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Instructional Design Linking Military Training and Academic Education for Officer Cadets: A Scoping Review[1]

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Introduction

In various areas of higher education, participants have the difficult task of integrating skills training and academic education. For example, Evans, Juchau, Wilson, Wilson (2012), and Jackling and De Lange described this educational issue regarding accounting instruction.[2] In this article, we focus on the linkage of skills training and academic education in the military context of officer education. In the following sections, we will discuss how the professional requirements for a military officer have changed over the years, leading to a greater emphasis on academic education at a modern military academy.

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[2] Elaine Evans, Roger Juchau and Richard Wilson, "The Relationship between Academic Accounting Education and Professional Training - an Overview", in *The Interface of Accounting Education and Professional Training*, eds. Elaine Evans, Roger Juchau and Richard Wilson (New York, NY: Routledge, 2012); Beverley Jackling and Paul de Lange, "Do Accounting Graduates' Skills Meet the Expectations of Employers? A Matter of Convergence or Divergence", in *The Interface of Accounting Education and Professional Training*, eds. Elaine Evans, Roger Juchau and Richard Wilson (New York, NY: Routledge, 2012); Richard Wilson, "Alignment in Accounting Education and Training", in *The Interface of Accounting Education and Professional Training*, eds. Elaine Evans, Roger Juchau and Richard Wilson (New York, NY: Routledge, 2012).

Traditionally, soldiers were primarily trained physically to actually fight an enemy.[3] However, nowadays soldiers find themselves in increasingly complex military operations,[4] like the Resolute Support Mission (RSM) in Afghanistan and enhanced Forward Presence (eFP) in Lithuania. During such modern military missions, being trained in military skills alone would not equip officer cadets sufficiently for the challenges faced herein. Consequently, Haltiner spoke of "the presented necessity of a shift from combat-centred know-how to problem-solving capacities" in regard to officer education.[5] Officer cadets need to acquire both military skills and strategic thinking. Jacobs Kem, LeBoeuf, and Martin noted that the lessons learned in Iraq and Afghanistan are supportive of this suggested change.[6] Miller and Wackwitz's "warrior-scholars" seem to characterize the desired outcome of present-day officer education aptly.[7] This contemporary perspective on officer education necessitates the ability to think strategically.

Strategic Thinking

Strategic thinking is often considered an essential aspect of leadership, especially in the US Army (Sackett et al.; Silverstone and Ramsey).[8] As early as in the nineties, general

[3] Karl W. Haltiner, "Athens versus Sparta: The New Missions and the Future of Military Education in Europe," in *NL ARMS 2003. Officer Education: The Road to Athens!*, eds. Harry Kirkels, Wim Klinkert and Rene Moelker (Breda, the Netherlands: Royal Netherlands Military Academy, 2003), 177.

[4] Sae Schatz et al.,"The Changing Face of Military Learning,"*Journal of Military Learning* 1, no. 1 (2017): 79, https://www.armyupress.army.mil/Journals/Journal-of-Military-Learning/Journal-of-Military-Learning-Archives/April-2017-Edition/The-Changing-Face-of-Military-Learning.

[5] Haltiner, "Athens versus Sparta", 187.

[6] An Jacobs,"Teaching IR at Sandhurst: Blended Learning Through an Integrated Approach,"*Infinity Journal Special Edition. International Relations in Professional Military Education* (winter 2016): 52; An Jacobs,"Educating Strategic Lieutenants at Sandhurst, Parameters," *The US Army War College Quarterly* 29, no. 4 (2019): 81-82, https://publications.armywarcollege.edu/pubs/3720.pdf; John S. Kem, Eugene J. LeBoeuf, and James B. Martin,"Answering the Hottest Question in Army Education: What is Army University?," *Journal of Military Learning* 1, no. 2 (2017): 6, https://www.armyupress.army.mil/Journals/Journal-of-Military-Learning/Journal-of-Military-Learning-Archives/October-2017-Edition/Kem-Answering-the-Hottest-Question.

[7] Larry D. Miller, and Laura A. Wackwitz,"Writing, Integrity, and National Security,"*Joint Force Quarterly* 79, no. 4 (2015): 57, https://ndupress.ndu.edu/Portals/68/Documents/jfq/jfq-79/jfq-79_57-62_Miller-Wackwitz.pdf.

[8] Anna L. Sackett et al., "Enhancing the Strategic Capability of the Army: An Investigation of Strategic Thinking Tasks, Skills, and Development" (Research report, US Army Research Institute for the Behavioral and Social Sciences, 2016), https://apps.dtic.mil/sti/pdfs/AD1006147.pdf; Scott A. Silverstone, and Renee Ramsey, "Who Are We Teaching - Future Second Lieutenants or Strategic Leaders? Education

Krulak claimed that in the complex post-Cold War era the actions of even the lowest-ranking non-commissioned officer (NCO) have a potentially strategic impact. Therefore, he introduced the now classical concept of "the strategic corporal" .[9] Liddy defined this strategic corporal as "a soldier that possesses technical mastery in the skill of arms while being aware that his judgment, decision-making and action can all have strategic and political consequences that can affect the outcome of a given mission and the reputation of his country."[10]

Lammers (2016, 3) broadened the definition by using the term figuratively, "implying any junior commander that has to make decisions with impacts beyond the level associated with its rank in the chain of command, and that context."[11] Jacobs further extrapolated the latter concept to "the strategic lieutenant", which she described as "young officers who are not merely good tactical-level decision-makers but also cognizant of the potential strategic implications of their decisions".[12] Continuing this line of thought, the strategic lieutenant is herein regarded figuratively as a junior officer who thinks strategically, meaning that the strategic lieutenant comprehends the implications of his/her own decisions and actions, transcending his/her command level and corresponding magnitude of impact.

Modern warfare requires a further expansion of the concept of strategic thinking. Whereas Feltey doubted the strategic potential of the NCO's actions,[13] Lammers asserted that little controversy remains in the idea that NCOs need abilities beyond traditional military skills to achieve success.[14] This is even more considered to apply to officers. After all, the military's contemporary responsibility goes beyond the traditional set of tasks

for Strategic Thinking and Action," *Infinity Journal Special Edition. International Relations in Professional Military Education* (winter 2016), https://www.militarystrategymagazine.com/article/who-are-we-teaching-future-second-lieutenants-or-strategic-leaders-education-for-strategic-thinking-and-action.

[9] Charles C. Krulak,"The Strategic Corporal: Leadership in the Three Block War," *Marines Magazine* (1999): 5, https://doi.org/10.21236/ada399413.

[10] Lynda Liddy, "The Strategic Corporal: Some Requirements in Training and Education. Education, Training and Doctrine," *Australian Army Journal* 2, no. 2 (2004): 140.

[11]Johan W. J. Lammers, "Commanding the Strategic Corporal" (Working paper, King's College London, 2016): 3, https://doi.org/10.13140/RG.2.2.27881.70247.

[12] Jacobs,"Educating Strategic Lieutenants", 82.

[13] Thomas M. Feltey, "Debunking the Myth of the Strategic Corporal" (Master's thesis, National Defense University, 2015), https://apps.dtic.mil/dtic/tr/fulltext/u2/a621690.pdf.

[14] Lammers, "Commanding", 4.

concerning direct warfare.[15] Haltiner noticed that servicemen nowadays fulfill many non-traditional military roles, as they are also engaged with, among others, protecting and reconstructing state affairs, including the rule of law, democracy and humanitarian help. He highlights that these non-standard roles and military operations have become strategically important.[16] This is illustrated by the current military deployment in Bosnia and Herzegovina according to the General Framework Agreement for Peace in Bosnia and Herzegovina military objectives concern contributions to the stabilization of the countries throughout the region, and to the fulfilling of the requirements for EU membership by the country of Bosnia and Herzegovina.[17]

In fact, wars are more and more ambiguous In addition to conventional military methods, military powers engage at present with non-military methods to destabilize target nations. As chief of the general staff of the Armed Forces of Russia, General Gerasimov (as quoted by Bolt and Cross) stated "The very 'rules of war' have changed. The role of non-military means of achieving political and strategic goals has grown, and, in many cases, they have exceeded the power of force of weapons in their effectiveness."[18] These so-called hybrid warfare activities include conventional military, political, social, technological, economic and informational means. [19] That is why informational operations play an increasingly relevant role within the military.[20] As a consequence, we

[15] Kevin D. Stringer,"Educating the Strategic Corporal: A Paradigm Shift," *Military Review* 89, no. 5 (2009): 88, https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/MilitaryReview_20091031_art014.pdf; Lammers, "Commanding", 3-4; Peter Neuteboom, and Joseph Soeters,"The Military Role in Filling the Security Gap after Armed Conflict: Three Cases," *Armed Forces & Society* 43, no. 4 (2017): 712, https://doi.org/10.1177/0095327X16667087.

[16] Haltiner, "Athens versus Sparta", 177-178.

[17] US Central Intelligence Agency, "Dayton Agreement: General Framework Agreement for Peace in Bosnia and Herzegovina" (Peace agreement, US Central Intelligence Agency, 1995).

[18] Paul J. Bolt and Sharyl N. Cross. *China, Russia, and Twenty-First Century Global Geopolitics* (Oxford: Oxford University Press, 2018): 222.

[19] North Atlantic Treaty Organization (NATO), "The Secretary General's Annual Report" (Annual Report, NATO, 2019): 29, https://www.nato.int/nato_static_fl2014/assets/pdf/2020/3/pdf_publications/sgar19-en.pdf.

[20] North Atlantic Treaty Organization (NATO), "NATO Military Policy for Information Operations. Draft MC 0422/6. Working Version AS OF 11 SEP 18" (Policy, NATO, 2018): 2, https://info.publicintelligence.net/NATO-IO-Policy.pdf.

define the term strategic thinking in this article as wide-scope decision-making, concerning traditional and non-traditional warfare.

In this way, strategic thinking requires the development of a wide spectrum of higher-order cognitive abilities, such as problem-solving, and analytic and creative thinking, including social abilities and cultural awareness. Strategic thinking is not taught with typical military training. That is why Lammers wondered how to make the figurative corporal strategic.[21] With regard to NCOs, Stringer spoke therefore of a paradigm "shifting from training to education.".[22] In officer education, there is a comparable development observable: how to make the lieutenant strategic? That is, in officer education officer cadets need to learn military skills and strategic thinking, necessitating both military training and academic education.[23] In the next sections, training and education are discussed in greater detail.

Military Training and Academic Education

Military educators should enable the learning process in military personnel, including officers.[24] According to the US Army's description of learning, the means of learning are "experience, instruction, or study, or a combination of all three."[25] One could argue that brief instruction corresponds to training, study to academic education, and experience

[21] Lammers, "Commanding", 4, 10.
[22] Stringer, "Educating", 87.
[23] Liddy, "The Strategic Corporal", 142; Richard H. Thain, Ambrose McDonough, and Alan D. Priestley, "The Development and Implementation of a Teaching and Learning Strategy at a Modern Military Academy," *Journal of Further and Higher Education* 32, no. 4 (2008): 299, https://doi.org/10.1080/03098770802392899;
Blaise Cornell-d'Echert Jr., "Beyond Training: New Ideas for Military Forces Operating Beyond War," *New Directions for Adult and Continuing Education* 2012, no. 136 (2012): 19, https://doi.org/10.1002/ace.20032; Erik Hedlund,"Civil–Military Control over the Swedish Military Profession: An Analysis from the Perspective of Officer Rank and Officer Education," *Armed Forces & Society* 39, no. 1 (2013): 136, https://doi.org/10.1177/0095327X11426256; Erik Hedlund, "A Generic Pedagogic Model for Academically Based Professional Officer Education," *Armed Forces & Society* 45, no. 2 (2019): 335, https://doi.org/10.1177/0095327X17749488; Jacobs, "Teaching", 50, 55; Jacobs,"Educating Strategic Lieutenants", 81-82.
[24] Cornell-d'Echert Jr., "Beyond Training", 19.
[25] US Army, "The U.S. Army Learning Concept for Training and Education 2020-2040 (Alc-Te). TRADOC PAM 525-8-2" (Policy, US Army, 2017), 9, https://adminpubs.tradoc.army.mil/pamphlets/TP525-8-2.pdf.

can relate to both. Next, we discuss the nature of training and academic education and their relationship.

Training

One aspect of officer education is the training of military skills. Training focuses on specific tasks.[26] defined training "as a mechanistic process, where the relationship between training and specific purpose is articulated clearly."[27] Liddy uses the Australian Army's 2004 Training Doctrines' definitions and regards training "as a planned process to modify skills, knowledge and attitudes through learning experiences in order to achieve effective performance in an activity or range of activities."[28] considered training in essence as "learning what and how to do something."[29] Concerning training, there is always a clear link between the learning activity and some kind of performance or action. For example, the specific purpose of combat shooting skills training is to teach officer cadets how to handle their weapons and shoot at enemy forces in a direct combat situation.

Education

Academic education aims at higher-order abilities and is typically a sustained activity over time such as at an academy.[30] Thain, McDonough, and Priestley reasoned that academic education involves "the acquisition and application of a wider range of knowledge," "such as evaluation, judgement and commitment.".[31] Kem, LeBoeuf, and Martin agreed by stating that academic education must enhance "the abilities to think critically and creatively - within an ethical framework."[32] Liddy, again using the Australian Army's 2004 Training Doctrines, defined education as "those activities that aim at developing the knowledge, skills, moral values and understanding required in all aspects of life, rather than skills and knowledge relating to only a limited field of activity." She added that academic education stimulates "to question and hypothesize and to

[26] Cornell-d'Echert Jr., "Beyond Training", 18-19.
[27] Thain, McDonough, and Priestley, "The Development and Implementation", 299.
[28] Liddy, "The Strategic Corporal", 141.
[29] Cornell-d'Echert Jr., "Beyond Training", 18.
[30] Jacobs, "Educating Strategic Lieutenants", 84.
[31] Thain, McDonough, and Priestley, "The Development and Implementation", 299.
[32] Kem, LeBoeuf, and Martin, "Answering the Hottest Question", 4.

explain and solve problems." [33] Regarding education, Cornell-d'Echert Jr.also emphasized the importance of learning to solve problems.[34] Jacobs, in turn, considered academic education in terms of "applied knowledge and intellectual skills."[35]

In other words, academic education is more broad in nature than military training, in the sense that academic education does not intend to result directly in fulfilling one specific task. With regard to academic education, a linear and unambiguous relationship between learning and action is absent. De facto, academic education often aims to teach officer cadets to cope with situations not previously occurred or been encountered. Put differently, academic education typically addresses strategic thinking. It is important to make clear that a shift of focus, from military training to academic education, does not mean that from now on training is to be ignored. On the contrary, many argue that linking and balancing training and education is crucial.[36]

Indeed, during military operations, officers have to practice both military skills and strategic thinking simultaneously. However, in officer education military training is not always coupled adequately with academic education. Military instructors and civilian academicians don't always speak the same language, and neither do they use the same methods.[37] Jacobs asserted that military training and academic education often remain two separate tracks, executed by military instructors on one hand and civilian academicians on the other.[38] According to Liddy (2004), these tracks have a

[33] Liddy, "The Strategic Corporal", 141.
[34] Cornell-d'Echert Jr., "Beyond Training", 19.
[35].Jacobs, "Educating Strategic Lieutenants", 84.
[36] Haltiner, "Athens versus Sparta", 178; Liddy, "The Strategic Corporal", 142; Thain, McDonough, and Priestley, "The Development and Implementation", 299; S. Julian Lindley-French, "Effects-Based Education: From Cadet to the Commander-in-Chief. Defence Education and Research in a New Age," *Militaire Spectator* 178, no. 1 (2009): 41, https://www.militairespectator.nl/sites/default/files/uitgaven/inhoudsopgave/MS%201-2009%20Lindley-French%20Effects-Based%20Education.pdf.
[37]Jack D. Kem, and William E. Bassett, "The Right Education and Training at the Right Time: Deciding What to Teach and Ensuring it Happens," *Journal of Military Learning* 2, no. 1 (2018): 3-5, https://www.armyupress.army.mil/Journals/Journal-of-Military-Learning/Journal-of-Military-Learning-Archives/April-2018-Edition/The-Right-Education-and-Training-at-the-Right-Time.
[38] Jacobs, "Educating Strategic Lieutenants", 80-84.

complementary character at best.[39] There is thus a need for gaining a mutual understanding and shared perspectives.[40]

Possibly the abilities of military skills and strategic thinking will eventually integrate over time during emersion in practice. However, there are several reasons for not relying on this integration taking place in practice. Military missions are often an unsafe environment in which to learn. Besides, in practice, one could learn the wrong abilities. Moreover, the integration of military skills and strategic thinking is also part of selection: an officer cadet who fails to integrate these can be forced to take another learning track or, in the end, leave the officer's education. For all that, perhaps integration should also result earlier if training and education aim at an integrative approach to teaching as well.

Linkage of Training and Education

Indeed, several efforts have been made to link military training and academic education, varying from additional curriculum offerings for academic subjects possibly delivered by external organizations,[41] the accreditation of the military academy to stimulate education and research in addition to the already institutionalized military training,[42] to the establishment of new institutions that are responsible for both training and education activities.[43]

Others addressed the linkage between military training and academic education more directly at the level of learning. Thain, McDonough, and Priestleyand Jacobs described program designs, in which officer cadets need to apply the learning outcomes of military training and academic education in an integrated way during authentic exercises.[44] During these exercises, officer cadets have to solve complex problems in realistic scenarios by practicing both military skills and strategic thinking, often in the

[39] Liddy, "The Strategic Corporal", 142.
[40] Lindley-French, "Effects-Based Education", 41; Jacobs, "Educating Strategic Lieutenants", 86-87.
[41] Stringer, "Educating".
[42] Lindley-French,"Effects-Based Education", 38-39.
[43] Kem, LeBoeuf, and Martin,"Answering the Hottest Question", 5-6.
[44] Thain, McDonough, and Priestley, "The Development and Implementation", 299-300; Jacobs, "Educating Strategic Lieutenants", 82-84.

form of role-play. Similarly, Hedlund focused on the application of academic knowledge by officer cadets during military exercises.[45] Barron et al.described Operation Bushmaster, a multi-day medical practicum, in which military medical students, in their future role of military medical officers, have to demonstrate the accumulated learning outcomes of their leadership and medical courses during a fictitious mission.[46] Cornell-D'Echert Jr. suggested outcomes-based training and education. In this approach, an authentic learning environment with training and educational elements is designed by reasoning back from real-life problems.[47]

Although these efforts to connect military training and academic education mean remarkable progress, the initiatives have so far often paid little attention to the instructional methods underlying the learning process. After all, training and education are still delivered in their own more or less classical ways and by their own methods. Because of the new challenges faced during modern military missions and the opportunities offered by learning sciences to make learning more effective and efficient, there is a broad appeal for the use of innovative instructional methods in the military.[48] One of these instructional methods is instructional design (ID). In the next section, ID will be explained in more detail, after which its potential to facilitate the integration of military training and academic education is elaborated upon.

Instructional Design

[45] Hedlund, "A Generic Pedagogic Model", 343-344.

[46] Johanna Barron et al., "Medical Student Experiences in Operation Bushmaster 2019: "I Now See Myself as Equal Parts Physician and Leader."," *Military Medicine* 186, no. 11-12: e1066-e1070 (2020), https://doi.org/10.1093/milmed/usaa432.

[47] Cornell-d'Echert Jr., "Beyond Training", 24-25.

[48] US Army, "The U.S. Army Learning Concept", 30; Kem, LeBoeuf, and Martin, "Answering the Hottest Question", 9; Tom Bijlsma,"From Thinking Soldiers to Reflecting Officers - Facts and Reflections on Officers' Education," in *NL ARMS Netherlands Annual Review of Military Studies 2019*, eds. Wim Klinkert, Myriame Bollen, Marenne Jansen, Henk de Jong, Eric-Hans Kramer and Lisette Vos (The Hague, the Netherlands: T.M.C. Asser Press, 2019): 128, https://doi.org/10.1007/978-94-6265-315-3_8; Brenda Bannan, Nada Dabbagh, and J. J. Walcutt, "Instructional Strategies for the Future," *Journal of Military Learning* 4, no. 1 (2020): 69, https://www.armyupress.army.mil/Journals/Journal-of-Military-Learning/Journal-of-Military-Learning-Archives/April-2020/Walcutt-Instruct-Strategy; Thomas Williams, "An Evidence-Based Approach to Unit-Level Teaching and Learning," *Journal of Military Learning* 4, no. 1 (2020): 66, https://www.armyupress.army.mil/Journals/Journal-of-Military-Learning/Journal-of-Military-Learning-Archives/April-2020/Williams-Evidence-Based.

Concerning officer education, Reiser and Dempsey's definition of ID is appealing, because it covers both (military) training and (academic) education: "a systematic process that is employed to develop education and training programs in a consistent and reliable fashion."[49] Regarding that systematic process, van Merriënboer (1997) distinguished two approaches: instructional systems development (ISD) models and ID models.[50] ISD models cover the entire instructional design process and are made up of five phases: analysis, design, development, implementation and evaluation.[51] On the contrary, ID models concentrate on the phases of analysis and design in greater detail, as van Merriënboer indicated.[52] In this article, our scope is limited to the design phase: providing guidelines for the design of respectively military training and academic education.

ID Model for Military Training

As the ID model typical for military training, the Nine Events of Instruction model of Gagné, Briggs, and Wager was selected.[53] During World War II, the field of ID was born out of necessity, an urgent need for efficient military training. Gagné was one of the most influential pioneers, in both ID and military training.[54] He basically defined the framework for post-World War II military training .[55] In particular, Gagné's Nine Events are of great influence.[56] Gagné is still seen as an authority in the field of ID and military

[49] Robert A. Reiser and John V. Dempsey, *Trends and Issues in Instructional Design*, 2nd ed. (Harlow: Pearson Education, 2007): 11.

[50] Jeroen J. G. van Merriënboer, *Training Complex Cognitive Skills: A Four-Component Instructional Design Model for Technical Training* (Englewood Cliffs, NJ: Educational Technology Publications, 1997): 2-3.

[51] Walter Dick, Lou Carey and James O. Carey, *The Systematic Design of Instruction*, 6th ed. (Boston, MA: Allyn & Bacon, 2004): 3; Robert M. Branch, *Instructional Design: The ADDIE Approach* (New York, NY: Springer, 2009): 2.

[52] van Merriënboer, *Training*, 2-3.

[53] Robert M. Gagné, Leslie J. Briggs and Walter W. Wager, *Principles of Instructional Design*, 4th ed. (San Diego, CA: Harcourt Brace Jovanovich College Publishers, 1992): 190.

[54] Ellen Rose, "Boundary talk: A Cultural Study of the Relationship between Instructional Design and Education," *Educational Technology* 42, no. 6 (2002).

[55] J. Michael Spector, "Gagné's Influence on Military Training Research and Development," in *The Legacy of Robert M. Gagné*, ed. Rita C. Richey. (Columbus, OH: ERIC Clearinghouse, 2000): 213-214. https://files.eric.ed.gov/fulltext/ED445674.pdf.

[56] Cornell-d'Echert Jr., "Beyond Training", 21.

training.[57] These Nine events of instruction are gaining attention, informing of the learning objectives, stimulating recall of prior learning, presenting the content, providing learning guidance, eliciting performance (practice), providing feedback, assessing performance, and enhancing retention and transfer.[58]

ID Model for Academic Education

As an ID model for academic education, the flexibly adaptive instructional design (FAID) of Schwartz et al's STAR Legacy Cycle was selected.[59] The ID model for academic education should allow constructivist learning for the officer cadets, and it should not be too distant from the military experience. First, the learning events of STAR Legacy are described. Second, constructivist learning and military fitness are discussed in more detail in relation to STAR Legacy.

STAR Legacy and Learning Events

STAR Legacy dictates the following learning events: Look ahead (providing learning goals), The challenge (providing the problem to be solved), Generate ideas (learners sharing prior knowledge, experience and ideas), Multiple perspectives (learners comparing their initial ideas with the ideas of experts), Research and revise (learners improving their ideas by studying and experimenting), Test your mettle (learners trying out their solutions and receiving feedback), Go public (learners demonstrating their solutions), and Reflect back (learners reflecting on their learning process and outcomes in relation to the learning objectives).[60]

STAR Legacy and Constructivist Learning

[57] Stephen L. Goldberg, "Psychology's Contribution to Military Training," in *The Oxford Handbook of Military Psychology*, ed. Janice H. Laurence and Michael D. Matthews (Oxford: Oxford University Press, 2012).

[58] Gagné, Briggs and Wager, *Principles*, 190.

[59] Daniel L. Schwartz et al., "Software for Managing Complex Learning: Examples from an Educational Psychology Course," *Educational Technology Research and Development* 47, no. 2 (1999a): 41, https://doi.org/10.1007/bf02299464. Daniel L. Schwartz et al., "Toward the Development of Flexibly Adaptive Instructional Designs," in *Instructional-Design Theories and Models: New Paradigms of Instructional Theory, Volume 2*, ed. Charles M. Reigeluth (Mahwah, NJ: Lawrence Erlbaum Associates, 1999b), 190.

[60] Schwartz et al., "Software for Managing", 41.

Duffy and Cunningham (1996, 164) stated that according to constructivism, "learning is an active process of constructing rather than acquiring knowledge" and "instruction is a process of supporting that construction rather than communicating knowledge." Furthermore, they claimed the learning process to be a social process, i.e. one learns not only with but also by interaction with others. [61] Bannan, Dabbagh, and Walcutt, in turn, characterized constructivist learning as cooperative, authentic, constructive, intentional and active.[62] Thain, McDonough, Priestley and Bannan, Dabbagh, and Walcutt explicitly encouraged such a (social) constructivist educational style for military education. [63] Implicitly, Schatz et al. favored constructivist learning with regard to military education as well, by asserting that learning has to be aimed at the learner and social in nature.[64] Cornell-DDD'Echert Jr. likewise recommended contextualized and experiential learning.[65]

A plethora of principles, approaches and models for constructivist ID exists. Frequently practiced are, among others, the Discovery Learning of Bruner, Cognitive apprenticeship (Brown, Collins, and Duguid and the Interpretation Construction (ICON) Design model.[66] Another constructivist ID model is the STAR Legacy of Schwartz et al. (1999a, 1999b).[67] Firstly, it is substantiated why STAR Legacy is constructivist by nature. Secondly, it is argued why STAR Legacy fits particularly well in a military context such as an officer education.

[61] Thomas M. Duffy and Donald J. Cunningham, "Constructivism: Implications for the Design and Delivery of Instruction," in *Handbook of Research for Educational Communications and Technology*, ed. David Jonassen (Hoboken, NJ: Prentice Hall, 1996), 164.

[62] Bannan, Dabbagh, and Walcutt, "Instructional Strategies for the Future," 75.

[63] Thain, McDonough, and Priestley, "The Development and Implementation", 299; Bannan, Dabbagh, and Walcutt, "Instructional Strategies for the Future," 75.

[64] Sae Schatz et al., "The Changing Face", 87-88.

[65] Cornell-d'Echert Jr., "Beyond Training", 20.

[66] Jerome S. Bruner, "The Act of Discovery," *Harvard Educational Review* 31, no. 1 (1961); John S. Brown, Allan Collins, and Paul Duguid, "Situated Cognition and the Culture of Learning," *Educational Researcher* 18, no. 1 (1989), https://doi.org/10.21236/ada204690; John B. Black and Robert O. McClintock, "An Interpretation Construction Approach to Constructivist Design," in *Constructivist Learning Environments*, ed. Brent G. Wilson (Englewood Cliffs, NJ: Educational Technology Publications, 1996).

[67] Schwartz et al., "Software for Managing", 41; Schwartzet al, „Toward the Development", 190.

STAR Legacy has been developed for academic education as we defined it earlier. In fact, this case-/problem-/project-based model supports the integration of the four evidence-based principles of the How People Learn (HLP) educational framework. These principles are learner-centred (focus on knowledge, skills and attitudes), knowledge-centred (focus on understanding), assessment-centred (focus on performance and feedback), and community-centred (focus on cooperation[68]. STAR Legacy enables students to learn to cope, individually and collectively, with new real-world challenges in authentic and complex environments. By doing so, STAR Legacy facilitates students to construct active knowledge themselves.[69] Hence, STAR Legacy promotes constructivist learning.

STAR Legacy and Military Fitness

STAR Legacy is an appealing ID model for a military context because it has a number of qualities that can benefit its acceptance and use within the military. For one thing, STAR Legacy is constructivist by nature, but at the same time, it incorporates traditional learning activities such as attending lectures and studying learning materials.[70] These traditional learning activities are immediately recognizable in the military. Furthermore, in the military predetermined and specified learning objectives are appreciated.[71] Indeed, the learning cycle of STAR Legacy is well-structured and the learning objectives are expressed explicitly, in contrast to other learning cycles.[72] Lastly, STAR Legacy is not typically academic in its appearance, but it is an operational, user-friendly model that is easily understood.[73]

In summary, closing the gap between military training and academic education for officer cadets is paramount to optimally meet the contemporary needs of military deployment. This can potentially be facilitated by integrating an ID model for military training and an ID model for academic education into a new integrated ID model. In

[68] Sean Brophy and John Bransford, "Design Methods for Instructional Modules in Bioengineering," in *Proceedings of the 2001 American Society for Engineering Education Annual Conference & Exposition* (Albuquerque, NM, June 24-27) (Washington, DC: ASEE, 2001), 6.334.2, https://doi.org/10.18260/1-2--9082.
[69] Schwartz et al., "Software for Managing", 40.
[70] Schwartz et al., "Software for Managing", 40.
[71] Spector, "Gagné's Influence", 222.
[72] M. David Merrill, "First Principles of Instruction," *Educational Technology Research and Development* 50, no. 3 (2002): 51.
[73] Schwartz et al., "Software for Managing", 57.

order to design such a model, an exploratory research question needs to be answered first. Through a scoping review, we want to examine if, and if so, in what way the Nine Events of Instruction model of Gagné, Briggs, and Wager and the STAR Legacy Cycle of Schwartz et al. have previously been linked.[74] The specific objectives of this scoping review are to explore and map previous linkages and/or integrations of both ID models.

Methods

Colquhoun et al. defined a scoping review as a form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field by systematically searching, selecting, and synthesizing existing knowledge."[75] Unlike a systematic review, a scoping review can apply an adapting review protocol and a maximum scope, both in order to optimize the exploration. Consequently, compared to systematic reviews, scoping reviews can be more suitable for identifying and analyzing knowledge gaps in existing literature.[76] Therefore, we prefer the conduct of a scoping review over a systematic review.

To address our research question, such a scoping review was carried out on 26 April 2021. Our protocol was based on the scoping review framework of Arksey and O'Malley,[77] including the recommendations made by Levac, Colquhoun, and O'Brien,[78] as described procedurally by Thomas et al, without the optional step six (stakeholder

[74] Gagné, Briggs and Wager, *Principles*, 190; Schwartz et al., "Software for Managing", 41; Schwartz, et al.„Toward the Development", 190.
[75] Heather L. Colquhoun et al., "Scoping Reviews: Time for Clarity in Definition, Methods, and Reporting," *Journal of Clinical Epidemiology* 67, no. 12 (2014): 1292, 1294, https://doi.org/10.1016/j.jclinepi.2014.03.013.
[76] Zachary Munn et al., "Systematic Review or Scoping Review? Guidance for Authors when Choosing between a Systematic or Scoping Review Approach," *BMC Medical Research Methodology* 18, no. 1 (2018): 2-3, DOI: 10.1186/s12874-018-0611-x.
[77] Hilary Arksey, and Lisa O'Malley, "Scoping Studies: Towards a Methodological Framework," *International Journal of Social Research Methodology* 8, no. 1 (2005), https://doi.org/10.1080/1364557032000119616.
[78]Danielle Levac, Heather Colquhoun, and Kelly K. O'Brien, "Scoping Studies: Advancing the Methodology," *Implementation Science* 5, no. 69 (2010), https://doi.org/10.1186/1748-5908-5-69.

consultancy).[79] The PRISMA checklist for scoping reviews was used.[80] We searched three databases, ranging from general to specific educational: from Web of Science (version 5.35) to ERIC and LearnTechLib. We also performed a search for gray literature (unpublished or difficult to locate) by utilizing the search engine Google Scholar.

Regarding Web of Science, ERIC and LearnTechLib, there were no restrictions on time, language, publication or document types, or any other settings. Web of Science was furthermore set on all citation indexes. ERIC did not include the application of related words or equivalent subjects. Google Scholar was set on searching English papers, including patents and citations. There were no restrictions on time. With these settings, we reviewed as many sources as possible.

The Boolean search strings were designed in collaboration with an experienced librarian and one reviewer (SH). The search string examined the combination of terms from the Nine events of instruction model of Gagné, Briggs, and Wager on one hand with terms of the STAR Legacy Cycle of Schwartz et al. on the other hand.[81] We questioned the three databases with the search string Gagne AND ("Nine events" OR "Nine instructional events" OR "Nine learning events") AND Schwartz et al AND ("Flexibly adaptive instructional design" OR FAID OR "FAID-theory" OR "STAR.Legacy" OR "STAR Legacy" OR "Legacy Cycle"). Because the original search string did not yield any results, this search string was modified to all possible combinations of terms of both models respectively from the original search string, e.g. ("Nine events" AND "STAR Legacy"), (“Nine instructional events” AND “STAR.Legacy”), and (“Nine events” AND FAID). We questioned the search engine Google Scholar with the search string (Gagne "nine|9 events"|"nine|9 instructional events"|"nine|9 learning events") AND (Schwartz et al, "Flexibly adaptive instructional design"|FAID|"FAID-theory"|"STAR.Legacy"|"STAR Legacy"|"Legacy cycle").

Two reviewers (SH and JH) independently screened all publications on three levels: titles, abstracts and full text. A data abstraction form was developed and tested by

[79] Aliki Thomas et al., “Knowledge Syntheses in Medical Education: Demystifying Scoping Reviews,” *Academic Medicine* 92, no. 2 (2017): Table 1, https://doi.org/10.1097/ACM.0000000000001452.
[80] Andrea C. Tricco et al., “PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation,” *Annals of Internal Medicine* 169, no. 7 (2017), https://doi.org/10.7326/M18-0850.
[81] Gagné, Briggs and Wager, *Principles*, 190; Schwartz et al., “Software for Managing”, 41; Schwartz,et al. „Toward the Development”, 190.

one reviewer (SH) to determine which variables to extract (in AAppendix A). The data abstraction form was a priori discussed with the research team (SH, JH, SD, WvM) and modified with reviewing articles. The data items consist of database/search engine, publication characteristics, references to both ID models, definitions of both ID models, description of linkage, and integration. The two reviewers independently charted the data from each eligible publication into an Excel spreadsheet. During this data-charting process, the data abstraction form was iteratively updated. Publications that merely mention both ID models somewhere in the text, but not in relationship to each other, were excluded. The two reviewers resolved inconsistencies in study selection and data extraction by consensus. If necessary, discrepancies were resolved by discussion with the entire research team (SH, JH, SD, WvM). We mention the number of retrieved publications per database or search engine. Furthermore, we discuss in detail the type of linkage between the two ID models per publication.

Results

Zero publications were identified from searches of the electronic databases. Eight publications were identified from the search of Google Scholar, and considered for this scoping review. Based on title, abstract and full text, three publications that mentioned both ID models independently of each other were excluded. Five publications were ultimately included (Table 1).

Table 1 Publications included in the scoping review

Title	Year	Authors
Comparing instructional methods for teaching technology in education to preservice teachers using logistic regression	2006	Zheng and Young
Research-based instructional methods for teaching technology in education to pre-service	2003	Zheng, Young, Robinson, and Sulzen

teachers: A design experiment		
Strategy-centred modelling for a better understanding of learning/instructional theories	2010	Hayashi, Bourdeau, and Mizoguchi
Using ontological engineering to organize learning/instructional theories and build a theory-aware authoring system	2009	Hayashi, Bourdeau, and Mizoguchi
Content-oriented approach to the organization of theories and its utilization: Organizing learning/instructional theories and building a theory-aware authoring system based on ontological engineering	2009	Hayashi, Bourdeau, and Mizoguchi

In two of the five publications, the effectiveness of the Nine Events of Instruction and Star Legacy were compared to each other in a design experiment. Here among was also a hybrid variant in which these two models were delivered. The identified 2006 publication concerned a draft version, after which the final version was retrieved and reviewed.[82]

[82] Dongping Zheng et al., "Research-Based Instructional Methods for Teaching Technology in Education to Pre-Service Teachers: A Design Experiment" (Paper presentation, Northeastern Educational Research Association Conference Kerhonkson, NY, October 22, 2003), 11-16; Dongping Zheng and Michael F. Young, "Comparing Instructional Methods for Teaching Technology in Education to Preservice Teachers Using Logistic Regression," in *Proceedings of the 7th International Conference of the Learning Sciences: Making a Difference, Volume 2* (Bloomington, June 27-July 1), ed. Sasha A. Barab, Kenneth Hay and Daniel Hickey (Bloomington, IN: International Society of the Learning Sciences, 2006), 7.

In three of the five publications, an ongoing research program to develop a computer model to design learning environments is described. With one of these three publications only the title, abstract and references are in English and therefore reviewed.[83] In this research program, instructional strategies are extracted from eleven learning theories and models. For example, "Gagne & Briggs's theory is a cognitivist theory, Keller's theory (ARCS model) is an instructional management theory, and Star legacy model is a constructivist model", several instructional strategies to motivate learners are extracted.[84] Nine out of the eleven learning theories and models are mentioned. First, Hayashi, Bourdeau, and Mizoguchi mention seven:

> Gagne & Briggs' 'Nine Events of Instruction' Dick, Carey and Carey's 'ID model, Merrill's 'component display theory' (1983), Keller's ARCS model, Collins et al.'s 'cognitive apprenticeship', Jonassen's 'design of constructivist learning environments' as well as Schwartz et al, Xiaodong, Brophy, and Bransford's STAR LEGACY model[85]

Then Hayashi, Bourdeau, and Mizoguch mention two more of the eleven learning theories and models: "Merrill and Tennyson's I-Theory " and "Scaffolding Hmelo & Guzdial, ."[86] These instructional strategies were entered into a computer model with artificial intelligence to help educational designers build learning environments. Building on the aforementioned example, if designers need an instructional strategy to motivate learners, the computer model will provide several possible instructional strategies with references to the underlying learning theories and models.

Discussion

[83] Yusuke Hayashi, Jacqueline Bourdeau, and Riichiro Mizoguchi, "Using Ontological Engineering to Organize Learning/Instructional Theories and Build a Theory-Aware Authoring System," *International Journal of Artificial Intelligence in Education* 19, no. 2 (2009a); Yusuke Hayashi, Jacqueline Bourdeau, and Riichiro Mizoguchi, "Content-Oriented Approach to the Organization of Theories and its Utilization: Organizing Learning/Instructional Theories and Building a Theory-Aware Authoring System Based on Ontological Engineering," *Transactions of the Japanese Society for Artificial Intelligence* 24, no. 5 (2009b), https://doi.org/10.1527/tjsai.24.351. Yusuke Hayashi, Jacqueline Bourdeau, and Riichiro Mizoguchi, " Strategy-Centred Modelling for Better Understanding of Learning/Instructional Theories," *International Journal of Knowledge and Web Intelligence* 1, no. 3-4 (2010).

[84] Hayashi, Bourdeau, and Mizoguchi, "Strategy-Centred Modelling", 197.

[85] Hayashi, Bourdeau, and Mizoguchi, "Using Ontological", 223.

[86] Hayashi, Bourdeau, and Mizoguchi, "Using Ontological", 224.

This scoping review showed two prior indirect linkages of Gagné's Nine EEvents of IInstruction model and Schwartz's STAR Legacy.[87] Firstly, Zheng et al. and Zheng and Young used both ID models separately in a design experiment. Using the same references for the Nine Events of Instruction model and STAR Legacy, they defined both ID models exactly as in our publication.[88] Secondly, Hayashi, Bourdeau, and Mizoguchi used both ID models for input for a computer model to help educational designers build learning environments. Although they did not define either ID model, they used the same references as in our publication. However, regarding the Nine Events of Instruction model, they referred to an earlier edition of Gagné's work than we do.[89]

In spite of these two prior indirect linkages, this scoping review showed no evidence of a meaningful in-depth and/or direct integration of both ID models. Nevertheless, we could hypothesize preliminarily in what way these two ID models could be integrated. Each of the Nine events of instruction can be linked to one of the learning events of STAR Legacy. In this way, the procedure of the Nine Events of Instruction could also become a part of the procedure of STAR Legacy. By doing so, the terminology of military skills training could be explicitly incorporated into a learning cycle that facilitates academic education.

Strengths and limitations

Our scoping review has some strengths. Our extensive search strategy minimized the chance that we missed a previous integration of the two models. In our search, the settings of the electronic databases and Google Scholar were set so that we included as many as possible relevant publications. By using Google Scholar as a complementary search method, an ever more broad coverage was achieved .[90]

[87] Gagné, Briggs and Wager, *Principles*, 190; Schwartz et al., "Software for Managing", 41; Schwartz, „Toward the Development", 190.
[88] Zheng et al., "Research-Based"; Zheng and Young, "Comparing Instructional".
[89] Hayashi, Bourdeau, and Mizoguchi, "Using Ontological"; Hayashi, Bourdeau, and Mizoguchi, " Content-Oriented"; Hayashi, Bourdeau, and Mizoguchi, "Strategy-Centred Modelling".
[90] Neal R. Haddaway et al., "The Role of Google Scholar in Evidence Reviews and its Applicability to Grey Literature Searching," in *PloS ONE* 10, no. 9 (2015): Conclusions, https://doi.org/10.1371/journal.pone.0138237; Michael Gusenbauer, and Neal R. Haddaway. "Which Academic Search Systems are Suitable for Systematic Reviews or Meta-Analyses? Evaluating Retrieval

However, there are also some limitations. The exact scope of Google Scholar's search engine is unknown.[91] Therefore, it is unclear what the range of our Google Scholar search actually was and is. Furthermore, the Nine Events of Construction turned out to be the typical ID model for military training. Nevertheless, there are many alternative options with regard to the ID model for academic education. Consequently, it cannot be ruled out that an integrated ID model has previously been produced, based on the Nine Events of Instruction for military training, but with an ID model other than STAR Legacy for academic education.

Conclusions

This article makes a plea for an innovative, integrated ID model that meets the needs of both military training and academic education for officer cadets, based on Gagné's Nine Events of Instruction model as an ID model typical for military training, and Schwartz et al., STAR Legacy as a suitable ID model for academic education.[92] Such an integrated ID model is so far not available. That new integrated ID model intends to contribute to closing the gap between military instructors and civilian academicians by providing a common educational language and instructional method. By doing so, it is intended that in officer education, officer cadets could learn military skills and strategic thinking in a less isolated way, preparing them better as "strategic lieutenants" for modern military missions.

Future research could focus on the actual design-wise integration of the Nine Events of Instruction and STAR Legacy into an integrated ID model, both in terminology and procedure. Thereafter, the effects of that new, integrated ID model on the preparation of officer cadets for their jobs should be examined.

Qualities of Google Scholar, PubMed, and 26 Other Resources," *Research Synthesis Methods* 11, no. 2 (2020): 189, https://doi.org/10.1002/jrsm.1378.

[91] Haddaway et al., "The Role", Conclusions; Gali Halevi, Henk Moed, and Judit Bar-Ilan, "Suitability of Google Scholar as a Source of Scientific Information and as a Source of Data for Scientific Evaluation–Review of the Literature," *Journal of Informetrics* 11, no. 3 (2017): 824, https://doi.org/10.1016/j.joi.2017.06.005;
Michael Gusenbauer, "Google Scholar to Overshadow Them All? Comparing the Sizes of 12 Academic Search Engines and Bibliographic Databases," Scientometrics 118, no. 1 (2019): 197, https://doi.org/10.1007/s11192-018-2958-5; Gusenbauer, and Haddaway, "Which Academic", 183.

[92] Gagné, Briggs and Wager, *Principles*, 190; Schwartz et al., "Software for Managing", 41; Schwartz, et al,„Toward the Development", 190.

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Appendix A: Data abstraction form

Data extraction item	Data
Number	
Database / Search Engine	
Title	
Authors	
Year of publication	
Country	
Publication Type	
Gray literature (yes/no)	
Journal (if applicable)	
Book (if applicable)	
Conference (if applicable)	

Data extraction item	Data
References Nine events of instruction model	
Definition of Nine events of instruction	
References Star Legacy Cycle	
Definition of STAR Legacy Cycle	
Description of linkage	
Integration (yes/no)	