Peer Reviewed

Teaching Creative Problem-Solving

Tactics, Techniques, and Procedures

Todd T. Holm
Expeditionary Warfare School, Marine Corps University

Abstract

In 2016, U.S. Marine Corps commandant Gen. Robert Neller called for disruptive thinkers to change the Marine Corps, to keep it relevant, and to give it an edge on the battlefield (Bacon, 2016). He lamented that creative thinkers get frustrated in a large and bureaucratic organization like the U.S. military, and that they leave because of that frustration. While that may be true, this call for disruptive thinkers operates from the position that some people are creative problem solvers and others are not. It may be true that some people are naturally better at seeing new solutions to problems, but that does not mean the average person cannot be taught to be more creative. This article explores four specific tactics that empirical research suggests leaders and educators in the military can use to promote creative problem-solving in their units.

Creativity and the military don't seem like a logical pairing. The military bases itself on rules, conformity, a command structure, and bureaucracy (Vego, 2013). Mitchell and Cahill (2005) found that U.S. Naval Academy plebes who completed a seven-week nonacademic program not only scored lower on the Kirton Adaption-Innovation Inventory than undergraduates from nonmilitary schools, but the 98 academy plebes who dropped out scored higher on that assessment than those who stayed. Those differences would seem to be concrete proof that military education, as it is delivered today, is not suited to fostering creative and innovative thinkers. Instead, it may actually drum the creativity out of the service member very early in the education continuum. At the same time, military success depends on creative problem solvers and innovators. It is incumbent upon leaders and educators in the professional military education (PME) continuum to foster an environment where innovative thinkers can thrive. To achieve that end state, leaders and educators must also teach students and subordinates practical techniques and tactics to help them

become more creative thinkers and better at creative problem-solving. Creativity is part of the *art* of warfare, and Vego (2013) tells us, "A creative intellect allows commanders to surprise enemy counterparts and thus render them impotent" (p. 84). While several articles have been written about the need for critical and creative thinkers (Andre, 2017; Bialos, 2017; Bryant & Henderson, 2019; Ewy, 2018; Furtado, 2017; Murray, 1996/2003; Wong & Gerras, 2013), few focus on how to teach and foster creativity. This article provides four pragmatic approaches that draw from empirical research to teach and foster creative thinkers, which can be used by educators and leaders across the PME continuum.

Box, Box Adjacent, and Outside-the-Box Thinking

Before people can think outside the box, they need to understand the box. A key component of creative thinking is domain knowledge. Domain knowledge is what makes a person a subject-matter expert; it is "a well from which ideas are drawn" (Cropley, 2006, p. 395). A logistician can design a new type of container for transporting bundles of goods, but unless they also understand the types of materials, delivery routes, delivery vehicles, and a dozen other critical aspects of getting supplies from point A to point B, they are unlikely to develop a creative solution that will actually work. Learning the box is important. There is a particular body of information a person must master to be an expert in a field. It includes everything from terminology to modality variations. During the industrial revolution, a leader or a manager was expected to know *the one best way* for work to be conducted. This meant managers took all the information they could find and determined the best equipment, people, materials, and processes to complete a task with the greatest efficiency. This process is called convergent thinking. Convergent thinking is "deriving the single best (or correct) answer to a clearly defined question. It emphasizes speed, accuracy, logic, and the like and focuses on recognizing the familiar, reapplying set techniques, and accumulating information" (Cropley, 2006, p. 391). Convergent thinking is taking all the information available and coming up with *the* answer.

Creative problem-solving focuses more on divergent thinking. Divergent thinking is when a person takes all the available information and looks for all the possibilities, whether they are efficient, reasonable, achievable, or not.

Todd T. Holm is a professor at Marine Corps University. He received his PhD in instructional and organizational communication from Ohio University. He is currently in charge of the Professional Communication program at Expeditionary Warfare School on Marine Corps Base Quantico. Prior to joining Marine Corps University, he spent 25 years as a college speech and debate coach coaching dozens of national champions.

Divergent thinking is an important measurable component of creativity" (Moore et al., 2009, p. 267). However, even back in 1967, Guilford clearly stated divergent thinking is not equal to creativity. Both convergent and divergent thought require a level of mastery of domain knowledge. Marine Corps Doctrinal Publication 1, *Warfighting* (U.S. Marine Corps, 1991), establishes the need for domain knowledge to generate creative solutions when it says, "The art of war requires the intuitive ability to grasp the essence of a unique military situation and the creative ability to devise a practical solution" (p. 18). Before someone can think outside the box, they need to understand what is in the box.

Divergent thinking and creative thinking are terms that are similar in use, but they are not identical. Divergent thinking could be considered a required subset of creative problem-solving. When Ludwig von Bertalanffy, a theoretical biologist, developed general systems theory, he had only biological entities in mind. He took everything he knew about biological organisms and developed this theory to explain the operation of those organisms. That was convergent thinking. However, people outside his discipline became aware of his theory and realized it could also be applied to fields like business, education, psychology, and sociology. Cross-application to other fields of study is only possible if people with domain knowledge in a specific field seek theoretical tools and approaches from other areas to provide fresh insight to their own domains. To ask intelligent questions about a domain that lead to creative solutions, a person must first understand the domain. Then, they can capitalize on ideas outside the domain to give new and innovative approaches. To do this, they must shift from convergent thinking to divergent thinking.

Creative Solutions

For something to be considered creative, it must be original, appropriate, useful, and actionable (Amabile, 1998). Originality, however, is difficult to define. Man did not invent fire (lightning strikes or volcanoes probably did), but man did invent original ways to start fires. Everything from rubbing sticks together to modern lighters that use lasers represents a creative new way to start fires. Someone probably did invent the wheel. It was an idea no doubt derived by noticing the mechanical advantage of a log rolling. But the wheel was improved upon by creative thinkers. Their ideas are derivative of the original design but still original to some extent. The gear is derivative of the wheel, but most would consider it original. Adding a coffee maker to a car would be original; at least it was in 1959 when Volkswagen offered it as an option in the Beetle (Fernandez, 2021). Even though the car and the coffee maker were both existing inventions, it is considered original. Originality can take many forms, from something never conceived to a new use for existing items. Creativity, originality, and divergent thinking are very closely related.

While some people might have a natural propensity for creative thought, all people can be taught to be more creative. There is an abundant body of literature on leadership. One of the perennial questions about leaders is whether people are born great leaders or if situations create great leaders. Countless college essays have been written trying to answer that question. A similar question exists about creativity. Some believe that while certain people have a natural aptitude for leadership, leadership can also be formulaic and, therefore, teachable. However, while leadership classes are widely accepted, attempts to teach creative problem-solving are met with resistance. "Unfortunately, even though creativity is crucial to business and management success, higher education generally does not devote sufficient attention to it" (Lewis & Elaver, 2014, p. 236). The PME continuum can fill that gap by teaching/encouraging service members to be creative, find creative solutions, and take risks.

Risky Business

Creative solutions come with an inherent amount of risk. By their very nature, creative solutions have not been tried before (at least not in this specific context) which means they have not been proven successful, and they could fail. Creative thinkers must be risk takers. But there is also risk for those who lead the creative thinkers. A college senior named Dick Fosbury revolutionized the high jump in track and field competitions by trying a unique approach that could have made him look foolish. For three years his coaches convinced him to stick with the traditional straddle jump approach where the jumper ran up to the bar and threw themselves over by first throwing the right leg over the bar, then briefly straddling the bar in midair before bringing the left leg over. Fosbury wanted to try a different approach. It was not "new," but it was rarely used. His senior year, he came out strong using what eventually became known as the Fosbury flop. Fosbury ran up to the bar, turned his back to the bar, and went over it back first, pulling his legs over the bar, and landing on the foam on his back (Minshull, 2018). The Fosbury flop could have been a colossal flop. Because he and his coaches were willing to take the risk, Fosbury was able to take the gold in the 1968 Olympics and set a world record. Within 10 years, all Olympic high jumpers were using Fosbury's approach (Minshull, 2018).

Creative solutions aren't just risky for the person who proposes them; they are also risky for the people who approve them. Most people answer to someone at some point, and someone must be willing to take the risk of trying something new and untested. Whether that is the Fosbury flop, vertical envelopment, or drone swarms, there are risks, and someone must be willing to accept those risks. Leaders of creative thinkers often want the security of a time-tested and proven solution and are not willing to risk failure with a new *creative* approach. Shapira (1995) claims an organization's disposition toward risk tremendously influences members' creative actions and innovation.

Getting creative solutions requires accepting risk as part of the total package. Because of this, a zero-defect mentality is the enemy of creative problem solvers.

Leading Creative Thinkers

Creativity must be cultivated so it is available when needed. Leaders of creative thinkers must actively seek out ways to foster creative thought. Leaders need to welcome creative inputs by providing opportunities for creative thinkers to exercise that ability. Leaders must encourage creativity by acknowledging the ideas and not criticizing them even if they aren't the perfect solution. Criticism and even evaluation of creative solutions in the developmental stages can shut down lines of inquiry and idea progressions. Finally, leaders must reward creative thinkers. While it would be nice to be able to throw cash, cars, and prizes at them, unfortunately, that is not how the military works. However, the rewards for creative solutions (even those that do not come to fruition) can be far simpler and more personal. Acknowledging the effort, recognizing the creativity, and publicly praising the idea will go a long way toward fostering an environment where people feel able to flex their creative capabilities.

Some studies suggest that humans are born creative, but eventually, they have it drummed out of them. Land and Jarman (1992), in their book *Breakpoint and Beyond*, report the findings of "divergent creative thinking" (p. 153) tests given to 1,600 children in Head Start programs. They found that 98% of Head Start children scored in the genius category (for divergent/creative thinkers). When these same students were retested five years later, that number had dropped to 32%. Another five years later and only 10% tested at the genius level. When the same tests were given to 200,000 adults over the age of 25, only 2% scored at the genius level (Land & Jarman, 1992). Years of schooling focused on convergent thinking and trying to find the one right answer encourages students to default to convergent thinking. Military members toil under an even heavier load. "The main obstacles to military creativity are posed by the military's inherent hierarchical command structure—an authoritarian, bureaucratized system—and its thinking" (Vego, 2013, p. 84). For members of the military to be creative thinkers, they need to persist through years of formal education focused on convergent thinking and years in an organization filled with obstacles for creative thinkers. This is why Gen. Neller observed, "Most people with good ideas are annoying because they are frustrated … They get frustrated, they get tired of beating their head against the wall. [They say] 'You guys won't listen to me, I'm outta here. I'm going to go to college and make a million bucks.' And they do" (Bacon, 2016).

The good news is, if training causes the proclivity for convergent thinking, it is reasonable to assume that training can help regain divergent/creative thinking abilities. "Generativity Theory suggests, among other things, that creative potential in

individuals is universal and perhaps limitless" (Epstein et al., 2008, p. 7). Cultivating creativity is a continuous process. A person cannot just get people to be creative once and then claim to have established a creative culture. Creativity needs to be integrated into the organization and continually cultivated. All branches of the U.S. military offer essay contests that focus on finding creative or innovative solutions to existing problems. These are institutional signs that creativity is valued. Less formal competition can also promote creativity within a person's command. Holiday door decorating contests are not only good for morale, but they also get creative juices flowing and publicly recognize creativity. Getting creative with fitness is another way to foster creativity, as are chili cook-offs, cupcake contests, Rube Goldberg machines, and unit T-shirt design contests. Competitions like these encourage and reward creative thinkers. To cultivate a culture of creative thinking, leaders must make creative thinking an active part of what their unit does regularly.

Teaching Creative Problem-Solving

Some argue creativity and innovativeness cannot be taught (Gow, 2014). Maybe creativity cannot be taught the way mathematics or chemistry is taught, but educators can develop lessons and assignments that promote creativity. Some researchers have gone so far as to say, "creativity training should be part of the critical thinking skills" (Schlee & Harich, 2014, p. 134). Creativity is not a linear progression of thoughts that can be prescribed in a formula, but it is teachable. "As long as we cleave only to traditional pedagogies and courses of study that leave little or no room for new experiences, we will not find the time or space necessary for nurturing the act of creativity" (Livingston, 2010, p. 59). Traditional pedagogies tend to assess convergent thinking. If PME instructors are going to promote creative and divergent thought, they cannot continue teaching via lecture and assessing by looking for the one right answer.

Many have talked about creativity like it was a light within people that just needs to be let out. To some extent, that metaphor holds. Educators and leaders should have the tools to give students and subordinates tips, techniques, and procedures to develop creative solutions. Gregory et al. (2013) clearly state, "Creative thinking can and should be taught" (p. 43). However, the pragmatic means by which instructors and leaders teach people tactics to employ to be creative thinkers are rarely discussed. Here are four specific approaches to helping people become creative problem solvers.

Failure Fixation

It is easy to get locked into one approach to solving a problem, even if it has repeatedly proven unsuccessful. This is sometimes referred to as the *sunk cost fallacy*. People

will keep trying to fix, tweak, and modify a system when they should just throw it out and start fresh. There is an urban myth that perfectly illustrates this problem. As the story goes, NASA spent a decade and millions of taxpayer dollars developing a pen that would write in the weightless vacuum of space. The Russian space program solved the same problem by using a pencil (Reuters Fact Check, 2021). The story is not true, but it perfectly demonstrates how people can reasonably lock into one approach and be blind to other options. As a sidebar: a pen to write in space (and underwater and at extreme temperatures) was developed by the Fisher Pen Company in the 1960s, it was not funded by the government, and it was used by both U.S. and Soviet astronauts (Reuters Fact Check, 2021).

Today's militaries are in a technological arms race that allows for near-constant sensing and surveilling, but not everyone is quick to jump on the "big brother"-like technological trend. Many have concerns about safety and misuse. However, law enforcement jumped on the technology and crowdsourcing bandwagon with great success. Following the Boston Marathon bombing in 2013, the FBI crowdsourced the search through thousands of photos and videos of the event to track down the perpetrators. Currently, the New York Police Department is crowdsourcing the policing of people who break their "idling laws." New York City has a problem with vehicles idling and causing air pollution, so it passed a law saying vehicles could not sit and idle for more than three minutes. Unfortunately, policing that law was time intensive, so they developed a program where civilians could video record a vehicle idling for more than three minutes and post it to a city web site. If the vehicle is ticketed, then the person who turned them in would get 25% of the ticket cost, which was usually between $87.50 and $500 (Palmer, 2019). The program was so successful the city is trying a similar program for parking problems (Rahmanan, 2022). The takeaway is the New York Police Department didn't fixate on a lack of officers to police every idling vehicle; they found a new and creative approach.

Our world is constantly changing, facing new challenges, and finding new solutions. One of the greatest problems facing this generation is finding environmentally friendly power generation and storage. The world is dependent on electricity; consequently, the generation and storage of electrical energy are of paramount concern. Electricity is generated by coal plants, nuclear plants, petroleum plants, solar panels, wind farms, and hydroelectric dams (and others). Recently, the ability to store electricity has become even more important to us. Solar and wind generators are dependent on the weather. Nuclear and coal plants can produce around the clock, but each has its own environmental impact. Scientists are seeking ways to store the energy produced during peaks for use during production lows. Perhaps the most common method of storing electrical energy is by converting it to the chemical energy stored in common batteries comprised of environmentally harmful heavy metals like nickel, manganese, and cobalt. But recently, scientists started to look at more basic ways of storing energy. Pumped hydroelectric energy storage

is based on the gravitational potential energy of water to generate power (Office of Energy Efficiency & Renewable Energy, n.d.). When solar panels or wind generators produce more energy than needed, the surplus energy is used to pump water from a lower elevation to a higher one. Then, when needed, the water is released to produce hydroelectric power. Essentially, a lake or reservoir becomes a battery. If scientists continued to only look for ways to make batteries that are dependent on chemical storage, they never would have found this more environmentally friendly battery. Rather than becoming fixated on one way to store energy, they looked for something completely new.

Perspective Shifting

Seeing issues from another person's perspective is helpful in solving interpersonal problems, but shifting perspective is also an excellent way to find creative solutions to problems. Looking at a problem from a different perspective can yield insights and approaches that would not otherwise be considered. Finding creative solutions often requires input from multiple perspectives and an open discussion about those ways of seeing the situation. That is one of the reasons diversity is beneficial in problem-solving groups (Reynolds & Lewis, 2017).

There are obvious weaknesses and problems associated with bringing together a group of people from diverse backgrounds to work on a problem. There will be conflicts about how to approach the problem, what a successful solution entails, and how the group should proceed. Therefore, it makes sense to bring together like-minded people to solve problems. Not surprisingly, like-minded groups are not as successful at problem-solving because they tend to see the problem similarly (Scheible, 2017). More specifically, Hemlin et al. (2008) found "groups including members from different cultural or disciplinary backgrounds tend to be more creative than those whose members share a more homogeneous background" (p. 205). Seeing a problem from multiple perspectives is a real asset when a group is trying to find a new and creative solution.

Shifting perspectives is similar to using analogies or metaphors to see problems from a new perspective. Businesses "often participate in workshops that enhance the metaphorical or analogical thinking of their employees" (Schlee & Harich, 2014, p. 135). These exercises promote creative problem-solving by taking new perspectives. For example, if a group was looking for a better way to insulate against cold weather or winds, they might look closely at the flora and fauna of the area to see how it has evolved to thrive in the harsh environment. Birds provide insight into nature's best insulating practices. A bird has outer feathers that are rigid and create a solid barrier between the animal's body and the harsh climate. Between the outer feathers and their skin is a layer of lighter "fluffier" feathers that

create pockets of air. These air pockets prevent the transfer of heat away from the body. Builders in harsh climates have learned if the north side of a building is a solid barrier (no windows or door and wrapped in construction wrap) and a storage room of "dead air" is created inside the building, the heat stays in, and cold stays out. Using the feathering of a bird as an analogy for building construction results in a more energy-efficient building.

For military problem solvers in the twenty-first century, the solution to most problems is often a new technology, which has quickly led to technology dependence. When technology stops working, people are often left staring blankly at a nonfunctioning piece of tech, trying to figure out how to get a different piece of tech to do what the first one did. When operating in an antiaccess/area denial situation, it can be helpful to shift perspectives by thinking about how George Washington would have handled the problem. Wars were waged long before modern technology changed the face of war. Antiaccess/area denial threatens to send troops back to those earlier days in some regards. Unless warriors are prepared for those situations they will be at a disadvantage.

But many of these problems cannot be solved by an in-stride battlefield change. If satellite navigation is disrupted, the solution is not to just say, "We will navigate by the stars the way Magellan did." While the approach is valid, it will not work unless someone in the group has been trained in celestial navigation. That is one of the reasons the U.S. Naval Academy reinstated briefing lessons on celestial navigation in 2015 (Prudente, 2015). Chance favors the prepared mind. Being able to see problems through the lens of Washington does little good if the skills Washington and his contemporaries used have been lost to the ages.

Channeling your inner Washington or your inner Genghis Khan is only helpful if you have a solid understanding of how they operated, lived, and thought. Avid students of history have many iconic leaders from whom to choose when they get ready to see things from a new (old) perspective. Fortunately, you don't need to be a history scholar to use the technique. The key is to see the problem from a new perspective or with a fresh outlook, thereby seeing new solutions. An old idea in a new situation can be just the creative solution needed.

Repurposing Assets

The character MacGyver was the king of repurposed assets. With duct tape, a paperclip, and some innocuous third item, he could pick a lock, make a hang glider, disrupt satellite communication, or create a bomb. His particular genius was a combination of elemental thinking and repurposing assets. While his repurposing was clever, creative, and even funny, repurposing assets in times of war can be very serious business. While improvised explosive devices might not be thought of as

repurposed assets, that is exactly what they are. Multiple acts of domestic terrorism have been committed with repurposed fertilizer. Automobiles have become explosive delivery devices. Improvised explosive devices became the leading cause of U.S. casualties in Operations Iraqi Freedom and Enduring Freedom (Niedziocha, 2013). Asymmetric warfare leads forces to use what they have as what they need. That is the essence of repurposing assets as a creative problem-solving technique.

Asymmetric warfare is rife with examples of the smaller forces finding unconventional and creative ways of disrupting and sabotaging large enemy forces. During World War II, the French Resistance used explosives to damage bridges and railroads in occupied territories. But explosives were hard to come by even though the Allied forces airdropped tons of explosives to the Resistance. Eventually, the French started making their own explosives in secret laboratories in apartments and homes. Ultimately, they realized removing the bolts from the tracks of the railroads on a bridge was just as effective as dynamiting the bridge. They had wrenches used in construction and repair shops. They simply repurposed them as tools of war.

Most martial arts weapons were originally farm implements. In the 1400s, Okinawa's three warring parties were united into the Ryuku Kingdom, and King Shō Shin passed a law forbidding Okinawans from possessing weapons. The Mountain Academy of Martial Arts (2021) website explains that the Kama was originally a scythe-like tool used for harvesting grains and rice, and the tofu was either a weapon disguised as the crank handle on a grindstone, or the crank handle on a grindstone was turned into a weapon. These are just small examples of turning what is available into what is needed.

Delta Course of Action

In the PME environment, it is not uncommon for instructors to pose a problem to a group and ask for three courses of action (COA) to resolve it. These are often referred to as Alpha COA, Bravo COA, and Charlie COA. One idea is to simply ask for a fourth COA, Delta COA. Delta COA is the expressed creative problem-solving COA. It should feature a creative or risky approach that could conceivably solve the problem. It needs to solve the problem (or perhaps reframe the problem) through unconventional means. The Delta COA assumes that the first three COAs failed or were not possible. This approach codifies and normalizes creative problem-solving.

The idea of a Delta COA helps institutionalize creative problem-solving. It makes creative problem-solving a well-traveled path when seeking solutions. This is instrumental to success in creative problem-solving because the institutional environment plays an important role in shaping creative activities (Ford, 1996). As

Vego (2013) points out, a significant problem with introducing creative thinking in the military is that military thinking "is exemplified by conformity, groupthink, parochialism, dogmatism, intolerance, and anti-intellectualism" (p. 84). Institutions, including schools and the military, have pushed convergent thinking and slowly eroded the propensity for divergent thinking, and the result is it slowly disenfranchised the creative thinkers. It will take more than a couple of attempts to bring forth creativity regularly. To make creative problem-solving a readily accessible skill, it must be something people engage in on a regular basis.

Creativity needs to be habitual. Ford (1996) summarizes the works of many researchers and concludes that even very creative people tend to fall back on uncreative solutions in an organization that does not foster creative thinking. "These common frames of habitual thought and action narrow the range of likely behaviors an organization member will enact in familiar organizational settings" (Ford, 1996, p. 1116). Therefore, leaders and educators must seek out and enact ways to make creative problem-solving habitual. Making a habit of asking for the Delta COA is just one way of accomplishing that.

The Role of the Leader/Educator

Everyone has the ability to contribute innovative and creative solutions to problems. A combination of habit and institutional dogmatism has caused many to lose touch with their creative abilities. Therefore, it is part of the responsibility of leaders and educators to help them find their creative problem-solving skill set and drag it into the light of day where it can be used to *render our enemies impotent*. There are things educators and leaders can do to promote and foster creative problem-solving.

Suspend Judgment

Being armed with four tactical-level techniques for generating creative problem-solving ideas is only part of the solution. Those ideas must be curated and allowed to become full-fledged solutions. This requires patience, support, and good leadership. Assuming a leader has created an environment where creative thinking is welcome and even expected by employing the techniques described here, and that in doing so they have people coming forward with some outside-the-box ideas, it is incumbent upon the leader to help those ideas become a reality.

It is easy to find reasons something will not work. It might even be seen as a good way to save time and energy by rejecting ideas early in the process. But during a brainstorming session, judging the quality, validity, or even the preferability of the ideas is a surefire way to shut down idea generation and avenues of discovery. It is crucial for

leaders to withhold judgment until the group has reached a natural stopping point in the brainstorming process. Only then should ideas be evaluated. This also allows ideas to branch into new ideas and generate even more possible solutions. Any blunt instrument can smash an idea, but there is an art to turning ideas into working solutions.

The Way Ahead

The ideas and approaches presented here are tools educators across the PME continuum can use to teach and foster creativity. The next logical step would be for researchers to assess the efficacy of these techniques through empirical research. Researchers could use a classic instrument like the Torrance Test of Creative Thinking (Torrance, 1974) to test students at the end of the training cycle to get pretest data. Then, in the next training cycle, instructors could implement one or more of these techniques throughout the training cycle and administer the Torrance Test to this posttest group. Comparing the pretest and posttest results of the two groups should determine the efficacy of the instructional techniques. The variable would need to be more than a one-off exercise because creativity needs to be fostered over time. Adapting these techniques to a block of training should be relatively easy.

Conclusion

Creative problem-solving is essential to the profession of arms. "The art of war requires the intuitive ability to grasp the essence of a unique military situation and the creative ability to devise a practical solution" (U.S. Marine Corps, 1991, p. 18). While Vego (2013) argues there are many factors working against being creative in the military (authoritarianism, dogmatism, hierarchy, etc.), it is imperative that officers and noncommissioned officers be autonomous, free thinkers who can tap into their creative abilities to solve problems. Therefore, it is the responsibility of educators and leaders alike to provide opportunities for the men and women of the military to flex the might of their creative minds. The PME system is an ideal place to begin fostering creative problem solvers. The four simple techniques explained in this article are just a few of the many ways to promote and foster creative thinkers.

References

Amabile, T. M. (1998). How to kill creativity. *Harvard Business Review*, *76*(5), 76–87.

Andre, D. M. (2017). Embracing creativity: A Navy leadership challenge. *The Maritime Executive*. https://maritime-executive.com/editorials/embracing-creativity-a-navy-leadership-challenge

Bacon, L. M. (2016). Commandant looks to "disruptive thinkers" to fix Corps' problems. *Marine Corps Times*. https://www.marinecorpstimes.com/news/your-marine-corps/2016/03/04/commandant-looks-to-disruptive-thinkers-to-fix-corps-problems/

Bialos, J. P. (2017). *Against the odds: Driving defense innovation in a change-resistant ecosystem*. Center for Transatlantic Relations.

Bryant, S. F., & Henderson, A. (2019). *Finding Ender: Exploring the intersections of creativity, innovation, and talent management in the U.S. Armed Forces* (Strategic Perspectives 31). Institute for National Strategic Studies.

Cropley, A. (2006). In praise of convergent thinking. *Creativity Research Journal, 18*(3), 391–404. https://doi.org/10.1207/s15326934crj1803_13

Epstein, R. R., Schmidt, S. M., & Warfel, R. (2008). Measuring and training creativity competencies: Validation of a new test. *Creativity Research Journal*, *20*(1), 7–12. https://doi.org/10.1080/10400410701839876

Ewy, M. E. (2018). *Military personnel as innovators: An unrealistic expectation?* (Maxwell Paper No. 74). Air University Press.

Fernandez, D. S. (2021, January 23). *Volkswagen Beetle 1959 came with this coffee machine option*. Drive Safe & Fast. https://www.dsf.my/2021/01/volkswagen-beetle-1959-came-with-this-coffee-machine-option/

Ford, C. M. (1996). A theory of creative action in multiple social domains. *Academy of Management Review, 21*(4), 1112–1142. https://doi.org/10.5465/amr.1996.9704071865

Furtado, M. F. (2017). *Creativity in complex military systems*. U.S. Army Command and General Staff College. https://apps.dtic.mil/sti/pdfs/AD1038989.pdf

Gow, G. (2014). Can creativity really be taught? *Tech Directions*, *73*(6), 12.

Gregory, E., Hardiman, M., Yarmolinskaya, J., Rinne, L., & Limb, C. (2013). Building creative thinking in the classroom: From research to practice. *International Journal of Educational Research*, *62*, 43–50. https://doi.org/10.1016/j.ijer.2013.06.003

Guilford, J. (1967). Creativity: Yesterday, today, and tomorrow. *Journal of Creative Behavior, 1*, 3–14.

Hemlin, S., Allwood, C. M., & Martin, B. R. (2008). Creative knowledge environments. *Creativity Research Journal, 20*(2), 196–210. https://doi.org/10.1080/10400410802060018

Land, G., & Jarman, B. (1992). *Breakpoint and beyond: Mastering the future today*. HarperBusiness.

Lewis, M. O., & Elaver, R. (2014). Managing and fostering creativity: An integrated approach. *International Journal of Management Education, 12*(3), 235–247. https://doi.org/10.1016/j.ijme.2014.05.009

Livingston, L. (2010). Teaching creativity in higher education. *Arts Education Policy Review, 111*(2), 59–62. https://doi.org/10.1080/10632910903455884

Minshull, P. (2018, October 20). *50 years since the day Dick Fosbury revolutionized the high jump*. World Athletics. https://worldathletics.org/news/feature/dick-fosbury-flop

Mitchell, T., & Cahill, A. M. (2005). Cognitive style and plebe turnover at the U.S. Naval Academy. *Perceptual & Motor Skills*, *101*(1), 55–62. https://doi.org/10.2466/pms.101.1.55-62

Moore, D. W., Bhadelia, R. A., Billings, R. L., Fulwiler, C., Heilman, K. M., Rood, K. M. J., & Gansler, D. A. (2009). Hemispheric connectivity and the visual-spatial divergent-thinking component of creativity. *Brain and Cognition, 70*(3), 267–272. https://doi.org/10.1016/j.bandc.2009.02.011

Mountain Academy of Martial Arts. (2021). *A history of our Okinawan martial arts weapons*. https://mountainacademymartialarts.com/2021/08/a-history-of-our-okinawan-martial-arts-weapons/

Murray, W. (2003). Innovation: Past and future. *Joint Force Quarterly, 34*, 23–32. (Reprinted from "Innovation: Past and future," 1996, *Joint Force Quarterly, 12*, 51–60)

Niedziocha, C. (2013). Institutionalize CIED capabilities. *Marine Corps Gazette, 97*(5), 68–71.

Office of Energy Efficiency & Renewable Energy. (n.d.). *Pumped storage hydropower*. U.S. Department of Energy. https://www.energy.gov/eere/water/pumped-storage-hydropower

Palmer, Z. (2019, April 29). *A New Yorker made almost $5,000 for reporting idling vehicles to police in NYC*. AutoBlog. https://www.autoblog.com/2019/04/29/new-yorkers-make-cash-snitching-idle-trucks/

Prudente, T. (2015, November 1). Naval Academy reinstates celestial navigation. *Military Times*. https://www.militarytimes.com/news/your-military/2015/11/01/naval-academy-reinstates-celestial-navigation/

Rahmanan, A. (2022, October 3). *NYC may soon pay you for reporting illegally parked cars*. Time Out. https://www.timeout.com/newyork/news/nyc-may-soon-pay-you-for-reporting-illegally-parked-cars-100322

Reuters Fact Check (2021, May 3). *NASA did not spend billions on space pens while Russia used pencils*. Reuters. https://www.reuters.com/article/factcheck-nasa-pens/fact-check-nasa-did-not-spend-billions-on-space-pens-while-russia-used-pencils-idUSL1N2MQ1RR

Reynolds, A., & Lewis, D. (2017). *Teams solve problems faster when they're more cognitively diverse*. Harvard Business Review.

Scheible, D. H. (2017). Are culturally diverse teams the more creative ones? *IACCM – CEMS Congress Proceedings 2017*, 193–200.

Schlee, R. P., & Harich, K. R. (2014). Teaching creativity to business students: How well are we doing? *Journal of Education for Business, 89*(3), 133–141. https://doi.org/10.1080/08832323.2013.781987

Shapira, Z. (1995). *Risk taking: A managerial perspective.* Russel Sage Foundation.

Sternberg, R. J. (2006). The nature of creativity. *Creativity Research Journal, 18*(1), 87–98. https://doi.org/10.1207/s15326934crj1801_10

Torrance, E. P. (1974). *Torrance test of creative thinking: Norm technical manual*. Scholastic Testing Service.

U.S. Marine Corps. (1991). *Warfighting* (Marine Corps Doctrine Publication 1).

Vego, M. (2013). On military creativity. *Joint Force Quarterly, 70*, 83–90.

Wong, L., & Gerras, S. J. (2013). *Changing minds in the Army: Why it is so difficult and what to do about it*. U.S. Army War College Press. https://press.armywarcollege.edu/monographs/515