

IMPROVING CREATIVE THINKING THROUGH NARRATIVE PRACTICE

by Richard A. McConnell | Jared Kite | Angela Samosorn | Andrew Shoffner | Kenneth Long | Jacob Mong | Angus Fletcher | Ryan Strong | Morgan Cornstubble

U.S. Army Command and General Staff College

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ABSTRACT

Military leaders must poise subordinate leaders to predict future states. By appreciating clues presented in environments, leaders must predict what will happen next. Such prediction requires acute creative thinking skills. Army leaders plan for future operations using military planning processes including the Military Decision Making Process (MDMP). These processes entail a means of developing courses of action, testing those courses of action for viability, and publishing an order directing subordinate units to execute the selected course of action (Department of the Army, 2014; Department of the Army, 2012a). Also included is testing courses of action for viability also known as the wargaming step of MDMP. The focus of this study is to conduct a mixed methods study of the Creative Thinking Class C122 at the U.S. Army Command and General Staff College (CGSC) and document the observed effects on student creative skills, to determine two different methodologies to teach creativity. The current C122 is a lecture and practical exercise method to teaching creativity. The proposed test in this mixed methods study to improve creativity among CGSC students through narrative perspective taking follows the Ohio State University Project Narrative (Fletcher, 2021c).

PROBLEM

The problem is that quality creative thinking is a cognitive capability Army leaders aspire to but with which many struggle to master. One practical application of creative thinking is the MDMP planning step of Course of Action Analysis known as wargaming. Wargaming is a process whereby Army Leaders pre-mortem plans to determine unexpected threats and opportunities. Such anticipation capabilities require creative thinking combined with critical thinking. Anticipation and foresight enabled by creativity and innovation are important aspects of wargaming. For at least the last ten years of military operations, operational experiences indicate that environment complexity will continue to increase with the rate of change only accelerating (McConnell, 2020). Therefore, only by improving creative thinking will Army Leaders better identify challenges, opportunities, planning shortfalls, and unforeseen opponent options. Discovering the unforeseen during execution is a common occurrence during military operations. Improving the quality of creative thinking will enable commanders and staffs to envision multiple options and solutions to solve complex and chaotic problems in the future. (McConnell, 2020). Military leaders who seize opportunities to improve subordinate's creative thinking abilities may have a higher success rate against thinking and adaptive opponents (McConnell et al., 2021).

PURPOSE

The purpose of this mixed methods study is to determine the degree to which narrative practice can improve the quality of creative thinking among CGSC students. The focus of this study was to determine if groups of students who practice hearing and reframing narratives shared by colleagues will hone abilities to appreciate the perspectives of others through empathy and thus build creative thinking capacity. The purpose was accomplished by comparing student groups at the U.S. Army Command and General Staff College (CGSC) who engage in narrative practice to students who do not.

HYPOTHESIS

Student participants who engage in narrative practice (the Test Group) will display measurable improvement to creative thinking skills exceeding the creative thinking skills of participants who do not (the Control Group). Expressed in more detail, the hypothesis is conveyed as follows.

- H1: Student participants who engage in narrative practice (the Test Group) will display measurable improvement to creative thinking skills exceeding the creative thinking skills of participants who do not (the Control Group). H1 expressed mathematically: Test > Control.
- H2: Null hypothesis. Student participants who engage in narrative practice (the Test Group) will show the same creativity levels as participants who do not (the Control Group). H2 expressed mathematically: Test = Control.

- H3: Alternate hypothesis. Student participants who engage in narrative practice (the Test Group) was less effective at displaying measurable improvement to creative thinking skills exceeding the creative thinking skills of participants who do not (the Control Group). H3 expressed mathematically: Test < Control.

RESEARCH QUESTIONS

- R1. What is the level of student effectiveness at creative thinking after engaging in narrative practice?
- R2. What is the level of student effectiveness at creative thinking having not engaged in narrative practice?
- R3. How do C122S Group faculty members describe the effectiveness of student creative thinking after engaging in narrative practice?
- R4. How do C122 Control Group faculty members describe the effectiveness of student creative thinking having not engaged in narrative practice?

METHODOLOGY

The method for this study was a mixed methods study of student capabilities and faculty perceptions of student creative thinking skills having engaged in narrative practice, or not. Student creativity was initially determined qualitatively by a panel of credentialed experts applying judgement to determine a numerical score (Appendix F). Once the numerical score was determined, a subsequent quantitative statistical analysis was conducted thus demonstrating the quantitative aspects of this mixed methods study. The Test Group engaged in a 2-hour C122S (Study) narrative practice session during the time when all other CGSC students were conducting the C123 Gordian Knot Exercise. The Test Group conducted the C122S class as the third C120 class following the C122 legacy class. The Control Group received the C122 legacy class as the second C120 class followed by the C123 Gordian Knot Exercise.

Both test and Control Groups were provided with an envelope containing four instruments. Those instruments were an informed consent form (see appendix A), a pretest, a posttest (see appendices D and E), and an instruction sheet (see appendix L). All four instruments had an admin number applied so that participants can maintain a link to their data should student participants wish to request their data be excluded from the study after submitting their pre-and posttests. All names and admin numbers were recorded in a codebook. For more detailed information on admin numbers and codebook management, see those sections under data collection below. If participants wished to take part in the study, participants signed the informed consent form and then completed their pretest out of class prior to C122 and brought all four instruments to C122 and placed the informed consent form and pretest in the receptacle in the hallway outside the classroom. If students wished to be excluded from the study, no action was needed.

Faculty facilitating both test and Control Group C122 sessions also received an informed consent form (Appendix C) and were invited to participate in the study by recording perceptions of the quality of the creative thinking observed using a qualitative questionnaire (Appendix B). The identities of all participants using survey instruments were protected by informing participants to place no identifying marks on the pre and posttest or the questionnaires. Student participants and faculty who volunteered to participate in the study completed the pre and posttest (student participants) and questionnaires (faculty participants) and placed instruments in the receptacle in the hallway outside the classroom.

Faculty were provided with an instructional script to read to their classes prior to instruction (see appendices M and N). Control Group faculty read their script (appendix M) at the beginning of the C122 legacy class. Test Group faculty read their script (appendix N) at the beginning of the C122S class.

The study took place during the C120 block of instruction. There were 8 hours of lessons in C120 consisting of 4 hours for C121 (Critical Thinking), 2 hours for C122 (base-line Creative Thinking Class), and 2 hours for C123 (Critical + Creative Thinking in the form of the Gordian Knot Exercise). Test and Control Groups received C121 and the current Creative Thinking Lesson C122 legacy. The Control Group conducted C123. The Test Group conducted C122S in lieu of C123. This study was designed to ensure the Control and Test Group had equal hours of instruction for the C120 block.

The Control Groups conducted pre and posttest before and after the C122 lesson. The Test Group completed pre and posttest before and after the C122S. Because an entire staff group received random assignment to the Test or Control Group, if a student did not wish to participate in the study, they did not turn in the informed consent, pre and posttest, or the one-page response.

All students received 8 hours of instruction during C120. This mixed methods study took place over two collection phases in two locations (Fort Belvoir, Virginia, and Fort Leavenworth Kansas) Please refer to the C120 study timeline below.

Timeline for research

- May 2022:** First mixed methods study was at the start of May start of Satellite CGSC to be conducted at Fort Belvoir, Virginia. Two academic teams, consisting of 64 students, potential total N: 128 student participants and 16 faculty participants.
- May 2022:** Second mixed methods study conducted at Fort Leavenworth, Kansas. Ten academic teams, consisting of 64 students, potential total N: 640 students participants and 80 faculty participants.

DATA COLLECTION

The data collected in this mixed methods study were pre-and posttests from students and questionnaires from faculty who decided to volunteer to participate. All raw data was stored in a locked container in the office of the principal investigator. The data will be safely stored and held for three years after study completion, after which time the data will be destroyed. Students who elected to participate in this study, completed the pre-and posttest and placed those instruments in a collection receptacle in the hallway outside the classroom. Faculty completed their questionnaires after class and placed those instruments in the receptacle in the hallway outside the classroom. Research team members collected, collated, coded, and analyzed student responses to compare creative thinking scores of test to control. The scores of these instruments were determined by a credentialed panel of experts in the field that used qualitative judgement to assign a quantitative score, given novelty, suitability, and feasibility of solutions. These scores were captured and analyzed using PSPP and Libre Office Calc spreadsheet.

This mixed methods study included an informed consent for student participants (Appendix A) and faculty participants (Appendix C). Faculty electing to participate in the study at no time influenced a student's decision to participate. A recruitment email was sent to all students in the participating teams (see Appendix J). A recruitment email was sent to all faculty in the participating teams (see Appendix K). The email provided participants with introductory information regarding this study. Study participation is voluntary. All students (test and control) were provided a prompt of a scenario to solve with a one sheet response consisting of space for text and a space for a sketch (Appendix C & D). Randomized admin numbers were assigned to pre-and posttests so that responses can be associated to a single individual. These numbers enabled the panel of experts to ensure that the hundreds of respondent artifacts for both pre and posttest can be provided to the panel of experts in a random sequence of test and Control Groups, and in a random sequence for each panel member, to offset decision/judgement fatigue when performing a series of many evaluations. The numbers were assigned randomly to the two collected data sets before being mixed into distribution batches that randomly mix test and Control Group entries (Appendix G). Participant identities were protected and members of the credentialed panel of experts did not know whether the instruments evaluated came from test or control.

The distribution batches containing student pre and posttest and faculty questionnaires were collected by members of the writing team who delivered the instruments to the panel of experts in a random sequence. The panel of experts recorded scores associated with the admin number. Individual panel of experts score sheets were collected and scores cross tabulated against the master admin spreadsheet. From that integrated spreadsheet, scores could be segregated into test and Control Group data sets for statistical analysis. This procedure governed the treatment of both pre and post test entries. Analysis was conducted at the level of the broad populations (averages for test and control) as well as individually (comparing test and control creativity by individual participant). Because this study was analyzing responses from the broad population, if the number of participants for the pre and posttest were not equivalent, there should not be a statistically significant effect. The number of respondents in each data set was large enough where minor variations in N sizes should not be statistically significant, thus allowing the problem statement, hypothesis, and research questions to be addressed.

Students completed the one sheet response to the prompts (the pre-and posttests) and placed a de-identified sheet in a collection receptacle in the hallway outside the classroom. Those responses were collected, and the data collated, coded, and analyzed to compare creative thinking test scores to control, by the office of the investigator in charge of the panel of experts. The credentialed panel of experts in the field used the pre and post test rubric to evaluate the level of creativity demonstrated by students in the test and control (Appendix F).

Administrative number protocol:

1. Staff group pre and post test responses was stored in a locked container in the office of the principal investigator.
2. A set of random numbers from 1-2000 was generated using National Security Agency 128 bit encryption using Microsoft Excel© spreadsheet.

3. Each random number was associated with either the Test or the Control Group in a code book.
4. Each student was provided informed consent, pre and posttest, and an information sheet with admin numbers applied. Student participants completed these instruments out of class prior to (pretest) and after class (post test). Participants in classes executing C120 with the C121, C122, and C123 classes took pre and post test prior to and after C122. Participants in classes executing C120 with the C121, C122, and C122S classes took pre and post test prior to and after C122S.
5. When panel of experts viewed the entries, the test or Control Group were not visible.
6. Researchers recorded scores against the admin number and analyzed the population level effects of test vs control.

***For initial C122S lesson plan see Appendix H. For C122S Slides/Script follow below link:**

https://cgsc.blackboard.com/bbcswebdav/xid-26066767_1

Test Group (Experimental) *	Control Group C122	Non-Participants (No Research Election)
Pre/Post Test (Intervention Lesson = C122S -- Research)	Pre/Post Test Legacy Lesson C122 -- Research	No Testing Same as Population at large, Not assigned Pre/Post Test
Assigned to a random Admin Number	Assigned to a random Admin Number	No Observation or testing
Must Consent to be part of the study, Was faculty observed	Must Consent to be part of the study, Was faculty observed	No need for consent

Table 1: Study Population (Student and Faculty Participants)

CREDENTIALING OF THE PANEL OF EXPERTS

To credential the panel of experts, investigators employed an institutional microethnographic method (Willis, 2007; Wright, 2003). These 4 experts had at least 20 years uniformed experience, 2 years of faculty teaching experience at CGSC, and the group consisted of members of the Department of Sustainment and Force Management. This credentialing method was microethnographic. These experts, through years of experience in the military, possess an insider's view of the military institution and how creative thinking can be applied effectively in the military. This is like a regular ethnography except it also considers the years of observation the experts have operating in the military. Microethnographic methodology has been similarly applied to previous research studies at CGSC (Miller, 2015; McConnell, 2016) .

DATA ANALYSIS

The panel of experts used qualitative judgment to assign a quantitative score given novelty, suitability, and feasibility of the scenario solutions. Quantitative scores were collected from the credentialed panel of experts in the field by the lead researcher of the panel of experts. The quantitative data was analyzed using excel PSPP and Libre Office Calc Spreadsheet and then was displayed capturing the average creative thinking scores of both the Test and Control Groups across teams as well as individuals. These averages were meant to either prove or disprove the hypothesis (H1-3) and answer or fail to answer the research questions (R1-4).

Assigning a quantitative score to student responses to prompts

1. The panel of experts obtained the student products from members of the research team who retrieved the instruments from the locked receptacles in the hallways outside of the creative thinking classes.
2. Before the lead researcher of the panel of experts received the pre and posttest, the instruments were mixed to produce batched sets of 25.
3. Individual experts assigned a quantitative score to student responses to pre and post test prompts through qualitative acumen from credentialed experience given two dimensions (Novelty, Suitability, Feasibility), on a seven-point Likert scale (Appendix F).
4. Scores were recorded on a master control spreadsheet with all admin numbers.
5. After completing each batch, experts received another batch of 25, until all student responses to pre and post test prompts were completed.
6. The panel of experts consolidated spreadsheets after all quantitative scores had been recorded.
7. Statistical analysis proceeded.

PRE-TEST

Introduction and Warm Up

Prior to the creative thinking classes and at the end of C121, students were provided an envelope containing the four study instruments. The students are then instructed complete the pretest out of class prior to and after the appropriate creative thinking class (Control: prior to and after C122, Test: prior to and after C122S). Students are requested to respond with a graphic, narrative, or both. Once complete, students were requested to deposit their pre and post test into the receptacles in the hallway outside the classrooms.

Creative thinking faculty read the instructional script specific to test or control see appendices M and N).

C122S classes of 16 students after the pre-test received a brief introduction and then participated in a warmup exercise consisting of students first imagining a member of a previous unit, then imagining something that would make that person smile.

Perspective Plotting

C122S class students first conducted Perspective Plotting exercises.

Step 1: Students were provided a prompt and then asked to individually react to a prompt with a scenario then given five minutes to answer/react to that prompt and provide an individual solution(s).

Step 2: Students then paired off with a fellow student and have five minutes to conduct the following tasks:

- a. Share responses developed with the student paired with.
- b. Explain the rationale (i.e., the why) behind the responses to each other.
- c. Students then were asked to attempt to grasp the rationale of the other student's perspective/solution.

C122S classes conducted perspective plotting twice (two times) and then were given a short five-minute break.

Break

C122S class students are put on break with the explicit instructions to:

"Take five minutes for a break. During this break do some light exercise, do not use cell phones, screen time or any electronic devices during this break."

Plot Twisting

C122S class students after the break engaged in Plot Twisting.

Step 1: Initially students were given three minutes individually to develop responses to a scenario prompt.

Step 2: Once individual responses were completed students were placed into four person groups and given six minutes to conduct the following tasks:

- a. Quickly share imagined events with the other students in the group.
- b. Once shared, the other students in the group propose actions that could have been taken to precipitate or avoid that event.

C122S class students conducted Plot Twisting twice (two times) then put on break.

Break

C122S class students are put on break with the explicit instructions to:

"Take five minutes for a break. During this break do some light exercise, do not use cell phones, screen time or any electronic devices during this break."

Role Plotting

After the break the instructor split the class of sixteen students in half creating two groups (games) of eight. Each group were further split into two teams of four. Four students (in each group) was designated as a team of "Plot Twisters" and four students designated as a team of "Perspective Takers".

Step 1: Pre-Game preparation. Each game/team were given five minutes to prepare.

- a. Plot twisters take five pre-game minutes to think up unexpected but feasible war scenarios that could occur in the next ten years.

- b. Perspective Takers take five pre-game minutes to each teach another team member to adopt the other strategic rationale learned back in the Perspective-Plotting exercise.
[In other words, If Student A learned to strategize like Student B in the Perspective-Plotting Exercise, Student A could then train Student C to strategize like Student B.]

Step 2: Students were then for the next ten minutes be given the following instructions:

- a. The members of each team participate in order, so that no student participates more than anyone else (all participate).
- b. Each round began when a Plot Twister threw out a scenario, a Perspective Taker responded “in character,” the next Plot Twister tried to twist the response in an unexpected direction, the next Perspective taker responded back, and so on.
- c. The back-and-forth continued until one group stalled for more than ten seconds, at which time the other team is awarded one point and the game starts up again with a fresh scenario.

At the end of the ten minutes, teams swapped roles and repeat the same process: Perspective Takers now become Plot Twisters, and previous Plot Twisters are now Perspective Takers. The game is then repeated for an additional ten minutes.

Break

C122S class students are put on break with the explicit instructions to:

“Take five minutes for a break. During this break do some light exercise, do not use cell phones, screen time or any electronic devices during this break.”

Post Test

C122S class students were given a pre and post test with admin numbers applied with the prompt on the pre and posttest. Students are additionally requested to respond with a graphic, narrative, or both. Participants completed the pretest out of class prior to C122 and the post test after C122 and deposit their pre and posttest in the grey receptacles in the hallway outside the classroom. Control Group participants completed pre and post test prior to and after C122 legacy class and before C123. Test Group classes completed pre and posttest prior to and after C122S.

Debrief/Summary

Instructors for C122 spent 5 minutes summarizing the training the students just received providing an opportunity to provide verbal feedback on the training.

DEFINITIONS

Creative Thinking: The use of adaptive intelligence to solve problems. Quantified via a three-factor metric: Novelty, Suitability, and Feasibility.

Perspective Plotting: Hypothesizing from causes to effects or vice versa which is a form of perspective plotting employed in the test version of the C122S Creativity lesson for this mixed methods study.

Plot Twisting: An unprecedented consequence of an environmental rule.

Major Event Scenario List (MESL): Plot twists in military parlance used by Red Teams (Department of the Army, 2019).

Perspective-Taking: Adopting another person’s narrative speculation through perspective plotting.

Novelty: For the purposes of this mixed methods study, the panel of experts employed novelty to qualitatively determine the level of originality of an idea.

Feasibility: For the purposes of this mixed methods study, the panel of experts employed suitability to qualitatively determine the level of practicality of an idea.

Suitability: For the purposes of this mixed methods study, suitability was employed by the panel of experts to qualitatively determine the level of likelihood a commander in the field might be willing to attempt to try an idea.

MILITARY RELEVANCE

Creative thinking instruction is a key part of developing thinking and adaptive leaders as graduates of CGSC. This study incorporated proven and validated instruments into improving creative thinking instruction at CGSC. This research supports Officer Professional Military Education Policy (OPMEP) guidance directing that students “demonstrate critical and creative thinking skills” (Chairman of the Joint Chiefs of Staff, 2020). The narrative technique in this study is the vehicle for providing direct assessment for creative thinking equal to or greater than current creative thinking instruction while supporting Program Learning Outcome #1, Strategic Thinking and Communication. Finally, improving creativity can positively affect empathy which helped improve student appreciation for diversity, equity, and inclusion (Fletcher, 2021a).

BRIEF LITERATURE REVIEW

There are two competing doctrinal concepts that contribute to challenges faced by unit planners to conduct the blend of critical and creative thinking that is wargaming. These concepts are the art of command and the science of control (Department of the Army, 2014). Both concepts require critical and creative thinking. However, the science of control is often emphasized more than the art of command. This may be because the science of control is one of the first things that military leaders are taught, and it is all about synchronization, coordination, and practical aspects of the operation. The art of command is the creative application of intuition, innovation, and foresight, which is much harder to teach (McConnell et al., 2018, McConnell & Gerges, 2019, McConnell, 2020, McConnell et al., 2021). Mastering the art of command requires experience and is often transmitted one generation to the next through mentorship and coaching. For this reason, military leaders have historically used training exercises and combat experience to reflectively mentor and coach subordinates how to apply the art of command. However, it is possible that since military operations in the last decade have been high tempo, reducing time to share art of command reflections, perhaps the requisite skills for wargaming and creative thinking may have atrophied. The solution to the problem of reduced creative thinking may be in how leaders deliberately cultivate subordinates to think more creatively. This need for improved creative thinking has driven scholarship examining how military institutions teach creative thinking (McConnell et al., 2018).

Since the art of command is more associated with creative thinking, and because the art of command is more often than not transmitted from generation to generation, it may be argued, along with honing theory (Gabora, 2016), that creative ideas are human nature’s way of filling a psychological gap in currently-held mental models. According to this theory, ideas accumulate and change as people consider ideas, reshape ideas, and pass ideas along through a society – military subculture being a representation of a larger society. As Gabora and others (Couger, 1995; Osborn, 1963) argue that creativity is an innate human quality, it’s also a quality that needs to be exercised. This can come somewhat naturally; however, when examining complex, ambiguous problems, people need to make a deliberate effort toward bringing this creativity out, through a process and instruction.

A recent study examined creative thinking instruction at the U.S. Army War College (Samosorn, 2021). Senior leaders need to possess creative thinking skills to address the complexities of current potential operational environments. How military educators teach creativity is directly related to this proposed study of creativity instruction at CGSC. Additionally, this study may also inform how military leaders might engage in subordinate leader development.

Holt, Bjorklund, and Green (2009) conducted a quantitative study of perceived expectations of leader qualities based on cultural and family norms. Augustijnen, Schnitzer, and Esbroeck (2011) conducted a qualitative study of executive coaching using grounded theory to determine perceptions of executives coached and what was found most effective in coaching received. Elston and Boniwell (2011) conducted a qualitative grounded theory study to determine perceptions of women coached to identify strengths and find ways to apply those strengths within the workplace. Cilliers (2011) conducted a qualitative case study of leaders within a large financial organization utilizing positive psychology leadership coaching. These studies are additional sources to provide deeper understanding of coaching and leadership development studies from perspectives of those receiving it, which may influence subject perceptions of creative thinking.

As to how creative thinking is stimulated, new research in narrative theory has uncovered precise techniques that can simulate quantifiable increases in creative plotting and strategizing in human brains (Fletcher, 2021b). Those techniques emphasize two precise neural processes: (1) the debiasing of neural plotting via depersonalization and the reduction of individual hopes and fears and (2) training the brain to identify and emphasize exceptional information (Fletcher, 2022). Similar techniques have been shown in previous studies to have no harmful, and only beneficial, effects on human participants (Fletcher & Monterosso, 2016). These techniques have also been shown to empower a form of human intelligence, causal thinking, that cannot be replicated or performed by computer AI (Fletcher, 2021a).

POTENTIAL LIMITATIONS TO A SURVEY BASED STUDY

Because all participation is voluntary, student and faculty subjects may be unwilling to participate for a variety of reasons, presenting a potential limitation. To increase participation, the study team provided clear recruitment materials to the students and faculty.

PARAMETERS FOR COLLABORATION

The study team obtained command permission to conduct this study. Data was collected and maintained by CGSC researchers in the office of the principal investigator. A subject matter expert from Ohio State University (Dr. Angus Fletcher) assisted as a member of the writing team in research report development to include literature review, findings development, recommendations for future research and publication. Raw data was analyzed by representatives from Department of Sustainment and Force Management (DSFM) led by the lead researcher in charge of the panel of experts (Dr. Kenneth Long). CGSC maintains ownership of all de-identified raw data. Ultimately the panel of experts scored all participant responses to pre and post test prompts and record those scores on an Excel Spreadsheet by admin number. The principal investigator was assisted with mathematical analysis of the deidentified scores of the pre and posttest by a math expert on the research team (Morgan Cornstubble, MS). All outside CGSC collaborators signed the U.S. Army Combined Arms Center Command and General Staff College (CGSC) Researcher Responsibilities Agreement (RRA Appendix I). The RRA must be on file with the HPD prior to any commencement of research activities. All members of the research team depicted on page one of this report completed the Collaborative Institutional Training Initiative (CITI) certification and the principal investigator provided the Human Protections Director with all CITI transcripts prior to any commencement of research activities. The research protocol accompanied the research application for Human Protections review/approval prior to data collection. The final research report was submitted to the Public Affairs Officer and to Operations Security for review prior to publication. The Principal Investigator completed a CGSC Study Closure Report and submitted it to the Human Protections Director at the completion of the study.

SIGNIFICANCE TO SCHOLARSHIP, LEADERSHIP, AND PRACTICE

Creative thinking can be difficult to teach, especially in the military profession. Effective creativity, critical thinking, innovation, intuition, and the ability to synthesize multiple conflicting inputs are critical capabilities for military leaders. Although academic instruction regarding creative thinking can be useful, there is no substitute for experience tempered by mentorship and coaching. As many crafts use apprenticeship style coaching techniques, so also the mastering of effective creative thinking can benefit from such a methodology. As the complexities of the world situation continue to increase, anticipation of the unforeseen becomes ever more challenging. If the introduction of narrative practice can improve how staff officers perform creative thinking, then military leaders may have a useful tool for leader development.

FINDINGS

Quantitative Results

Fort Belvoir.

During a pilot (initial) data collection effort, 12 control group and 22 test group students and 4 faculty participated in the study. Statistical analysis of the pre and post test scores showed that the Test Group had a statistically significant increase in creativity, outperforming the Control Group (See figure 1). The Test Group's two-hour trial session at CGSC increased creativity, feasibility, and suitability as shown by a Wilcoxon Signed-Ranks test which showed that the posttest scores (mean rank = 6.55) were significantly higher than the pre-test scores (mean rank = 6.00), $Z = -2.59$, $p = 0.01$ with an effect size $r = 0.75$. In other words, the training significantly improved the ability of Army O-4s to invent effective new plans. Officers in the 50th percentile of creative strategy graduated to the 65th percentile. This is consistent with gains seen in other populations, including Fortune 50 executives and MBAs at Chicago Booth.

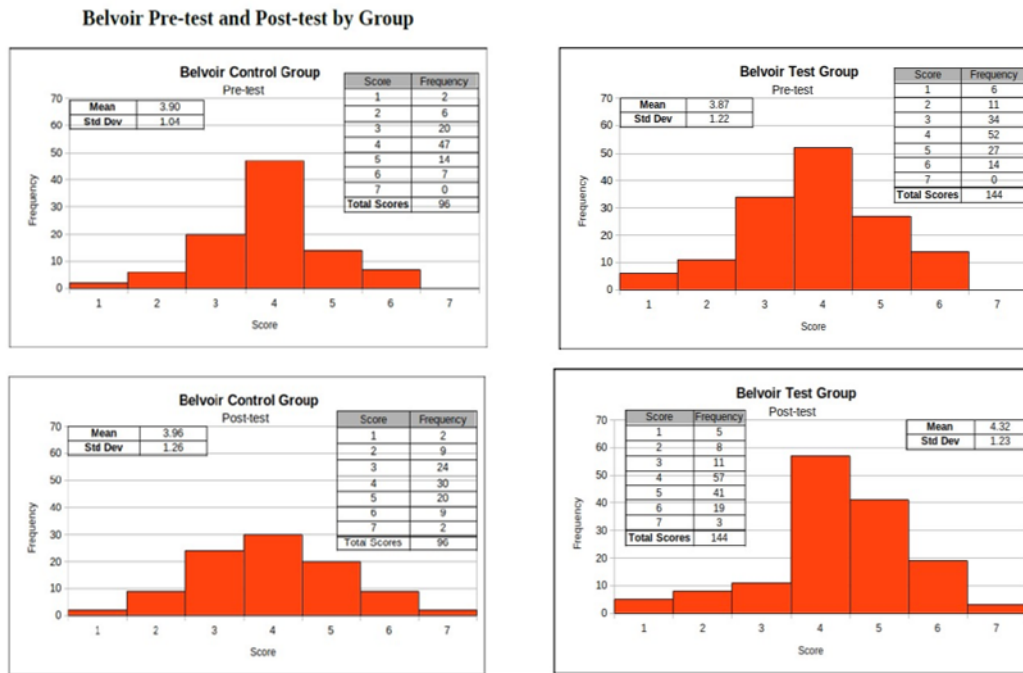


Figure 1. Fort Belvoir Pre and Post Test Creativity performance

Fort Leavenworth (Initial Test results).

During the initial stages of data collection, researchers isolated 14-person group of test subjects to determine if they encountered any improvements in creativity as was experienced at Fort Belvoir. Figure 2 depicts individual participant pre and post test scores with the percent change for this 14-person group of test participants. All participants experienced positive change ranging from a low of 4.35% to a high of 114.29% creating an average creativity improvement of 19.47% for the group. This constitutes a significant improvement in creative thinking which would improve the ability of Army O-4s to invent effective new plans.

Admin #	Pre-Test				Post-Test				% Change
	Novelty	Suitability	Feasibility	All Mean	Novelty	Suitability	Feasibility	All Mean	
2077	3.25	3.25	3.25	3.25	3.50	3.75	3.75	3.67	12.82%
3197	1.25	1.25	1.00	1.17	2.50	2.50	2.50	2.50	114.29%
3314	5.00	4.75	4.50	4.75	6.00	5.00	5.75	5.58	17.54%
3711	3.75	4.25	4.25	4.08	4.75	4.50	4.75	4.67	14.29%
3903	3.50	4.25	4.25	4.00	4.75	4.25	4.75	4.58	14.58%
4076	3.75	4.25	4.00	4.00	4.50	4.50	4.75	4.58	14.58%
4161	3.75	3.75	4.00	3.83	3.75	4.00	4.25	4.00	4.35%
4481	3.50	3.75	3.75	3.67	4.00	3.75	4.50	4.08	11.36%
4872	4.50	4.25	4.75	4.50	5.00	4.75	5.00	4.92	9.26%
6887	5.00	5.00	4.75	4.92	5.75	4.75	5.75	5.42	10.17%
7700	3.75	4.00	4.00	3.92	4.75	4.25	4.75	4.58	17.02%
8445	3.75	3.50	3.25	3.50	5.00	3.25	2.75	3.67	4.76%
8960	3.25	4.00	4.00	3.75	4.75	4.50	4.50	4.58	22.22%
9001	5.00	4.50	4.25	4.58	5.50	4.75	4.25	4.83	5.45%
								Avg Change:	19.48%

Table 1. Fort Leavenworth isolated 14-person Test group Pre and Post Test Creativity performance

Figure 3 depicts the 14-person test group more broadly on their pre and post test scores with means and standard deviations. The mean for this group started at 3.85 and increased to 4.40 which suggests significant improvement in creativity. Figure 4 depicts scores and means for the specific criteria of novelty, suitability and feasibility. For the specific criteria, novelty is the largest increase of 3.79 to 4.61, a 22% increase which suggests a significant improvement of participants to develop new and surprising ideas. Although not as significant, suitability and feasibility experienced notable increases: Suitability 3.91 increased to 4.18 = 6.9% increase; Feasibility 3.86 increased to 4.43 = 15% increase.

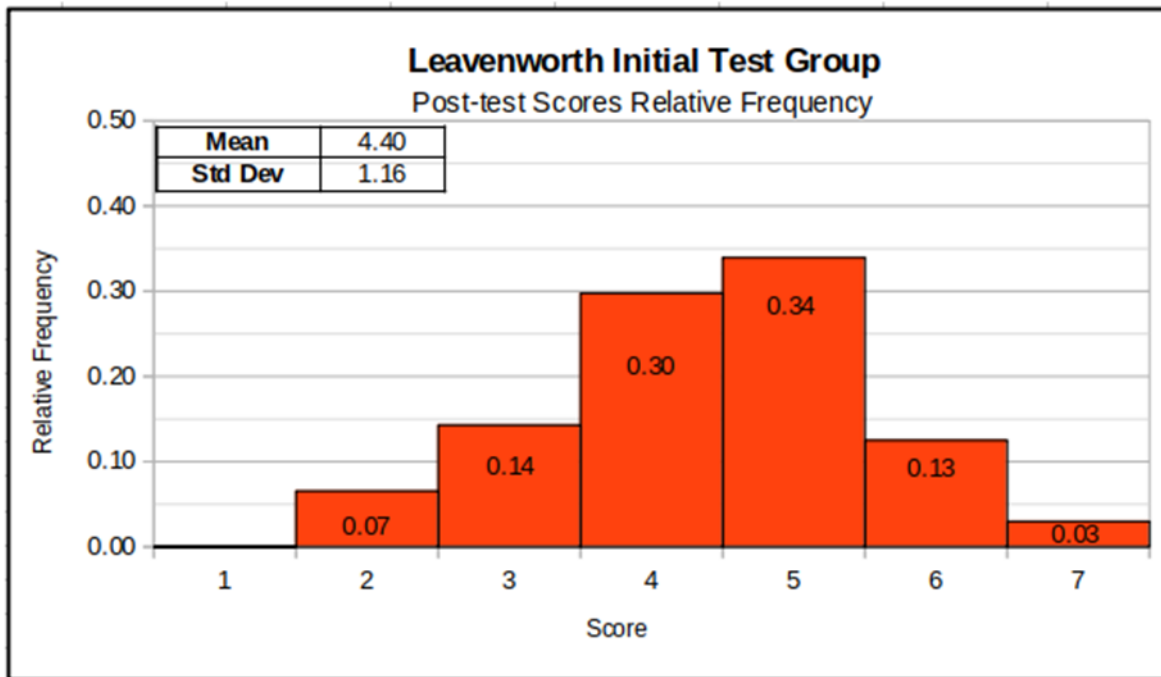
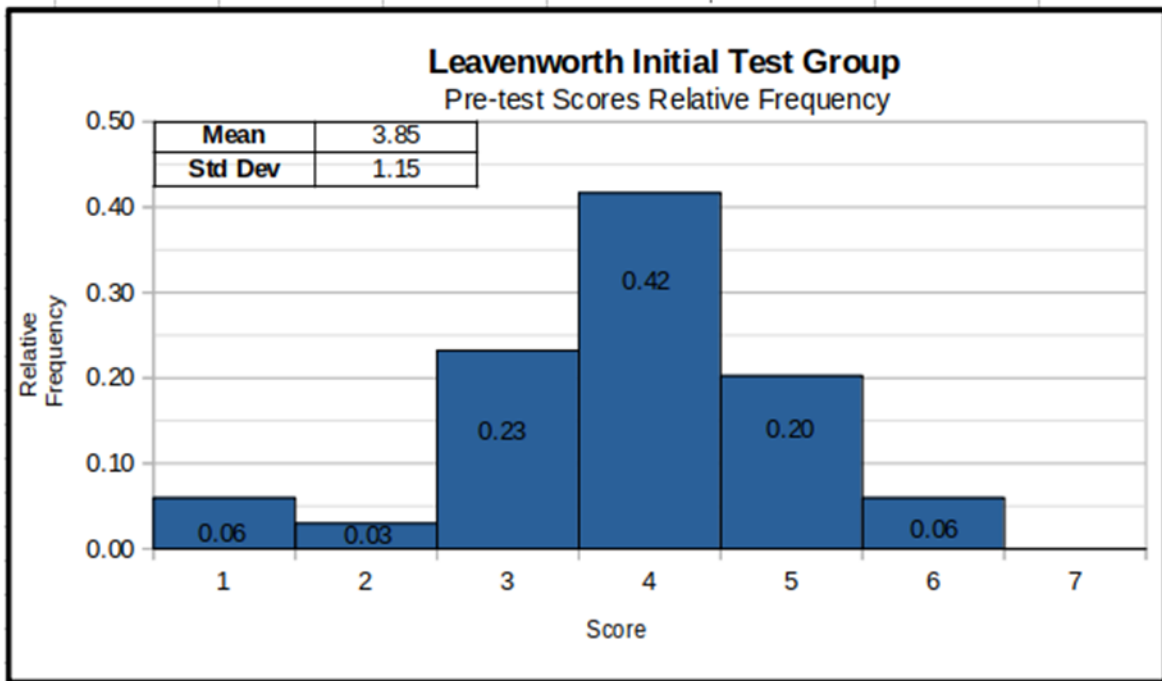


Figure 2. Fort Leavenworth isolated 14-person Test group Pre and Post Test Creativity performance (Bar graphs with means and standard deviation and scores.

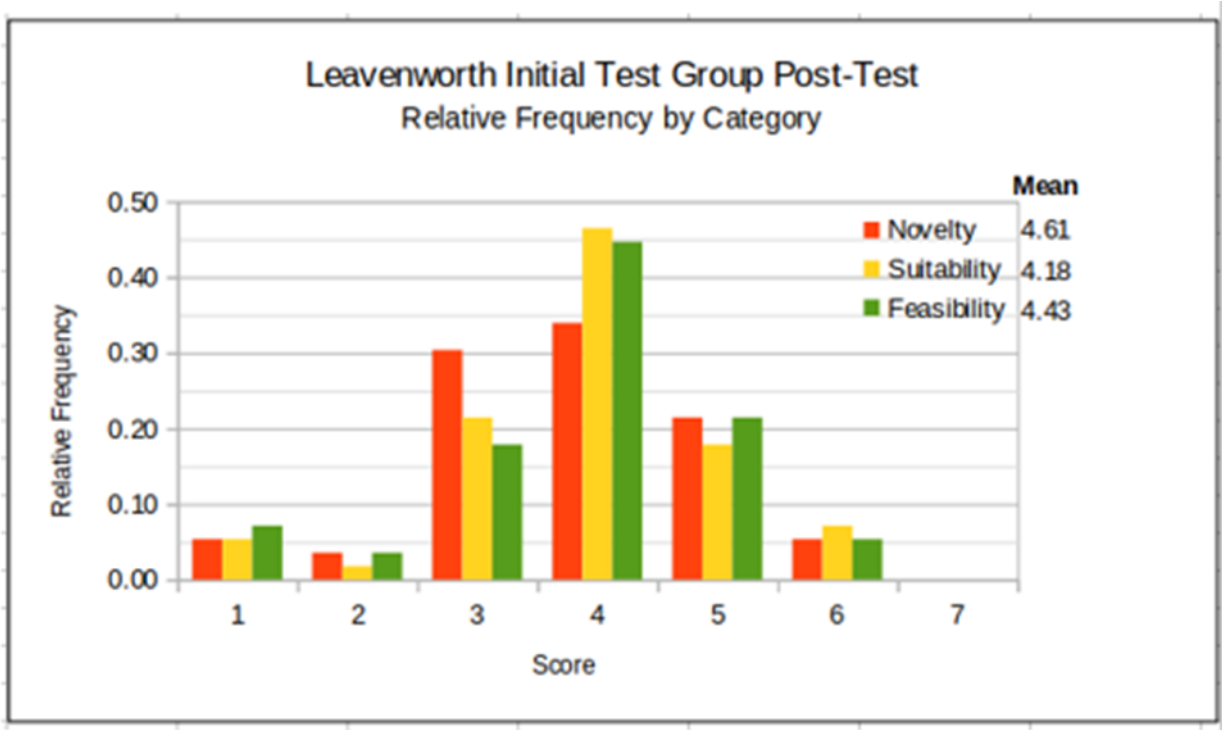
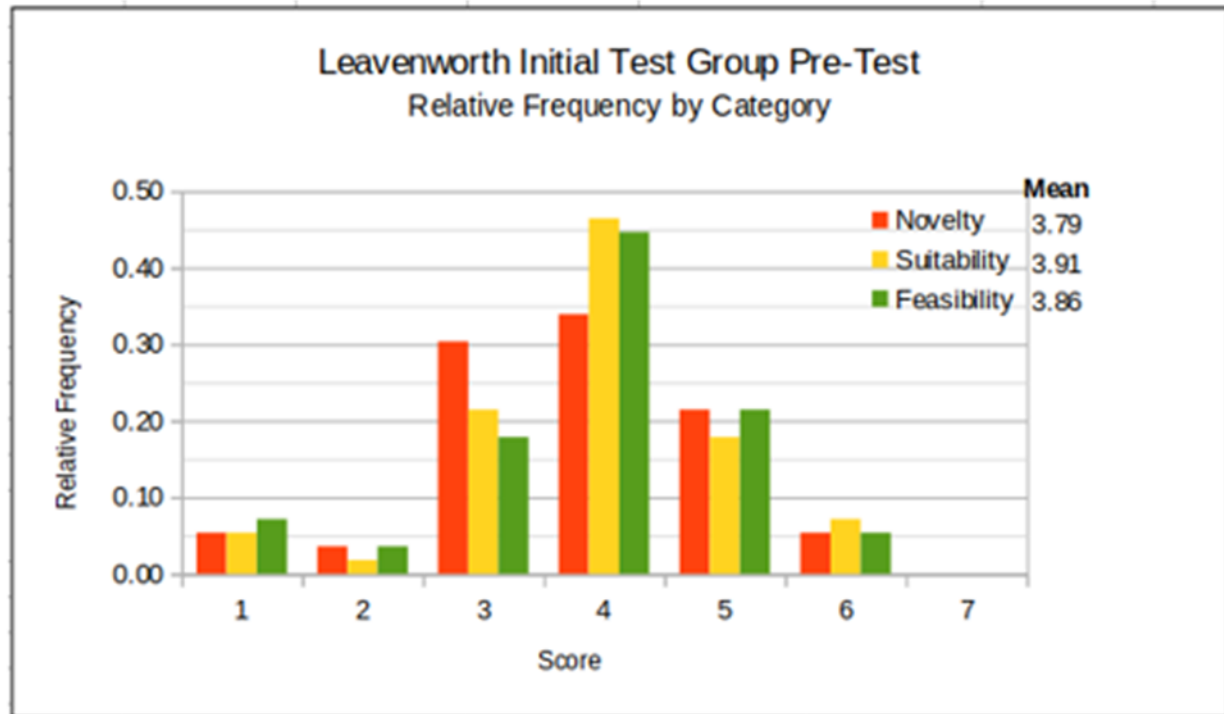


Figure 3. Fort Leavenworth isolated 14-person Test group Pre and Post Test Creativity performance (Bar graphs with means and scores for Novelty, Suitability, and Feasibility).

These results for this isolated 14-person test group seemed to replicate the improvements in creativity experienced in May 2022 at Fort Belvoir with significant improvements in creativity.

Fort Leavenworth (Main Test and control results).

The main data collection effort occurred between 8 and 24 August 2022 with 234 student participants (55 control, 179 Test) returning an 18% response rate for the control and 57% response rate for the test. There were 16 Faculty participants who completed qualitative questionnaires. In this case for the student participants, the test and control both improved as in previous cases – the difference was magnitude of change for the test and control groups. Figure 4 depicts relative frequency distributions showing the percentage of the group which received each score for pre- and post-tests.

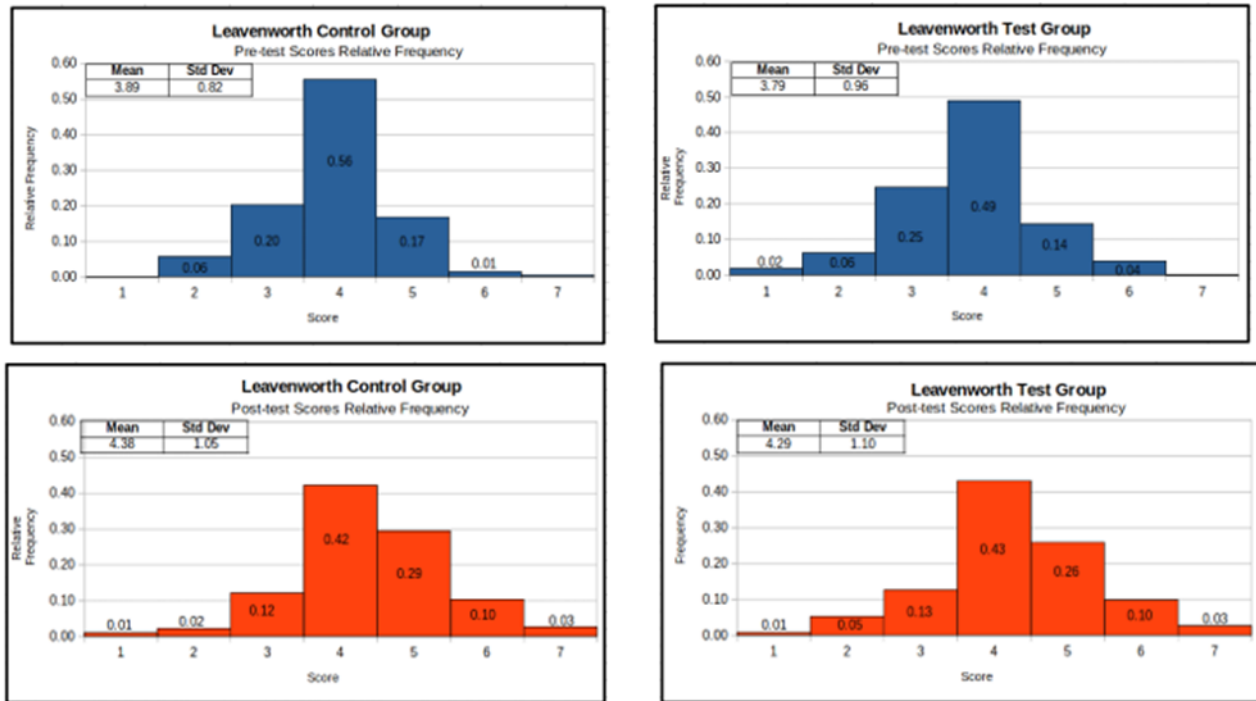


Figure 4. Fort Leavenworth Main data collection Test and Control Groups group Pre and Post Test Creativity performance.

In this case, the test and control both improved as in previous cases – the difference was magnitude of change for the test and control groups. The mean score for the control group increased from 3.89 points to 4.38 points, a 12.6% improvement in creativity. The mean score increase for the test group was similar, increasing from 3.79 points to 4.29 points, a 13.2% improvement in creativity. The data suggests that this control group started out more creative than the test group; 74% of the control pretest scores are 4 and above compared to 67% for the test group. The greater improvement for the test group is also seen in the increase in the high post-test scores (scores of 4 and above) for each group: 15 percentage points for the test group (from 67% to 82%) versus 10 percentage points for the control group (from 74% to 84%). (See appendix O to view samples of student pre and posttest submissions) Paired t-tests using mean scores for both groups showed a statistically significant difference between pre-test and post-test means: ($t = -5.62$ w/ $df=54$, $p < .001$ for control, and $t = -12.45$ w/ $df=178$, $p < .001$ for test). The Cohen's d measure of effect size is 0.76 for the control group and 0.93 for the test group, which also depicts a larger change in the difference in the mean scores from pre-test to post-test for the test group than for the control group. Not only is the test group's Cohen's D score considered large (>0.8 by 0.12), but the test score is also just below an entire probable error (PE = 15%) so the test magnitude increased $\approx 14\%$.

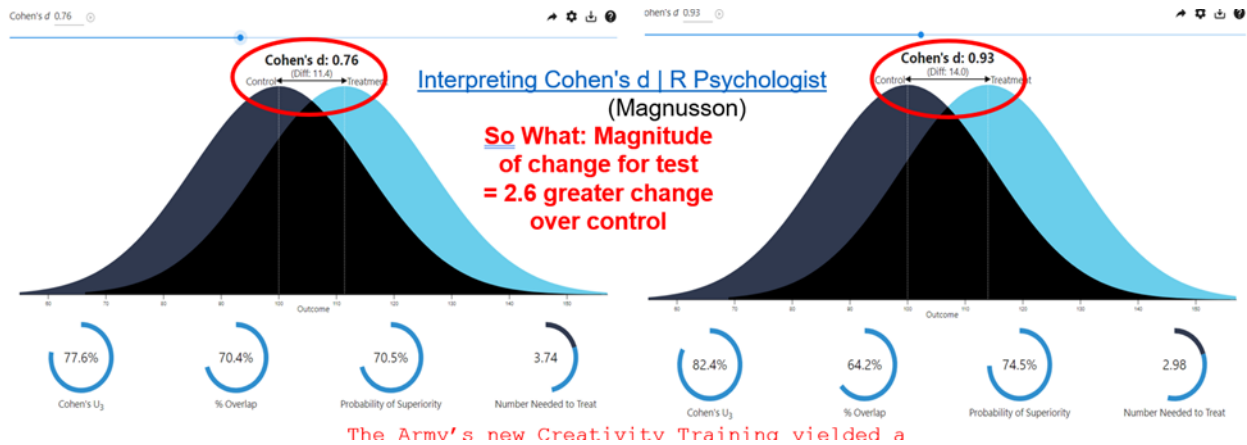


Figure 5. Fort Leavenworth main data collection Pre and Post Test Creativity performance Cohen's D comparison.
Source of image: rpsychologist.com/cohend/ Kristopher Magnusson

This data could suggest that the control group participants may have been more interested/passionate about creativity driving their decision to participate in the study creating a more concentrated sample of creatives. The lower control response rate supports this conclusion (control 18% versus test 57%). These results combined with analysis of faculty qualitative questionnaire results suggested that some faculty experienced some discomfort with the experimental lesson. Researchers theorized that response rates by academic teaching teams might reveal a different picture of creative performance. A macro view of the data (all teaching teams data depicted together) might not paint the complete picture of the phenomenon under study. A micro view of this data (creativity levels depicted by teaching team) might reveal the level to which individual teaching team students, Team Leaders, and Faculty might influence creativity level. Researchers repeated Quantitative analysis examining pre and post test scores by highest to lowest response rate for creativity performance scores to find if there were noticeable differences by team (Table 3).

- p values marked with an asterisk evaluated using the Wilcoxin Signed-Rank test with corresponding effect size calculated using z/\sqrt{n} ; all others Matched Pairs t-Test with corresponding Cohen's d ;
- p values in red indicate no statistically significant difference between the pre-test and post-test scores for that group.
- Each student's overall score for pre- and post-tests is the average of all nine raw scores for that student (three per grader). The Mean Scores in the above table are calculated by taking the average of all student overall scores in that team.
- High Scores are scores 4-7; so the % High Scores is the percentage of the total for the given team and test that are in the range 4-7.

TEST TEAMS	Size (n)	Participation Rate	Pre-test Mean Score	Post-test Mean Score	% Change Mean Score	Pre-test % High Scores	Post-test % High Scores	% Change High Scores	Matched Pairs Test*	Effect Size
Team A	47	86.67%	3.61	4.06	12.52%	61.47%	73.52%	19.62%	$p < .001$	0.91
Team B	43	75.00%	3.68	4.39	19.24%	63.31%	85.79%	35.51%	$p < .001$	1.64
Team C	34	56.67%	3.84	4.25	10.90%	68.95%	84.97%	23.22%	$p < .001$	0.75
Team E	25	40.00%	4.04	4.43	9.56%	73.78%	80.89%	9.64%	$p = .005^*$	0.57
Team F	16	26.67%	4.07	4.40	8.19%	78.47%	90.97%	15.93%	$p = .066$	N/A
Team K	14	100.00%	3.91	4.41	12.78%	69.84%	76.98%	10.23%	$p = .002^*$	0.82
			Avg. Change:		12.20%	Avg. Change:		19.02%		
CONTROL TEAMS	Size (n)	Participation Rate	Pre-test Mean Score	Post-test Mean Score	% Change Mean Score	Pre-test % High Scores	Post-test % High Scores	% Change High Scores	Matched Pairs Test*	Effect Size
Team D	28	48.33%	3.98	4.54	14.04%	82.14%	89.68%	9.18%	$p < .001$	1.06
Team G	9	16.67%	3.81	3.99	4.53%	62.96%	74.07%	17.65%	$p = .441^*$	N/A
Team H	7	11.29%	3.63	4.40	20.96%	57.14%	82.54%	44.44%	$p = .027^*$	0.84
Team I	5	8.33%	3.96	4.18	5.62%	80.00%	75.56%	-5.56%	$p = .500^*$	N/A
Team J	6	8.33%	3.83	4.39	14.49%	68.52%	87.04%	27.03%	$p = .043^*$	0.83
			Avg. Change:		11.93%	Avg. Change:		18.55%		

Table 2. Fort Leavenworth Main data collection group Pre and Post Test Creativity performance by academic teams.

The micro view of the data by teaching team revealed an interesting phenomenon. The teams with higher participation rates achieved higher percentages of change (Test teams A-C and Control team D), they generally had higher effect sizes, and indicated significant change. These findings suggest that higher participation rate teams showed improvement in creativity that could be a sign of a creativity-accepting/nurturing culture within those teams. Team leaders, Faculty, and the students themselves (or a combination) could encourage a creativity-friendly culture. Although not something initially part of this study, researchers in future studies could include cultural acceptance of creativity as variables to examine in future studies. Further analysis by teaching team revealed indicators for further research regarding not only cultural acceptance of creativity but also indicators of improvements in novelty depending on creativity improvement interventions.

Qualitative Results

Overview of the Attitudinal questions: a qualitative assessment

Respondents:

The participants in the research project were US Army field grade officers. These are successful career-minded members of a large professional organization, whose leadership development model establishes the importance of Creativity as a significant cognitive skill and attribute in critical mission problem-solving situations.

They are on average, 30-34 years old, have 8-10 years of field experience in their organization

About 60% of the respondents have master's degrees already. They attended a 6-month professional school upon entering the profession to prepare them for operational assignments. At about the 5-year mark, they attended another 6-month school to prepare them for the next set of operational challenges as small unit leaders. At about the 10-year mark, the current school they attend is a yearlong course to develop their skills as organizational leaders, when they will be responsible to plan for, manage and lead organizations ranging in size from 500 to 5000 individuals. In the first week of the current school, they receive instruction in foundations cognitive skills like critical thinking, oral and written communication, and opportunities for self and peer assessment with a variety of industry-standard psychometric instruments

In that foundations week, the respondents volunteered to participate in an IRB approved, human subjects research project to evaluate their creativity, using the Consensual Assessment Technique (CAT). Before receiving a 2-hour class on Creativity, respondents were given a 5-minute pre-test to describe a creative approach to solving a complex professional problem and then asked to respond to 4 attitudinal questions about Creativity. All respondents then received 1 of 2 Creativity lessons. The Control Group received a traditional lecture and discussion-based Creativity lesson, while the Test Group received a significantly different 2-hour lesson featuring storytelling, literature, role-playing and experiential learning. All respondents then received a posttest with 5 minutes to describe a creative approach to solving a complex professional problem and responded again to the same 4 attitudinal questions about Creativity. Respondents' solutions were evaluated using the Consensual Assessment Technique, and the attitudinal question respondents

How do respondents feel about Creativity, before and after a 2-hour lesson, based on 4 questions, on a 7-point Likert scale:

- Question A: How important is Creativity to me?
- Question B: How important is Creativity to my organization?
- Question C: How satisfied am I in my current level of skill in Creativity?
- Question D: How confident am I that I can use Creativity in my organization mission?

What follows is a detailed analysis of responses to each question during pre and posttest responses (See figures 6-X).

1. Question A: How important is creativity to me?

Pre-test					Post test					Pre - Post				
	A	B	C	D		A	B	C	D		A	B	C	D
1	2	4	2	1		0	1	6	3		-2	-3	4	2
2	0	8	21	4		1	5	14	3		1	-3	-7	-1
3	5	24	51	26		6	19	51	23		1	-5	0	-3
4	12	35	35	22		11	21	34	31		-1	-14	-1	9
5	33	53	73	90		36	50	67	78		3	-3	-6	-12
6	109	58	40	68		100	69	47	68		-9	11	7	0
7	65	44	4	15		72	61	7	20		7	17	3	5
avg	5.92	5.10	4.29	5.04		5.96	5.50	4.38	5.04		0.04	0.40	0.08	0.01

Initial rating Heuristics:

- 1-2 "of minor importance"
- 3 "moderately unimportant"
- 4 "of normal importance"
- 5 "moderately important"
- 6-7 "of major importance"

Pre-test

- Avg = 5.92 strong importance; negligible "minor importance" (2/226) (1%)

Post test

- Avg = 5.96 strong importance; negligible "minor importance" (1/226) (0.5%)

Pre to post test change on Question A

- Little change in Avg (+.04; 5.96); little change in "minor importance", "major importance" (172 -> 174)

Officers strong believe Creativity is important to them; Almost no one believes it is insignificant

Highest average score of all 4 questions (5.92); feel most strongly that Creativity is important

Second lowest change in average (.04); negligible difference on strength of belief

Figure 6: Importance of creativity to me

2. Question B: How important is creativity to the Army?

Pre-test					Post test					Pre - Post				
	A	B	C	D		A	B	C	D		A	B	C	D
1	2	4	2	1		0	1	6	3		-2	-3	4	2
2	0	8	21	4		1	5	14	3		1	-3	-7	-1
3	5	24	51	26		6	19	51	23		1	-5	0	-3
4	12	35	35	22		11	21	34	31		-1	-14	-1	9
5	33	53	73	90		36	50	67	78		3	-3	-6	-12
6	109	58	40	68		100	69	47	68		-9	11	7	0
7	65	44	4	15		72	61	7	20		7	17	3	5
avg	5.92	5.10	4.29	5.04		5.96	5.50	4.38	5.04		0.04	0.40	0.08	0.01

Initial rating Heuristics:

- 1-2 "of minor importance"
- 3 "moderately unimportant"
- 4 "of normal importance"
- 5 "moderately important"
- 6-7 "of major importance"

Pre-test

- Avg = 5.10 moderate importance; 6% "minor importance" (12/226) 6x higher than Question A

Post test

- Avg = 5.50 strong importance; 3% "minor importance" (6/226) (reduced by half 6% to 3%)

Pre to post test change on Question B

- .4 change in Avg (+.40; 5.50); largest net change in average of any question
- 3% reduction in "minor importance", (12 -> 6; -3%; "half moved)
- 30% increase in "major importance" (+28, 102 -> 130)

Officers believe Creativity is of more importance to the Army after taking the training

Significant reduction in how many think the Army does not consider it important (6% -> 3%)

Figure 7: Importance of Creativity to the Army

3. Question C: How satisfied am I in my current skill?

Pre-test					Post test					Pre - Post				
	A	B	C	D	A	B	C	D		A	B	C	D	
1	2	4	2	1	0	1	6	3		-2	-3	4	2	
2	0	8	21	4	1	5	14	3		1	-3	-7	-1	
3	5	24	51	26	6	19	51	23		1	-5	0	-3	
4	12	35	35	22	11	21	34	31		-1	-14	-1	9	
5	33	53	73	90	36	50	67	78		3	-3	-6	-12	
6	109	58	40	68	100	69	47	68		-9	11	7	0	
7	65	44	4	15	72	61	7	20		7	17	3	5	
avg	5.92	5.10	4.29	5.04	5.96	5.50	4.38	5.04		0.04	0.40	0.08	0.01	

Initial rating Hueristics:

- 1-2 "major dissatisfaction"
- 3 "moderately dissatisfied"
- 4 "of normal satisfaction"
- 5 "moderately satisfied"
- 6-7 "major satisfaction"

Pre-test

- Avg = 4.29 normal satisfaction; 10% "major dissatisfaction" (23/226) lowest score of the 4 pre-test questions

Post test

- Avg = 4.38 normal satisfaction; 9% "major dissatisfaction" (20/226) (reduced by 15%, 23 -> 20; 10% to 9%)

Pre to post test change on Question B

- .08 change in Avg (4.29 -> 4.38); 2d largest net change in average of any question
- reduced dissatisfaction by 15%, 23 -> 20; 10% to 9%)
- 22% increase in "major satisfaction" (+10. 44 -> 54) second largest positive move of the 4 questions

Officers are satisfied with their level of skill in Creativity, slightly more after the training (hungry for more = "Hunger Factor")

Reduction in how many are unsatisfied with their current skill, but a significant number remain dissatisfied (training motivation)

Significant improvement in satisfaction with their personal skill, although still hungry for more

Figure 8: My satisfaction with my current skill using creativity

4. Question D: How confident am I in applying my skill?

Pre-test					Post test					Pre - Post				
	A	B	C	D	A	B	C	D		A	B	C	D	
1	2	4	2	1	0	1	6	3		-2	-3	4	2	
2	0	8	21	4	1	5	14	3		1	-3	-7	-1	
3	5	24	51	26	6	19	51	23		1	-5	0	-3	
4	12	35	35	22	11	21	34	31		-1	-14	-1	9	
5	33	53	73	90	36	50	67	78		3	-3	-6	-12	
6	109	58	40	68	100	69	47	68		-9	11	7	0	
7	65	44	4	15	72	61	7	20		7	17	3	5	
avg	5.92	5.10	4.29	5.04	5.96	5.50	4.38	5.04		0.04	0.40	0.08	0.01	

Initial rating Hueristics:

- 1-2 "major unconfidence"
- 3 "moderately unconfident"
- 4 "of normal confidence"
- 5 "moderately confident"
- 6-7 "major confidence"

Pre-test

- Avg = 5.04 moderately confident; 2% "major unconfident" (5/226) 2d lowest score of the 4 pre-test questions

Post test

- Avg = 5.04 moderately confident; 2% "major unconfident" (6/226) (tied for 2d lowest score of the 4 post test questions)

Pre to post test change on Question B

- .01 change in Avg (5.04 -> 5.04); smallest change of any relative comparison questions
- No real change in level of confidence in applying skills

Officers are confident in their ability to apply Creativity, little to no change, hungry for more repetitions and opportunity

Little change in confidence (both overconfident and underconfident)

Recognition of a need for more repetitions and opportunity to improve skill and confidence in application

The Importance of the skills is greater than the satisfaction and confidence, indicating a positive pull towards more training being desirable

Figure 9: My confidence level using creativity

5. Comparing relative questions A vs B

Pre-test					Post test					Pre - Post				
	A	B	C	D	A	B	C	D		A	B	C	D	
1	2	4	2	1	0	1	6	3		-2	-3	4	2	
2	0	8	21	4	1	5	14	3		1	-3	-7	-1	
3	5	24	51	26	6	19	51	23		1	-5	0	-3	
4	12	35	35	22	11	21	34	31		-1	-14	-1	9	
5	33	53	73	90	36	50	67	78		3	-3	-6	-12	
6	109	58	40	68	100	69	47	68		-9	11	7	0	
7	65	44	4	15	72	61	7	20		7	17	3	5	
avg	5.92	5.10	4.29	5.04	5.96	5.50	4.38	5.04		0.04	0.40	0.08	0.01	

Pre-test

- Avg = 5.92 vs 5.04 Officers believe Creativity is important but that the Army does not place enough importance on it

Post test

- Avg = 5.96 vs 5.50 after training,

Officers revise their estimate of the Army's perception higher (strongest net improvement)
(the training is evidence of importance)

Figure 10: Comparison of mine versus Army importance of creativity

6. Comparing relative questions C vs D

Pre-test					Post test					Pre - Post				
	A	B	C	D	A	B	C	D		A	B	C	D	
1	2	4	2	1	0	1	6	3		-2	-3	4	2	
2	0	8	21	4	1	5	14	3		1	-3	-7	-1	
3	5	24	51	26	6	19	51	23		1	-5	0	-3	
4	12	35	35	22	11	21	34	31		-1	-14	-1	9	
5	33	53	73	90	36	50	67	78		3	-3	-6	-12	
6	109	58	40	68	100	69	47	68		-9	11	7	0	
7	65	44	4	15	72	61	7	20		7	17	3	5	
avg	5.92	5.10	4.29	5.04	5.96	5.50	4.38	5.04		0.04	0.40	0.08	0.01	

Pre-test

- Avg = 4.29 vs 5.04 before training, officers are confident in application, but want to be more skilled

Post test

- Avg = 4.38 vs 5.04 after training, officers remain confident in application, but want to be more skilled

Little change in officer perceptions, self-assessment after the training, except to reinforce a belief that more training at the apply level is needed

Figure 11: Comparison of my satisfaction with my current creativity skills versus my confidence applying those skills

7. Comparing individual relative assessments:

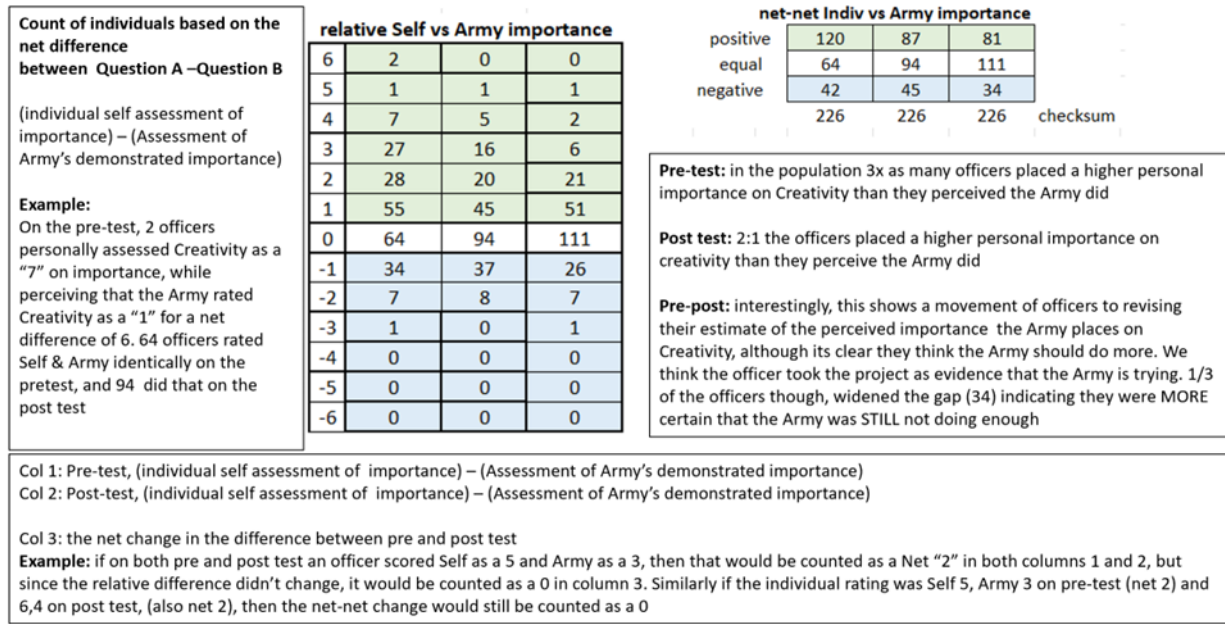


Figure 12: Comparison of individual creativity assessments

Summary of insights

- Officers started with a higher rating of the importance of Creativity than they assigned to the Army's perceived rating. After the training, of any type, officers raised their rating of the Army's perceived rating. We think this may signal the officers giving the Army positive credit for conducting training on Creativity.
- Officers self-assessed affirmative confidence and satisfaction in their own skills and their ability to apply Creativity prior to the training, and these improved after the training which may signal officers hunger for more creativity capability i.e. "Hunger Factor".
- Officers saw the value of the Creativity training in terms of positive reactions to the training, an increase in the importance of the skills and confidence in their ability to apply the skill.
- We think there is a strong case for increasing the lessons and opportunities to learn about and apply Creativity in professional settings, with an emphasis on applying best practice from spaced repetition educational theory and keeping the experiential learning directly associated with professional application topics.

Faculty Qualitative Questionnaires results: Qualitative analysis examines the experience of the participant; in words they chose to share with the study team based off questions posed at the end of the study. The use of open-ended faculty participant questionnaires served as a way for the research team to get a better understanding of the faculty's perceptions of the creativity curriculum both in the traditional course and the study's course. The questionnaire's covered explicit concepts of curriculum planning, preparation, execution, assessment, and the overall experience of teaching creative thinking to CGSC students. The same questions were asked of the control and test group faculty.

A simplified version of conceptual analysis was used to examine participant responses. Content analysis requires the researcher to pay particular attention to the meaning of every word in the data (Miles, Huberman, & Saldaña, 2014), however for this study the data did not provide enough information for this level of analysis. Yet, the data does reveal concepts, a broader picture beyond the participants explicit words, that are helpful in thinking about the experiences of faculty. Analysis began by reading through all participant responses received to become familiar with the data. For initial coding, data was grouped into the themes of overall perception of the curriculum, challenges, and value. And separated into explicit concepts from the survey questions. Then, the data was further coded into concepts inferred from participant responses. Additionally, the number of times a concept was coded in the data is noted. Table 3 provides the results of the data analysis in the control group, while Table 4 breaks down the data provided by the test group. These tables are more conceptual for observing trends across the participant responses in the test and control groups.

The explicit concepts from the faculty questionnaires, when coded for the broader themes of perception, challenges, and value of the curriculum, showed patterns in the data. These patterns became concepts in which the data are separated for interpretation. Each of the groups were coded for comments related to curriculum design, setting the stage for the use of the curriculum, buy in from either faculty or students, mentions of time as it relates to the curriculum for things such as preparation or execution, how concepts from the curriculum could transfer across the broader CGSC curriculum or the work environment, faculty development of pedagogical practices surrounding the curriculum, student growth centered around creativity witnessed by the faculty, and how the curriculum engaged students. There were two additional concepts found with the test group. The first additional concept was faculty growth which was used to code data around the expressed personal growth and learning from the use of the curriculum which went beyond teaching practices. The second concept was entertainment of the curriculum.

Control group concepts and supporting data			
Theme	Concepts	Supporting Data	Interpretive Summary
Perception	curriculum design (x26)	Flexibility to choose practical exercises based on dynamics of the small group.	Curriculum can be customized for delivery.
		The readings are terrible.	Concern with readings not being helpful with this curriculum.
		Creative thinking introduced in C121 (with critical thinking). There is a potential to merge these into one lesson. Seeming disconnect between critical and creative thinking classes.	Overlap of creative/critical thinking should be taken advantage of.
		C122 lesson is too basic for analysis level of learning. At this point, students are aware of creativity, we do not need more awareness [we] need a lesson [that] teaches techniques.	The practical application of creative techniques should be prioritized over enhancing awareness of creativity.
	Stage Setting (x3)	FDP2 [faculty development] discussion, detailed Lesson plan with in depth discussion questions. Why were those particular readings selected for C122?	Provide set up for the curriculum, with the "why" behind the materials.
	Buy-in (x1)	Diversity, equity, and inclusion is a stretch. I understand why it is there but feels like it is half baked	Mis-match between what is claimed in curriculum and what is seen by faculty
Challenges	Time (x4)	As a staff group advisor there are a lot of things on the plate and executing this takes a lot of preparation. Time is the biggest concern in execution, especially on discussion heavy occurrences.	Curriculum takes considerable amount of time in both preparation and execution.
		Insufficient time to address a complex problem.	

Table 3. Fort Leavenworth control group qualitative questionnaire concepts, supporting data and interpretive summary.
Part 1 (continued)

	Concept Transfer (x3)	Allow for new systems during core to solve complex problems.	Concepts from creativity curriculum are applicable elsewhere in CGSC curriculum.
Value	Faculty Development (x4)	Plan practical exercises for the novice who is executing this for the first time. That may lead to a better success rate of practical exercise execution and completion to include a summary of lesson plan objectives. Provide additional recommendations for practical exercises (what worked well) for new instructors.	Organized information sessions for faculty prior to use are needed to provide tips and enhance understanding of curriculum.
	Student Growth (x4)	Highlight the importance of creative thinking and how students are already doing it. Students had great (and different) ideas during the practical exercise.	Curriculum showcases what students are already doing while allowing them to demonstrate greater understanding of creative concepts.
	Engagement (x2)	Dialogue with students allowing them to drive the discussion and the generalization of new information.	Curriculum increased participation within the classroom organically or with the assistance of the instructor.

Table 3. Fort Leavenworth control group qualitative questionnaire concepts, supporting data and interpretive summary.
Part 2

Test group concepts and supporting data			
Theme	Concepts	Supporting Data	Interpretive Summary
Perception	curriculum design (x67)	Well developed narratives, stories, techniques, and scenarios. Straightforward execution. Good to mix up group for different perspectives. Sometimes felt forced to read the script	Well developed and easy to execute, but felt forced and scripted.
		Students struggle to think with creativity. Logic has been reinforced as the dominant skill. Creativity goes hand in hand with critical thinking.	Highlights creativity and critical thinking overlap.
	Stage Setting (x13)	Provide background readings/Ted talk/video...on the narrative practice. More depth of "why" we do certain activities.	Use methods aside from reading to help students obtain background information about narrative practice (videos, TED talks).
		Individual group faculty development program two training with the research team was the right format. Future faculty development programs explain why you are using these vignettes to the instructors. Very clear intent and thorough discussion on the impact potential of the study.	Time spent with the test group provided needed information about the study background and curriculum execution. This was helpful and should be part of the routine plan when implementing this curriculum.

Table 4 Fort Leavenworth test group qualitative questionnaire concepts, supporting data and interpretive summary.
Part 1 (continued)

	Buy-in (x3)	Recommend faculty development phase two for instructors, facilitating C122S by the entire cohort vice by team. This will enable cross fertilization of buy in for execution.	Entire teaching cohort should receive training on this curriculum as students seemed to buy-in to the curriculum.
Challenges	Time (x8)	This lesson could easily use more time to execute and inculcate the skills. The exercise went a bit long but not a detractor from the experience.	Lesson could use more time, but the time hacks, script, and scenarios were appropriate for allotted time.
	Concept Transfer (x 10)	I believe the students positivity demonstrated throughout the experience (the lesson) will have an impact on the following core/AOC blocks of instruction. I think it should be used in all courses.	Faculty see ability for concepts in this curriculum to apply across the CGSC curriculum and future jobs.
Value	Faculty Development (x17)	The person doing the facilitation needs to know how to shift if there are challenges. More background on each technique should be shared with the faculty	Faculty asking for more background, time to ask questions and prepare before they teach it again.
		Provide faculty a timeline with potential questions to ask 2 support student discussion during perspective plotting and plot twisting.	Tips on what to ask students could help in executing curriculum.
	Faculty Growth (x11)	There are great opportunities to empower creativity in groups using "easy to facilitate" types of exercises. I will use these tools in the future. Getting a better insight into how my officer students think.	Faculty grew in their understanding of creativity.
		Trying a new approach to the topic of creative thinking.	Tried new pedagogical approaches to a topic they are familiar with.
		This ties nicely with red teaming concepts; I can use both in planning scenarios.	Expressed use of tools from this curriculum in other parts of their teaching.
	Student Growth (x18)	Students tended to default to own frame of reference rather than explore possible or improbable. Some students still lacked the ability to push themselves to a more creative mindset. Students defaulted to their understanding of possibility (branch specific). How easy one person who lacks creativity or is frustrated in a process can REALLY stifle the creativity of the group.	Students will default to their frame of reference and it's difficult for some to move past that.

Table 4 Fort Leavenworth test group qualitative questionnaire concepts, supporting data and interpretive summary.
Part 2 (continued)

		Provide background in lesson on each technique so the students can embrace these tools to foster creativity in their future units.	With more information on the background, students may be able to use these tools outside of the classroom.
	Entertainment (x7)	Fun and collaboration. I thought the students would enjoy it more than they did.	Mixed feelings on a fun experience with this curriculum.
	Engagement (x18)	The interactive group work among students. Getting up and having them discuss their concepts with peers was very effective. Students were excited to share.	Active rather than passive learning was observed.
		Teambuilding of students early in the course and interaction of them.	Students interacted with each other early in the academic year.

Table 4 Fort Leavenworth test group qualitative questionnaire concepts, supporting data and interpretive summary.
Part 3

The number of comments discussing curriculum design in the test and control groups are unsurprising given the stem of the questions within the faculty participant survey. Overall, faculty recognize the overlap between creativity and critical thinking. The overlap should be utilized to enhance the application of creative thinking skills rather than just bringing awareness to the students. Additionally, both the test and control groups felt the curriculum given provides concepts that can be integrated across the broader CGSC curriculum and potentially into an officer's work environment. A main difference between the two groups is the views centered around stage setting. The faculty in the test group found the stage setting to be more robust than the control group. The control group felt a greater ability to customize the standard curriculum, whereas the test group felt the curriculum was too scripted. Faculty noted both versions of the curriculum require a good stage setting to provide relevant background and applicability. The test group noted that they would have felt better prepared to answer student's questions had they had more information before using the curriculum. Interesting results show the time to execute the curriculum to be a larger concern for those in the control group, whereas the time given for the test curriculum was manageable. Also, there was a noted mismatch between what the standard curriculum claims and what the faculty observe, particularly in the areas of diversity, equity and inclusion.

Limitations in the analysis of the qualitative data are due to the inability of the research team to ask probing questions based on the provided written response on the questionnaire. While the context of written responses is generalized to the participant's experience with teaching CGSC students a version of the curriculum focused on creativity, some respondents provided little in terms of more specific context related to their classroom. Therefore, the ability to fully extrapolate the meaning of written responses is difficult given the lack of rich and robust responses. Overall, there were 19 participant comments that were not coded due to needing more information to avoid inserting researcher bias. To further decrease bias during the analysis, the research team did not infer positive or negative thoughts on responses that were ambiguous. For example, one participant was surprised by the unusual answers given by the students. It is unclear if the surprise was positive or negative in nature, thus the study team did not interpret the statement in such a way. The shared knowledge of creativity, narrative practice, teaching, and military relevance assisted researchers in the interpretation of the data. The concepts noted from this study are not enough to imply generalized meaning to broader populations of faculty. However, when paired with the data generated by the students, the faculty's experience provides valuable information for future iterations of this work. In summary, the qualitative results show that overall the study curriculum is a well thought out and researched approach to teaching creative thinking which has potential to provide faculty and student growth in creative instruction, thinking, and future use. Further refinement of the curriculum and delivery is needed, as well as greater stage setting and explanations of why concepts are taught in a particular way.

RECOMMENDATIONS

Experimental design

Do the pretest 5 minutes before class starts and the post test 5 minutes after class ends. When designing the research protocol for the creativity study, concerns were raised about conducting pre and post tests for participants in the presence of other potential participants. The reason for this was to avoid even the appearance of undue peer pressure to participate which might

cause psychological distress. Therefore, the decision was made to issue research packets that contained informed consent and pre and post tests to the students prior to class for them to do as homework outside of class. During the conduct of the experiment, some faculty dedicated 5 minutes prior to class starting for the pretest and 5 minutes after class for the post test. These instruments were completed outside of class but immediately prior to and after class. Feedback from the faculty in those classes claimed that executing the pre and post tests in this way was a preferred method for several reasons. First, most students would be happy to participate if reminded closer to the class itself. Some students would misplace or forget to bring the instruments and deposit them in the collection boxes. Additionally, faculty found that conducting the pre and post tests closer to the class was easier to manage. Researchers theorized that conducting the pre and post tests closer to the intervention was potentially a better measure of the extent to which the intervention produced a measurable effect of increased creativity in participants. Narrative practice is intended to stimulate the portions of the brain that enable creativity. Students conducting the post test outside of class in some cases days after the intervention may have missed measurable effects from the experimental lesson. Finally, for classes that conducted the pre and post tests in this manner at a higher participation rate than those that did not. Therefore, researchers theorized that the minimal chance of peer pressure and psychological distress was worth obtaining the good outcome of a higher participation rate and a more direct connection to the intervention. In future studies if peer pressure and psychological distress is a concern, researchers recommend having all students conduct the pre and post tests and only the participants deposit the pre and post tests into the data collection boxes. This way, all students are doing something at the same time, and no one knows who is participating and who is not mitigating the chance of peer pressure and psychological distress.

CONCLUSION

The ability to predict future states so that leaders may prepare for the unexpected is an important skill that is enabled by creativity. The creativity study has shown that creativity is a skill that can be deliberately improved through narrative practice. These discoveries are applicable to contexts beyond the military. If educational leaders could improve pedagogy by using narrative practice, they should seriously consider doing so. If business leaders can anticipate opportunities and seize them prior to their competitors using narrative practice, why would they not? One need only to observe the war between Ukraine and Russia to see the effect of creativity as well as the lack of it. In the future, creativity will not be optional but a requirement. Narrative practice provides the tools to meet that requirement.

POST SCRIPT

On 28OCT 2022, LTC Thomas L. Gaines, Professor of Military Science at Wake Forest University, ran a 90-minute version of C122S for 36 ROTC cadets. Cadets were assessed with a CAT pre-training and post-training, with an additional "resilience" component following the post-training CAT. In the resilience component, cadets were informed that their post-training answer had failed and they were given 60 seconds to come up with another creative answer.

The overall result of the training was a significant ($p < .0001$) and substantial (Cohen's $d = 0.95$) increase in creativity from pre to post. Significantly, the increased creativity was *maintained* in the resilience answer. The training therefore helped students improve not only their creativity but their resilience, enabling them to rebound from failure to create a second plan.

The training also yielded an increase in "potential moonshots," that is, plans that are too original for experts to assess their feasibility in advance.

Pre-Training Creativity (scored from 1 - 10)

Mean 4.84 ± 0.26

Post-Training Creativity

Mean 7.29 ± 0.24

Resilience Creativity

Mean 7.29 ± 0.26

Cohen's $d = 0.949035$ (major effect)

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APPENDIX A: STUDENT PARTICIPANT INFORMED CONSENT.**IMPROVING CREATIVE THINKING THROUGH NARRATIVE PRACTICE**

This is a mixed methods study conducted in support of researching alternative approaches to creative thinking instruction at the Command and General Staff College (CGSC). This form provides information on your rights as a research participant in the above name study. CGSC has approved this study and supports the research.

Purpose

You are invited to participate in a research study researching alternative methods improve creative thinking skills. The purpose of this mixed methods study is to describe the extent to which narrative perspective taking might affect creative thinking. There is no deception in this study. The researchers are interested in determining to what extent, if any, empathetically role playing with colleagues affects creative thinking.

Procedures

1. The duration of your participation is the two hours of the C122 or C122S lesson. You will participate in solving a problem posed in the form of a narrative prompt out of class prior to and after the appropriate creative thinking lesson. Participants in staff groups executing C120 with the C121, C122, and C123 classes will take pre and post test prior to and after C122. Participants in staff groups executing C120 with the C121, C122, and C122S classes will take pre and post test prior to and after C122S. Your instructor will remind you when to complete the posttest.
2. You will read the prompt and take approximately five minutes complete a narrative and a sketch of your solution on the one-page sheet provided. Do not place any personally identifiable information on the sheet.
3. If you are participating in the study, you will place your completed one-page solution in the bin outside the classroom. If you are not participating in the study, you may dispose of your one-page solution in the trash. Please do not discuss classified information, potential violations of the UCMJ or criminal law, or other comments that could place your clearance, credentials, or other privileged access or duty at risk.

Risks

There are no known risks in this study. You may withdraw at any time. Since all data collected was de-identified, there is a low risk of your identity becoming known if you do not share your participation with others.

Benefits

There are no direct benefits to participating in this study. However, the results of this study will benefit researchers, instructors, and staff in identifying alternative methods to teach creative thinking at CGSOC. The study of creativity and improving creative thinking instruction may benefit the military institution by assisting in a leader's ability to innovate as well as forecast, predict, and anticipate the unexpected.

Compensation

No compensation or incentives will be offered for your participation in this study.

Confidentiality

All data obtained about you, as an individual, will be considered privileged and held in confidence; you will not be identified in any presentation of the results. Complete confidentiality cannot be promised to participants who self-identify. All data collected in this study are confidential and are de-identified at the point of collection. Your identity will be protected if you do not place any identifying marks on the pre and post test instruments. Your admin number will be recorded in the upper right hand of the one-sheet response for both the pre and posttest. The admin number is only for aligning your pre and posttest so researchers know that the two responses with the same admin number were submitted by the same person. Please keep the study instruction sheet as it links you to this study and contains your admin number. The CGSC Human Protections Director or a designated Department of Defense (DoD) representative may review this form to ensure compliance with DoD regulations.

Research personnel

LTC Jared Kite, Major Angela Samosorn, PhD, Ryan Strong LTC (Ret), Andrew Shoffner COL (Ret), Richard A. McConnell, D.M LTC (Ret), Kenneth Long, D.M. LTC (Ret), Jacob Mong LTC (Ret), Angus Fletcher, PhD, Greg Bunch, MBA, Morgan Cornstubble, MS.

The following person is the principle investigator conducting the research for this study and may be contacted at any time: Richard A. McConnell, D.M., richard.a.mcconnell4.civ@mail.mil, 684-4766 ofc 913 680-7178 cell.

RIGHT TO WITHDRAW

Participation in this study is voluntary. You have the right withdraw from the study at any time without penalty. You have the right to decide to not answer questions during the scenario or on the one-page solution.

CONTACTS FOR ADDITIONAL ASSISTANCE

Please direct your questions or comments about this study to Richard A. McConnell, D.M., Richard A. McConnell, D.M., email:XXXXXXXX, ofc: XXX-XXX-XXXX, cell: XXX-XXX-XXXX.

If you have any questions or concerns about the conduct of this study, please contact the CGSC Human Protections Director, Dr. Michelle A. Miller, ofc: XXX-XXX-XXXX.

Signature

I have read the above description of Improving Creative Thinking Through Narrative Practice and understand the conditions of my participation. My signature indicates that I agree to participate in the study.

Participant's printed name: _____

Participant's signature: _____

APPENDIX B: FACULTY PARTICIPANT QUESTIONNAIRE

This form is to be used when soliciting faculty about their perceptions regarding participation in the study.

Questionnaire Pre-Brief:

Thank you for participating in this study regarding the effect of narrative practice on creative thinking. Your participation is voluntary, and you can decline to answer any question. You can also withdraw from the study at any time. Researchers in this study are interested in understanding the capabilities of the staff group you observed to demonstrate creative thinking skills, so please be detailed in your answers. This questionnaire will ensure your anonymity as you are not asked to place any identifying marks on this paper response thus the primary investigator conducting the study will not be able to identify you. Completing this questionnaire constitutes your consent to participate.

We would like for you to consider what could be sustained and improved when thinking about the Planning, Preparation, Execution and Assessment phases of the development, preparation, and delivery of this lesson/research program. We will use your input to inform the process for developing future creative thinking instruction for CGSC.

1. Planning:

a) Sustain

b) Improve

2. Preparation:

a) Sustain

b) Improve

3. Execution:

a) Sustain

b) Improve

4. Assessment:

a) Sustain

b) Improve

Please give us feedback by answering these five questions:

1. What was the best thing about this experience?
2. What was the least effective thing about this experience?
3. What was the best takeaway (immediately applicable in your teaching) from this experience?
4. What was the biggest surprise about this experience?
5. What is your biggest question(s) about this experience?
6. What else would you like to say about this experience?

Questionnaire Out-Brief: Thank you very much for your time. As a reminder, please do not place any identifying marks on this questionnaire so your identity will be protected and the primary investigator conducting the study will not be able to identify you. Researchers will attempt to maintain your confidentiality to the greatest extent possible, but your confidentiality cannot be guaranteed if you voluntarily share your questionnaire content with others.

APPENDIX C: FACULTY PARTICIPANT INFORMED CONSENT

Improving Creative Thinking Through Narrative Practice

This is a mixed methods study conducted in support of improving creative thinking instruction at the Command and General Staff College (CGSC). This form provides information on your rights as a research participant in the above name study and of the responsibilities that researchers have during this study. CGSC has approved this study and supports the research.

Purpose

You are invited to participate in a research study examining methods to improve creative thinking skills. The purpose of this mixed methods study is to describe the extent to which narrative perspective taking might affect creative thinking. There is no deception in this study. Researchers in this study are interested in determining to what extent if any narrative practice affects creative thinking.

Procedures

1. As a participant, you are being asked to complete the Faculty Participant Questionnaire following your facilitation of C122. This should not take more than 10 minutes to complete.
2. Please do not discuss classified information, potential violations of the UCMJ or criminal law, or other comments that could place an individual's clearance, credentials, or other privileged access or duty at risk.

Risks

There are no known risks in this study. You may withdraw at any time. Since all data collected will be de-identified, there is low risk of your identity becoming known through your participation in this study if you do not share with others that you participated.

Benefits to faculty

There are no direct benefits to participating in this study. However, the results of this study will benefit researchers, instructors, and staff in identifying alternative methods to teach creative thinking at CGSOC. The study of creativity and improving creative thinking instruction may benefit the military institution by assisting in a leader's ability to innovate as well as forecast, predict, and anticipate the unexpected.

Compensation

No compensation or incentives for your participation in this study will be offered.

Confidentiality

All data obtained about you, as an individual, will be considered privileged and held in confidence; you will not be identified in any presentation of the results. Complete confidentiality cannot be promised to participants who self-identify. All data collected in this study are confidential and are de-identified at the point of collection. Your identity will be protected if you do not place any identifying marks on the questionnaire instrument. There will be an admin number on your questionnaire instrument.

Research personnel: LTC Jared Kite, Major Angela Samosorn, PhD, Ryan Strong LTC (Ret), Andrew Shoffner COL (Ret), Richard A. McConnell, D.M LTC (Ret), Kenneth Long, D.M. LTC (Ret), Jacob Mong LTC (Ret), Angus Fletcher, PhD, Greg Bunch, MBA, Morgan Cornstubble, MS.

The following person will be the principle investigator conducting the research for this study and may be contacted at any time: Richard A. McConnell, D.M., email:XXXXXXXX, ofc: XXX-XXX-XXXX, cell: XXX-XXX-XXXX.

Right to Withdraw

Participation in this study is voluntary. You have the right to withdraw from the study at any time without penalty. You have the right to decide to not answer questions on the faculty C122 perceptions questionnaire. All participants have the right to withdraw at any time, there will be no penalties whatsoever associated with withdrawing.

Contacts for Additional Assistance

Please direct your questions or comments about this study to Richard A. McConnell, D.M., email:XXXXXXXX, ofc: XXX-XXX-XXXX, cell: XXX-XXX-XXXX.

If you have any questions or concerns about the conduct of this study, please contact the CGSC Human Protections Director, Dr. Michelle A. Miller, email: CXXXXXXXXXXXXXXXXX, ofc: XXX-XXX-XXXX.

Signature

I have read the above description of Improving Creative Thinking Through Narrative Practice and understand the conditions of my participation. My signature indicates that I agree to participate in the study.

Participant's printed name: _____

Participant's signature: _____

APPENDIX D: PRE-TEST PROMPT

CGSC C122 CREATIVITY RESEARCH PROJECT: PRE-TEST

Team: _____

Admin # _____

Instructions: Please read the prompt, and take 5 minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than 1 minute to respond to the 4 statements on the Likert scale at the bottom Thank you!

Prompt: In 5 minutes, on a blank sheet of paper provided, describe the ideal qualities of an artificial intelligence robot that would act as your trusted intelligent advisor, and how you would use it to support your decision making if you were assured that it actually had those qualities. Also describe any risk mitigation you would use to protect against surprise, bad advice or a situation where it might inadvertently give bad advice.

Please take 1 minute to describe your level of agreement with these "gut check" statements	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
In YOUR military decision-making process:	1	2	3	4	5	6	7
Creativity is important to me							
Creativity is important to the Army							
I am satisfied with my current level of skill							
I am confident in using my creativity on military missions							

APPENDIX E: POST-TEST PROMPT

CGSC C122 CREATIVITY RESEARCH PROJECT: POST-TEST

Team: _____

Admin # _____

Instructions: Please read the prompt, and take five minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than one minute to respond to the four statements on the Likert scale at the bottom. Thank you!

Prompt: The Army has committed to an all-electric ground combat vehicle fleet by 2040. Describe your concept for the energy resupply system for Large Scale Combat Operations

Please take 1 minute to describe your level of agreement with these "gut check" statements	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
In YOUR military decision-making process:	1	2	3	4	5	6	7
Creativity is important to me							
Creativity is important to the Army							
I am satisfied with my current level of skill							
I am confident in using my creativity on military missions							

APPENDIX F: PRE AND POST TEST RUBRIC FOR PANEL OF EXPERTS

Scoring rubric	1	2	3	4	5	6	7
Novelty							
Suitability							
Feasibility							
Sum of scores							

1	Suprisingly uncreative, un-wow
2	Noticeably mundane, below average
3	Slightly limited creativity,
4	Mainstream, conventional expected professional effort
5	slight improvement over the expected
6	Noticeably good, above average, well done!
7	Surprisingly good! Wow!

Novelty	Unconstrained, surprising connections/applications
Suitability	Professionally reasonable, given normal risk assessments
Feasibility	Affordable/acceptable within reasonable constraints

Note: Panel of experts completed this rubric for each student participant response and recorded scores on an excel spreadsheet maintained by the investigator leading the panel of experts.

APPENDIX G: CREDENTIALS OF PANEL OF EXPERTS USING CONSENSUAL ASSESSMENT TECHNIQUE (CAT) DESIGN AND APPLICATION

The purpose of this appendix is to identify who is eligible to render a qualitative assessment of responses provided by students participating in the creative thinking study. Using the principles and process of the foundational Consensual Assessment Technique (CAT) guide of Baer and Kaufman (2019), investigators designed the following process for empaneling an credentialed panel of experts. The method is consistent with the body of knowledge described by Lebuda & Glavineau, (2019) which represents the current state of the art of the discipline of evaluating social creativity.

The expert panel consisted of a team of four, representing a diverse cross-section of college faculty who meet standards listed below as “credentialed experts”. Investigators documented the specific qualifications of each expert and list those qualifications in a report appendix. Investigators will recognize the following qualifications/experiences as constituting sufficient professional expertise. More of the below qualifications is better.

1. A graduate of CGSC
2. Successful Field grade experience as a battalion or higher Executive officer, Operations officer or Commander
3. Completion of the Army Force Management Course
4. Functional Area 50 (Force Management)
5. Staff officer assignment in an Army proponent or battle lab
6. Assignment as a strategic plans officer
7. Assignment as a force modernization officer
8. 2 years assignment as a CGSC faculty
9. CGSC instructor in the Force Management block
10. Reader on an MMAS thesis employing the Applied Professional Case Study methodology
11. Graduate degree in a program featuring Organizational Development
12. Terminal degree in a program featuring Organizational Development
13. Equivalent experience as a product, project, program manager in either military or civilian experience
14. Assignment as a Force Design Update (FDU) action officer or staff officer
15. Field experience in field unit that participated in a materiel experiment evaluating potential DOTMLPF solutions/

Preparation of the panel of experts: the standard prompt that the panel of experts reviewed prior to each grading session were intended to place panel members in the frame of mind as a field grade leader. The experts assigned a quantitative score for innovation, looking through a professional judgment lens that balances Suitability/Novelty and Feasibility/Accessibility for potential solutions over a time frame encompassing either a tactical (1-2 year) or operational (10 year) time frame.

Student offers of creative solutions:

1. Student participants completed a pretest and posttest consisting of a narrative and a sketch of creative solutions to a problem described in the pre and posttest prompt.
2. The Control Group completed pre and posttest during C122 legacy lesson and the Test Group completed pre and posttest during the C122S experimental lesson.
3. Randomized admin numbers were employed for each student instrument. Admin numbers ensured researchers could map evaluations to each student pre and post test, as well as Test or Control Group members.
4. Panel of experts did not know if the student is from the Test or Control Group.
5. Students who elected to participate obtained pre and posttest from the participating classroom prior to data collection. Random admin numbers were generated using National Security Agency 128 bit encryption using a Microsoft Excel© spreadsheet and were also prepopulated on the pre and posttest.

Performance of the assessment:

1. Using the principles of Blink! (Gladwell, 2007) a panel of experts made a rapid assessment of the creative solution from each student and rendered a professional judgment on a 7-point Likert scale for 3 variables: Novelty, Suitability, and Feasibility (Appendix F): Novelty = level of originality of an idea. Suitability = level of practicality of an idea. Feasibility = level of likelihood a commander in the field might be willing to attempt to try an idea. Higher is better on both scores.

2. Panel of experts recorded 3 numbers, 1 for each variable on a spreadsheet maintained by the leader of the panel of experts.
3. Scores were compiled on a master log sheet for subsequent statistical analysis by Lead Researcher of Panel of experts.
4. Statistics were applied to investigate the effect, if any, of the efficacy of both the control and the Test Group lessons, and to compare between populations.

Analysis: Statistical tests were performed using PSPP and Libre Office Calc spreadsheet.

Summary: The purpose of this survey is to record whether student attitudes about creativity in the Test and Control Groups changed after receiving the C122S class.

Concept: Researchers evaluate student responses to four statements about student attitude and the Army institutional attitudes towards creative thinking after the class. Students respond to the four statements on a seven-point Likert scale. The four statements address student's attitudes on the importance and student comfort with using creativity in a professional setting. To analyze individual attitudes, beliefs, and personal assessments about creativity in military decision making processes, researchers used a form of the valancing technique (Qualtrix, 2021) popular in measuring customer satisfaction. Researchers compared attitudinal changes in both the Test and Control Groups with before and after responses. This allowed researchers to examine feedback in the Kirkpatrick model (2009) at Level 1 (self-reporting), using a variation of the Qualtrics standard measurement method to measuring customer satisfaction (Qualtrix, 2021). The balancing technique allows researchers to compare strengths and weaknesses of the narrative practice as reported by participants and examine themes and trends emerging from student self-reporting. In the Kirkpatrick model of assessment, student self-reporting has value within well-defined boundaries. Given that the officers are at 8-10 years of service, self-reporting (keyed to "self-awareness") is an important component of the leadership curriculum for the year, and these insights added to our understanding of this vitally important element of creativity.

Please take 1 minute to describe your level of agreement with these "gut check" statements	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
In YOUR military decision-making process:	1	2	3	4	5	6	7
Creativity is important to me							
Creativity is important to the Army							
I am satisfied with my current level of skill							
I am confident in using my creativity on military missions							

APPENDIX H: TEST GROUP C122 CLASS LESSON PLAN

US ARMY COMMAND AND GENERAL STAFF COLLEGE
US Army Command and General Staff School
Command and General Staff Officer Course (CGSOC) Common Core
C100: Foundations of the Army Profession

Lesson Plan for C122S
AY 22 Creative Thinking Study

Lesson Plan: 2 Hours

Curriculum Developer: Mr. Gerald Sewell, 913-684-4139, gerald.f.sewell.civ@mail.mil

Module Author: Dr. Richard A. McConnell, 913-684-4766, richard.a.mcconnell4.civ@mail.mil

Lesson Authors: Mr. Jacob A. Mong, 913-684-3489, jacob.a.mong.civ@mail.mil

LTC Jared R. Kite, 913-684-2797, jared.r.kite.mil@mail.mil

Study Authors: Angus Fletcher, Ohio State University, fletcher.angus@gmail.com

Greg Bunch, University of Chicago, greg@hey.com

Dr. Kenneth Long, 913-684-2925, kenneth.e.long20.civ@mail.mil

Mr. Ryan Strong, 913-684-3791, ryan.d.strong.civ@mail.mil

Date Prepared: 30 April 2021

1. SCOPE

DISCLAIMER: This lesson plan is intended for the teaching teams participating in the Creative Thinking Study, as either part of the control or study groups. If you are not part of the study, please use the AY C122 lesson plan to conduct C122. Additionally, teaching teams identified in the “control group” of the study use the standard C122 lesson plan with the modification to conduct a creativity pre and post-test to gather control data for the study. Teams that are participating in the study and are in the “study group” use this lesson plan to conduct C122S.

The purpose of this lesson plan is to provide instructors the framework for conducting the AY 22 Creative Thinking Study in lieu of C122. This lesson is highly interactive. The information gathered provides data to researchers in order to identify ways to make creative thinking exercises that improve field grade officer's ability to think creatively in dynamic, uncertain, and unprecedented situations.

Teaching teams administer quick creative thinking pre and post-tests to the students participating in the study. The pre-test administered at the beginning of the class is to gather data to set a baseline of information for researchers. The post-test is administered at the end of class after the activities in order to gather data to see if there is a statistically significant and measurable change in students' creative thinking skills.

Students who wish to participate in the study will turn in the pre and posttests to the bin located in the hallway outside the classroom. Students who do not wish to participate will throw away their one-page solution sheet at the end of class.

Of the teaching teams participating, half are in the control group, and half are in the study group. Do not share which group your team/staff group is in with the students. The teaching teams, as part of the control group, teach C122 in the regular C122 lesson, with the slight modification of having the students take the pre and post creative thinking tests. These tests should take no more than five (5) minutes each to complete.

Teaching teams as part of the Test Group conducted the C122S Lesson in accordance with this lesson plan. The C122S Lesson is time intensive, and it will take the entire two hours. Instructors must plan ahead to ensure familiarity with all the activities of the C122S Lesson.

Author's Intent:

Big Idea: The need for creativity in dynamic, uncertain, unprecedented situations. Creativity is a muscle that can be trained.

ELO	Standards	Main Teaching Points (Student "Take Aways")
ELO-CC-2.2 Action: Incorporate creative thinking skills.	1. Practice strategizing from the perspective of another person. 2. Anticipate environmental changes. 3. Condition your brain to identify exceptional information.	The need for creativity in dynamic, uncertain, unprecedented situations. Creativity is a muscle that can be trained.

Links to Other Parts of the Curriculum: This lesson, in conjunction with lessons in the C100 Block sets the conditions for learning in CGSOC. We expect students to apply the aspects of effective critical and creative thinking to all academic endeavors while in CGSOC—and beyond.

2. LEARNING OUTCOMES/OBJECTIVES

This lesson supports CGSOC Program Learning Outcome 1 (Strategic Thinking and Communication): Graduates who can incorporate thinking that is broader than the issue at hand and effectively communicate that thinking.

CGSOC , and creatively design or revise concepts and ideas. Graduates expertly use oral and written communication to deliver graduates independently research and critically evaluate information to inform understanding of the context, create meaningful rational, complete, and well-supported arguments, explanations, options, and/or solutions in a form that is specifically tailored to the most relevant audience.

CGSOC PLO #1 Standards:

- a. Independently research and critically evaluate information.
- b. Comprehend context of the situation.
- c. Create meaning from those ideas.
- d. Creatively design or revise concepts and ideas.
- e. Communicate concepts with clarity and precision in written, graphical, and oral forms.
- f. Compose complete and well-supported arguments.
- g. Provide options and/or solutions to commanders.

Common Core Course TLO-CC-2

Action: Incorporate thinking skills.

Condition: Given individual reading and writing assignments, staff group and smaller collaborative group discussions, and practical exercises while faced with problems characteristic of the operational environment.

Standard: Incorporation includes -

1. Critical thinking skills
2. Creative thinking skills

Learning Domain: Cognitive **Level of Learning:** Synthesis

ELO-CC-2.2

Action: Incorporate creative thinking skills.

Condition: Given individual reading and writing assignments, small group discussions, and practical exercises.

Standard: Application includes-

1. Identification of creative thinking enhancers
2. Identification of creative thinking barriers
3. Apply creative thinking

Learning Domain: Cognitive **Level of Learning:** Application

JPME I Learning Areas Supported:

6b. Comprehend critical thinking and decision-making skills needed to anticipate and recognize change, lead transitions, and anticipate/adapt to surprise and uncertainty.

6f. Analyze the importance of adaptation and innovation on military planning and operations.

3. ISSUE MATERIAL

- a. Advance issue: C122S Advance Sheet and Readings
- b. During class: None

4. HOMEWORK ASSIGNMENT

- a. Study requirements
 - (1) First requirement

Read:

C122RA "From Guilford to Creative Synergy: Opening the Black Box of Team-Level Creativity" by Terri Kurtzberg and Teresa Amabile (10 pages) <https://web.s.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=b61b559a-2dd6-4419-bb31-ec90df1a02fc%40redis>

C122RB Military Personnel as Innovators (2018), by COL Michelle Ewy (16 pages) https://www.airuniversity.af.edu/Portals/10/AUPress/Papers/mp_0074_ewy_military_personnel_innovators.pdf

C122RC ADP 6-22, 31 July 2019, *Army Leadership and the Profession*, paras 4-1 through 4-10, 6-25, 9-29 through 9-40 (4 pages total).

C122RD FM 6-22, 30 June 2015, *Army Leadership*, paras 5-7 through paragraph 5-29 (5 pages).

C122RE "Divergence – Convergence," adapted for the Red Team Handbook, from *The Thinker's Toolkit*, by Morgan Jones, and *Winning Decisions*, by J. Russo and P. Schoemaker. Link to Red Team Handbook (see page 144-146). https://usacac.army.mil/sites/default/files/documents/ufmcs/The_Red_Team_Handbook.pdf (3 pages)

C122RF "The Creative Problem Solving Methodology," in *Creative Problem Solving and Opportunity Finding*, by J. Couger (20 pages).

C122RG "Lotus Blossom Technique Ideation Guide," <https://online.visual-paradigm.com/knowledge/brainstorming/lotus-blossom-technique/> (1 page).

Optional Reading:

C122ORF: "How Innovative is Your Company's Culture," by Rao and Weintraub <https://sloanreview.mit.edu/article/how-innovative-is-your-companys-culture/>

- (2) Second requirement:

Questions for students to prepare for C122 Lesson: Be prepared to discuss the following questions during this lesson:

- How do we think creatively?
- What are the benefits of creative thinking?

- How does diversity, equity, and inclusion support creative thinking?
- What enhances creative thinking?
- What are some barriers to creative thinking?
- Do we really value creative thinking or just say we do?
- How do we set a climate that encourages creativity in the classroom? In our future units?

5. OPTIONAL INSTRUCTOR ADDITIONAL READING(S)/MATERIAL: NONE

6. INSTRUCTIONAL AIDS

Appendix A: N/A

Appendix B: Slides on Blackboard

Appendix C: Blended learning instructions

Computer and projection system

White Board and dry erase markers

30 Circles handout

7. CONDUCT OF LESSON

a. Lesson Timeline:

Prior to the lesson faculty members will inform students of team participation in the study. Do not tell students whether which group the team is in, test or control. It is recommended that Instructors read the proctor instructions the day prior to conducting C122 in order to preserve time in the classroom for the activities.

Control Group: Discussion Heavy (see C122 Lesson plan for more details)

First hour:

5 minutes	Creativity test
10 minutes	CE #1: Think, Pair, Share, 30 Circles, or TED Talk, Giovanni Corazza.
10 minutes	Publish and Process
25 minutes	GNI: Creative Thinking Discussion Diversity, Equity, Inclusion (DEI)
10 minutes	Break

Second hour:

15 Minutes	Continue GNI: Creative Thinking Enhancers and Barriers
25 Minutes	Practical Exercise: 10 Creative Thinking Exercises (choose one)
5 Minutes	Develop
5 minutes	Creativity Test

Test Group: Activity Heavy

First hour:

5 minutes	Creative Thinking Test
10 minutes	Introduction
10 minutes	Warm-up
20 minutes	Perspective Plotting
5 minutes	Break

Second hour:

20 Minutes	Plot Twisting
5 minutes	Break
30 minutes	Role plotting
5 minutes	Break
5 minutes	Creativity Test
5 minutes	Debrief

Slide 1: Title Slide	
Title Slide with disclaimer to ensure instructors are using the correct slides for the class being taught.	<p style="text-align: center;">Creative Thinking Study C122S</p> <p><small>DISCLAIMER: These slides are intended for the teaching teams that will participate in the Creative Thinking Study as either part of the control or study groups. If you are not part of the study, please use the AY C122 Lesson Plan to conduct C122.</small></p>
Slide 2: Program Learning Outcome (hidden)	
This is the Program Learning Outcome associated with the class.	<p style="text-align: center;">CGSOC Program Learning Outcome</p> <p>CGSOC Program Learning Outcome 1 Strategic Thinking and Communication:</p> <p>CGSOC PLO #1 Standards:</p> <ol style="list-style-type: none"> Independently research and critically evaluate information. Comprehend context of the situation. <u>Create meaning from those ideas.</u> <u>Creatively design or revise concepts and ideas.</u> Communicate concepts with clarity and precision in written, graphical, and oral forms. Compose complete and well-supported arguments. Provide options and/or solutions to commanders.
Slide 3: Common Core Terminal Learning Objective (hidden)	
This is the Common Core Terminal Learning Objective associated with the class.	<p style="text-align: center;">Common Core Terminal Learning Objective</p> <p>TLO-CC-2 Action: Incorporate thinking skills. Condition: Given individual reading and writing assignments, staff group and smaller collaborative group discussions, and practical exercises while faced with problems characteristic of the operational environment. Standard: Incorporation includes -</p> <ol style="list-style-type: none"> Critical thinking skills Creative thinking skills <p>Learning Domain: Cognitive Level of Learning: Synthesis</p>
Slide 4: Enabling Learning Objective (hidden)	
This is the Enabling Learning Objective and JPME Learning Area for the class.	<p style="text-align: center;">Enabling Learning Objective and JPME Learning Area</p> <p>ELO-CC-2.2 Action: Incorporate creative thinking skills. Condition: Given individual reading and writing assignments, small group discussions, and practical exercises. Standard: Application includes—</p> <ol style="list-style-type: none"> Identification of creative thinking enhancers An identification of creative thinking barriers Apply creative thinking <p>Learning Domain: Cognitive Level of Learning: Application</p> <p>JPME I Learning Areas Supported: 6b. Comprehend critical thinking and decision-making skills needed to anticipate and recognize change, lead transitions, and anticipate/adapt to surprise and uncertainty. 6f. Analyze the importance of adaptation and innovation on military planning and operations.</p>

Slide 5: Agenda	
This is the outline for the class.	<p style="text-align: center;">Agenda</p> <p>Creative Thinking Test (5 Min) Introduction (10 Min) Warm-Up (10 Min) Perspective Plotting (20 Min) Break (5 Min) Plot Twisting (20 Min) Break (5 Min) Role Plotting (30 Min) Break (5 Min) Creativity Test (5 Min) Debrief (5 Min)</p>

- b. **First Creative Thinking Test:** (5 min). This is the first creative thinking test that will establish the baseline of data/information to inform the study. Give the students the forms provided in Annex A to fill out and to react to the situation on slide 6. Only give 5 minutes to complete the test, then move on to the next activity.

Slide 6: 1 st Creative Thinking Test (pre-test)	
This slide provides the guidance for the first creative thinking test. Instructors should gather the pre-test answers and results using the provided forms.	<p style="text-align: center;">Creative Thinking Pre-Test</p> <p>Write a response to the following question:</p> <p>"You are attacking up a mountain, against a dug-in enemy one-third your size but with comparable arms and equipment, when an electrical storm strikes that makes it impossible for anyone to see or communicate at distances greater than two feet. What do you do?"</p> <p>You have five (5) minutes to write your response.</p>

- c. **Introduction:** (10 min) The purpose of this slide is to inform students at a macro level of the activities and behaviors that we want to exercise and train during the class.

Slide 7: Introduction	
The purpose of this slide is to introduce the training to the students. The purpose of the introduction is to build confidence in the method and a willingness to participate, so questions and skepticism are encouraged.	<p style="text-align: center;">Introduction</p> <p>The need for creativity in dynamic, uncertain, unprecedented situations. Creativity is a muscle that can be trained. You will now receive that training, in a format based in neuroscience.</p> <p>In Part I of the training, you will practice strategizing from the perspective of another person; every other person has his/her unique way of strategizing that you can borrow by (1) observing that other person strategically respond to a challenge and (2) asking why s/he responded as s/he did.</p> <p>In Part II of the training, you will learn (a) to anticipate environmental changes and (b) to condition your brain to identify exceptional information. The training will involve a two-step process of (1) breaking down the environment into specific rules of action and (2) imagining how those rules could produce unprecedented events.</p>

- d. **Warm up Exercise:** (10 min) The warmup is a brief creativity-stretching exercise.

Slide 8: Warm up	
The warm up is a brief creativity-stretching exercise.	<p>Warm Up</p> <p>Imagine a member of your last unit.</p> <p>Now imagine something unexpected that would make that person smile.</p>

- e. **Perspective Plotting:** (20 min) Students are presented with an imagination-stretching five-minute challenge. Students have five minutes to formulate a response. Students are then paired with another student. The paired students (1) share challenge responses and (2) explain the rationale (i.e., the why) behind the responses. Each student does his best to grasp the rationale of the other student.

Then the students are presented with another five-minute challenge. This time, each student has five minutes to strategize a response from the perspective of the other student, extending the other student's rationale into a solution to this new situation. The idea is for students to see solutions through the eyes of the other student (for example, Napoleon pretending to be Caesar, or Caesar pretending to be Napoleon).

After the exercise is over, the two students share responses and get feedback on level of success achieved while adopting aspects of the other's strategic perspective. The goal of the feedback is to push each student to improve his/her ability to strategize from the other's point of view.

Slide 9: Perspective Plotting (1 of 4)	
The purpose of this slide is to generate discussion on the "30 Circles Exercise" the students just completed.	<p>Perspective Plotting (1 of 4)</p> <p>"You are dug into desert terrain at a distance of 500 meters from an enemy who is comparably equipped but three times your size. You have one technical advantage: DARPA has provided a device that allows you to mind-control any one enemy from within 50 meters. What do you do?"</p> <p>You have five (5) minutes to write an individual response</p>

Slide 10: Perspective Plotting (2 of 4)	
This is the second in a series of 4 slides to guide the students through the exercise.	<p>Perspective Plotting (2 of 4)</p> <p>Now pair off with another student and:</p> <p>(1) Share your responses with your partner. (2) Explain the rationale (i.e. the why) behind your responses to your partner/fellow student. (3) Do your best to grasp the rationale of the other student and their perspective/solution.</p> <p>You have five (5) minutes.</p>

Slide 11: Perspective Plotting (3 of 4)	
<p>This slide has the follow up scenario to present to the students to solve from the perspective of the student teammate during collaboration session.</p>	<p>Perspective Plotting (3 of 4)</p> <p>"You are entering an urban environment and have been tasked with destroying an enemy force, one-third the size of your own, when you receive a message from your intel officer: The enemy has an aerial weapon that can kill any soldier who remains in place for more than two seconds. What do you do?"</p> <p>Formulate your solution/response from the perspective of your fellow student. Try to solve the problem using your partner student's rationale.</p> <p>You have five (5) minutes.</p>

Slide 12: Perspective Plotting (4 of 4)	
<p>This slide has the students pairing off again to share solutions using the other student's rationale.</p>	<p>Perspective Plotting (4 of 4)</p> <p>Again pair off with your previous partner student and:</p> <p>(1) Share your responses with your partner. (2) Explain the rationale (i.e. the <i>why</i>) behind your responses to the situation using your partner's rationale.</p> <p>You have five (5) minutes.</p>

- f. **Break!!!:** (5 min) Students will take a break now to clear minds of the last activity. It is important that students do not check emails, cell phones, or conduct other screen activities. Bathroom or light exercise only.

Slide 13: Break!!!	
<p>This slide gives guidance for the break.</p>	<p>Break!!!</p> <p>Take five (5) minutes for a break. During this break do some light exercise, do not use cell phones, screen time or any electronic devices during this break.</p>

- g. **Plot Twisting:** (20 min) Students are presented with a speculative future scenario, and then given three minutes to respond.

For six minutes, students then break into four-person groups and quickly share an imagined event; the other students respond by proposing actions that could be taken to precipitate or avoid that event.

The exercise is then repeated with a second future scenario. Students are then given three minutes to respond.

For six minutes, students break into new four-person groups and quickly share an imagined event; the other students respond by proposing actions that could be taken to precipitate or avoid that event.

Slide 14: Plot Twisting (1 of 4)

This slide introduces the plot twisting scenario.

Plot Twisting (1 of 4)

1st Future Scenario:

"DARPA has invented a new AI that can think like Patton. What is the most unexpected but feasible event that could occur?"

You have three (3) minutes to write your response.

Slide 15: Plot Twisting (2 of 4)

This slide guides the students to share events and collaborate on mitigating actions.

Plot Twisting (2 of 4)

Now break into four (4) person groups and

1. Quickly share your imagined event.
2. Once shared, the other students in the group propose actions that could have been taken to precipitate or avoid that event.

You have six (6) minutes to collaborate.

Slide 16: Plot Twisting (3 of 4)

This slide introduces the second future scenario.

Plot Twisting (3 of 4)

2nd future scenario

"In the future, we are fighting with an enemy over 10,000 acres of flat terrain with one strange property: it is completely frictionless, like super-ice. What is the most unexpected but feasible event that could occur?"

You have three (3) minutes to write your response.

Slide 17: Plot Twisting (4 of 4)	
<p>This slide, like slide 15 has the students identifying mitigating strategies to avoid the events.</p>	<p>Plot Twisting (4 of 4)</p> <p>Now break into four (4) person groups and</p> <ol style="list-style-type: none"> 1. Quickly share your imagined event. 2. Once shared, the other students in the group propose actions that could have been taken to precipitate or avoid that event. <p>You have six (6) minutes to collaborate.</p>

- h. **Break!!!** (5 min) Students will take a break now to clear minds of the last activity. It is important that students do not check emails, cell phones or conduct other screen activities. Bathroom or light exercise only.

Slide 18: Break!!!	
<p>This slide gives guidance for the break.</p>	<p>Break!!!</p> <p>Take five (5) minutes for a break. During this break do some light exercise, do not use cell phones, screen time or any electronic devices during this break.</p>

- i. **Role Plotting:** (30 min) Students split into games of 4-on-4, which would require instructors to have two games going on simultaneously for 16 students in a staff group. If you have not had an instructor assisting you up to this point, this exercise may require the assistance of another instructor.

On one side of each game are the Plot Twisters, on the other, the Perspective Takers. The plot twisters take five pre-game minutes to think up unexpected but feasible war scenarios that could occur in the next 10 years. The Perspective Takers take five pre-game minutes to each teach another team member to adopt the other strategic rationale learned back in the Perspective-Plotting exercise. [In other words, If Student A learned to strategize like Student B in the Perspective-Plotting Exercise, Student A will now train Student C to strategize like Student B, further stretching brain muscles.]

Then the teams play against each other for 10 minutes. The members of each team participate in order, so that no student participates more than anyone else. Each round begins when a Plot Twister throws out a scenario, a Perspective Taker responds "in character," the next Plot Twister tries to twist the response in an unexpected direction, the next Perspective taker responds back, and so on. The back-and-forth continues until one group stalls for more than ten seconds, at which point the other team is awarded 1 point and the game starts up again with a fresh scenario.

The teams then swap roles and repeat.

Slide 19: Role Plotting (1 of 4)

This slide introduces the Role Plotting exercise.

Role Plotting (1 of 4)

Split into four x four (4) person teams.
(2 x games, one on one half of classroom, one on the other)

4 person team = Plot Twisters
4 person team = Perspective Takers

Slide 20: Role Plotting (2 of 4)

This slide gives the student teams instructions to prepare for the Role Plotting exercise.

Role Plotting (2 of 4)

Instructions for pre-game preparation:

Plot twisters take five pre-game minutes to think up unexpected but feasible war scenarios that could occur in the next 10 years.

Perspective Takers take their five pre-game minutes to each teach another member of their team to adopt the other strategic rationale learned back in the Perspective-Plotting exercise.

[In other words, If Student A learned to strategize like Student B in the Perspective-Plotting Exercise, Student A will now train Student C to strategize like Student B, further stretching their brain muscles.]

You have five (5) minutes to prepare.

Slide 21:

This slide shows the sequence of the exercise, with two games of teams of 4 on 4.

Role Plotting (3 of 4)

For the next ten (10) minutes:

1. The members of each team participate in order, so that no student participates more than anyone else.
2. Each round begins when a Plot Twister throws out a scenario, a Perspective Taker responds "in character," the next Plot Twister tries to twist the response in an unexpected direction, the next Perspective taker responds back, and so on.
3. The back-and-forth continues until one group stalls for more than ten seconds, at which point the other team is awarded 1 point and the game starts up again with a fresh scenario.

Slide 22: Role Plotting (4 of 4)

This slide directs the students to swap roles and repeat the game for 10 more minutes.

Role Plotting (4 of 4)

Now Teams swap roles and repeat.

Perspective Takers are now Plot Twisters.

Plot Twisters are now Perspective Takers.

Repeat the game for ten (10) minutes.

- j. **Break!!!** (5 min) Students will take a break now to clear minds of the last activity. It is important that students do not check emails, cell phones, or conduct other screen activities. Bathroom or light exercise only.

Slide 23: Break!!!	
This slide gives guidance for the break.	<p>Break!!!</p> <p>Take five (5) minutes for a break. During this break do some light exercise, do not use cell phones, screen time or any electronic devices during this break.</p>

- k. **Creativity Test (5 mins)**. Students write a response to an open-ended challenge question. Use the forms provided to capture student responses. Students who will participate in the study will turn their tests in to the bin located outside the classroom. Students who opt out of participating in the study will throw their one-page solution in the trash at the end of class.

Slide 24: 2nd Creative Thinking Test (post-test)	
Same conditions as the pre-test, this slide shows the prompt for the post test.	<p>Creative Thinking Post-Test</p> <p>Write a response to the following question:</p> <p>"The Army has committed to an all-electric ground combat vehicle fleet by 2040. Describe your concept for the energy resupply system for Large Scale Combat Operations"</p> <p>You have five (5) minutes to write your response.</p>

Slide 25: Debrief/Summary	
This slide depicts the activities in the agenda and give students a chance to provide some immediate feedback to the class.	<p>De-Brief/Summary</p> <p>For the next five (5) minutes: Share your feedback on the training you just received.</p> <p>Creative Thinking Test (5 Min) Introduction (10 Min) Warm-Up (10 Min) Perspective Plotting (20 Min) Break (5 Min) Plot Twisting (20 Min) Break (5 Min) Role Plotting (30 Min) Break (5 Min) Creativity Test (5 Min) Debrief (5 Min)</p>

Slide 26: End of Class Slide	
	<p>Creative Thinking Study C1225</p>

- I. **Assessment Plan:** See Appendix A below for the forms to assess creative thinking to provide data to the study. Student participation in the study is voluntary. The sheets provided are just instructions and pre and posttest with Team and Admin information identified. Instruct the students to not put names or any identifying information on these sheets. Give the students no other information other than the instructions and prompts to complete the tests. Students who participate in the study will place their pre and posttest in the bin located outside the classroom. Students who do not wish to participate will throw their one-page solution into the trash at the end of class. There are no incentives to participate in the study.

APPENDIX I: RESEARCHER RESPONSIBILITIES AGREEMENT

U.S. Army Combined Arms Center Command and General Staff College (CGSC) Researcher Responsibilities Agreement (RRA)

The Office of the Under Secretary of Defense for Personnel and Readiness requires that all research investigators (principal investigators, associate investigators, as well as external investigators) engaged in research with one of its institutions explicitly acknowledge and accept responsibility for protecting the rights and welfare of human research subjects as stated therein.

1. I understand that the rights of the subjects take precedence over the needs of the research and I will protect the rights of human research subjects and will comply with the following: the Belmont Report, 32 CFR 219; 10 USC 980; DoDI 3216.02; where applicable 45 CFR 160 and 164; where applicable 45 CFR 46 (Subparts B, C, and D) under the authority of the DoD; and other Federal, State and local laws as they may relate to proposed human subjects research.
2. I am aware of the Joint Ethics Regulation, DoDI 5500.7-R, specifically areas addressing investigators relationships with sponsoring companies including monies received for research protocols. I understand that financial and other conflicts of interest must be reported to the CGSC Human Protections Director (HPD) and/or the Collaborative Academic Institutional Review Board (CAIRB).
3. I understand that I must have either (a) a written exemption determination from the Human Research Protections Director (HPD), or the Exemption Determination Official (EDO), (b) an approval letter from a DoD IRB, or (c) written DoD concurrence with a nonfederal IRB review prior to initiating any research.
4. I shall promptly report to the approving authority (HPD, EDO or CAIRB) proposed changes in a research activity and shall ensure that such changes in approved research, during the period for which approval has already been given, are not initiated without proper authority review and approval except when necessary to eliminate apparent immediate hazards to the subject.
5. I will ensure that all subjects, or their representatives, are fully informed of the nature of the research to include potential risks to subjects and I will obtain informed consent from each as required.
6. I will maintain study records for 3 years after the study is closed or for 6 years if the study is regulated by the Health Insurance Portability and Accountability Act. I am responsible for submitting a Research Study Closure report to the CGSC HPD.
7. I will respect the privacy of subjects. I shall protect confidential information given to me and advise subjects in advance of any limits upon my ability to ensure that the information will remain confidential.
8. I am aware and will complete the training required (CITI) by the CGSC Human Research Protection Program (HRPP) prior to initiating research.

9. I will report immediately to the approving authority (HPD, EDO, or CAIRB) any unanticipated problems involving risks to subjects or others in research.

With my signature, I acknowledge that I have read and understand the responsibilities stated within and will comply with them. I understand that if I fail to comply with any of these responsibilities, all protocols for which I am an investigator may be suspended.

Investigator Signature Date

Print (First Name) (Middle Initial) (Last Name)

Mailing Address

(City) (State/Province) (Zip/Country)

Phone Number Email Address

(This document may be digitally signed.)

APPENDIX J: STUDENT PARTICIPANT RECRUITMENT EMAIL

My name is Dr. Richard McConnell, and I am a Tactics Professor and part of a team conducting a study examining creative thinking instruction at CGSC, seeking CGSC students to participate in research. You will be given an envelope containing four instruments: an informed consent form, pretest, posttest, and an information sheet. If you wish to participate, please read and sign the informed consent form complete the pretest. Your identity will be completely protected as long as you do not place any self-identifying marks on the consent form or the pre and posttest. There will be an admin number in the upper right-hand corner of the pre and posttest. The same admin number will be on the instruction sheet. Keep the instruction sheet with your admin number if you wish to have documentation linking you to this research. The admin number is necessary for researchers to associate the pre and posttest to one de-identified person.

All study participants will receive the C122 creative thinking legacy lesson, C122. In addition, some study participants will receive the C122S proposed new creative thinking lesson. You will complete the pretest before the C122 class. Your instructor will let you know when to take the post test. Total time commitment should be 10 minutes (5 minutes for the pretest and 5 minutes for the post test). Once you complete the pre and posttest please place the instruments in the bin outside your classroom. There is no financial compensation for participation. This research study has been reviewed and approved by CGSC. Your participation in this study is strictly voluntary.

APPENDIX K: FACULTY PARTICIPANT RECRUITMENT EMAIL

My name is Dr. Richard McConnell, and I am a Tactics Professor and part of a team conducting a study examining creative thinking instruction at CGSC. Our team is seeking CGSC faculty to participate in research to take place during C120. Prior to C120, you will receive consent forms. If you wish to participate, please read and sign the informed consent form and place it in the bin outside your classroom. Your identity will be completely protected as long as you do not place any self-identifying marks on the consent form. Your decision to participate does not automatically enroll your students into the study. Your students may also elect to participate, and this must be done without your influence.

If you choose to participate, your staff group will be randomly assigned to the Control or the Test Group. Your students will also receive a recruitment email with instructions to self-elect to participate. The Control Group will participate in the traditional C120 curriculum. All study participants will receive the C122 creative thinking legacy lesson. The Test Group will also receive the C122S class, a new creative thinking lesson, which will be done in lieu of C123.

You will be asked to complete a questionnaire intended to solicit your perceptions of the creative thinking instruction in which you participated during C120. Please complete the questionnaire and place it in the bin outside your classroom. Questionnaires will be completed after C123 (Control Group) or C122S (Test Group). Total time commitment for the questionnaire will be 10 minutes. There is no financial compensation for participation. This research study has been reviewed and approved by CGSC. Your participation in this study is strictly voluntary.

APPENDIX L: INSTRUMENT PACKET INSTRUCTION SHEET

Greetings:

You are being requested to participate in a mixed methods study to examine potential improvements to creative thinking instruction at CGSC. Please read the enclosed informed consent form which will explain the study to you. If you choose to participate in the study, please print your name and sign the informed consent form. After signing the informed consent form, please complete the pretest out of class. Please bring the informed consent form, your completed pre-test, and the uncompleted post-test with you to C122. Please place the signed consent form along with the pretest in the bin located outside of your classroom. You might notice that all four instruments in your packet have the same admin number. The admin number is also on this information sheet. Please retain this information sheet with the admin number applied for future reference in case you wish to have your data excluded from the study after you have submitted your pre-and posttests. If you wish to have your data excluded just inform your C122 instructor who will inform the principal investigator to complete the exclusion. You will receive detailed instructions from your C122 instructor on when to complete your post test. After completing your post test please place it in the bin outside of your classroom.

APPENDIX M: C122 (CONTROL) FACULTY TO STUDENT INSTRUCTION SCRIPT (TO BE READ AT THE BEGINNING OF C122).

At the conclusion of C121 you were provided an envelope containing four instruments. You were provided an informed consent form, pre-and posttest, and an instruction sheet. You were instructed to read the informed consent form, decide if you wished to participate, and then sign the informed consent form if you wish to participate. If you signed the informed consent form, you should have completed the pretest. You should have put the completed informed consent form and pretest in the bin outside our classroom. If you completed those actions, then you should still have a posttest to complete. At the end of C122, you will complete the posttest and place it in the bin outside the classroom. Remember that participation is voluntary, your identities will be protected, and you may withdraw from the study at any time without penalty.

APPENDIX N: C122S (TEST) FACULTY TO STUDENT INSTRUCTION SCRIPT (TO BE READ AT THE BEGINNING OF C122S)

At the conclusion of C121 you were provided an envelope containing four instruments. You were provided an informed consent form, pre-and posttest, and an instruction sheet. You were instructed to read the informed consent form, decide if you wished to participate, and then sign the informed consent form if you wish to participate. If you signed the informed consent form, you should have completed the pretest. You should have put the completed informed consent form and pretest in the bin outside our classroom. If you completed those actions, then you should still have a posttest to complete. At the end of C122S, you will complete the posttest and place it in the bin outside the classroom. Remember that participation is voluntary, your identities will be protected, and you may withdraw from the study at any time without penalty.

APPENDIX O: STUDENT PRE AND POST TEST SAMPLES

0095

Pre-Test Prompt

CGSC C122 Creativity Research Project: Pre-Test

Instructions: Please read the prompt, and take 5 minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than 1 minute to respond to the 4 statements on the Likert scale at the bottom. Thank you!

Prompt: In 5 minutes, on a blank sheet of paper provided, describe the ideal qualities of an artificial intelligence robot that would act as your trusted intelligent advisor, and how you would use it to support your decision making if you were assured that it actually had those qualities. Also describe any risk mitigation you would use to protect against surprise, bad advice or a situation where it might inadvertently give bad advice.

That important is to have precise information answering to my priority information requirements.

Accuracy. I always need to know the status of my forces. Any significant changes (losses) I need to know ASAP.

That would be advantage having the virtual, digital picture of ENT picture of the desk saving lot of the personnel (intel info).

I need to have the clone of me on the commander.

I need to be in few more places on the same time.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
In YOUR military decision-making process:	1	2	3	4	5
Creativity is important to me					X
Creativity is important to the Army				X	
I am satisfied with my current level of skill					X
I am confident in using my creativity on military missions					X

0095

Post-Test Prompt

CGSC C122 Creativity Research Project: Post-Test

Instructions: Please read the prompt, and take five minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than one minute to respond to the four statements on the Likert scale at the bottom. Thank you!

Prompt: The Army has committed to an all electric ground combat vehicle fleet by 2040. Describe your concept for the energy resupply system for Large Scale Combat Operations

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
In YOUR military decision-making process:	1	2	3	4	5
Creativity is important to me				X	
Creativity is important to the Army				X	
I am satisfied with my current level of skill					X
I am confident in using my creativity on military missions					X

Admin #	Pretest			Posttest		
	Novelty	Suitability	Feasibility	Novelty	Suitability	Feasibility
0095	4.3	3.7	3.7	5.7	4.3	4.0

Pre-Test Prompt
3966

CGSC C122 Creativity Research Project: Pre-Test

Instructions: Please read the prompt, and take 5 minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than 1 minute to respond to the 4 statements on the Likert scale at the bottom. Thank you!

Prompt: In 5 minutes, on a blank sheet of paper provided, describe the ideal qualities of an artificial intelligence robot that would act as your trusted intelligent advisor, and how you would use it to support your decision making if you were assured that it actually had those qualities. Also describe any risk mitigation you would use to protect against surprise, bad advice or a situation where it might inadvertently give bad advice.

AI NEEDS

ANALYZE
RECOGNIZE STATISTICAL PATTERNS
HIGHLIGHT TRENDS

I, EITHER DUE TO A FEAR OF ROBOTS FROM MOVIES OR THE SUICIDE BOMBER DRONES, DO NOT WANT AI TO BE A CREATIVE THINKER AT ALL. I WANT IT TO SIMPLY PROVIDE ME QUICK STATISTICS, ANALYZES WHEREBY I CAN THEN USE ITS DATA & ANALYSIS TO SUPPORT MY DECISION MAKING. BEING THAT HUMANS PROGRAM THE AI, I HAVE A HARD TIME BELIEVING THAT THE COMPUTER WOULD ~~BEING~~ SURPRISE ME.

DID THIS CLASS FYI.

Please take 1 minute to describe your level of agreement with these "gut check" statements	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
In YOUR military decision-making process:	1	2	3	4	5	6	7
Creativity is important to me							
Creativity is important to the Army							
I am satisfied with my current level of skill							
I am confident in using my creativity on military missions							

Post-Test Prompt
3966

CGSC C122 Creativity Research Project: Post-Test

Instructions: Please read the prompt, and take five minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than one minute to respond to the four statements on the Likert scale at the bottom. Thank you!

Prompt: The Army has committed to an all-electric ground combat vehicle fleet by 2040. Describe your concept for the energy resupply system for Large Scale Combat Operations

Please take 1 minute to describe your level of agreement with these "gut check" statements	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
In YOUR military decision-making process:	1	2	3	4	5	6	7
Creativity is important to me							
Creativity is important to the Army							
I am satisfied with my current level of skill							
I am confident in using my creativity on military missions							

Admin #	Pretest			Posttest		
	Novelty	Suitability	Feasibility	Novelty	Suitability	Feasibility
3966	4.3	3.7	4.0	6.7	5.0	4.3

Pre-Test Prompt
7833

CGSC C122 Creativity Research Project: Pre-Test

Instructions: Please read the prompt, and take 5 minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than 1 minute to respond to the 4 statements on the Likert scale at the bottom. Thank you!

Prompt: In 5 minutes, on a blank sheet of paper provided, describe the ideal qualities of an artificial intelligence robot that would act as your trusted intelligent advisor, and how you would use it to support your decision making if you were assured that it actually had those qualities. Also describe any risk mitigation you would use to protect against surprise, bad advice or a situation where it might inadvertently give bad advice.

Speaks/understands English
-uses data/analyzes to solve problems
-can cook a mean omelette
-has a dictionary/Encyclopedia of knowledge for doing questions

Risk mitigation: ask a friend/colleague for a counter opinion
-start w/ small decisions & work our way to larger / more responses slowly

Please take 1 minute to describe your level of agreement with these "gut check" statements	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
In YOUR military decision-making process:	1	2	3	4	5	6	7
Creativity is important to me							
Creativity is important to the Army							
I am satisfied with my current level of skill							
I am confident in using my creativity on military missions							

Post-Test Prompt
7833

CGSC C122 Creativity Research Project: Post-Test

Instructions: Please read the prompt, and take five minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than one minute to respond to the four statements on the Likert scale at the bottom. Thank you!

Prompt: The Army has committed to an all-electric ground combat vehicle fleet by 2040. Describe your concept for the energy resupply system for Large Scale Combat Operations

wireless recharging via direct satellite/radio waves.

or

satellite Lasers used to recharge vehicles from space

Battery Replacement/Drops → quickly change out batteries

Please take 1 minute to describe your level of agreement with these "gut check" statements	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
In YOUR military decision-making process:	1	2	3	4	5	6	7
Creativity is important to me							
Creativity is important to the Army							
I am satisfied with my current level of skill							
I am confident in using my creativity on military missions							

Admin #	Pretest			Posttest		
	Novelty	Suitability	Feasibility	Novelty	Suitability	Feasibility
7833	5.0	4.0	4.3	6.0	5.0	4.0

Pre-Test Prompt

CGSC C122 Creativity Research Project: Pre-Test

Instructions: Please read the prompt, and take 5 minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than 1 minute to respond to the 4 statements on the Likert scale at the bottom. Thank you!

Prompt: In 5 minutes, on a blank sheet of paper provided, describe the ideal qualities of an artificial intelligence robot that would act as your trusted intelligent advisor, and how you would use it to support your decision making if you were assured that it actually had those qualities. Also describe any risk mitigation you would use to protect against surprise, bad advice or a situation where it might inadvertently give bad advice.

OUTPUT: COAS to Decide on w/ Pros/Cons etc.

Please take 1 minute to describe your level of agreement with these "gut check" statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
In VUCA military decision-making processes:					
Creativity is important to me					
Creativity is important to the Army					
I am satisfied with my current level of skill					
I am confident in using my creativity on military decisions					

Post-Test Prompt

CGSC C122 Creativity Research Project: Post-Test

Instructions: Please read the prompt, and take five minutes to describe your response, with your choice of a mix of text and/or sketch. Then please take not more than one minute to respond to the four statements on the Likert scale at the bottom. Thank you!

Prompt: The Army has committed to an all-electric ground combat vehicle fleet by 2040. Describe your concept for the energy resupply system for Large Scale Combat Operations

SATELLITES

1. Geosynchronous orbit over anticipated conflict Areas
2. GPS Controlled
3. Space Vehicles on board packed with re-supply.
4. High-speed/Hypersonic delivery capability
5. Delivered by communicating through AF's JAD 22 capability
6. Space force manages Delivery, restocking & overall systems in Space.

* All Logisticians move to Space Force!

Please take 1 minute to describe your level of agreement with these "gut check" statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
In VUCA military decision-making processes:					
Creativity is important to me					
Creativity is important to the Army					
I am satisfied with my current level of skill					
I am confident in using my creativity on military decisions					

Admin #	Pretest			Posttest		
	Novelty	Suitability	Feasibility	Novelty	Suitability	Feasibility
9562	5.3	5.0	4.7	6.7	6.0	5.7