TRAINING PLATOON LEADER ADAPTIVE THINKING SKILLS IN A CLASSROOM SETTING

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ABSTRACT

Given the irregular and unconventional nature of current military conflicts, a major objective for military training and education is to develop "highly adaptable leaders that can quickly hone unit skills on an assigned mission, can reach back to leverage sources of expertise before and during mission execution, can rapidly adjust to changing circumstances, and can aggressively learn from previous and current operations" (AR 350-1, 2007). Today's Soldiers must be able to think critically, make rapid and accurate decisions, and solve complex problems. However, to develop instruction that is designed to train such cognitive skills may require the use of training approaches that are currently either not employed at all or employed very rarely within traditional military education. This paper reports on the results of an effort examining the development and evaluation of an exemplar training module designed to train adaptive thinking in the context of troop leading procedures (TLP), and that can be used within the real circumstances and constraints of a typical military educational environment. The training is based on constructivist principles of experiential learning and draws heavily from approaches such as contrasting cases/invention (e.g., Schwartz & Bransford, 1998). The approach requires students to exercise adaptive thinking skills in response to changing conditions during mission planning that have been engineered to contrast with previous conditions in order to demonstrate important principles of planning (e.g., terrain-based planning vs. enemy-based planning). Forty-two participants from the Infantry Basic Officer Leader Course (IBOLC) participated in the pilot trial of the new approach. Practical implications for adopting this training methodology within Army institutional training are identified.

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BACKGROUND

The demands facing small unit leaders (platoon, squad, team) in the contemporary operational environment (COE) require that they demonstrate a high level of adaptability. Leaders must be able to adjust rapidly to new and unforeseen circumstances across a wide variety of operations including humanitarian assistance, peacekeeping, peace enforcement, and low intensity conflict as part of a joint, combined, or interagency operation (TRADOC PAM 525-66, 2001). High operational tempo, increased uncertainty, cultural differences, a determined and resourceful enemy, and the need to constantly shift tactics and approaches are some of the key factors which have contributed to an environment where adaptability is required for mission success (Mueller-Hanson, White, Dorsey, & Pulakos, 2005). The Army, more than ever, needs "… agile and adaptive leaders able to handle the challenges of full spectrum operations in an era of persistent conflict." (FM 3-0, 1-83, 2008).

Adaptability has been defined in many ways (e.g., Pulakos, Arad, Donovan, & Plamondon, 2000; Smith, Ford, & Kozlowski, 1997). The definition adopted for this research is the one provided by Mueller et al. (2005) who define adaptability as an effective change in response to an altered situation. Underlying this definition is the notion that, for an individual to respond in an adaptive fashion, he or she must first recognize the need to change based on some perceived alteration in the environment and then change his or her behavior in an appropriate manner.

Objective: Training Adaptability

Institutional courses such as the Infantry Basic Officer Leader Course (IBOLC) are tasked with providing new lieutenants with the fundamental knowledge and skills that will enable them to function effectively as platoon leaders in their first unit of assignment. Not surprisingly, the operational needs of units have impacted course content. In addition, the need to rapidly fill platoon leader positions in operational units may shape how topic areas are taught, which will limit how such content domains as adaptability are addressed in these (institutional) settings.

Thus, only select adaptability attributes or characteristics may be amenable to training at the institutional level. Attributes such as personality and cognitive ability, while predictive of adaptive performance, would be less amenable to training interventions and have a low payoff with regard to improved adaptive performance relative to the costs of developing training in these areas. On the other hand, attributes such as domain specific knowledge, (varied) experience, and, to a lesser extent, metacognition, and problem solving skills are much more amenable to training within an institutional setting (Mueller-Hanson et al., 2005).

Institutional training is typically formal and structured, involving both classroom training and field training in a controlled environment. The focus of this research is on designing effective and efficient classroom training to enhance the adaptive/critical thinking process, i.e., to provide the basic knowledge, concepts, and skills that will lay the ground work for future learning and, importantly, will enhance the transfer of knowledge to novel situations (a key component of adaptability). More specifically, this research will examine adaptability/critical thinking as applied to the mission planning and analysis process. This is a very challenging task for junior leaders. The fast paced, rapidly changing nature of operational missions requires that the platoon leader be able to quickly assess situations, identify key aspects of the planning process, and create follow-on orders which reflect an awareness of these factors (i.e., the changing situation and its impact on earlier plans).

Overview of Training Strategies

Three general learning strategies were considered to guide the development of the mission planning module and are briefly described below.

Inquiry Based Learning (IBL)

Inquiry or problem based-learning is founded on research which suggests that by having students learn through problem solving experiences, they can learn both content as well as thinking strategies. In IBL, students learn through facilitated problem solving. More specifically, learning centers on a complex problem that does not have a single correct answer. Students work in collaborative groups to identify what they need to learn to solve a problem. They engage in self-directed learning and then apply their new knowledge to the problem. They then reflect on what they learned and the effectiveness of the strategies employed. In this approach, the instructor's role is to facilitate the learning process rather than provide knowledge. Because students are self-directed, managing their learning goals and strategies to solve ill defined problems, they are able to, presumably, acquire the skills needed for lifelong learning (Hmelo-Silver, 2004; see also Hmelo-Silver, Duncan, & Chinn, 2007).

Guided Experiential Learning (GEL)

The GEL approach to learning is based on a large body of research which indicates that providing information does not equate to training. Furthermore, under the GEL model, providing trainees with a field-based problem or an immersive situation alone are not adequate to achieve individual or team learning (Mayer, 2004). A GEL-based course module is grounded on the premise that strong early guidance for the learning of expert-based strategies for task performance works best.

Guidance consists of clear procedures, accurate demonstrations of authentic field-based problem solving, and practice on increasingly difficult problems where expert feedback helps correct trainee misconceptions concerning the correct performance of the task. Guidance is gradually faded until the trainee is able to continue to learn and perform at or above expectations (Clark, 2004).

The structure of a GEL lesson or module follows the same format regardless of the problem. Typically, lessons are sequenced in the following order. The lesson starts with the instructor presenting students with a learning objective (to give the trainees an end state), then telling them why (to motivate learning) and what will happen in the lesson (an overview) to create a mental model of what will be learned. The instructor then teaches the conceptual knowledge needed to learn the procedure (if any), demonstrates the procedure and provides practice and feedback (Clark, 2004).

The overall quality of a GEL lesson is a direct function of the cognitive task analysis (CTA) that is performed in the course design phase. A CTA is a knowledge elicitation procedure designed to uncover information about the knowledge, thought processes and goal structures that underlie observable task performance (Clark, Feldon, van Merrienboer, Yates, & Early, 2007). Execution of Clark's CTA approach is highly structured (Expert Knowledge Solutions, 2007) and requires extensive training (and certification) of the interviewer before he/she is permitted to conduct a CTA (Clark's version) without supervision.

Not all courses are candidates for GEL design. Courses for advanced learners and or/experts do not require the learning support provided in a GEL designed course. In general, when the learning goals of a course are vague or the problems addressed in the course are unstructured/ill defined, and when only conceptual knowledge is being taught (i.e., without "how to" instruction) GEL design is not useful (Clark, 2004).

Contrasting Cases/Invention

Contrasting cases/invention are two instructional design features used to enhance deep understanding of subject matter materials. The approach was developed to help learners construct new knowledge for themselves and become more adaptive/effective problem solvers (Schwartz & Bransford, 1998; Schwartz & Martin, 2004). A key objective of this approach is to optimize the use of lectures/reading text materials to develop these skills. Schwartz and Bransford argue that the value of lectures can be enhanced if the trainee is able to map information from the lecture or text into the knowledge of the problem situation that they have already developed as a result of their prior experiences. A key assumption of this strategy is that the trainee can activate the prior knowledge. Schwartz and Bransford propose a way for activating this prior knowledge through the use of contrasting cases/invention. Based on theories of perceptual learning that emphasize differentiation (e.g., Bransford, Franks, Vye, & Sherwood, 1989), providing trainees with opportunities to analyze sets of contrasting cases (e.g., analyzing the results from different experiments, key aspects of different theoretical models) can help them become sensitive to information that they might not otherwise notice. Contrasting cases help attune people to specific features and dimensions that make the cases distinctive. The refined information provides the foundation for guiding other activities such as creating images, elaborating, and generating questions, which can enhance development of adaptive problem solving skills.

According to Schwartz and Martin (2004), contrasting cases can help learners pick up or notice distinctive features of a problem; however, it is their actions that are critical for helping them discern the deep-level structures that organize those features. To make contrasting cases effective, learners need to undertake productive activities that lead them to notice and account for contrasts in the different cases. Schwartz and Martin use the term "invention" to describe this process. Invention involves production activities, like inventing solutions that can be particularly beneficial for developing early knowledge and facilitating learning. These solutions could, for example, be in the form of graphs, or general formulas. Invention can help develop and/or clarify interpretations of the problem in question by forcing students to notice inconsistencies in their approach or mental model of their solution and work to reconcile them. This, in turn, provides the knowledge that will prepare them to learn from subsequent instruction (lectures) with deeper understanding (Schwartz, Sears, & Chang, 2008).

As with IBL, to optimize deep understanding of the subject matter material, Schwartz and colleagues advocate a particular sequencing of events. Students first try to solve novel problems without guidance/instruction. Then, they receive direct instruction and demonstrations regarding the tasks. Finally, they apply what they have learned to novel situations. For example, students might analyze data sets from classical experiments and attempt to graphically display the general phenomena from the data. Or, they might be asked to invent a model or formula that will accurately describe the concept (e.g., reliability or correlation). This would be followed by a lecture and (sometimes) class discussion. Finally, students would be presented with new problems and asked to make predictions concerning the outcomes of new experiments or applying the formula or model to solve another (novel) problem (Schwartz & Martin, 2004; Schwartz, Bransford, & Sears, 2005).

METHODOLOGY AND DESIGN OF A HYBRID TRAINING APPROACH

The training approach developed for this effort combined elements of IBL and Invention. Considerations for not using the GEL approach include the extensive time involved in training personnel to conduct and accurately execute a CTA, as well as the time involved to train instructors in the GEL approach, and the inability of GEL to address the key objective of the proposed training module - to develop the conceptual skills (adaptive/critical thinking) needed to produce effective solutions (plans) which have no clearly defined right or wrong answer. Because the goal was to promote adaptive thinking, we believed that these two approaches were more appropriate than GEL. Prior research suggest that direct instruction (e.g., GEL) is very effective in training procedural skills and the acquisition of facts, while constructivist (e.g., IBL, Invention) approaches are more effective in promoting cognitive skills like adaptability (e.g., Duffy and Kirkley, 2007). For all of these reasons, our hybrid approach therefore combined elements of both IBL and Invention.

The IBL Influence: Sequence of Activities

While there are variations on the IBL approach, the current training strategy requires the participants to work on multiple exercises (missions) prior to receiving any lecture or extensive discussion; a distinguishing characteristic of the IBL approach. Following the lecture, participants are then presented with another mission, related to the earlier ones (for additional practice). Finally, the participants receive a very different mission to assess near transfer (i.e. whether the newly acquired knowledge is successfully applied (transferred) to a novel problem/situation). Thus, while the design factors are the same in both the current approach and the Mueller-Hanson approach, (i.e., lecture, multiple exercises [or exposure to multiple examples], discussion/feedback), the key difference between the approaches is the sequencing of activities. By beginning with a problem, IBL advocates argue, the learner becomes more prepared to learn from the lecture. As they argue, there is a "time for telling" (e.g., Schwartz & Martin, 2004).

The Invention Influence: Contrasting Cases

While the sequencing of activities (problem before lecture) represents a framework for the training events, the selection of what those events should cover is a critical instructional consideration; this is where Contrasting Cases influenced the current approach. Given the goal of promoting adaptive thinking, the multiple exercises need to not only differ from one another, but differ in a meaningful way. Indeed, the power of designing such "contrasting cases" is that the student discovers the desired instructional outcome (i.e., the dimension along which two cases contrast). The link between contrasts and training objectives distinguishes this approach from general "what-if" exercises (though these can certainly help trainees consider contingencies at a general level).

In the present context, the desired educational outcome was for students to understand the dynamic relationship of friendly, enemy, and terrain components of terrain analysis when developing operational orders (OPORDs). New lieutenants might treat each of these components in an isolated, static fashion because they are focused on writing the OPORD rather than understanding the mission. The contrasts were therefore designed to demonstrate to the student that changes to any one component (friendly, enemy, terrain) will affect the other two. The contrasts are described in more detail below.

In the first scenario, the company OPORD described the plan for an offensive operation. The company mission was to clear Objective (OBJ) Anvil, and the third platoon's mission was to secure a mosque, which would enable the company main effort, second platoon, to clear the rest of OBJ Anvil. Included in the company OPORD were the area of operations/interest, situation (enemy and friendly), terrain and weather, concept of operations, attachments and detachments, company mission, commander's intent, tasks to maneuver units, and coordinating instructions.

The first FRAGO changed the task of third platoon from "secure" to "isolate", thereby changing the entire operation from being focused on the terrain (the bomb making facility) to being focused on the enemy (bomb making expertise). Table 1 summarizes the change in the OPORD and their intended impact on the participant's (platoon leader's) analysis/development of his OPORD.

The new lieutenant may not fully appreciate the power of the meanings of the tactical mission tasks (secure vs. isolate). Consequently, s/he may simply change the actual words in the revised OPORD rather than changing the plan conceptually. However, what they should come to realize, and what the instructor should help them discover in the lecture following FRAGO 1, is that the change to the friendly mission changes how they should analyze the enemy and the terrain; indeed, terrain analysis is dynamic.

Table 1. Example of a Contrasting Case

OPORD	FRAGO 1
Platoon's primary task is to "secure"	Primary task changes to "isolate"
Battalion operation is terrain focused	Battalion operation becomes enemy focused

In FRAGO 2, a high value target (HVT) is said to be on the objective. Again, the new lieutenant could simply add these words to the OPORD but keep the plan relatively unchanged. However, having worked through the OPORD and FRAGO 1, and having received the lecture following FRAGO 1, s/he should consider the dynamic nature of the analysis and consider how this knowledge of the enemy will affect friendly forces and the terrain. For example, s/he should expect the enemy now to fight in order to allow the HVT to escape. S/he may not have been prepared for that possibility before.

LESSONS LEARNED

The project team evaluated this training approach in a two-day pilot session with 42 male second lieutenants who recently graduated from the Infantry Basic Officer Leader Course (IBOLC). Demographics are presented in Table 2. Because we were evaluating a new training approach, we present lessons learned from all aspects of the project: development of materials, execution of the classroom session, and analysis of findings. But we first start with a more detailed description of the procedure.

Table 2. Participant Demographics

Age	Years in Militar y	Prior Enlisted	Deployed in OIF/OEF
M = 23.4	*M* = 4.0	7 (16.7%)	4 (9.5%)
SD = 1.8	*SD* = 1.9		

Procedure

The participants were provided with notebooks and different colored pens and instructed to do all their work, except graphics and concept sketches in the notebooks. The instructor role played the company commander and gave the area of operations (AO) orientation briefing and company OPORD. The Area of Operations brief was similar to a briefing a unit might get during a Relief in Place/Transfer of Authority (RIP/TOA), and while not entirely doctrinally correct, provided the appropriate background information to allow students to familiarize themselves with the situation. For assessment purposes, the participants were asked to record any questions they had for the company commander in their notebooks.

Each participant role played a platoon leader for 3rd platoon, Alpha company, and was asked to write their own individual platoon order. They were allowed to use whatever OPORD format they wanted (e.g., matrix). If they felt constrained by time they were instructed to focus on what was important, just as they would do in a unit.

The participants then began work on their backbriefs and Warning Order (WARNO). When they finished, they were instructed to start on the OPORD. The students were allotted a total of two hours (with an hour break for lunch) to complete the backbrief, WARNO, and OPORD before they received the first FRAGO (FRAGO 1). They then began to revise their OPORD based on FRAGO 1 by making changes to their base plan (using a different color pen).

After participants received FRAGO 1 and worked for 45 minutes, the instructor provided a lecture. The focus of the lecture was to emphasize the overall importance of developing a model of the plan and mentally playing out the plan (mental simulation). In addition, the instructor discussed how the changes in FRAGO 1 differed from the original company OPORD (part of the contrasting case strategy). The goal was to highlight distinctive features in the two plans (original OPORD and FRAGO 1), e.g., implications between isolate and secure, presence of high value target (experienced IED maker), changes in the battalion focus (neutralize, contain, and defeat) and how that impacted FRAGO 1. The instructor closed the lecture by asking the participants what they would add/change to their OPORD based on the changes noted on FRAGO 1, and how would these changes show up on their platoon OPORD.

The instructor then passed out FRAGO 2 along with a different colored pen in order to track the changes made in each phase. The participants were then given time to update their order. When the participants completed FRAGO 2, the instructor conducted a brief discussion designed to highlight second order effects (e.g., Did you do the mission at night with night vision goggles or with white light? If you used night vision goggles (NVGs), how did you account for the Iraqi squad that probably did not have NVGs?).

Following the discussion, the participants received the second scenario (transfer task) which was very different from the first OPORD. The transfer task was a stability operation (secure a market place). In contrast, the first OPORD and follow on FRAGOs were part of an offensive operation. The objective was to determine how well information provided in the contrasting cases and lecture and employed in FRAGO 2 generalized (transferred) to the more nebulous stability operation. For example, we intended to see if students considered the actions of the enemy after they had secured the market—how would they attempt to further disrupt the market given a new security posture? How would they neutralize the terrain features that most affected the marketplace? How would they incorporate other combat multipliers for full advantage, such as the engineers or civil affairs team?

Lessons Learned: Course Development

The development of course materials that promote adaptability is a challenging, but potentially liberating, task. One approach to training adaptability would be to create a course about adaptability and associated constructs and concepts. The approach we endorse here, however, has a subtle but important feature; adaptability is trained in the context of the existing course curriculum. Terrain analysis was still covered, as it is in the existing IBOLC program of instruction (POI). But, it was covered in a way that not only teaches students about terrain analysis, but promotes adaptive thinking at the same time. This value added is the great potential benefit of this approach.

Designing the contrasts, however, is a challenging task. As described earlier, though both contrasting cases and what-if exercises promote contingency planning skills, contrasts are meant to be more illustrative of training objectives than traditional what-if exercises. But they require extensive effort and thought to design, and it can be difficult to know that the students will discover the same underlying dimension of the contrast that the instructor sees. This can, of course, be mitigated to an extent by the keen instructor-guided facilitation of discussion.

While contrasting cases/invention is a critical part of Schwartz's approach, the lecture component is equally valuable. It offers a higher level explanation of the concept/phenomena that would be quite difficult and time consuming for the student to discover on his or her own. The higher level explanation is important because it provides a generative framework that can extend one's understanding beyond the specific cases that have been analyzed and experienced (Schwartz & Black, 1996) and thus, enhances adaptive problem solving in general (transfer). Schwartz, Bransford, and Sears (2005) present evidence that the most effective design combination includes both opportunities for invention and analysis (contrasting cases) followed by opportunities for learning efficient solutions derived by experts (typically) presented in lecture format.

Lessons Learned: Procedure

While a constructivist approach is appealing from the standpoint of developing problem solving skills which may be applied to similar situations outside the initial training environment, there were several drawbacks to this strategy for the current research. For example, issues involving classroom organization (shorter instructional periods in IBOLC with often strict time constraints), skill levels of current instructors to serve as course facilitators for this approach, and the relatively high IBOLC student/instructor ratio (40:1) threaten the practicality of a constructivist approach.

For example, it became immediately clear during the execution of the session that an extremely long amount of time elapsed between the AO brief and when students received any feedback (following FRAGO 1). This was intentional; we wanted students to get deep enough into the problem, and develop a strong enough commitment to a plan in response to the OPORD, that the introduction of a change (FRAGO 1) would significantly impact them. However, *the theory* behind the sequencing was diminished by *the practice* of the sequencing; participants appeared fatigued after working independently all morning on their OPORD. Despite being given less time to work on FRAGO 1, in some sense the damage to their motivation had been done. The participants seemed much less able to commit their full attention to FRAGO 2, and even less to the transfer task.

In addition, instructor selection and training would therefore be heavily impacted by a major commitment to adopting approaches such as these in Army institutional training. Ideally, the instructors themselves would be adaptive thinkers, capable of and comfortable with deviating from the course plan in order to facilitate classroom discussion. However, current training courses for instructors typically do not address such skills.

Lessons Learned: Evaluation

Initially the team had planned to have experts rate participants' adaptive thinking on the OPORD, FRAGO 1, and FRAGO 2 using a set of behaviorally anchored ratings scales (BARS) developed by Phillips, Ross, and Shadrick (2006). The logic was that participants would demonstrate greater adaptive thinking following FRAGO 1 than preceding it (by virtue of having experienced the contrasting cases and the lecture). However, this proved a troublesome method. For one, we conducted the training in a single day. The expectation that participants would become adaptive thinkers after a single day of instruction was unrealistic; the measure was therefore not going to be sensitive enough. In addition, the effort to score many sets of OPORDs is great as well (in fact, the grading of the OPORDs continues as of the writing of this paper). An instructor would struggle to provide timely feedback to students based on their evolving responses to three versions of an OPORD.

Assessment in general can be challenging in a constructivist approach. For one, rather than cumulative assessment (i.e., a grade at the end of an exercise), constructivists emphasize formative assessment (i.e., feedback as part of the exercise). This presents another institutional challenge, as it complicates the award of promotions and other recognition currently based on grades. Second, grading thinking skills as opposed to procedural skills may also be new and unfamiliar to instructors. Indeed they need to understand at a deep level how the outputs of procedural skills are connected to thinking skills. The anchors of the BARS were intended to help make this connection, and a replacement tool would require the same connection. Such a tool would require extensive design and validation, placing yet another burden on the institution.

CONCLUSIONS

Constructivist theorists provide compelling reasons to employ their methods for training adaptive thinking. Similarly, experiences with using direct instruction to train such cognitive skills can be unsatisfying (not just in the military of course, as almost all of us can attest to). Consequently, there seems to be a willingness and an openness to adopting new methods of instruction to train such skills (e.g., soon to be released Army training manuals will explain that different training approaches are appropriate for training different types of skills).

However, the institutional barriers to incorporating new approaches are tremendous. As described earlier, class sizes and schedules alone make the adoption of constructivist approaches prohibitive. Furthermore, changing the way instructors are trained to do training (to be facilitator rather than conveyor) would be a massive undertaking as well.

Constructivist approaches explored in this research were not successful due, in part, to some of the institutional training constraints identified earlier in this paper (not unique to only the military). This presents a challenge to constructivist theorists: how can approaches be implemented in this training environment given these constraints?

Indeed, that was the question we aimed to answer in this effort, and we believe we have identified potential parts of the solution, as well as additional constraints. For example, while the use of working through contrasting cases in the context of an actual operations order exercise is appealing and, we continue to believe, pedagogically valuable, a more targeted task, or sub-task, could address some of the time and fatigue pressures experienced during our exercise. Perhaps focusing simply on developing concept sketches, for example, would have required the same kind of thinking but with less of the cognitively tangential tasks. Or perhaps eliminating the backbrief and WARNO and focusing more on the OPORD would have saved time and effort. However, part of the reason why we did not do this ahead of time is that we were unable to find any descriptive guidance on how to develop constructivist approaches. The guidance we did find seemed vague.

Finally, training cognitive skills takes more than one day. It will almost certainly require repeated exercises over several classroom sessions with follow-on lectures and discussion to highlight key learning points and insure deeper understanding of the concepts presented. We were constrained logistically to one day, but instructors too would have to plan for several such exercises rather than a single one.

In conclusion, constructivist approaches hold a lot of promise for training the cognitive skills essential in the operational environment; however they require significant engineering to be implemented in the institutional environment.

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