

A surprising finding from the data was the number of participants who commented that their favorite part of the study was not having to worry about being right or wrong. This intellectual freedom gave them permission to try things they might not otherwise have considered. This is a real benefit to using improv games as a part of design-thinking methods. Giving permission to participants to explore avenues of thought they might not otherwise entertain is one of the values of the methodology. Further research into the effect of improv games on academic anxiety may be of particular interest.

Emergent Theme: Workspace Shapes Work

In more than one instance, the classrooms where the workshops were held were small and cramped. This made the participants less likely to get up and move around during ideation. Being confined to their seat prevented them from collaborating with those around them. In this case, the confined spaces constricted the flow of ideas. Therefore, understanding how the room configuration for design-thinking workshops affects the outcomes is a potential area for further research.

Limitations & Future Research

Although this study did result in some significant findings about the effects of improv on creative confidence and applied creative-thinking skills, it is important to address the limitations of the study. One of the most significant limitations of the study was that although randomly selected, the control group was more creative at the beginning of the study than the improv group. This made comparing the collaborative results of the SCAMPER and Creative Matrix activities between the improv and control groups problematic as the data does not take into account the inherent difference in skill and predisposition between these two groups. Future research using a larger sample may be able to overcome this limitation.

Creativity can be influenced by the chemistry of a group and other factors outside the control of research. This proved to be the case as some sample groups were much more lively and engaging than others. This limitation is inherent and will likely play a factor in any study in this arena. Humor can also be influenced by participants' perceptions, the group dynamic, mood, and other external

Study participants complete the entry questionnaire.

factors. These limitations can be mitigated by increasing the size of the study to account for variations in group dynamics.

An additional challenge to the validity of the study was the variety in rooms and settings. This could be mitigated in future studies by conducting all of the workshops in the same physical space. Another limitation of this study is that the participants come from the same community and class. This limitation could be overcome by expanding the study on a regional or nationwide basis, however the size of the sample may help to reduce this limitation. Because the study will be conducted over a 3-week time period, with groups on different campuses beginning the study at different times during the semester, there is a challenge to the internal validity of the study. The initial sections, C2

and T5, did generate significantly fewer ideas during the SCAMPER exercise. This may be due in part to the fact that they were the first groups to participate in the study activities. The later groups appeared to benefit from the additional course curriculum that they had participated in prior to the beginning of the study. For future research, this could be mitigated by conducting a longitudinal study over several semesters to identify any challenges present.

Challenges to the internal validity of the study include questionnaire decay and attitudinal threats. The questionnaire decay can be addressed by having volunteers (outside of the sample) take the questionnaire prior to the study (i.e., pilot testing the questionnaire). Attitudinal threats will be mitigated by the size of the sample.

Conclusions

Improv games deserve a place at the table for creative-thinking endeavors. On an individual basis, study participants who experienced improv as part of the curriculum showed an increase in their creative-thinking—both in how they saw themselves and in the actual application—that far exceeded their counterparts who did not participate in any improv games. Whether or not improv games should be added to the design-thinking toolkit remains to be seen. Additional research on the effect of improv games on group dynamics and collaboration is still needed.

Participants from T4 gather around the whiteboard to collaborate during the SCAMPER activity

Awkward room configurations drove group dynamics

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APPENDICES

Appendix A: Demographic Comparisons: National, Surrounding Community, School Populations, and Sample

	UNITED STATES	COLORADO SPRINGS, CO	FOUNTAIN, CO	SECURITY WIDEFIELD CDP, CO	PIKES PEAK COM.COLLEGE	TOTAL SAMPLE	TREATMENT/ IMPROV	CONTROL
POPULATION	325,719,178	464,474	29,804	32,882[a]	13,460	94	53	21
FEMALE	50.8%	50.3%	51.1%	51.1%	57%	47.87%	47.17%	48.78%
HISPANIC/ LATINO	18.1%	17.4%	19.3%	17.9%	18%	26.60%	22.64%	31.71%
AFRICAN AMERICAN/ BLACK	13.4%	6.4%	11.0%	8.3%	7%	9.57%	7.55%	12.20%
WHITE	60.7%	69.1%	59.3%	64.2%	59%	48.94%	56.60%	39.02%

NOTE: Data retrieved from: https://www.census.gov/quickfacts/fact/table/coloradospringscitycolorado,securitywidefieldcdpcolorado,fountaincitycolorado,US/PST045217 and https://www.ppcc.edu/diversity-equity-inclusion/fall-2016-enrollment-headcount

Statistics for male population is not listed in census data.

[a] 2017 Estimated population data for Security Widefield CDP is unavailable from the US Census Bureau. Population listed is 2010 Census data, unadjusted for population growth.

[b] Population listed is 2010 Census data, unadjusted for population growth used in the calculation of veterans and likely results in inflated data.

Appendix B: Informed Consent Document

PIKES PEAK COMMUNITY COLLEGE

RADFORD UNIVERSITY
Department of Design

Adult Informed Consent – Non-survey Research

Title of Research: Examining the intersection of creativity and humor

Researcher(s): *Betsy A. Tuma, Pikes Peak Community College*
Joan I. Dickinson, Ph.D, Radford University

We ask you to be in a research study that will: investigate the relationship between creativity and humor. If you choose to be in the study, you will be asked to participate in creative thinking exercises and games for three consecutive class periods. In addition, you will be asked to complete two short homework assignments between class meeting times.

This study has no more risk you may find in daily life.

If you decide to be in this study you may benefit from being a part of it. Some benefits to you may be: *an increase in creative thinking skills and creative self-efficacy. In addition, you may receive extra credit towards your AAA 109 coursework.*

You can choose not to be in this study. If you chose not to be in this study, you will be assigned alternative course work. If you decide to be in this study, you may choose not to answer certain questions or not to be involved in parts of this study. You may also choose to stop being in this study at any time without any penalty to you.

There are no costs to you for being in this study. There is not payment for you taking part in this study. If you participate in this study, you will receive 10 points of extra credit for each of the homework assignments that you turn in.

If you decide to be in this study, what you tell us will be kept private unless required by law to tell. We will present the results of this study, but your name will not be linked in any way to what we present. In order to protect your anonymity, you will be assigned a nickname to use for the duration of the study.

If at any time you want to stop being in this study, you may leave the study without penalty or loss of benefits by contacting: Betsy A. Tuma (719) 510-6669, or Joan I. Dickinson, Ph.D. (540) 818-1169.

If you have questions now about this study, ask before you sign this form.

Appendix B cont.: Informed Consent Document

If you have any questions later, you may talk with Betsy A. Tuma (719) 510-6669, or Joan I. Dickinson, Ph.D. (540) 818-1169.

This study was approved by the Institutional Review Board at Pikes Peak Community College and by the Radford University Committee for the Review of Human Subjects Research. If you have questions or concerns about your rights as a research subject or have complaints about this study, you should contact Dr. Patricia Diawara, Executive Director of Institutional Effectiveness, Pikes Peak Community College, patricia.diawara@ppcc.edu, (719) 502-2037 or Dr. Laura J. Jacobsen, Interim Dean, College of Graduate Studies and Research, Radford University, ljacobsen@radford.edu, (540) 831-5470.

Being in this study is your choice and choosing whether or not to take part in this study will not affect any current or future relationship with *Pikes Peak Community College or Radford University.*

If all of your questions have been answered and you would like to take part in this study, then please sign below.

I understand the study described above and have been given a copy of the description as outlined above. I am 18 years of age or older and I agree to participate.

_____ _____

Date Signature

I/We have explained the study to the person signing above, have allowed an opportunity for questions, and have answered all of his/her questions. I/We believe that the subject understands this information.

_____ _____

Signature of Researcher(s) Date

_____ _____

Signature of Researcher(s) Date

Appendix C: Nicknames

Bang	Crater	Houston	Mario	River	Supernova
Birdy	Demolition	Indigo	Marshmallow	Rocco	Switch
Bitmap	Diesel	Jackalope	Mate	Romeo	Tacklebox
Blackbeard	Doctor	Jax	Merlin	Scooby	Tangerine
Bleachers	Dozer	Jigsaw	Moose	Scout	Teeth
Blinker	Dragon	Judge	Mountain	Scratch	Tink
Bolt	Dragonfly	Junior	Neo	Scully	Trey
Bowler	Drift	Keystone	Neutron	Shay	Trinity
Brainiac	Einstein	Kickstart	Nirvana	Skippy	Twitch
Brooklyn	Elf	Kirk	Nova	Slash	Venom
Brutus	Engineer	Knuckles	Numbers	Snapdragon	Vito
Bud	Ferarri	Libster	Oscar	Sneezy	Wally
Cannon	Firecracker	Link	Otter	Sonic	Winky
Champ	Flash	Lucy	Patch	Sourdough	Wonka
Charisma	Freckles	Luigi	Pepper	Speedwell	Zelda
Chipmunk	Freeway	Lynx	Peppermint	Spock	Zen
Chuckles	Grinch	Manatee	Pockets	Stealth	
Cosmic	Hafling	Maple	Porsche	Stella	
Cosmo	Hightower	Marbles	Rara	Stickers	

ENTRY QUESTIONNAIRE

Thank you for agreeing to participate in this study on the relationship between humor and creativity.

NICKNAME: _____ **COURSE SECTION:** _____

DEMOGRAPHIC QUESTIONS:

For demographic purposes only. Please answer the following questions by circling the answer that best applies to you.

HOW MANY SEMESTERS HAVE YOU ATTENDED PPCC?

1 2 3 4+

AGE

18-25 26-35 36-54 55+

RACE / ETHNICITY

African American / Black
American Indian / Alaska Native
Asian
Hispanic / Latino
White
Other

GENDER

Female Male Other/Non-binary

DEFINITIONS:

Many words have more than one definition, or definitions vary between people based on their personal experiences, beliefs, and world view. For the questions indicate how much you feel the question relates to you and then share your definition.

Are you creative?

No, Not Really 1 _____ 2 _____ 3 _____ 4 _____ 5 Absolutely!

How do you define CREATIVITY?

_____

_____

_____

_____

Are you funny?

No, Not Really 1 _____ 2 _____ 3 _____ 4 _____ 5 Absolutely!

How do you define HUMOR?

_____

_____

_____

_____

KAUFMAN DOMAINS OF CREATIVITY SCALE

The Kaufman Domains of Creativity Scale (K-DOCS) helps identify how creative you perceive yourself to be in the areas of Everyday Creativity, Performing, Science, Artistic, and Scholarly pursuits. The scale consists of 50 questions. There are no right or wrong answers.

INSTRUCTIONS:

Compared to people of your approximate age and life experience, how creative would you rate yourself for each of the following acts? For acts that you have not specifically done, estimate your creative potential based on your performance on similar tasks.

1	2	3	4	5
Much Less Creative	Less Creative	Neither More nor Less Creative	More Creative	Much More Creative

1. _____ Finding something fun to do when I have no money
2. _____ Helping other people cope with a difficult situation
3. _____ Teaching someone how to do something
4. _____ Maintaining a good balance between my work and my personal life
5. _____ Understanding how to make myself happy
6. _____ Being able to work through my personal problems in a healthy way
7. _____ Thinking of new ways to help people
8. _____ Choosing the best solution to a problem
9. _____ Planning a trip or event with friends that meets everyone's needs
10. _____ Mediating a dispute or argument between two friends
11. _____ Getting people to feel relaxed and at ease
12. _____ Writing a nonfiction article for a newspaper, newsletter, or magazine
13. _____ Writing a letter to the editor
14. _____ Researching a topic using many different types of sources that may not be readily apparent
15. _____ Debating a controversial topic from my own perspective
16. _____ Responding to an issue in a context-appropriate way
17. _____ Gathering the best possible assortment of articles or papers to support a specific point of view
18. _____ Arguing a side in a debate that I do not personally agree with
19. _____ Analyzing the themes in a good book
20. _____ Figuring out how to integrate critiques and suggestions while revising a work
21. _____ Being able to offer constructive feedback based on my own reading of a paper
22. _____ Coming up with a new way to think about an old debate
23. _____ Writing a poem
24. _____ Making up lyrics to a funny song
25. _____ Making up rhymes
26. _____ Composing an original song
27. _____ Learning how to play a musical instrument
28. _____ Shooting a fun video to air on YouTube
29. _____ Singing in harmony
30. _____ Spontaneously creating lyrics to a rap song
31. _____ Playing music in public
32. _____ Acting in a play
33. _____ Carving something out of wood or similar material
34. _____ Figuring out how to fix a frozen or buggy computer
35. _____ Writing a computer program
36. _____ Solving math puzzles
37. _____ Taking apart machines and figuring out how they work
38. _____ Building something mechanical (like a robot)
39. _____ Helping to carry out or design a scientific experiment
40. _____ Solving an algebraic or geometric proof
41. _____ Constructing something out of metal, stone, or similar material
42. _____ Drawing a picture of something I've never actually seen (like an alien)
43. _____ Sketching a person or object
44. _____ Doodling/drawing random or geometric designs
45. _____ Making a scrapbook page out of my photographs
46. _____ Taking a well-composed photograph using an interesting angle or approach
47. _____ Making a sculpture or piece of pottery
48. _____ Appreciating a beautiful painting
49. _____ Coming up with my own interpretation of a classic work of art
50. _____ Enjoying an art museum

Appendix E: Alternative Uses: Paper Clip Data Collection Sheet

NICKNAME: _____

COURSE SECTION: _____

For this challenge, there are NO right answers, there are NO wrong answers -- there are just LOTS of answers.

Please list AS MANY ways as you can come up with to use a PAPERCLIP.

Appendix F: SCAMPER Homework Sheet

NICKNAME: _____ **COURSE SECTION:** _____

The questions that make up the SCAMPER acronym were developed by Alex Osborn in the 1950's. What other words or ideas might help you come up with more ideas when brainstorming?

Come up with at least 5 of your own

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

Substitute
what else could be used?
different materials, ideas, actions, people, rules

Combine
what could we add to it?
mix & match
mash-ups
blend w/ another

Adapt
how else can it be used?
change part of the problem
how do others use it?

Modify
how can we change it?
make it bigger or smaller
change its attributes
add features

Put to Another use
how might a ____ use it?
teacher / doctor
artist / detective
toddler / teenager

Eliminate
what can be taken away?
simplify
reduce reuse recycle
what can it do without?

Rearrange
change the order
inside out
upside down
backwards
start at the end

SCAMPER

Appendix G: Incongruity Homework Data Collection Sheet

INCONGRUITY

NICKNAME: _____

COURSE SECTION: _____

DUE DATE:

Definition:
when things don't match as they are expected to, being out of place, ludicrous, absurd, lacking harmony

Examples:
A dozen clowns get out of a tiny car
A politician tells the truth

Instructions:
Over the next few days pay attention to where incongruity appears in the world around you.

Note where you were, what was happening, and why it was incongruent. If you run out of space, use the back of this sheet, or additional papers.

DATE/TIME: _____

WHERE: _____

WHAT: _____

_____

DATE/TIME: _____

WHERE: _____

WHAT: _____

Appendix H: Alternate Uses: Rubber Band

NICKNAME:

_____

COURSE SECTION:

_____

For this challenge, there are NO right answers, there are NO wrong answers -- there are just LOTS of answers.

Please list AS MANY ways as you can come up with to use a RUBBER BAND.

EXIT QUESTIONNAIRE

Your participation in this study is greatly appreciated. If you would like to receive the results of this study when available, please email: BETSY.TUMA@PPCC.EDU

NICKNAME: _____ **COURSE SECTION:** _____

INSTRUCTIONS:

For this exit survey, you will be asked three (3) open ended questions, be challenged to come up with uses for a common household item, and take the Kaufman Domains of Creativity Scale assessment again.

OPEN ENDED QUESTIONS:

Please share your honest opinions and feedback about your experiences as a participant in this study.

Which activity that was part of this study was your favorite?

_____

_____

_____

_____

What did you like about it?

_____

_____

_____

_____

Do you feel more creative than you did at the beginning of the study? Please explain your answer.

_____

_____

_____

_____

_____

KAUFMAN DOMAINS OF CREATIVITY SCALE

The Kaufman Domains of Creativity Scale (K-DOCS) helps identify how creative you perceive yourself to be in the areas of Everyday Creativity, Performing, Science, Artistic, and Scholarly pursuits. The scale consists of 50 questions. There are no right or wrong answers.

INSTRUCTIONS:

Compared to people of your approximate age and life experience, how creative would you rate yourself for each of the following acts? For acts that you have not specifically done, estimate your creative potential based on your performance on similar tasks.

1	2	3	4	5
Much Less Creative	Less Creative	Neither More nor Less Creative	More Creative	Much More Creative

1. _____ Finding something fun to do when I have no money
2. _____ Helping other people cope with a difficult situation
3. _____ Teaching someone how to do something
4. _____ Maintaining a good balance between my work and my personal life
5. _____ Understanding how to make myself happy
6. _____ Being able to work through my personal problems in a healthy way
7. _____ Thinking of new ways to help people
8. _____ Choosing the best solution to a problem
9. _____ Planning a trip or event with friends that meets everyone's needs
10. _____ Mediating a dispute or argument between two friends
11. _____ Getting people to feel relaxed and at ease
12. _____ Writing a nonfiction article for a newspaper, newsletter, or magazine
13. _____ Writing a letter to the editor
14. _____ Researching a topic using many different types of sources that may not be readily apparent
15. _____ Debating a controversial topic from my own perspective
16. _____ Responding to an issue in a context-appropriate way
17. _____ Gathering the best possible assortment of articles or papers to support a specific point of view
18. _____ Arguing a side in a debate that I do not personally agree with
19. _____ Analyzing the themes in a good book
20. _____ Figuring out how to integrate critiques and suggestions while revising a work
21. _____ Being able to offer constructive feedback based on my own reading of a paper
22. _____ Coming up with a new way to think about an old debate
23. _____ Writing a poem
24. _____ Making up lyrics to a funny song
25. _____ Making up rhymes
26. _____ Composing an original song
27. _____ Learning how to play a musical instrument
28. _____ Shooting a fun video to air on YouTube
29. _____ Singing in harmony
30. _____ Spontaneously creating lyrics to a rap song
31. _____ Playing music in public
32. _____ Acting in a play
33. _____ Carving something out of wood or similar material
34. _____ Figuring out how to fix a frozen or buggy computer
35. _____ Writing a computer program
36. _____ Solving math puzzles
37. _____ Taking apart machines and figuring out how they work
38. _____ Building something mechanical (like a robot)
39. _____ Helping to carry out or design a scientific experiment
40. _____ Solving an algebraic or geometric proof
41. _____ Constructing something out of metal, stone, or similar material
42. _____ Drawing a picture of something I've never actually seen (like an alien)
43. _____ Sketching a person or object
44. _____ Doodling/drawing random or geometric designs
45. _____ Making a scrapbook page out of my photographs
46. _____ Taking a well-composed photograph using an interesting angle or approach
47. _____ Making a sculpture or piece of pottery
48. _____ Appreciating a beautiful painting
49. _____ Coming up with my own interpretation of a classic work of art
50. _____ Enjoying an art museum

Appendix J: Alex Osborn Presentation Slides

1.

What is Creativity?

Not just for artists

2.

Problem solving

with novelty & relevance

Create - to make

3.

Alex Osborn

"Inventor" of brainstorming

Educator & advertising exec

It's much easier to tame a wild idea than invigorate one that has no life in the first place.

4.

SCAMPER Technique

Substitute
Combine
Adapt
Modify
Put to another use
Eliminate
Rearrange

Appendix K: SCAMPER Prompts for Idea Generation

SUBSTITUTE
What materials or resources can you substitute or swap to improve the product? What other product or process could you use? What rules could you substitute? Can you use this product somewhere else, or as a substitute for something else? What will happen if you change your feelings or attitude toward this product?
COMBINE
What would happen if you combined this product with another, to create something new? What if you combined purposes or objectives? What could you combine to maximize the uses of this product? How could you combine talent and resources to create a new approach to this product?
ADAPT
How could you adapt or readjust this product to serve another purpose or use? What else is the product like? Who or what could you emulate to adapt this product? What else is like your product? What other context could you put your product into? What other products or ideas could you use for inspiration?
MODIFY
How could you change the shape, look, or feel of your product? What could you add to modify this product? What could you emphasize or highlight to create more value? What element of this product could you strengthen to create something new?
PUT TO ANOTHER USE
Can you use this product somewhere else, perhaps in another industry? Who else could use this product? How would this product behave differently in another setting? Could you recycle the waste from this product to make something new?
ELIMINATE
How could you streamline or simplify this product? What features, parts, or rules could you eliminate? What could you understate or tone down? How could you make it smaller, faster, lighter, or more fun? What would happen if you took away part of this product? What would you have in its place?
REVERSE
What would happen if you reversed this process or sequenced things differently? What if you try to do the exact opposite of what you're trying to do now? What components could you substitute to change the order of this product? What roles could you reverse or swap? How could you reorganize this product?

Appendix L: Incongruity Presentation Slides

1.

Incongruity

The secret sauce

2.

Incongruity

Something that is:
Inconsistent
Unexpected
A Contradiction
A Paradaox

3.

Oxymorons

Pairs of words that have opposite meanings, when combined, have a third meaning

4.

Jokes

The punchline

Words are often used in a different context than we are used to

5.

Innovation

Everyday items used in new ways or in different industries

Appendix M: The Matrix Presentation Slides

1.

New Technologies

What will they think of next?

2.

At the speed of technology

Technologies that we rely on every day are all really new.

What's next?

YouTube - 2005

Kindle eReader - 2006

iPhone - 2007

Netflix Streaming - 2007

Kickstarter - 2008

iPad - 2010

Augmented Reality - 2014

3.

Project Soli

Soli is a purpose-built interaction sensor that uses radar for motion tracking of the human hand.

4.

DuoSkin

DuoSkin devices enable users to control their mobile devices, display information, and store information on their skin while serving as a statement of personal style.

5.

Sixth Sense

Sixth Sense is a user friendly interface which integrates digital information into the physical world and its objects, making the entire world your computer. It uses hand gestures to interact with digital information.

6.

Muse Headband

Muse translates your mental activity into the guiding sounds of weather to help you find focused calm.

7.

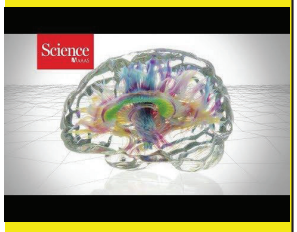
Tilt Brush

Tilt Brush lets you paint in 3D space with virtual reality.

8.

Voxel Printing

Stunning 3D models are transforming scientists' raw data. Resin-based voxel printing can even reproduce empty space.



9.

How might we reimagine education for the 21st Century?

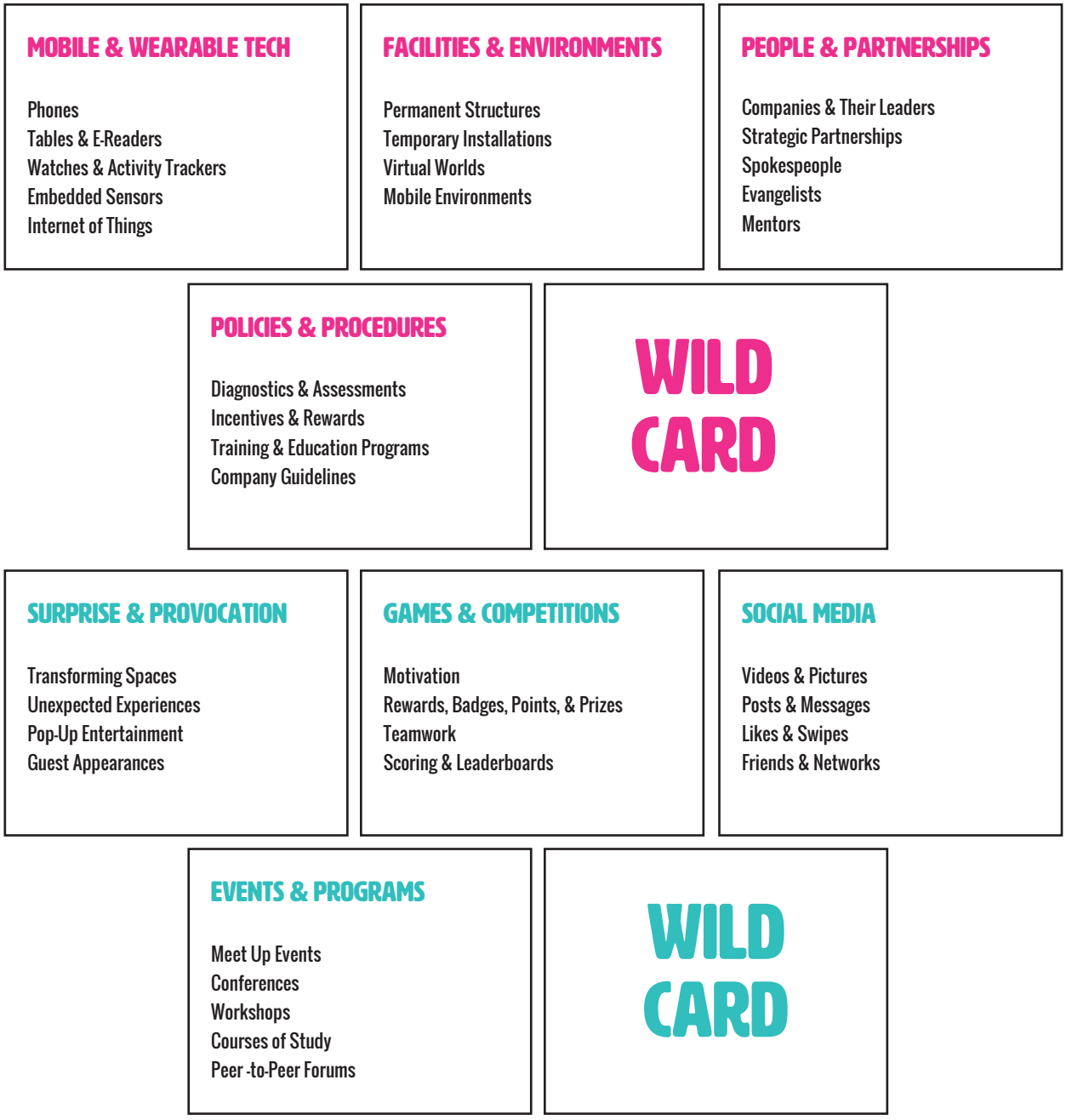
10.

Creative Matrix

Using Mash-Ups to Inspire Innovative Ideas

Appendix N: Creative Matrix

These are the row and column headers that made up the Creative Matrix for use with the prompt: *How might we re-imagine education in the 21st century?* The matrix was constructed by posting the headers on a magnetic whiteboard. So long as one color was used for the columns and the other used for the rows, the integrity of the matrix was maintained.



Appendix O: Letter of Support

Division of Math and English

PIKES PEAK COMMUNITY COLLEGE

December 13, 2018

Re: Letter of Support for the research study, *Examining the Intersection of Humor and Creativity* conducted by Ms. Betsy Tuma, Department of Design, and Dr. Joan Dickinson, Professor, Department of Design, Radford University

To whom it may concern:

On behalf of Pikes Peak Community College, we are happy to support the research study, *Examining the Intersection of Humor and Creativity*. We recognize the need to empower students to be creative thinkers and innovators. Therefore, we agree to provide the investigators at Radford University with access a sample of students enrolled in AAA 109 at Pikes Peak Community College during the Spring 2019 semester. The objective is to evaluate the effects improvisational humor and creative thinking instruction through design thinking activities and two questionnaires. For this research investigation, the researchers will go through IRB approval process at both Radford University and Pikes Peak Community College prior to gaining access to the students. At Pikes Peak Community College, we believe that participating in this study has the potential to improve student's creative self-efficacy and creative thinking skills.

Sincerely,

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Students collaborate on a design thinking activity during the study.

Examining the INTERSECTION of HUMOR CREATIVITY

Betsy A. Tuma, M.F.A.

IT'S no secret that comedic improvisation takes a quick mind, active listening skills, and a willingness to explore the unexpected. The same skills are at the heart of ideation and innovation. Creatively confident individuals are willing to take risks, fail, and work at the edges of their comfort zone in order to find creative solutions to problems. Creative confidence builds on the social cognitive theory of psychology which states that social interactions are an important part of how people learn new skills. One core tenet of this theory is guided mastery, a process by which one is moved from phobia to a state of self-efficacy. Self-efficacy is a belief that one is capable of completing a task and affecting change.

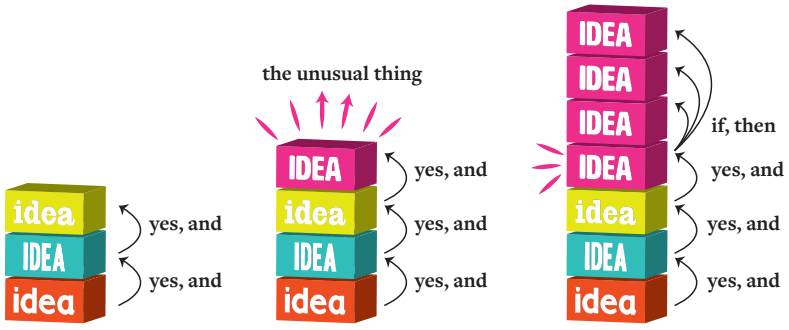
Facilitation is essential to design thinking, with stakeholders being selected and activities planned by a trained facilitator. One of the core tenets of facilitation is the power of experiential learning (Berta et al., 2015). This same tenet is at the core of the self-efficacy theory and guided mastery therapies.

Both innovation and humor rely on an ability to make unusual connections and see things in a different light. Incongruity theory of humor provides an approach for better understanding the commonalities between humor and innovation. In design-thinking sessions, stakeholders come from a variety of backgrounds and social standings. This creates an environment that can be filled with fear of the unknown and a general discomfort with freedom that creative problem solving requires. We propose that humor is the key to creating a level and open playing field where the voices of all stakeholders can be heard.

An experimental design solution was implemented to answer the question ***"Can a set of guided improv exercises increase the quantity of ideas generated during a group ideation session?"*** A sample of 94 community college students participated in three brainstorming activities of increasing difficulty as part of a three session creative-thinking module. The control group received standard instruction for each activity. The improv group received the same instruction with the addition of one comedic improv inspired activity during two of the sessions. Results were measuring through pre and post study questionnaires including the Kaufmann Domains of Creativity Scale (KDOCs) and alternative uses tests in which participants listed as many possible uses for a common household object as they could.

The first of the improv activities, The Nickname Game, is used at IDEO to reduce hierarchy and limit self-censoring (Kelley & Kelley, 2013). Nametags, preprinted with nicknames, were distributed to the participants who then introduced themselves by telling a story about how they got their nickname. They were encouraged to be as outlandish as possible.

The second improv game consisted of three parts: *Yes, And, Identify the Unusual Thing, and Heightening*. During the game, the participants helped to create a story about a dog who went to college. Each participant added to the story using the structure of Yes (previous idea) and (new idea) generating as many ideas as possible. During the Identify



The Yes, And, Identify, Heighten Activity modified from Hatcher et al. 2019

the Unusual Thing phase, the facilitator lead the participants in a discussion to find the idea they thought was the most unusual, or the most surprising. Participants further developed the "Unusual Thing" by following the protocol of "If the unusual thing is true, then (this is also true)."

We found that participating in improv games as part of a creative-thinking curriculum did increase individual participants creative self-concept and ability to generate ideas. The findings of this study also reinforce the effectiveness of the design improv method proposed by Hatcher et al. (2018) and further extend the validity of the method by testing it in an experimental environment..

Over the course of the study, the majority of participants (75.5%) saw an increase in their creative confidence as measured by an increase in their before and after KDOCs scores. This shows an increase in their creative self-concept, the way they see themselves as a creative or not creative person. A larger percentage of the improv group (77.4%) experienced an increase than the control group (73.1%) although both groups overall did see an increase in the way they viewed their own creativity. While the majority of both the control and improv groups KDOCs scores increased, the improv group experienced more growth, 113% of the increase that the control group experienced. This shows that creativity can be taught and that participating in improv games was beneficial to the growth experience.

This study also shows that improv games were beneficial to a participants ability to apply their new creative framework. In an interesting twist which proved to be a substantial limitation to the study, the improv group was naturally less creative than the control group at the outset of the study. This was evidenced by the first alternative uses test in which participants were tasked with coming up with as many uses as they could for a paper clip. The improv group was able to come up with an average of 9.66 ideas per person compared to the 10.59 ideas per person of the control group. At the conclusion of the study, the results were the opposite. The improv group averaged 11.62 ideas per person, an increase of 20.31%. The control group averaged 11.49 ideas per person, an increase of 8.53%. These results indicate that the improv group experienced more than twice the growth as the control group. These were individual metrics based on each participant's own view of their creativity and their ability to apply the skills they learned to the alternative uses tests. *When quantity of ideas is the goal, the value of improv to foster a creative environment is an important revelation.*

Another interesting finding was that the most challenging activity undertaken during the study was also the activity that the largest

number of the study participants identified as their favorite, with 43% of the improv group indicating it as their favorite, compared with 33% of the control group. This could imply that the improv games fostered a sense of grit and persistence in the improv group. This is an area for future study.

Although this study did result in some significant findings about the effects of improv on creative confidence and applied creative-thinking skills, it is important to address the limitations of the study. One of the most significant limitations of the study was that although randomly selected, the control group was more creative at the beginning of the study than the improv group. This made comparing the results of the collaborative activities between the improv and control groups problematic as the data does not take into account the inherent difference in skill and predisposition between these two groups. Additional limitations effected the results including preexisting group dynamics and environmental constraints such as room size and seating configuration. These findings suggest further research on the effect of improv games on collaboration in groups, both newly formed and preexisting, is needed. ■

RESULTS TO CROW ABOUT:

Creative thinking can be taught.

Both improv & control groups saw increases in alternative use test scores, KDOCs score.

If you think you are creative, you're right.

Significant correlation exists between self-assessment of creativity & alternative use test scores, KDOCs score.

Improv "greases the wheels" for ideation.

Improv group alternative use test scores increased **138% more** than the control group.

Berta, W., Cranley, L., Dearing, J. W., Dogherty, E. J., Squires, J. E., & Estabrooks, C. A. (2015). Why (we think) facilitation works: Insights from organizational learning theory. *Implementation Science*, 101-13. doi:10.1186/s13012-015-0323-0 | Hatcher, G., Ion, W., MacLauchlan, R., Wodehouse, A., Marlow, M., & Simpson, B. (2018). Evolving improvised ideation from humour constructs: A new method for collaborative divergence. *Creativity and Innovation Management*, 27(1), 91-101. | Kaufman, J.C. (2012), Counting the muses: development of the Kaufman domains of creativity scale (K-DOCS). *Psychology of Aesthetics, Creativity and the Arts*, 6(4), 298-308. doi:10.1037/a0029751 | Kelley, T., & Kelley, D. (2013). *Creative confidence: Unleashing the creative potential within us all*. London: William Collins.