



New Technologies to Foster Critical Thinking

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Eisenhower Paper
Research Division - NATO Defense College, Rome



N° 4
JULY
2015

Much has been written on how technology changes our daily lives and how the new generation has grown up with devices that belong to their immediate environment, so much so that we are barely able to imagine how we could live without them just a decade ago. Tablets, smartphones, cloud-computing, social media, and search engines have not just changed the way we live: they have deeply influenced (and continue to do so) the way we think. Because this is also happening in a different and fast-changing environment, these factors challenge our societies and among them, our militaries. To quote a US general, “years of persistent conflict, adaptive enemies, decentralized operations that push both responsibility and risk to the edge of our operational formations, decreased resources, increased mission requirements and exponential technological change” have not just changed the way militaries used to operate, they have radically modified the way they approach problems.¹

From a military point of view, the conflicts in Iraq and Afghanistan – even more than the decade spent in the Balkans – have deeply impacted the way we wage wars, raising awareness about the need for adaptive soldiers and leaders, able to make their way in challenging environments. One major question has been – and still is – how we turn out, foster, train, educate, promote and retain those who will be intellectually and mentally agile enough to ensure rapid response and adaptation on the battlefield. Winning this battle requires two things: greater strategic understanding at every level, and the tools that would help to implement and adapt it. We should also acknowledge that the next generation of soldiers and leaders is not cast from the same mould as its predecessors

in terms of being connected with the outside world, an advantage on which all comprehensive education should capitalize. Education has to be broad and connected enough to embrace the complexity of our geopolitical, scientific, military, social, and economic environment. It must also embrace the diversity of the upcoming generation of leaders.

If there is one common characteristic to this new generation, it is its attachment to new technology and the way it is influenced by technological means when it comes to problem-solving. The incredible advance in technology is particularly important, since it might prove challenging from the educational community’s point of view, to cope with a generation of soldiers who have grown up in a digital world and whose ideas on education and training differ from the vision of their predecessors. Often portrayed as “Generation Y,” these future leaders are more demanding in terms of new learning approaches, insisting on collaborative thinking and making a maximum use of the technology at hand. Generally speaking, this forces outdated teaching methods, based on a top-down approach and platform-centric, location-dependent model, to evolve into one adaptable learner-centric, tailor-made model.

This does not mean, however, that the viewpoints or positions of both “sides” are incompatible, since their common objective is to create a robust 21st century professional military model of education with for adaptive leaders. On the contrary, everyone tends to agree on the contents of this future military education: it has to be varied and embrace the widest possible academic domain in order to develop an open mind. Because it has to keep up with the ever-

¹ Brig. Gen. Bryan T. Roberts, *Army Learning Model for 2015 ... in 2013*, http://www.army.mil/article/99282/Army_Learning_Model_for_2015_in_2013/

increasing quantity knowledge and experience, it has to be supported by the right educational tools – “enablers” or “enhancers.” The use of new learning technologies and on-demand content has already begun, but this has to fit in with a true technology-based educational strategy, which neither can nor should be limited to finding meaningful ways to be incorporated into the “classroom,” nor should it be driven by the potential savings which might result. This paper considers a proposal for the harnessing of new technology and its assimilation into the curriculum of professional military education.

A statement

In 1999, the President of the US National Defense University defined the dramatic changes that would affect PME: “[it] must be seamless, continuous, and career-long. It must be needs-based, available on demand, and offered just-in-time. It must be more information technology-based (even network-centric), as well as more experiential and virtual. And it must be fused with operations, integrate resident and non-resident instruction, and appeal to both military and civilian components as well as international institutions.”² Generally speaking, this statement is still valid and takes into account both the challenges and obstacles that our educational institutions now face or will face in the future.

A new generation ...

The truth is that military institutions might not have anticipated the rapid pace of change, and our organizations appear to have been bowled over by the advent of new technology and by

the arrival of a generation with different needs, different backgrounds, and different views. Known as the “military millennial” – the military equivalent of the so-called “Y generation” – this generation was born in the late 1970s - early 1980s, has always known and used the computer, and barely remembers a time when Internet was not available.³ Also called the “wired generation”, they are quite different from their predecessors in terms of skills and attitudes: they do not analyse or think in terms of a linear cause-effect relationship, but appreciate the complexity of the new information environment.⁴ They use civilian social networking, such as Facebook or Twitter, for everything, including for military tasks, and have an affinity for the interconnected world.⁵ They cannot imagine life without communication – whatever form it takes (text messaging, emails, tweets, pokes, videos, blogs, etc.). Of course, this creates a gap with more traditional-thinking senior military leaders and with the way our organizations are currently set up. Our educational systems are still anchored in traditional hierarchical structures and, when it comes to the military, despite the standard axiom that it will not teach “what to think but how to think,” it is still very difficult to voice opinions which contradict conventional wisdom.⁶ When it comes to getting and analysing information, it also leads to two different routes: on the one hand, information is seen as a vertical up and down flow, passing through multiple echelons along linear paths; and on the other hand, as a consequence of the explosion of social networking, the open media, and the birth of a “society of information permeability,” new customers are in the habit of accessing information immediately, without due regard for proper scrutiny.

² Richard A. Chilcoat, “The Revolution in Military Education,” *Joint Forces Quarterly*, Summer 1999, pp. 59-63.

³ Art Fritzon, Lloyd W. Howell Jr., and Dov S. Zakheim, *Military of Millennials*, Strategy + Business, 28 November 2007, <http://www.strategy-business.com/article/07401?pg=all>

⁴ Michael Macedonia, *Games, Simulation, and the Military Education Dilemma*, 2002, p. 157-158, <https://net.educause.edu/ir/library/pdf/ffpiu018.pdf> and B. Ring, R. Brown, L. Howard, P. Van Ness, “Leading Structured Organization in the Dynamic Information Age,” *Military Review*, March-April 2014, pp. 66-72.

⁵ Which justifies and explains, for instance, the use of social networks and the internet to place recruitment videos by some of our nations’ military branches and services.

⁶ On the difficulties of gaining knowledge from your own network, see Ori Brafman, *NDU Lincoln Talks*, NDU Channel, <http://www.ndu.edu/Outreach/LincolnTalks/Brafman.aspx>

... living in a world where the media and communication are everything

If one wants to be awed by the massive power of communication and new technology, one need only recall the Arab Spring and the series of events which spawned revolutionary movements throughout the Middle East and North Africa through the use of social media: “The factors of social media affecting public opinion and international support, rapid dissemination of news, widespread messaging, and the ability of the individual to spread information globally are relatively new phenomena during revolutions. Likewise, regimes and counter-insurgents can implement social media to meet their own agendas in never before seen ways.”⁷ The mass mobilization of ideas and people (in other words, propaganda) has been made easier by social media, as too for recruiting insurgents and terrorists. Its decentralized infrastructure, user-friendliness, and virtual untraceability allow the Internet to be used as a forum for the recruitment and training of potential terrorists and the coordination of logistical and financial resources to conduct that terrorism.⁸

Together, these dynamics pose new and formidable challenges to domestic and international policy-makers: the last decade has seen Western militaries face non-state actors and terrorist and insurgent groups who use Internet, the global mass media and strategic communication tools as enablers to mitigate their asymmetry in military strength.⁹ Generally, the contrast between Western militaries and their opponents is equivalent to the difference between a spider and a starfish: “when you cut the leg off a spider, it is disabled. When you cut the arm off a

starfish, it grows one back.”¹⁰ Our militaries resemble spiders, whilst our adversaries are more like starfish. This condition is reflected in our organizational charts, where we are still very parochial, with stovepiping around our working methods and mindset, while our opponents think in terms of a network. It is also mirrored in our strategic communications: when our potential adversaries capitalize on lies and false truths, we have the utmost difficulty in dragging the false narrative out into the limelight and exposing it.¹¹

How to better use our technology in education?

Plenty has been written about our Western way of waging war and our understanding of technology in general. The most common approach is to see technology as a means to guarantee that our nations’ militaries maintain their potential in order to prevail over armed opponents. This also has implications for our educational system and PME; if knowledge is power – to quote Francis Bacon – we recognize that new technologies have a powerful place in instruction. Still, there is a paradox, as we could in any case achieve positive learning objectives without using technology at all.

Opportunities

Technology and teaching (in general) have a reciprocal relationship: the emergence of new technologies and their implementation are often seen in two ways: as a source of leverage, and

⁷ Richard A. Lindsey, *What the Arab Spring Tells Us About the Future of Social Media in Revolutionary Movements*, Small Wars Journal, 29 July 2013, <http://smallwarsjournal.com/jml/art/what-the-arab-spring-tells-us-about-the-future-of-social-media-in-revolutionary-movements>

⁸ For more development, see USC Center on Public Diplomacy, *Terror Online: Developments In The Use Of New Media Technologies By Terrorist Organizations*, Policy Report 2005, http://uscpublicdiplomacy.org/pdin_monitor_article/terror_online_developments_in_the_use_of_new_media_technologies_by_terroris

⁹ Carsten Bockstette, “Taliban and Jihadist Terrorist Use of Strategic Communication,” *PfP Consortium Quarterly Journal*, Summer 2009, pp. 10-12.

¹⁰ Ori Brafman and Rod Beckstrom, *The Starfish and the Spider: The Unstoppable Power of Leaderless Organizations*, New York, Penguin Books, 2006.

¹¹ As made particularly clear in the Russian course of action in Ukraine: *NATO Commander Breedlove Discusses Implications of Hybrid War*, DoD News, 23 March 2015, <http://www.defense.gov/news/newsarticle.aspx?id=128430>

as a gadget. In higher education, the emphasis has always been on employing proven methods while showing a certain reluctance to embrace new, innovative techniques or alternative syllabi – partly because academic models, especially in the humanities, remain extremely diffident towards mass media and the Internet. We might expect more from the military, which, throughout history, has used cutting-edge methods for training purposes. Who could possibly deny that, since World War I, the military has been on the leading edge of progress, especially in terms of modelling and simulation techniques?¹² At the same time, one must recognize that this advantage has been related primarily to training, not education.

If we leave aside the reasons for NOT using technology at all in our educational systems, we still struggle with the reasons justifying why we should. Most of the arguments used to support technology-based education have to do with cost-effectiveness; while trying to save every dollar or euro, our academies and colleges claim they are doing their best to do more with less, reducing the time and money spent on education and using every means available to salvage their budgets. By introducing smart devices and by using simulation, shrinking budgets could be balanced and “every soldier or military student could review his lessons in an online drive or portal, complete an assignment with teammates online, or attend a class via video link, all from their tablet, smartphone or desktop.”¹³ Take the case of an officer attending a course in geopolitics: why have him arrive ahead of time, pay for his travel and per diem, while he could satisfy most of the prerequisites beforehand through readings and lectures available on his smart device? In addition, he would still be available for his day-to-day job, and could most probably start his development programme while multitasking in his own time at home. In this case,

technology creates a scissors effect: while the time spent in the classroom or on a residential course diminishes, the shared or multitasking time spent by learners and students increases, helping to further condense the duration of courses or lessons, and as a consequence, limit the budget and overall costs.

New challenges

This would be ideal, if we were only concerned by the savings obtained in travel and personnel costs. But it does not reflect the fact that to be effective, what is at stake are not the tools that are used, but the contents. What needs addressing are the real benefits of distributed learning and e-learning in general. The mission statement of the US Army Distributed Learning Program is appealing in this regard: “Improve Army readiness by providing rigorous, relevant, and tailored distributed training and education to Soldiers, Leaders, and Army Civilians anytime anywhere from a responsive and accessible delivery capability.”¹⁴ This works perfectly if one considers that education and learning have a personal and individual dimension. The problem is that, when it comes to assessing its effectiveness, distributed learning stumbles over a number of hurdles:¹⁵

- *limited impact on education/training*: still, the way to institutionalize distributed learning takes time, and represents only a small – but fast-growing – fraction of institutional education/training;
- *concerns about the quality of the programme*: there are significant issues about the quality of the courseware, especially because of its life-cycle. The time it takes to produce a course and to put it online is sometimes so long that the content is declared obsolete before it can be completed;

¹² National Training and Simulation Association, *A Primer on Modeling and Simulation*, 2011, pp. 5-9, <http://www.corporatepress.com/clientfiles/ntsa/files/primeronmodelingandsimulation.pdf>

¹³ Argument taken from the “Military E-Learning and Smart Devices Conference,” London, 21-24 October 2014.

¹⁴ TRADOC Capability Manager, *The Army Distributed Learning Program*, <http://www.atsc.army.mil/tadlp/>

¹⁵ Some of these remarks already figure in a decade-old RAND Report: Michael G. Shanley, James C. Crowley, Matthew W. Lewis, Susan G. Straus, Kristin J. Leuschner, John Coombs, *Making Improvements to The Army Distributed Learning Program*, RAND, 2006, http://www.rand.org/content/dam/rand/pubs/monographs/2012/RAND_MG1016.pdf

- *maintenance and updating*: to be relevant, a course needs to be updated regularly, which requires a team (a teacher or at least several assistants) with the skills and knowledge to update the data;

- *design*: some argue that if an e-learning system is designed and developed to match the requests of engineers and teachers, it has every chance of failing, of being rejected or rated low by the learners/users. Designing an e-learning system can therefore not be a one-size-fits-all process, but what is expected (the educational requirements) should be analysed carefully first in order to create a system that will withstand the test of time.¹⁶ It is possible, however, to mitigate this effect by using devices that service personnel already use in their daily lives, and create/implement specific apps to assist students in mobile learning.¹⁷

With the arrival of the new “Y generation,” the main challenge is to avoid a growing disconnect between the way students are taught in our schools, universities and academies, and the way the “outside world” approaches socialization, “meaning-making” and accomplishment.¹⁸ Henceforth, the way we consider new technology has to be reflected by a change in mindset, or a 180° turn in our approach to instruction, to leverage the power and potential of these new processes. To put it bluntly, new technology has to be taken into account not because it represents the current hype or because of its efficiency or cost-effectiveness, but because of its ability to convey concepts in new ways. Just one of the criticisms that could be addressed to the military is that it doesn’t yet maximize the educational and operational ben-

efits of this technology for the development and performance enhancement of its personnel.

New technologies, new learning: devices, games and online chat

In a recent article, a journalist described the increasing number of new technological devices making their way into military operations, along with the associated challenges.¹⁹ If one thinks about devices, miniaturization has found its *raison d’être* and we no longer bother to discuss the role of computers, which were at the centre of network-centric warfare in the 1990s. Now, tablets and smartphones are part of today’s military equipment, even though their use is sometimes held up by security concerns or the need for ruggedization. The availability of the necessary “apps” to be downloaded from the Apple store or from an Android supplier, raises issues of reliability, paving the way for vendors to develop systems that turn commercial devices built for consumers into a warfighter’s tool. Elsewhere, needs are different: ruggedization is not the main issue for the US Air Transport Command, which estimates that “using Apple iPads eliminates 40 to 70 pounds of paper, which yields considerable fuel savings when spread across the military’s aircraft fleet. Tablets make it simpler to update information while also reducing printing costs and helping DOD achieve its environmental goals.”²⁰ This is a justification that any educational system could well accept. The problems lie in being able to keep up with the fast-changing technological world and the implementing of already outdated models by our militaries. Therefore, there is growing dependence on the BYOD movement (*Bring Your Own Device*) which reduces costs

¹⁶ Ion Roceanu, *Designing The Military Advanced Distributed Learning System*, Internet Learning, Vol. 2, n° 1, article 3, Spring 2013, <http://digitalcommons.apus.edu/internetlearning/vol2/iss1/3>

¹⁷ This is already the case at the NATO Defense College, where the iPads provided to Course Members have specific apps created for them by the NDC.

¹⁸ This is not just a lesson for the military: E. Klopfer, S. Osterweil, J. Groff and J. Haas, *Using the Technology of Today, in the Classroom Today*, MIT, Education Arcade Paper, 2009, p. 3.

¹⁹ Terry Costlow, *Mobile mashup: The military’s proliferating mix of smartphones and tablets*, Defense Systems, 23 March 2015, <http://defensesystems.com/Articles/2015/03/23/Military-unconventional-mix-smartphone-tablets.aspx?Page=1>

²⁰ *Ibidem*

and only requires an updating of the devices.

However, in education, if we consider technology as a whole, the true challenge is to implement both mobile learning and applications/tools that help students develop new skills. The issue is not just having permanent online access to learning material, but using the tool in a manner that makes it useful and enjoyable. Therein lies the idea of using “serious games,” which, as the name implies, are not for entertainment, but have a fun basis with a view to education and training.²¹ In the case of the military, they include a broad range of “war games” that have been adopted by colleges or academies – sometimes decades ago – either by modifying commercial products or by selecting off-the-shelf software to match student needs. In addition, the practice capitalizes on existing bridges between academia and industry to design and develop specific skills and proficiencies. A more philosophical analysis would reflect on the fact that games have always been used as a way to educate the elite. Plato, for example, in *The Republic*, made the connection between play and education, seeing philosophical discourse as wordplay and, hence, as an educational game. This approach taught the students of the time to see both sides of an issue, so that they could govern well and fairly.²² In general, these games provide a dramatic interpretation of the subject or problem being studied, and allow players “to assume realistic roles, face problems, formulate strategies, make decisions and get fast feedback on the consequences of their actions – all without the cost of real world consequences or errors.”²³ In the US military – leaving aside training with the use of simulators – a lot of ef-

fort has gone into the production of videogames able to reflect the changing character of war: VECTOR was a way to develop better interaction with foreign cultures, not only by teaching foreign languages but also by using cognitive and emotional modelling to provide cultural instruction. In other governmental domains, the emphasis has been on how to manage and coordinate resources between national, regional, and local agencies.²⁴

Recently, the US National Defense University – backed by the Naval Postgraduate School – conducted an alternative content delivery method, using the US Navy’s “Massive Multiplayer Online Wargame Leveraging the Internet” (MMOWGLI) as a delivery platform. Adapted from a cyber tabletop exercise, the learning objectives were: 1) to increase familiarity with cyber issues; 2) to appreciate the complexity of “wicked” problems;²⁵ and 3) to collaborate across the NDU enterprise. The choice of wicked problems makes sense, as they are very similar to those that military and policy-makers face in real-life. The solutions brought forward can be good or bad, not true or false, as there is no idealized end-state to arrive at, and approaches should be tractable ways to improve a situation rather than solve it.²⁶ The idea is that problems can be mitigated, rather than fixed, through “non-linear thinking.” In the case of the US NDU exercise, the choice of a “cyber scenario” had several advantages: it helped people to get a grasp on cyber threats, as it stressed the gravity, complexity and difficulty involved in finding potential solutions. Based on that, and because there were no easy solutions, the idea was to work as a community, to increase the

²¹ The term “serious game” was invented in 2002 and now includes a series of games that teach military personnel about field operations, non-combat skills and help with recruitment. They also help to teach students and other groups about the operation and influence of governments and the history of wars (<http://www.seriousgamesdirectory.com/proj/military-government/>). More broadly, these games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement.

²² The same Plato used to say: “You can discover more about a person in an hour of play than in a year of conversation.”

²³ Dave Michael and Sande Chen, *Serious Games: Games that Educate, Train, and Inform*, Boston, Thomson Course Technology, 2006, pp. 25-26.

²⁴ *Ibidem*, pp. 62 and 85.

²⁵ A wicked problem is a social or cultural problem that is difficult or impossible to solve for as many as four reasons: incomplete or contradictory knowledge, the number of people and opinions involved, the large economic burden, and the interconnected nature of these problems with other problems.

²⁶ For the characteristics of the wicked problems, see Austin Centre for Design, *About Wicked Problems*, available online at: <https://www.wickedproblems.com/about.php>

chance of finding a common approach and, at the very least, to reach a consensus. Eventually, and despite some technical issues that could be solved in the future, the game proved to be a useful tool for brainstorming, generating ideas and promoting broad thinking.²⁷ This is exactly how gaming or simulation must be understood: they help students to visualize and conceptualize complex phenomena, interacting in a cross-cutting way which is very close to what is needed in real life. The advantages of this network-centric approach, where participating students from different services and branches, are located in different places and time zones, are similar to the organization of our future military C2, which will, more and more, rely on distributed command groups for managing, and responding to, crises and threats.

By extension, the familiar skills owned by the new social-networked generation will unfold into creating networked communities outside the classroom, which will play an increased role in helping individuals prepare for a changing world and changing wars. The role of forums greatly enhances self-development by encouraging readers and participants to contribute content. They support reflection, and the more active participants are, the more ready and aware they become.²⁸ The intensity of this learning process is essential to nurture the spirit and knowledge of future leaders: it fosters new out-of-the-box ways of thinking, based on non-linear thinking and decision-making.²⁹ This is essential, as the forum framework acts as an equalizer where every opinion is valuable. The simple fact of empathizing with the viewpoints of others changes one's own mind, and can lessen egocentric tendencies that are the most

significant barrier to effective critical thinking³⁰. The goal is to go beyond given assumptions and ready-made thinking, towards the sharing of ideas and the acceptance of criticism.

Conclusion

These discussions demonstrate that technology, as more than just a tool, has a role to play in changing not only **what**, but **how** we learn and teach. To strive for new innovative ways in the classroom and in academies is also a question of survival, as traditional schooling is more and more challenged by alternative models that focus on massive online courses, free information taken from the internet, and peer-to-peer learning. Even in the military, the hype about e-learning and distributed or distance learning has imposed its mark on the transformation of PME. However, one must not forget that technology is first an enabler – a way or a mean – to achieve identified outcomes (the endstate). There's no purpose in fighting an already lost battle that would repulse the numerous advantages of technology, which for instance, expands learning over traditional boundaries and selection processes, in such ways that students will get a better understanding of their current environment and of future challenges. These are things that will help them to be more efficient and operate faster when necessary.

More generally, this will be reflected in the re-organization of our whole approach to future wars and conflicts, with the emphasis on maintaining our competitive edge through improved knowledge management and an adequate com-

²⁷ Paulette Robinson, Elizabeth Bartels, Gina Cordero, Luke Feltz, Vern Wendt, and Rebecca Law, "NDU Massive Game Pilot White Paper," 2014.

²⁸ These ideas are borrowed from Joe Byerly's Blog, *From the Green Notebook*, which is dedicated to military thinking and the study of military affairs: <https://fromthegreennotebook.wordpress.com/>

²⁹ Charles M. Vance, "Professional Military Education's Imperative of Linear/Nonlinear Thinking Style Balance for Improved Strategic Thinking," in Heather M.K. Wolters, Anna P. Grome, and Ryan M. Hinds (eds), *Exploring Strategic Thinking: Insights to Assess, Develop, and Retain Army Strategic Thinkers*, Army Research Institute, February 2013, p. 203 sqq: "Using a traditional *linear* decision-making approach characterized by experience-based rules, rationality, analysis, logic, reason, and cause-effect predictability, we no longer can hope to compete with those who now also actively employ alternative *nonlinear* thinking and decision-making tools such as expertise-based intuition, emotion, imagination, and creativity."

³⁰ Richard Paul and Linda Elder, *Critical Thinking. Tools for Taking Charge of Your Learning and Your Life*, Upper Saddle River, NJ, Prentice Hall, 2001, p. 214.

mand and control structure. As a matter of fact, what is at stake is not so much the debate between linear and nonlinear thinking, as the future set-up of organizational structures that would combine the best of two existing worlds: on the one hand, the old-fashioned but combat-proven hierarchical organization, which is cautious but sometimes too slow in generating a decision; and on the other, a shared community of interest, which is decentralized, permeable to innovative answers, fast and responsive – but disorganized.

The key issue here is how to make our struc-

tures and organization fit both new tools and new leaders. Wouldn't the solution lie in an increased role for leaders, facilitating a collaborative environment where personal power and influence would take precedence over direct command and control? This would allow officers to prepare for new intellectual challenges, enabling them to defend their ideas in a wide-ranging environment and, therefore, to overcome the inescapable complexities attendant on a civilian-interservice perspective. The idea is to put some of the “starfish” knowledge into our “spider” organization.



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