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Adaptive Facilitation Skills for Army Instructors

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The process of adapting instruction to meet individual student needs is not a trivial challenge and places many demands on instructors. The U.S. Army is one of the organizations attempting to meet this challenge. In this research, a method and instructional tool was developed and tested for supporting Army instructors within the Abrams Tank Maintenance Advanced Individual Training (AIT) program to recognize and diagnose individual learner problems, and adaptively employ instructional techniques in near real-time to correct those problems. Following a thorough review of literature, extensive quantitative and qualitative data were gathered through a series of observations, questionnaires, and focus groups with instructors and students. These data helped to identify and narrow down top challenges students face in the course, associated observable student behaviors, diagnostic techniques, and recommended instructional strategies. Finally, an empirical evaluation of the tool was conducted. The findings from the evaluation were favorable and indicated that the Abrams AIT instructors found the instructional tool to be helpful especially for brand new or novice instructors. The full process, solution prototypes, evaluation results, and theoretical and practical implications are discussed. The instructional tool is included as a DVD.

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ADAPTIVE FACILITATION SKILLS FOR ARMY INSTRUCTORS

EXECUTIVE SUMMARY

Research Requirement:

Given diverse learning populations, to increase the efficiency and effectiveness of training, instructors must try to meet individual student needs and deliver customized training at the point of need (Martin, 2015). The process of adapting instruction is not a trivial challenge and places many demands on instructors. The United States Army, given the Soldier-centered approach described in the Army Learning Concept for Training and Education (U.S. Department of the Army, 2017), is one of the many organizations attempting to meet this challenge. Within the Army, although the majority of instructors attend the Foundational Instructor/Facilitator Course (FIFC) and learn a variety of instructional techniques, additional tools are needed to help instructors tailor their small group instruction to the individual Soldier. Compounding the issue, instructors often face schedule, time, and resource constraints, as well as understaffing. Thus, instructors often struggle to fully facilitate a Soldier-centered learning approach.

Procedure:

This research showcases a process through which an instructional tool was developed to help instructors meet these challenges. In the present study, a method was developed and tested for supporting Army instructors within the Abrams Tank Maintenance Advanced Individual Training (AIT) program to recognize and diagnose individual learner problems, and adaptively employ instructional techniques in near real-time (e.g., during breaks) to correct those problems. Through three phases of research, a thorough review of academic and military literature was conducted, and extensive quantitative and qualitative data were gathered through a series of observations, questionnaires, and knowledge elicitation sessions with instructors and students. These data helped to identify and narrow down top challenges students face in the course, associated observable student behaviors, diagnostic techniques, and recommended instructional strategies. Finally, the instructional tool was developed and empirically evaluated.

Findings:

Phase 1 of the research identified learner problems and associated learner behaviors that would be indicative of those problems. The four main learner problems and associated subcategories identified were as follows: Anxiety (subcategories: social anxiety and academic (test) anxiety); Lack of Comprehension (subcategories: ineffective learning habits; cognitive overload; and difficulty integrating knowledge); Lack of Confidence (subcategories: lacks initiative and insecure about own ability to learn and perform); and Lack of Motivation (subcategories: disinterested by job/content and discouraged). In Phase 2, the instructional strategies that instructors could use to mitigate the potential problems were identified in relation to specific problems. Finally, in Phase 3, an Excel-based instructional tool was developed that contained a total of 30 learner behaviors indicative of a potential problem and 80 unique instructional strategies. The findings from the tool evaluation are favorable and indicate that the Abrams AIT instructors found the instructional tool helpful especially for brand new or novice

instructors. In addition, based on end-user feedback, the tool would most likely be used during breaks or at the beginning or end of day whenever problems arise. The tool can be used proactively or reactively depending on the nature of the learner problems and associated context. For example, certain strategies can be applied in an effort to anticipate and prevent common mistakes or learner issues during challenging portions of the course (i.e., proactive approach). Other strategies can be used after an instructor recognizes the presence of a learner problem and applies the strategy in an effort to alleviate the problem (i.e., reactive approach).

Utilization and Dissemination of Findings:

While the approach was developed and validated for the Abrams Tank Maintenance AIT instructors and students (MOS 91A), the research process can be reused for any instructional setting (e.g., Bradley AIT, Advanced Leader Course, Initial Entry Training, and Officer Candidate School). The findings from the initial evaluations were favorable and indicated that the Abrams AIT instructors found the instructional tool helpful, especially for brand new or novice instructors. As such, one recommendation is to incorporate the instructional tool into the FIFC curriculum and Abrams Instructor Certification course. Doing so would raise awareness about the importance of adaptive facilitation and help new instructors learn how to recognize and address student problems in near-real time. The instructional tool is included as a DVD.

Whereas the explicit focus of this research was on helping instructors adapt at the micro-level in a predominantly reactive manner, future research could focus on macro-level adaptations and proactive instructional approaches. Additional future areas of opportunity that were identified as part of this research include the presence of company-related issues that play a role in emergence of learner problems manifested in the Abrams course. Exploring company-related stressors and identifying associated remedial strategies could be a fruitful avenue to pursue in future research. Finally, due to the strong interest in student tracking tool capabilities, a tool can be developed to consolidate student-related notes among instructors to assist in the transition process to new instructors as students advance in the course.

ADAPTIVE FACILITATION SKILLS FOR ARMY INSTRUCTORS

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Adaptive Facilitation Skills for Army Instructors

In 2011, the Army introduced the Army Learning Model in the U.S. Army Learning Concept for 2015 (U.S. Department of the Army, 2011) and presented ideas for a more Soldier-centered approach to learning; those ideas were further endorsed in the U.S. Army Learning Concept for Training and Education 2020-2040 (U.S. Department of the Army, 2017). Adaptability is at the center of the learner-centric, career-long learning model described in the Army Learning Concept in that (a) the Army must develop adaptive Soldiers; (b) training content must be adaptive such that training occurs outside of the classroom and adjusts to operational needs; and (c) content, learning methods, and technologies continuously adapt based on Soldier performance. This theme of adaptability persists within the Human Dimension strategic objectives as well, which state that Army institutions must deliver innovative solutions not only to meet needs but also in advance of those needs (The U.S. Army Human Dimension Strategy, 2015). Thus, from a teaching and learning perspective, both the Army Learning Concept and the Human Dimension strategy are advocating for instructors who continuously monitor the individual state of their students and emerging learning requirements, and proactively remediate challenges by tailoring their instructional approaches to meet those needs.

Providing individualized instruction by tailoring instructional strategies and approaches places many demands on instructors. A key challenge is identifying how to facilitate instructor performance across a range of environments so that they are able to adapt their instructional skills to meet learner needs, enabling individual Soldiers to progress on the key cognitive, physical, and social dimensions. The ability to adapt instructional skills is far from a trivial challenge. Within the context of the Foundational Instructor/Facilitator Course (FIFC) and the Intermediate Facilitation Skills Course (IFSC), novice instructors become familiar with a variety of instructional techniques (e.g., lecture, demonstration, practical exercises, etc.). However, while an essential start, the process of actually adapting instruction to meet learner needs faces several organizational and instructor level challenges including, but not limited to the following:

- Adapting instruction while meeting prescribed Programs of Instruction that specify what must be learned
- Adapting instruction while effectively meeting complex training schedules that demand a high level of throughput with rigid constraints (e.g., rounds per Soldier; class length; designated student/instructor ratios)
- Recognizing a range of challenges that individual learners might face
- Knowing when to apply particular instructional techniques given the social, cognitive, and physical challenges that are paramount to address
- Adapting instruction both in real time/near real time to meet challenges of individual learners, and also over longer timescales by adapting instructional techniques to meet the needs of the larger classroom

Simply put, to help meet the intent of the Army Learning Concept and the Human Dimension objectives, instructors must be able to recognize if, when, and how students are struggling, and then apply alternate techniques that help achieve complex learning goals within resource and time constraints. In other words, the instructors must progress through a *sense-assess-adapt* process to adjust their strategies and meet the needs of the students (Figure 1).

Grounded in learning theory (Microadaptive Teaching; Corno, 2008; Zone of Proximal Development; Vygotsky, 1978), the sense-assess-adapt process of adaptive instruction was developed for this research as a guiding framework that enables instructors to address critical learning challenges and maximize the learning potential of students.

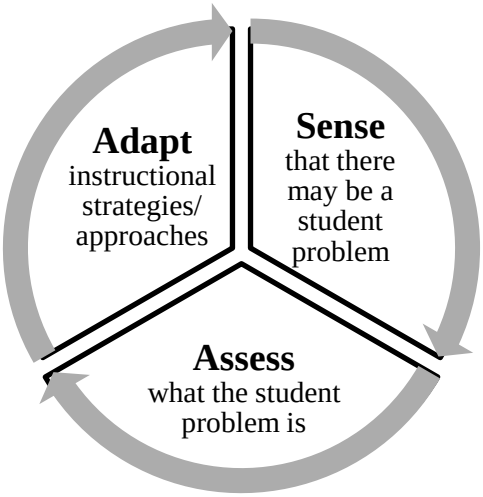

Figure 1. The sense-assess-adapt process for instructors.

Current Research

This report describes the research process through which an instructional tool was developed to help instructors meet some of the challenges associated with a Soldier-centered approach to learning. In the present study, a method was developed and tested for supporting Army instructors within the Abrams Tank Maintenance Advanced Individual Training (AIT) program to recognize and diagnose individual learner problems, and adaptively employ instructional techniques in near real-time (e.g., during breaks) to correct those problems. Following a thorough review of academic and military literature, extensive quantitative and qualitative data were gathered through a series of observations, questionnaires, and knowledge elicitation sessions with Abrams AIT instructors, training developers, course managers and students. These data helped to identify and narrow down top challenges students face in the course, associated observable student behaviors, diagnostic techniques, and recommended instructional strategies. An interactive tool was developed to help instructors adapt their approach by recognizing the signs that may point to common learner challenges or problems, and provide facilitation techniques and strategies that can help the individual students and class overcome those problems. Finally, an empirical evaluation of the tool was conducted. The full process, solution prototypes, evaluation results, and theoretical and practical implications (including the generalizability to other contexts) are discussed.

Although this research focused on one specific Army course (Abrams Tank Maintenance), the ultimate goal was to develop a generalizable, reusable process to help instructors in any setting tailor their instructional approaches. Therefore, while some of the identified student learning problems and behaviors as well as the instructional strategies are specific to the Abrams course, the overarching conceptual framework and process are generalizable to other contexts. As discussed in the next sections of this report, many of the problems and behaviors exhibited by learners and strategies utilized by instructors to address

these issues were extracted from the academic literature and tailored to the specific research context. However, once extrapolated to a higher level, they likely are applicable to any instructional context.

Underlying Framework and Research Process

As illustrated in Figure 1, the goal of this research is to produce a tool grounded in a conceptual framework developed for this research in which Army instructors will learn to sense if a student is having difficulties learning, assess what the student problem may be, and then adapt facilitation techniques to improve learning for the individual learner. Multiple cycles of sense-assess-adapt can occur at different nested levels. The two levels of interest in this work are *micro-level* and a more *macro-level*. The former is focused on real-time adaptation in relation to individual learner problems. For example, if an instructor senses that a student is not engaged in a task as evidenced by behaviors such as falling asleep in class or doing other tasks, he may review what the student has accomplished so far and assess that the task is too difficult for that student. Based on that information, the instructor could then adapt in real-time/near real-time by providing additional scaffolding to help that student. The macro-level is about adapting on a slightly longer time scale to potential learning problems across students at the classroom level. For example, during one block of instruction, the instructor may sense that the class is not engaged through various observable behaviors and assess that the students are struggling with the topic's relevance. The next day, the instructor could adapt the instructional strategy by providing more practical exercises to engage the students and demonstrate the relevance of the topic. In both cases, the instructor, making an assessment about student problems based on behaviors (e.g., falling asleep), is adapting instructional strategies to create the right learning environment (in the examples, providing more scaffolding and providing additional practical exercises) and then reassessing the impact of the tailored approach (thus facilitating a cyclical sense-assess-adapt process). In this research, the explicit focus is on helping instructors adapt at the micro-level. However, macro-level adaptations may occur as a by-product of increased monitoring and assessment.

To develop a tool that facilitates the sense-assess-adapt process within instructors, a multi-phased research process was used. This research process was designed to identify the information that instructors would need at each step in their adaptation process. The process included three main phases, each with one or more studies. The goal of the first phase was to identify common learner problems and the associated learner behaviors (enables sensing and assessing); a literature review and three studies were conducted as part of this phase. The goal of the second phase was to identify effective instructional strategies and map them to the learner behaviors and problems (enables adapting); this goal was accomplished by a literature review and one study. The goal of the third phase was to develop and evaluate an instructor tool that facilitates the full sense-assess-adapt process as part of two studies. Phases 1 and 2 are based on a combination of the scientific literature and focus group data from Soldiers and civilian subject matter experts (SMEs). Appendix A outlines the data collection sessions that occurred throughout this research, as well as the purpose of each session. The remainder of this report describes the details of the multi-phased research process.

Phase 1: Identification of Common Learner Problems and Associated Behaviors

To help instructors both sense whether a learner problem exists and then assess what that problem is, from a research perspective, the first step is to identify the types of learner problems that may be present. This step is closely followed by identifying the learner behaviors by which instructors may be able to recognize the presence of a problem. In the current research, Phase 1 was accomplished by first using the academic literature to identify common learner problems and then conducting focus groups with Abrams AIT Instructors to (a) determine which problems were relevant to their specific setting, and (b) identify the associated learner behaviors. These two pieces were identified through an initial literature review followed by three separate studies each with the goal of contextualizing and further refining the data.

Phase 1 Literature Review

The purpose of the literature review was to obtain a baseline understanding of the types of learner problems on which research has focused. The literature reviewed fell into six domains within the education field: student-centered instruction, learning indicators, learning inhibitors, physical environment, e-learning, and military. See Table 1 for a brief description of each literature domain reviewed. As can be seen in the summaries in this section, the literature reviewed here was helpful for identifying not only learner problems but also instructional strategies that may be useful for helping students to overcome those problems.

Table 1

Literature Domains Reviewed

Literature domain	Brief description
Student-Centered Instruction	Teaching strategies that prioritize student engagement and facilitate self-paced learning, self-reliance, and student responsibility.
Learning Indicators	Environmental factors, personal traits, and behaviors associated with a specific learner that assist an instructor with gauging the current state and potential achievement level of the learner.
Learning Inhibitors	Barriers that could prevent a learner from achieving their full potential.
Physical Environment	The educational setting that influences a learner.
e-Learning	Learning that is facilitated using electronic means, usually through a software program or internet-based courseware.
Military Education	Educating and training learners in various facets of the military.

The literature on *student-centered instruction* identifies various instructional strategies and learner factors that may impact learning (e.g., Crick & Goldspink, 2014; Newton, Billett, Jolly & Ockerby, 2009). Strategies are methods or activities an instructor may use to facilitate student learning (e.g., deliberate practice). Of relevance to this review is the relationship between

such strategies and identified learner factors such as learners' needs, characteristics, attitudes, cognitive load, goal orientation, amount of practice, and the learning culture in the class (Platzer, Blake, & Ashford, 2000). These factors must be considered when helping an instructor determine how to differentiate instruction to fit each student's unique needs. The literature on student-centered instruction pointed specifically to the following learner problems: cognitive overload, lack of meaning-making (e.g., inability to see the bigger picture), low intelligence, low confidence in learning ability, hyper-performance focus (e.g., focused on obtaining the right answer, not necessarily learning), and boredom/low engagement.

The *learning indicators* literature focuses on helping instructors understand a learner's current state as well as potential future achievement levels through an analysis of learning indicators. This literature domain groups indicators into three categories including environmental factors, personal traits, and behaviors (e.g., Hockings, 2005; Rolfhus & Ackerman, 1999). Examples of indicators within the environmental grouping are the presence of distractions and the learning culture in the class (Platzer et al., 2000). The main personal traits discussed in the literature include the following: the learner's disposition (i.e., the way learners engage in and relate to the learning process); comprehension; concept-mapping structure (i.e. conceptual system for understanding how to represent and use knowledge); self-theories (i.e. beliefs about the self which orient individuals toward, or away from, new learning opportunities); working memory; and self-regulation (i.e. the ability to act in one's long-term best interest, consistent with his/her deepest values) (Crick & Goldspink, 2014). The final type of learning indicator is learner behavior – a visible response stemming from an individual's current state. The primary learner states found in the research are anxiety, motivation, and confidence (Newton et al., 2009). With an accurate understanding of the three categories of indicators, an instructor can attempt to diagnose learner state and positively influence future achievement levels.

The literature on *learning inhibitors* focuses on two groups of inhibitors: the inhibitor itself and the path forward to overcome it (e.g., Amadieu, Tricot, & Marine, 2009; Corno, 2008; Johnson & Snow, 1986). These inhibitors, often referred to as barriers, are factors such as the difficulty level of instruction, complexity of learning environments, and students' motivation, anxiety, and confidence (Newton et al., 2009). As evident, barriers exists at different levels, including environmental factors and individual learner factors (e.g., motivation). Once barriers are recognized, strategies for overcoming them can be identified including unifying a home, school, and community approach, shifting system policy and priority, integrating public health concerns, accurately understanding the school social system, gaining additional information from students, and incorporating effective knowledge management solutions (Hunt, Barrios, Telljohann, & Mazyck, 2015). Every barrier, regardless of the level at which it occurs (e.g., individual vs. environmental), should be treated uniquely given the specific context, therefore requiring a tailored approach to overcome the barrier.

Physical environment becomes the surrounding learning environment once it is deemed as the location where instruction will take place (Platzer et al., 2000). However, establishing a productive learning culture or classroom community involves more than just a physical room. In addition to adequate materials, appropriate class size, and healthy relationships among learners, tasks and learning, the instructor must create an atmosphere where students can pursue goals, take responsibility for their learning, and work commutatively to achieve their learning aspirations (Meeks, 2014). Thus, this literature area provides insight into both the potential

causes of problems that learners face (e.g., class size, time constraints) as well as the high level strategies instructors can use to help students overcome those problems (e.g., helping students take responsibility for learning). From such literature, problems such as learner attentiveness, lack of goal setting and responsibility, and lack of effective learning strategies – especially in relation to the specific instructional format – can be inferred.

In recent years, the effects of using technology developed and tailored for educational settings on student outcomes, especially in regards to the domain of *e-learning*, has been a major research focus (Scheiter, Gerjets, Vollmann, & Catrambone, 2009). Within this literature, two main areas are relevant to the current research: types of e-learning environments and e-learner considerations. The types of e-learning environments typically discussed are computer learning environments, simulations, virtual worlds, agent-based environments, and ubiquitous learning environments (Landriscina, 2013). This area of the literature provides insights into how contextual factors may contribute to learner problems. In relation to e-learner considerations, these are factors that influence the effectiveness of the e-learning tool or environment. Important factors identified in the literature include the following: learner characteristics and attributes (e.g., motivation, values, and prior knowledge), reflections (e.g., goal setting); minimizing confusion over material (e.g., through effective user interfaces); reducing distractions (e.g., interpersonal and environmental); and learning styles (e.g. visual, auditory, kinesthetic; Platzer et al., 2000). Instructors must take each consideration into account when shaping strategies used within e-learning to mitigate potential learner problems.

Finally, the *military education and training* research domain involves some discussion of barriers to learning. The barriers discussed include a lack of trust; ineffective communication (both on the part of the instructor and the learner); a lack of a learning environment developing organizational learning; and an inability to learn under stress (Johnston, Fiore, Paris, & Smith, 2013). The research also discussed the application and use of approaches and strategies to overcome the barriers. Some of the learner problems that can be inferred from this literature domain include difficulty dealing with the instructional format, ineffective communication, lack of meaning-making, and lack of self-awareness.

An initial list of over 150 potential learner problems was reviewed to determine if each problem was unique and appropriate for this specific research. Based on that review, the list was consolidated down to 12 unique learner problems contained across three categories: learning environment, information processing, and motivation. These categories, along with the learner problems in each category are in Table 2. As described in Studies 1-3, an iterative cycle of data collections followed by data analysis and refinement took place to identify and finalize the learner problems and associated learner behaviors.

Table 2

Learner Problem Categories, Descriptions, and Examples Identified from the Literature Review

Learner problem category	Category description	Learner problems
Learning Environment	Environmental factors in the teaching space that are not learner driven but impact learning.	Format of Instruction Ineffective Communication Time Constraints
Information Processing	A learner's ability to be creative, engage in fluid thinking, and cognitively manage the information presented.	Cognitive Overload Lack of Meaning Making Low Intelligence Inattentiveness Lack of Self-Awareness
Motivation	Interest in the training; a learner's willingness to engage with the training.	Low Confidence in Learning Ability Too Performance Focused Boredom/Low Engagement Passiveness

Phase 1 Study 1: Identify Learner Problem Categories and Associated Learner Behaviors

Method. As part of Study 1, data were collected to identify common learner problems that students typically struggle with in the Abrams course. This data collection was also simultaneously used to gather information on related learner behaviors.

Participants. Thirty-two participants engaged in a focus group. Thirteen of the 32 participants also completed a questionnaire and demographics form. Of those 13, 11 participants indicated that they are currently Abrams AIT instructors, and two participants indicated they have training developer roles. The range of reported tenure in role was between three days and five years (M = 16 months; SD = 16.58 months), years in active and reserve component military service ranged from 6 to 40 years (M = 16.46 years; SD = 9.38 years), and time in rank ranged from one year and 9 months to 25 years (M = 4.75 years; SD = 6.77 years).

Procedure. The data collection blended quantitative (demographics form, questionnaire) and qualitative approaches (knowledge elicitation session/focus group). The focus group discussion was conducted after the participants completed the demographics form and questionnaire. The discussion followed a semi-structured line of query that centered on (a) gathering insights about the Abrams training course and instructional context, (b) identifying common areas where students struggle, (c) pinpointing learner problems that instructors believe contribute to these struggles, and (d) beginning to identify how instructors know when a learner is having a problem (e.g., observable learner behaviors).

Measures. After completing the demographic form, participants were asked to respond to a questionnaire that presented a set of learner problems selected from the literature. These included items relating to the learning environment (e.g., format of instruction, time constraints), information-processing/cognitive problems (e.g., cognitive overload, inattentiveness), and

motivational problems (e.g., boredom, passiveness). Participants leveraged their experience to rate how often they think each problem contributes to struggles learners have on a scale ranging from 1 = *Never* to 5 = *All the time*.

Results. Study 1 results indicate that all learner problems included in the questionnaire were considered as having at least minimal contribution to the struggles experienced by students in the Abrams course. Of particular interest were problems related to passiveness, inattentiveness, and time constraints associated with the training context. Descriptive statistics (mean, standard deviation) are presented in Table 3.

Table 3

Descriptive Statistics for SME Frequency Ratings Associated with Depicted Learner Problems

Learner problems	*M (SD)*
Learning environment problems	2.82 (0.28)
Format of instruction	2.77 (0.83)
Ineffective communication	2.54 (1.33)
Time constraints	3.15 (1.28)
Information-processing/Cognitive problems	2.72 (0.23)
Cognitive overload	2.92 (1.32)
Lack of meaning making	2.85 (0.99)
Low intelligence	2.31 (0.85)
Inattentiveness	3.08 (1.19)
Lack of self-awareness	2.46 (0.78)
Motivation problems	2.91 (0.24)
Low confidence in learning ability	2.62 (0.87)
Too performance focused	2.85 (0.80)
Boredom/low engagement	2.77 (1.09)
Passiveness	3.38 (1.33)

Note. Learning environment problems, informational processing cognitive problems, and motivation problems are conceptualized, for the purposes of this research, as overarching learner problem categories consisting of the specific learner behaviors listed underneath each respective category. Means and standard deviations are provided at both the category and specific problem level. *M* = mean, *SD* = standard deviation.

Full consensus was reached among the instructors in the focus group session that the most common student issues they encounter in the course typically stem from challenges associated with four main problems. These problems included (a) *comprehension* of the training material, (b) *confidence* in an academic setting, (c) *motivation* to learn or be successful in the course, and (d) *test anxiety*, especially during direct observation of learner performance on practical/hands-on tasks.

Conclusion. Four overarching learner problems were identified that relate to, but are somewhat modified from, the original problems identified from the literature (Table 3). Comprehension largely relates to the initial problems identified under the information-processing category. Confidence and motivation largely align with the original problems in the motivation category. Finally, the new test anxiety category has some overlap with the original information-

processing category, but also takes into account some learner problems in the original learning environment category.

Phase 1 Study 2: Refine Learner Problem and Behavior Framework

After identifying the most common categories of learner problems (test anxiety, lack of comprehension, lack of confidence, and lack of motivation) from the training instructors and developers during the first data collection session, a more targeted and focused literature review was conducted with these categories in mind. This research resulted in the initial identification of approximately 24 learner problem subcategories that were relevant to the four main learner problem categories. For instance, lack of confidence in learning ability is often attributed to low academic self-efficacy and high fear of failure which perpetuate a cycle of poor performance and negative self-view (e.g., Crick & Goldspink, 2014; Kauffman, 2015). This problem (i.e., lack of confidence) often manifests in students as not engaging with material or participating in class, being shy or anxious when called upon, and requiring clear instructions and expectations. Based on this research, a subcategory was included that encompasses lack of self-efficacy and self-esteem associated with learning (i.e., struggles with self-concept issues). Other subcategories were identified using a similar process.

The research team mapped the 24 identified subcategories onto the four overarching learner problem categories in order to (a) identify the subcategories that are related to each problem, (b) eliminate unnecessary redundancies, and (c) consequently develop a comprehensive and concise underlying framework that would guide subsequent behavior and strategy identification. The mapping results were also compared to the data collected from instructors and developers to fill any gaps and, as such, enhance the comprehensiveness and relevance of the framework. For example, subcategories that were rated highly in the questionnaire (e.g., cognitive overload) were retained, and subcategories over which instructors are likely to have no/limited control (e.g., course time constraints, low raw intelligence) were excluded from this framework. This review and consolidation process yielded the following four main learner problem categories and 15 lower order problem subcategories:

- *Lack of Motivation* (4 problem subcategories): Low psychological safety perceptions, Disinterested, Disillusioned, Discouraged.
- *Lack of Comprehension* (5 problem subcategories): Ineffective metacognitive strategies & study/test-taking techniques, Cognitive overload, Incongruence between expectations/experiences and reality, Lack of attention/focus, Incomplete prerequisite knowledge.
- *Anxiety* (3 problem subcategories): Emotional dysregulation, Experiences social pressures, Academic/Test anxiety.
- *Lack of Confidence* (3 problem subcategories): Lacks initiative/perseverance, Struggles with self-concept issues, Unfamiliar/Inexperienced with academic context.

Following the identification of those four main learner problem categories and the 15 associated subcategories, learner behaviors were extracted from the literature as well as from the data collected during the first data collection session. The intent of this portion of the process was to ensure the relevance and differentiation of the subcategories. For example, based on past research (e.g., Ackerman, 1999; Amedieu et al., 2009; Snow 1986) cognitive overload is defined

as being overwhelmed by the amount of presented information and is often manifested by behaviors such as suddenly disengaging from the lesson, appearing stressed, showing a lack of attention, being frustrated, having a glazed over look, and an increase of errors in work where there were few before. In addition, lack of engagement/motivation is often indicated by unwillingness to participate in class, not seeming interested in learning material, not volunteering to answer any questions, not putting in any effort into activities, assignments, and discussions (e.g., Corno, 2008; Crick & Goldspink, 2014; Duffy & Elwood, 2013; Newton et al., 2009).

Over 70 behaviors were identified by the research team, which were then mapped onto the 15 learner problem subcategories. The research team reviewed this initial mapping for redundancies, and also used their knowledge of the Abrams training context to generate additional behaviors. This process resulted in a total of 288 behaviors: 58 across the learner problem subcategories for Anxiety; 108 for Lack of Motivation; 99 for Lack of Comprehension; and 23 for Lack of Confidence. A series of iterations followed where the learner problem subcategories were evaluated for specificity, comprehensiveness, and differentiation from the rest based on the collective list of associated behaviors. Definitions were also refined for each category and subcategory to assist with the differentiation process. Following multiple rounds of revisions, the resulting framework consisted of four overarching problem categories, 11 problem subcategories, and 80 specific behaviors under the four-category umbrella. See Table 4 for a description of the learner problems and some example behaviors.

Table 4

Refined List of Learner Problems, Subcategories, and Example Learner Behaviors

Learner problem subcategories	**Subcategory description**	**Example learner behaviors**
Lack of Motivation: Lack of interest or desire to learn and perform successfully in the course.		
Resorts to self-preservation tactics	Engages in behaviors that protect the self emotionally or psychologically in uncertain or high-risk contexts.	Blames others for own errors; Throws others under the bus.
Disinterested in content and/or job	Sees little value in the course or its content; has other priorities.	Surfs internet (e.g., Facebook); uses Blackboard for purposes other than intended (e.g., gossip, online chat).
Discouraged	Loss of enthusiasm over learning course content; loss of determination to succeed.	Quits or becomes indifferent at the first sign of defeat (e.g., without trying to apply constructive feedback).

Learner problem subcategories	Subcategory description	Example learner behaviors
Anxiety: Uncomfortable feelings of apprehension, worry, or nervousness impairing one's learning capacity and performance.		
Social anxiety	High degrees of nervousness and self-consciousness in social situations.	Does not want to stand up and project voice.
Academic (test) anxiety	High degrees of nervousness in performance situations.	Makes silly mistakes; Makes more errors in work where there were few before.
Lack of Comprehension: Inability to fully understand material.		
Ineffective learning strategies	Inability to improve performance despite efforts to learn.	Engages in passive learning (e.g., does not take notes or participate in class).
Overloaded	Experiences cognitive demands that are too much to handle; Feels overwhelmed with amount of material.	Appears lost in the reading; Struggles to define terms, pronounce words, and/or express sentences fluently.
Incongruence between expectations/ past experiences and reality	Requirements of instructional environment are incompatible with previous study habits or expectations, thus hindering ability to attain/apply new knowledge in a timely manner.	Struggles to break bad habits; Keeps making same mistakes over and over.
Difficulty incorporating previously learned knowledge into new material/ lessons	Struggles to integrate multiple pieces of information from various sources in order to gain a 'big picture' understanding.	Does not realize (slow to realize) when a mistake has been made while following process flowchart; Does not backtrack.
Lack of Confidence: Low degree of reliance, trust, and faith in self and own abilities to learn and perform successfully.		
Lacks initiative and/or perseverance	Lack of foresight and ability to plan, begin, and sustain a task for a period of time.	Awaits to be spoon-fed info by instructor or peers; Sits back while other students find

Learner problem subcategories	Subcategory description	Example learner behaviors
		the right answers or do the work.
Struggles with self-concept issues (insecurity, low self-esteem/ efficacy)	Low belief in own ability to succeed in certain situations.	Engages in self-doubt (e.g., second guesses, talks self out of correct answer, easily swayed when given options).

Note. Lack of Motivation: 18 total learner behaviors; Anxiety: 15 total learner behaviors; Lack of Comprehension: 37 total learner behaviors; Lack of Confidence: 10 total learner behaviors. See Appendix B for the full list of behaviors.

Method. As part of Study 2, data were collected to refine the learner problem framework (i.e., the specific problem categories and subcategories) based on feedback from SMEs.

Participants. Twenty-three participants completed a demographics form and questionnaire and engaged in a focus group (one participant was removed due to excessive missing survey data). Of the 22 remaining participants, 18 were Abrams AIT instructors, two were in training developer roles, and two were training managers. The reported tenure in role ranged from 3 days to 3.5 years (M = 11.28 months; SD = 10.82 months), years in active and reserve component military service ranged from six to 27 years (M = 13 years; SD = 5.37 years), and time in rank ranged from one and a half years to four years (M = 2.74 years; SD = 1.14 years).

Procedure. Participants were first asked to complete a demographics form followed by a questionnaire. A focus group was then conducted based on a semi-structured line of query to gather (a) feedback from participants on the relevance, accuracy, and comprehensiveness of the four main learner problem categories and associated subcategories, and (b) insights into specific learner behaviors that map onto delineated learner subcategories. The identified behaviors were used as a reference to help instructors understand how subcategories were defined.

Measures. Participants were asked to respond to a series of items as part of a questionnaire (see Appendix C). The questionnaire included 11 learner problem subcategories organized by problem type. Participants leveraged their experience to provide two complementary ratings for each learner problem subcategory. Specifically, participants were asked to rate (a) the extent to which each problem subcategory (e.g., lacks initiative or perseverance, experiences test anxiety) impedes learning in students (i.e., severity of impact determination) on a scale of 1 = *Not at all* to 5 = *A great deal*, and (b) how often they see each problem in students (i.e., frequency determination) on a scale of 1 = *Never* to 5 = *All the time*.

Results. Study 2 results indicate that all of the depicted problems and subcategories were considered as having at least some impact on learning and encountered at least some of the time. Descriptive statistics (mean, standard deviation) are presented in Table 5.

Table 5

Descriptive Statistics for SME Severity of Impact and Frequency Ratings Associated with Depicted Learner Problem Subcategories

Learner problem categories and subcategories	Severity *M (SD)*	Frequency *M (SD)*
Lack of Motivation	3.57 (1.12)	2.83 (0.94)
Resorts to self-preservation tactics	3.05 (1.07)	2.55 (0.83)
Disinterested in content and/or job	4.10 (0.83)	3.00 (0.92)
Discouraged	3.57 (1.21)	2.95 (1.05)
Anxiety	3.83 (1.10)	3.73 (1.30)
Social anxiety	3.48 (1.17)	2.85 (1.23)
Academic (Test) Anxiety	4.19 (0.93)	4.60 (0.60)
Lack of Comprehension	3.54 (1.11)	2.98 (0.99)
Ineffective learning strategies	3.91 (1.26)	2.60 (0.75)
Overloaded	3.43 (1.25)	3.05 (1.19)
Incongruence between expectations/past experiences and reality	3.24 (0.94)	3.10 (1.02)
Difficulty incorporating previously learned knowledge into new material/lessons	3.57 (0.93)	3.15 (0.93)
Lack of Confidence	3.93 (0.97)	3.63 (1.10)
Lacks initiative and/or perseverance	4.05 (1.02)	3.70 (1.03)
Struggles with self-concept issues (insecurity, low self-esteem/efficacy)	3.81 (0.93)	3.55 (1.91)

Note. Lack of Motivation, Anxiety, Lack of Comprehension, and Lack of Confidence are conceptualized, for the purposes of this research, as overarching learner problem categories consisting of the specific learner subcategories listed underneath each respective category. Means (*M*) and standard deviations (*SD*) are provided at both the category and subcategory level.

The following problems were identified as having the greatest impact on learning: lack of interest in the content/job, academic/test anxiety, ineffective learning strategies, lack of initiative and/or perseverance, and self-concept issues (e.g., insecurity). The problems that were seen the most *frequently* in students were test anxiety, lack of initiative and/or perseverance, and self-concept issues. The variability in provided ratings suggest a high level of inter-individual differences among instructor experiences, reflecting the idiosyncrasies of each instructional context which may be due to differences in factors such as tenure, experience, quality of instruction, and content of instruction (e.g., hull, turret[1]).

Upon completion of the questionnaire, the participants were prompted to verbally share what learner problems they see most often, which problem they think causes the greatest learning issues for the students, and what major problems, if any, were missing from the list. All four of the main learner problem categories were considered important by the instructors, with lack of

[1] There are two main parts of the Abrams vehicle—the hull and the turret—and thus two main parts of the course. The hull portion comes first and is more procedural in nature. The turret portion tends to be more complex and to require more problem solving on the part of the student. Hence, students tend to struggle in the transition between the two components.

motivation and anxiety being consistently named as *the most critical* issues from which learning challenges seem to emerge. In terms of subcategories, (a) discouragement (e.g., due to a poor test score in the course), (b) difficulty incorporating previously learned knowledge, and (c) incongruence between expectations/past experiences and current experiences in the class (e.g., differences in testing format) were named as the most common during the focus group discussion. Furthermore, by utilizing a blank slate approach, the instructors were asked to generate examples of specific learner behaviors that are typically manifested in students who are struggling with each of the learner problem categories and subcategories, with an emphasis on identifying any notable variation among different course modules and annexes (e.g., between turret and hull).

Based on these findings, the research team refined and iteratively reviewed the list of problems and behaviors to identify and address (a) the learner problems that required reclassification, (b) unnecessary overlaps or conceptual issues, (c) subcategories or behaviors that needed rewording or relabeling, (d) behaviors that need reprioritizing, and (e) behaviors that are not immediately observable and would instead be identified through a line of questioning. Only those behaviors that were identified as the most important and frequently encountered in the Abrams course were prioritized and retained resulting in six to 10 behavioral examples per subcategory. Table 6 shows the final list of learner problems as well as example behaviors for each learner problem subcategory.

Table 6

Final Learner Problems and Example Associated Learner Behaviors

Learner problem subcategories	**Subcategory description**	**Example learner behaviors**
Lack of Motivation		
Disinterested in content/job	Sees little value in the course/job or its content; has other priorities.	Consistently ignores instructions or feedback. Pays more attention to things outside of the course; Actively seeks out distractions; Frequently requests breaks.
		Surfs internet (e.g., Facebook); Uses Blackboard for purposes other than intended (e.g., gossip, online chat).
		Dozes off; Struggles to remain alert; Moves slowly.
Discouraged	Loss of enthusiasm over learning course content; loss of determination to succeed.	Is excessively disappointed in self due to poor performance on a test despite high effort (e.g., verbalizes, starts crying, shows frustration). Has unrealistically high expectations/goals of performance.
		Shares negative circumstances outside of the course that have contributed to a reduced desire to succeed.

Learner problem subcategories	Subcategory description	Example learner behaviors
Anxiety		
Social anxiety	High degrees of nervousness and self-consciousness in social situations.	Behaves out of character or becomes flustered when observed by instructor/peers during test/practical exercise (e.g., shuts down, grinds to a halt).
		Appears embarrassed when called upon (e.g., face turns red, looks flustered)
		Only asks questions in private rather than raising hand during class.
Academic (test) anxiety	High degree of nervousness in performance situations.	Has difficulty settling on an answer (goes back and forth); Double and triple checks work. Appears frustrated while working through a test problem (e.g., may give up, shut down, or grind to a halt).
		Has difficulty concentrating, organizing thoughts, and clearly communicating answers; Easily forgets material or previous instruction.
Lack of Comprehension		
Ineffective learning habits	Inability to improve performance despite efforts to learn.	Makes little improvement in performance on assignments or tests; Consistently gives incorrect answers.
		Engages in passive learning (e.g., does not take notes/participate).
		Attempts to memorize steps; Simply locates the right answer rather than seeking to understand the concepts.
Cognitive overload	Experiences cognitive demands that are too much to handle; Feels overwhelmed with amount of material.	Has trouble getting started or progressing when solving a problem (e.g., does not know where to start or the right question to ask).
		Information does not sink in; Struggles to retain info (e.g., keeps asking questions or requests info to be repeated, reads material over and over).
Difficulty integrating knowledge	Struggles to integrate multiple pieces of information from various sources in order to gain a 'big picture' understanding.	Blindly follows procedures or looks for keywords rather than extracting meaning from material.
		Asks the wrong question at the wrong time; Asks questions that are not relevant to the current lesson.
		Reads directly from the manual rather than explaining in own words.

Learner problem subcategories	Subcategory description	Example learner behaviors
Lack of Confidence		
Lacks initiative	Lack of foresight and ability to plan, begin, and sustain a task for a period of time.	Does not ask any 'why' questions or seek to gain a better 'big picture.' understanding when going through steps.
		Awaits to be spoon-fed info by instructor or peers; Sits back while other students find the right answers or do the work.
		Consistently fails to volunteer to lead.
Insecure about own ability to learn and perform	Low belief in own ability to succeed in certain learning situations.	Unaware of own growth or improvement in learning or performance.
		Verbally questions performance and progress (esp. on tasks done before); Seeks unnecessary assistance from others.
		Avoids taking charge and/or making decisions; Is hesitant or reluctant to lead when assigned a leadership role.

Conclusion. Feedback from Abrams system maintenance training course instructors, relevant literature, and subsequent discussions among the research team yielded several decisions about the learner problems and behaviors framework. First, the four main learner problem categories (anxiety, lack of motivation, confidence, and comprehension) were retained as the most critical and frequently encountered challenges in this learning context. Second, two learner subcategories (resorts to self-preservation tactics and incongruence between expectations and reality) were removed from further consideration based on instructor criticality and frequency ratings and qualitative feedback. Although the idea of incongruity between expectations and reality was rated as common during the focus group discussion, it was not listed as critical; furthermore, qualitative feedback indicated that this was often beyond the control of the Abrams instructors. Relevant behavioral examples that were originally categorized as part of these two categories were subsumed where needed under alternate subcategories resulting in a more streamlined and clear-cut classification.

Phase 1 Study 3: Refine Learner Problem Subcategories and Associated Learner Behaviors

Method. A survey and focus group were used to gather feedback from instructors on the relevance, importance, accuracy, comprehensiveness, and frequency of the learner behaviors for each learner problem subcategory.

Participants. Of the 27 participants who participated in this study, 22 indicated that they are instructors, two indicated they are training developers, one self-identified as a subject matter expert, and two participants held more than one role (e.g., both instructor and training developer). The reported tenure in role ranged from brand new (approx. 1 day) to 5.5 years (M = 1.09 years; SD = 1.18 years), time in rank ranged from 2 weeks to 25 years (M = 2.94 years; SD

= 5.08 years), and time in active and reserve component military service ranged from 6 years to 29 years (*M* = 12.86 years; *SD* = 5.59 years).

Procedure. All participants completed a demographics form and questionnaire (five were removed due to excessive missing data, apparent misunderstanding of instructions or carelessness in responding). The questionnaire results were then discussed as part of the focus group in order to capture emerging themes and elicit additional contextual information or rationale behind the provided ratings. The participants were prompted to verbally share what student behaviors they see most often, which behaviors they consider the most critical with respect to student learning for each learner problem subcategory, and any behaviors that are missing from the list. Also discussed were behaviors that are more likely to be encountered in select portions of the training course (e.g., hull vs. turret) or that may be more likely to be observed in a group vs. individual (one-on-one) setting. Furthermore, instructors were asked to provide examples of techniques that they have employed in the past upon observing the listed student behaviors. These suggestions were considered during the instructional strategy development process.

Measures. After completing a brief demographic form, participants were asked to leverage their experience to provide several complementary ratings for each learner behavior listed in the questionnaire (see Appendix D). Specifically, participants (a) rated the extent to which each behavior is indicative of the presence of a learning problem in students on a scale of 1 = *Not at all* to 5 = *A great deal*, (b) rated how often they come across that behavior in students in the course (i.e., frequency) on a scale of 1 = *Never* to 5 = *All the time*, and (c) rank ordered the behaviors within each specific learner problem subcategory based on importance/priority.

Results. Descriptive statistics (mean, standard deviation, median, and mode) are included in Appendix E. The questionnaire results indicate that all behaviors were largely on point for the respective subcategories. The most critical behaviors (also most frequently encountered and highly ranked) for each learner problem subcategory are:

- Does not read/follow instructions carefully; Misunderstand instructions; Overlooks details *(Academic/test anxiety)*
- Reluctant to ask or answer questions (e.g., due to fear of belittlement by instructor or peers) *(Social anxiety)*
- Quick to give up when faced with roadblocks; Does not try to find a workaround *(Lacks initiative)*
- Engages in self-doubt (e.g., second guesses, talks self out of correct answer, easily swayed when given options) *(Insecure about own ability to learn and perform)*
- Has no interest in learning the material, just completing the course *(Disinterested in content or job)*
- Quits or becomes indifferent at the first sign of defeat (e.g., without trying to apply constructive feedback) *(Discouraged)*
- Attempts to memorize steps; Simply locates the right answer rather than seeking to understand the concepts *(Ineffective learning habits)*
- Information does not sink in; Struggles to retain info (e.g., keeps asking questions or requests info to be repeated, reads material over and over) *(Cognitive Overload)*

- Blindly follows procedures or looks for keywords rather than extracting meaning from material *(Difficulty integrating knowledge)*

The least critical behaviors for each learner problem subcategory (also least frequently encountered and lowest ranked) are:

- Struggles to adapt to new testing formats *(Academic/test anxiety)*
- Only asks questions in private rather than raising hand during class *(Social anxiety)*
- Consistently fails to volunteer to lead *(Lacks initiative)*
- Unaware of own growth or improvement in learning or performance *(Insecure about own ability to learn and perform)*
- Consistently ignores instructions or feedback *(Disinterested in content or job)*
- Has unrealistically high expectations/goals of performance *(Discouraged)*
- Makes little improvement in performance on assignments or tests; Consistently gives incorrect answers *(Ineffective learning habits)*
- Complains that there is too much going on in his/her life outside of the classroom; Usually engages/participates but chooses not to *(Cognitive Overload)*
- Consistently asks questions about basic foundational material or concepts from previous lessons *(Difficulty integrating knowledge)*

The learner problem subcategories are listed below in decreasing order of importance based on composite severity and frequency mean ratings for the respective set of behaviors (subcategories with the most highly rated behaviors are listed at the top).

(1) Lacks Initiative *(Category: Lack of confidence)*
(2) Ineffective Learning Habits *(Category: Lack of comprehension)*
(3) Disinterested in Content or Job *(Category: Lack of motivation)*
(4) Difficulty Integrating Knowledge *(Category: Lack of comprehension)*
(5) Cognitive Overload *(Category: Lack of comprehension)*
(6) Insecure about own Ability to Learn and Perform *(Category: Lack of confidence)*
(7) Academic/Test Anxiety *(Category: Anxiety)*
(8) Social Anxiety *(Category: Anxiety)*
(9) Discouraged *(Category: Lack of motivation)*

The interview results strongly aligned with those from the questionnaire for the majority of the behaviors. No additional behaviors were suggested by instructors. Behaviors that were not rated highly but mentioned as important during the interviews and as such warranted retention for further analysis included the following:

- Has poor test scores compared to assignments or practical exercises *(Academic/test anxiety)*
- Ruminates over potential negative consequences of poor performance (e.g., recycled, reduced privileges/pay, leaving Army) *(Academic/test anxiety)*
- Only asks questions in private rather than raising hand in class *(Social anxiety)*
- Puts down, blames, or disrespects others; Acts defensively or aggressively *(Insecure about own ability to learn and perform)*

- Has declining scores on tests or assignments *(Discouraged)*
- Stops doing assignments or participating in Blackboard discussions; Has stopped coming prepared for class; Falls behind pace of course/instructor *(Cognitive Overload)*

Conclusion. Study 3 results solidified the learner problem subcategory to behavior mapping; however, behaviors that could be trimmed were identified, and the learner problems and behaviors were refined based on the results. Specifically, the behaviors rated and ranked the most relevant were retained; behaviors not meeting this criterion but specifically mentioned by instructors in the focus groups were also retained. Cut-off points for the ratings were used to determine behaviors that could be trimmed (i.e., under the average rating of 3 or *SD* over 1). Examples of behaviors that were removed include "struggles to adapt to new testing formats" (under test anxiety) and "unaware of own growth or improvement in learning and performance" (under Insecure). Both of those behaviors were rated as comparatively less important, not as indicative of learning problems, and somewhat infrequent. Some changes in how the problems and behaviors were worded were also made to ensure relevance to the Abrams AIT instructional context. The refined list of behaviors is in Appendix F.

Phase 2: Identification of Instructional Strategies

Phase 2 of the research focused on the identification of strategies instructors can use in response to the learner problems and behaviors identified in Phase 1. More generally, Phase 2 focused on determining how instructors can adapt their approach based on what they learn through sensing and assessing. To identify relevant instructional strategies, an iterative approach of using both the literature as well as obtaining SME feedback was used. The literature review was used to develop an initial mapping of the learner behaviors and problems identified in Phase 1 to the identified instructional strategies. Then, those strategies were down-selected through an iterative research process, described below, to those most feasibly accomplished in the Abrams system maintenance course.

Phase 2 Literature Review

To identify instructional strategies and techniques that can be used to possibly remediate specific learner problems, the relevant academic and Department of Defense literature was reviewed through Google Scholar and DTIC searches, among others. Searched keywords included those associated with the defined problem subcategories including 'anxiety,' 'comprehension,' 'confidence,' and 'motivation' as well as other domain-specific words including 'mitigation,' 'remediation,' and 'military.' Once a set of initial strategies were identified, they were mapped to specific learner problems and behaviors identified in Phase 1 of the research. One study was conducted to collect data on the mapping between the strategies and learner problems and behaviors. The relevant literature on instructional strategies as they relate to the four main learner problems (anxiety, comprehension, confidence, and motivation) is briefly reviewed here first, followed by a description of the study methodology and results.

Learner Anxiety. Anxiety has been negatively linked to performance settings ranging from presentations (Tanaka, Takehara, & Yamauchi, 2006) to sports (Woodman & Hardy, 2003). Two forms of anxiety- social and performance- may occur and negatively influence learning in Army classroom environments. For example, if a student exhibits signs of social anxiety, such as

passive demeanor and reluctance, applying techniques used in Cognitive Behavioral Therapy (CBT) may be effective (Akinsola & Nwajei, 2013; Weems et al, 2009). Specifically, instructor implementation of exposure tasks and verbal rewards, such as giving students general praise and encouragement, having students engage in self-praise after goal attainment, and pairing constructive feedback with positive feedback, may function as positive reinforcement. Consequently, these strategies can help boost self-efficacy, can create a safe learning environment, and reduce anxiety (Weems et al., 2009).

Research suggests other anxiety reducing strategies may be more effective if a student exhibits signs of performance/test anxiety, such as displaying frustration, indecisiveness, or lack of organized thoughts or making silly mistakes. For instance, instructors may elect to engage in "priming" positive expectations/stereotypes, which lead to affirmation and confidence (Lang & Lang, 2010). Other effective strategies include encouragement of deep breathing and other relaxation strategies, which physically promote calming, as well as taking breaks at logical stopping points in dense course material, which helps provide perspective and can restore concentration (Akinsola & Nwajei, 2013; Feldman, 2013; Kondo, 1997). Last, helping students consider and plan their test strategy can provide structure and alleviate stress associated with encountering unknown variables in testing environments (Carter et al., 2005).

Lack of Comprehension. Comprehension is positively associated with performance, and failure to comprehend material likely impairs performance (Boulware-Gooden, Carreker, Thornhill, & Joshi, 2007; Rasinski, Samuels, Hiebert, Petscher, & Feller, 2011). Lack of comprehension can occur for a variety of reasons. Among these reasons are a poor understanding of course material which can result from ineffective learning habits, cognitive overload, and/or difficulty integrating knowledge. These reasons differ considerably, as do their manifested behaviors, each requiring a different set of strategies to attenuate their negative effects.

Lack of comprehension that results from ineffective learning habits may be evidenced by students having difficulty learning despite honest efforts, ineffective use of available resources, or failure to engage in active learning (Gregory, 2011). To help remediate ineffective learning habits, research suggests four feasible strategies. First, instructors may have students create graphic organizers, which can help promote active learning (Gregory, 2011). By helping students understand relationships among concepts through visual representations rather than learning these concepts in isolation, graphic organizers can create additional linkages that enhance memory and performance (Gregory, 2011). Another way to enhance memory through active learning is to promote use of recall strategies when learning material and preparing for exams. Examples of recall strategies include chunking, whereby pieces of information are grouped together during memory storage; mnemonic devices and other pattern-forming rituals; and providing vivid examples of materials (Jonassen & Grabowski, 1993). Third, diagnostic information can likely help comprehension. By instructors' diagnosing errors and highlighting specific areas for improvement, they can help Soldiers understand exactly what needs to be done to improve (Anderson, Boyle, & Reiser, 1985). Fourth, instructors can help improve ineffective learning habits by employing reciprocal teaching. This active learning technique places students in pairs, who in turn teach one another portions of class material, and helps students verbalize the content in meaningful ways (Gregory, 2011).

Lack of comprehension stemming from cognitive overload and manifesting itself as difficulty in getting started or progressing through material can be remedied through instructor use of scaffolding and faded work examples. Scaffolds can be used to support students when they begin to work on objectives that are more complex or difficult to complete and as such foster a supportive learning environment. Scaffolds can be tailored to support individual student learning and consequently be gradually removed as a student progresses and comprehension level increases. Like reciprocal teaching above, scaffolding enables students to take ownership of the learning materials and has been shown to help students' graduate to higher level material (Goldberg, Sinatra, Sottilare, Moss & Graesser, 2015). One example of scaffolding is instructors serving as facilitators while students work together to perform a task or ask questions and provide feedback to one another. Types of scaffolds include concept and mind maps, examples, prompts, and graphic organizers. Another effective technique is use of faded work examples, a technique where students complete partially solved problems, and gradually supply greater knowledge as less information is provided (Kalyuga & Sweller, 2004).

Students may lack comprehension because they have difficulty integrating knowledge. If students display signs of difficulty moving on from basic information, there are several things instructors may do to help. First, instructors are encouraged to ask questions of varying difficulty frequently, as a check for student comprehension, when introducing material (Gregory, 2011). Instructors could also use a technique called modelling, whereby instructors or even the students themselves demonstrate correct procedures in front of a class (Randi & Corno, 2005). Second, instructors can aid students in honing self-regulatory skills, which in turn can help students plan, monitor, and modify thoughts, feelings, and actions. These skills are useful for improving critical thinking and increasing motivation (Corno, 2004). Last, instructors can improve comprehension by contextualizing instruction for their students. For instance, instructors might share overarching goals and frameworks for the course. Doing so will not only communicate expectations, but also provide a structured road map for achieving these expectations. Seeing the big picture can also increase meaning and purpose for individual lessons for students as well (Jonassen & Grabowski, 1993).

Lack of Confidence. Another common learner problem is the lack of confidence in their abilities. Lacking confidence can result from either lacking initiative or being insecure about one's ability to learn. If the former, students tend to put in the minimum effort and do not seek to understand the material further. In such cases, instructors can help students by having them participate in one of two reflection exercises. Research finds that when instructors provide enactive mastery experiences, whereby students reflect on positive performances in a timely way, this exercise helps build self-efficacy and bolsters against the damaging effects of failure (Bandura, 1977). Research also points to debriefing, or after action review (AAR), as an opportunity to build confidence. During an AAR, the instructor discusses the outcomes of a group exercise with group members. Executing an AAR in a safe environment for expressing opinions and experiences can increase students' accountability, planning, and salience of actions, and thereby their motivation for future exercises (Lasater, 2007). If students lack confidence because they are insecure about their ability to learn, instructors may want to focus on repetition. Studies find that the rote memorization of drill and practice are effective for building confidence before moving on to more challenging material (Haskvitz & Koop, 2004).

Lack of Motivation. Students may suffer from lack of motivation in the classroom. Because motivation is one of the most important predictors of performance (Mueller & Dweck, 1998; Struthers, Perry, & Menec, 2000), it is crucial to address signs of insufficient motivation. Lacking motivation can typically result from either disinterest in the topic or from discouragement. If students' lack of motivation stems from disinterest, instructors have several options from which to choose to remedy the problem. For instance, research finds that students learn better when material is familiar to them (Mauk, 2006). Instructors can easily integrate this technique into teaching by learning about their students and their interests, and relating material to things that interest the class. Further, instructors may incorporate creativity to increase engagement and an element of surprise either by including novel class activities or by assigning supplemental material (Duffy & Elwood, 2013). Both of these techniques should help recapture students' wandering attention and motivation in the course.

Students may also lack motivation because they are discouraged. If students display behaviors such as disappointment in their performance or withdrawal of effort, there are effective remediation tactics instructors can implement. For example, instructors might establish meaningful benchmarks during long sections of material, and communicate with the class upon successful completion of benchmarks. Doing so can make progress more salient to students, and build self-efficacy (Snow, 1994). Further, and perhaps most comprehensive of the techniques for adaptive facilitation to learner problems, instructors should do everything they can to create a healthy, open learning environment. Learning environments are particularly effective when students feel safe to participate without consequence, and when the level of difficulty is high enough to interest students while not so challenging as to discourage them (Falasca, 2011).

Sixty-one instructor strategies that could be used in the course and 32 specific recommendations (i.e., guidance on what to tell Soldiers) were extracted from academic and military literature that addressed the four identified main learner problem categories and associated problem subcategories. After the strategies supported by the research were identified, they were framed in a way that was the most applicable to the context under investigation. A description of the overarching remediation strategy is also provided. Example strategies are included in Table 7 and the full set of strategies can be found in Appendix G.

Table 7

Example Strategies Extracted from Literature to Help Address Lack of Confidence

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
Lack of Confidence	Lacks Initiative	Debriefing (AAR) Immediately following an exercise, this strategy leads participants through a purposeful discussion of recent experience so they can reflect upon it. Students hear what they did wrong, and how they might fix it, increasing their confidence in performing correctly the next time they complete the exercise. The conversation should focus on what went right, what went wrong, and what can be improved upon the next time the exercise is performed.	Following the completion of a group practice exercise, lead the class in an after-action review (AAR). The goal of an AAR is to have a purposeful discussion on the recent operations and outcomes of an exercise, including conversation on what went right, what went wrong, and what can be improved upon the next time the exercise is performed. Engage Soldiers in active discussion and reflection while assuring them that an AAR is a safe venue in which to express their opinion on the functioning of the recent activity.	Following a group exercise, it is good practice to reflect and debrief your partners what happened. Volunteer to lead an after-action review (AAR) with your group members. Discuss what went right, what went wrong, and where things can be improved. Discuss if each group member successfully handled their responsibilities. Encourage your group members to be honest and respectful when expressing their opinion about the recent exercise.
Lack of Confidence	Insecure about Ability to Learn and Perform	Drill and Practice Technique of repeating concepts or procedures until students have memorized the content or behavior. While drill and practice is more rote memorization than a form of active learning, it does have the benefit of greatly increasing a student's confidence in themselves after sufficient practice.	Drill and practice course content and exercises to sharpen comprehension and cement Soldiers' confidence. Repeatedly quiz Soldiers until their success rate reaches a high level. Shuffle the timing and ordering of drilled items so Soldiers are always on their feet and comfortable with surprises.	Boost your confidence before an upcoming exam by drilling and practicing difficult concepts as much as possible. Repeatedly quiz yourself on material but be sure to shuffle the items and space them out in time. Flashcards can be great tools for drilling several items, the more cards you answer right, the more confident you will be. Practice makes perfect.

Phase 2 Study 1: Refine Instructional Strategies

Method. As part of Study 1, feedback was obtained from Abrams AIT instructors and students on the instructional strategies derived from the literature, as well as on any strategies that may be missing from the initial list.

Participants. Of the 22 participants that participated in the study, 19 indicated that they were Abrams AIT instructors, and three indicated they were training developers (e.g., both instructor and training developer). The reported tenure in role ranged from brand new (approx. 1 day) to 5.5 years (M = 1.05 years; SD = 1.21 years) while time in rank ranged from 2 weeks to 25 years (M = 2.94 years; SD = 5.08 years), and time in active and reserve component military service ranged from 5 years to 29 years (M = 12.13 years; SD = 5.68 years). Three participants' data were removed due to excessive missing data, and two participants' data were removed due to apparent carelessness in survey responding. Thirteen Abrams AIT students were also interviewed separately from the instructors. The students did not complete any forms or surveys.

Procedure. Following the completion of a demographics form and questionnaire, the instructors participated in a focus group that centered on validating the list of instructional strategies based on the learner problems and behaviors. Instructors were asked to comment on their questionnaire responses and provide suggestions for refining the existing strategies or adding new strategies. The questionnaire results were discussed as part of the focus group to capture emerging themes and elicit additional contextual information or rationale behind the provided ratings. Of particular interest was (a) gaining a better understanding of the factors that help instructors decide on the right approach with students, and (b) uncovering specific obstacles/barriers that may prevent instructors from using certain strategies even if perceived as effective.

Thirty-minute interviews with Abrams AIT students were also conducted separately from the instructors. At a high level, the student interviews focused on gaining additional perspective on effective instructional techniques to ameliorate the common learner problems. The students were interviewed in pairs or groups of three after completing a practical examination. A semi-structured line of query was used to elicit information about accuracy and comprehensiveness of the learner problems, how instructors can help mitigate those problems, and, as such, improve instructional effectiveness in the Abrams training course. Feedback was gathered on specific ways that instructors may help students who are facing anxiety, have difficulty comprehending the material, struggle with confidence issues, or lack motivation.

Measures. Instructors completed a brief demographics form followed by a questionnaire (see Appendix H). Instructors leveraged their experience to provide several complementary ratings for each instructional strategy listed in the questionnaire. Specifically, instructors were asked to rate each strategy on (a) the degree of effectiveness with respect to reducing the respective learning problem in students on a scale of 1 = *Not at all effective* to 5 = *Very effective*, (b) how frequently they have used each strategy as instructors in this course on a scale of 1 = *Never* to 5 = *A great deal*, and (c) how challenging they think it is to implement each strategy given the current instructional environment on a scale of 1 = *Not at all challenging* to 5 = *Very challenging*.

Results. The instructor questionnaire results indicated that all instructional strategies were largely on point in terms of effectiveness in mitigating the respective learner problems. The majority of the strategies were rated favorably across all dimensions. Descriptive statistics (mean, standard deviation) are presented in Appendix I.

The following strategies were rated among the most effective and were also rated as most frequently used and least challenging to implement:

- Communicate to students that they are expected to rise to the challenge of the course; Assure students that they are in a safe space to ask questions and express any concerns about course *(Discouraged)*
- Advise students on how to best study and be successful in this course (e.g., # hours studying, doing homework, preparing for next lesson, etc.) *(Ineffective learning habits)*
- Continuously ask student questions as more new material is added to help connect the dots (including varying difficulty levels of the questions, incorporating questions about past material) *(Difficulty integrating knowledge)*

The following were rated among the most effective strategies and also rated as least frequently used and most challenging to implement:

- Schedule a number of breaks at logical stopping points; Discourage cramming of material *(Academic/test anxiety)*
- Deliver standard course material in a creative format or variety of modalities to stimulate engagement and interest (e.g., 'thought' exercises, group activities, discussions, hands-on exercises, games) *(Disinterested in content or job)*
- Slowly scale up the difficulty of complex problems or procedures so students have time to adjust *(Cognitive Overload)*

The following were rated among the most effective strategies and also rated as least frequently used and least challenging to implement. This combination points to the strategies that would be of value for the instructors that they may not have considered previously but would, at the same time, be easy to implement in the course:

- Highlight and congratulate the class as each course objectives/benchmarks/milestones are reached *(Discouraged)*
- Request students share what memorization strategies they use when studying for tests *(Ineffective learning habits)*
- Point out effective methods for memorizing material (e.g., visualizations, storytelling, acronyms, and mnemonic devices); Provide examples of each method by using course content *(Ineffective learning habits)*

The following were rated among the <u>least</u> effective strategies and also rated as <u>least</u> frequently used and <u>most</u> challenging to implement. These strategies would require more significant refinement to be useful and should be potentially removed from consideration:

- Break up the routine or monotony of a task by changing up format or location of instruction *(Academic/test anxiety)*
- During lecture or practice, pause and ask students to take a breather, stand up, and stretch to help refocus *(Academic/test anxiety)*
- Shuffle the timing and ordering of drilled items so students are always on their feet and comfortable with surprises *(Insecure about own ability to learn and perform)*

A few strategies such as "Reiterate that even the best students will receive low scores or No-Go's from time to time" (lacks initiative) are not used as frequently because they are perceived as less effective despite being rated as relatively easy to implement. Certain instructional strategies that were rated less favorably appeared to be due to time and structure-related course issues (e.g., prescribed assignments and lesson plans that are difficult to deviate from due to policy constraints or simply lack of time). The focus group feedback strongly aligned with those from the questionnaire for the majority of the instructional strategies.

The feedback gathered from the Abrams AIT students supported the existence of the four overarching learner problem categories (i.e., anxiety, lack of comprehension, confidence, and motivation). Interestingly, the students' review of the course and instructors was overwhelmingly positive and favorable. While there appear to be inherent challenges associated with the course from the students' perspective (e.g., instructor to student ratio, time allotted for hands-on activities), the students are largely satisfied with the course and the teaching effectiveness of the instructors. The majority of the students indicated that any issues that may be perceived as lack of motivation are likely to stem from causes outside of the course itself (e.g., AIT Company related issues). Given that the Abrams instructors have little control and impact over non-course related issues, challenges stemming from such issues are beyond the scope of this research.

Conclusion. The findings and insights gathered during the data collection were used to refine the instructional strategies to better fit the Abrams instructional context. During the refinement process, the goal was to enhance the specificity, relevance, and face validity of the instructional strategies relative to the respective learner behavioral symptoms. Strategies identified through the data collection not previously harvested from the literature review were also added, and existing strategies were further contextualized and refined. The most strategies were added to the specific problem subcategory of academic (test) anxiety. For example, within the course, practical tests are conducted with the students on an individual basis. To help combat anxiety, instructors can get the student into testing early in the day so anxiety does not continue building up as the student waits for his/her turn. This strategy is not necessarily feasible in every testing environment but does fit within the Abrams context. The revision process above resulted in a total of 69 unique instructional strategies across the four overarching learner problems and nine problem subcategories (see Appendix J).

Phase 3: Training Tool Development and Evaluation

Upon finalizing the learner behaviors, associated problems, and instructional strategies, an actionable set of information to help instructors sense, assess, and adapt had been identified. Thus, the purpose of the third research phase was to develop a tool that instructors could use to help them more easily progress through that cyclical process. In other words, the purpose of the tool is to provide instructors with a mechanism for helping them identify the most effective strategies for remediating the learner problems and behaviors they observe in their students. Throughout the other research phases, the research team held discussions with the leadership of the Abrams AIT course (e.g., course managers) to determine what type of tool would not only be most helpful to the instructors but also fit within the constraints of the course. The following constraints were identified: (a) cannot collect or store any personally identifiable information (PII); (b) any content must be capable of being edited and changed in the future to facilitate the longevity of the product; and (c) to enable all instructors access to the tool, must be compatible with the Army network while not requiring its own Certificate of Networthiness. Based on these constraints, the team identified the best solution as a macro-less, modifiable, Microsoft Excel-based interactive tool that can be managed and maintained internally (i.e., by designated Abrams Training personnel).

As described within this section, an iterative research process was followed in developing and refining the instructional tool in order to ensure that the content and workflow meet the instructor identified course constraints. To help finalize and simplify the behaviors and strategies in the tool, research team members engaged in an exercise in which the effectiveness of each instructional strategy was rated in relation to each of the previously identified learner behaviors. The purpose of the mapping was to (a) ensure each strategy made sense in relation to the learner problem category with which it was grouped, and (b) gain additional data on the presumed effectiveness of each strategy to lead to a truncated list of strategies. Six research team members applied their expertise and knowledge of the domain to separately rate each strategy in relation to each learner behavior, and the data were consolidated. These data, as well as data previously obtained from the Abrams AIT instructors were used to identify and prioritize the top instructional strategies per behavior, and as such, inform the development of the tool content.

Stemming from the instructor and training manager feedback, the instructional tool design enabled a user to select one behavior he/she was seeing in a student, and from there, the top two to three instructional strategies would appear. In addition, the user would obtain information on the context/setting in which that behavior is most likely to occur as well the learner problem from which the behavior likely stems. See Figure 2 for screen shots of the main screen within the tool.

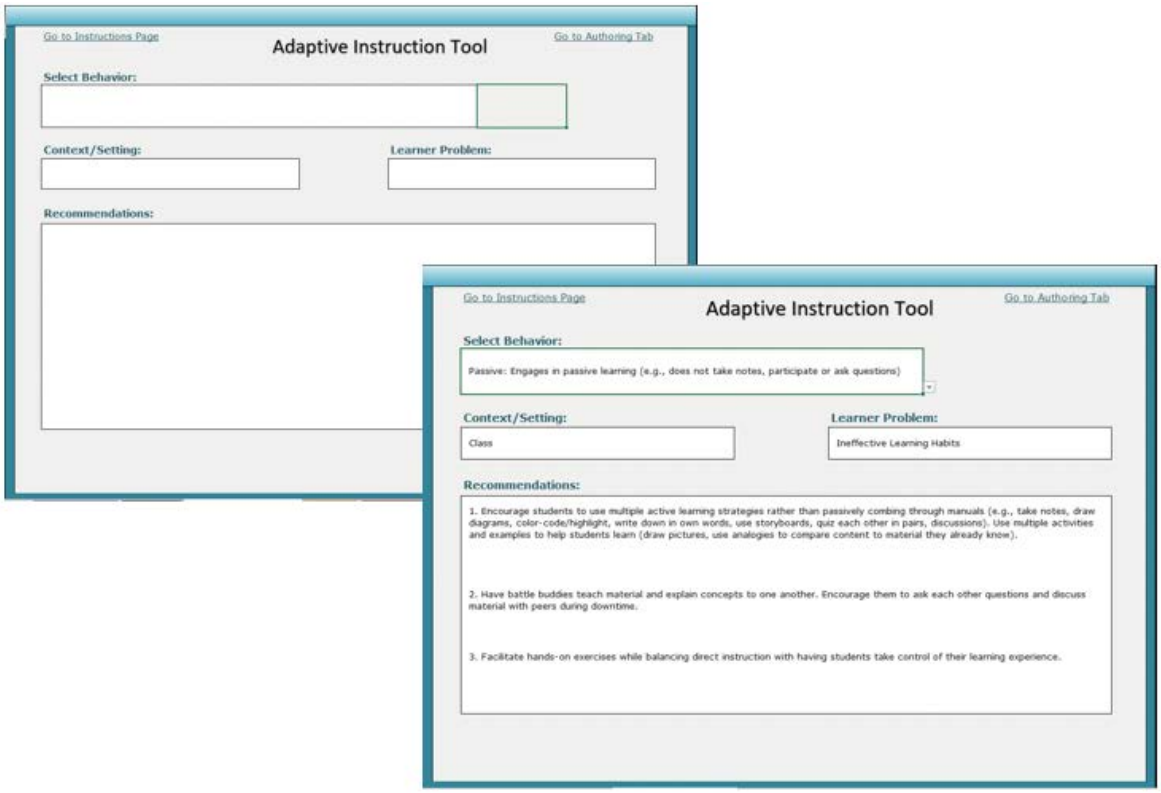

Figure 2. Screen shots of the main page of the instructor tool showing a blank screen as well as one with a selected learner behavior.

In addition to the main part of the tool shown in Figure 2, the initial tool also contained several additional features. Namely, there was an authoring component where instructors could add in notes regarding specific instructional strategies, additional behaviors they may have observed in their students, and/or new strategies that they have used in response to a specific behavior. The goal of the authoring tool is to ensure that the tool is a "living document" that can continue to benefit from the expertise that the instructors possess and allow instructors to learn from the strategies that others have implemented.

After the design of the initial adaptive instructional tool version, an evaluation protocol was developed to examine the utility and usability of the tool from an end-user (i.e., instructor) and SME perspective in two studies involving: (a) course observations, and (b) initial training and pilot. The overall objective was to evaluate the tool by gathering empirical data on instructor reactions and instructor ability to identify learner problems based on observable behaviors and adapt instructional approaches based on recommended courses of action. Specifically, the ability of the tool to support identification and implementation of relevant strategies was evaluated. In addition, opportunities for tool enhancements were identified based on any reported usability, functionality, and efficiency issues.

Phase 3 Study 1: Course Observations

Method. For the first part of the instructional tool evaluation, four members of the research team observed key training events. Such events included parts of the course where students typically demonstrate the most problems such as turret familiarization and testing.

Participants and Procedure. The courses of eight instructors were observed as part of this study, $M\ (SD)_{\text{yrs in current role}} = 4.17\ (5.55)$; $M\ (SD)_{\text{yrs in rank}} = 2.30\ (1.66)$. During the observation periods, the research members took notes of the student problems and behaviors they were seeing, and then discussed these potential student problems with each instructor during breaks and/or at the end of the period of instruction. During that debrief period, the instructors discussed what issues they observed in their students and how they attempted to remediate those issues. Then following the observations, the members of the research team reviewed the information in the tool to determine if the recommended strategies aligned with the instructor behavior. In addition to the observations, a demonstration of the tool occurred with members of the Abrams leadership team to gather initial reactions and feedback.

Results and Conclusion. Based on the observation periods and the feedback obtained from the instructors, several changes were made. First, behaviors and instructional strategies were modified and added to better align with the Abrams context (e.g., classroom testing, hands-on instruction). Second, while the instructors liked the simplicity of the tool (i.e., only showing a few instructional strategies in response to a given learner problem), they believed that having access to the full library of strategies in the tool would be beneficial. Finally, members of the leadership team demonstrated an interest in being able to track how often student problems were occurring throughout one instantiation of the course; they were interested in this tracking occurring at the class level to show overall trends rather than at the individual student level. Based on this feedback, changes were implemented in to the tool prior to the second part of the evaluation. Appendix K shows the behaviors in the tool mapped to the top three instructional strategies for each behavior.

Phase 3 Study 2: Initial Training and Pilot

Method. In this stage of the instructional tool evaluation, a set of instructors were trained to use the tool, and the tool's usability, utility, and impact on instructor knowledge were examined as part of a pilot.

Participants. To conduct the training, members of the research team demonstrated the tool to a group of instructors, $n = 10$; $M\ (SD)_{\text{yrs in current role}} = 2.68\ (2.24)$; $M\ (SD)_{\text{yrs in rank}} = 2.83\ (1.93)$, walked them through how to use it, and answered any questions the instructors had. Three instructors were relatively novice with fewer than five Abrams course cycles taught (in role tenure of eight months or less), while the remainder were relatively experienced, with at least two years tenure in current role and 12 or more cycles taught.

Procedure. Prior to the tool demonstration, the instructors were given a declarative knowledge assessment to gather baseline information on their knowledge of various instructional strategies. Following the demonstration, the instructors were administered a questionnaire to obtain initial reactions toward the tool and its content. The instructors were asked to share their

reactions and elaborate on their survey responses as part of a brief semi-structured focus group interview questions. Following the training, the tool was distributed to the instructors to use for a period of about two weeks. During these two weeks, the ten instructors were asked to use the tool frequently. At the end of the two-week period, the instructors completed similar questionnaires to those completed at the end of the training; they also participated in short semi-structured interviews to contextualize and elaborate on their questionnaire responses.

Measures. A declarative knowledge assessment and questionnaires were administered, and targeted semi-structured interviews were conducted to gather instructor feedback on tool content and functionality before and after the pilot. The utility and usability questionnaires consisted of items pertaining to the tool content and functionality. Instructors were asked to provide ratings on a scale of 1 = *Strongly disagree* to 5 = *Strongly agree*. Sample items include "I think the list of behaviors is comprehensive" and I intend to use this tool in the future." The semi-structured interview questions focused on perceived tool utility and usability, tool use, and impact. See Appendix L for pre-pilot data collection materials and Appendix M for the post-pilot data collection materials. The declarative knowledge assessment consisted of multiple choice questions prompting the instructor to select the (a) most likely underlying learner problem based on a specified learner behavior, (b) most indicative behavior for a specified learner problem, and (c) most effective instructional strategy for dealing with a specified learner behavior. The declarative knowledge assessment can be found in Appendix N.

Results. Descriptive statistics based on the pre- and post-pilot questionnaire ratings, as well as magnitude and direction of change in mean ratings after the instructors used the tool for approximately two weeks are presented in Appendix O. The instructors indicated they used the tool approximately 10 times over the course of the pilot. Most tool usability and utility items were rated favorably (i.e., mean rating of at least 3). The highest rated items were generally those pertaining to comprehensiveness, ease of use, and simplicity of the tool and content. Specifically, top three rated content and functionality items include the following:

- *Tool Content*
    - I think the list of behaviors is comprehensive
    - I found the behaviors to be easy to navigate
    - I felt confident using the strategies

- *Tool Functionality*
    - I thought the tool was easy to use
    - I think I would need support of a technical person to be able to use tool (reverse-coded item)
    - The interface was easy to read

The items rated the least favorably for each category include the following:

- *Tool Content (all ratings above 3)*
    - I found the strategies were easy to implement
    - I found the strategies to be effective
    - I believe the strategies have nothing to do with the selected behaviors (reverse-coded item)
- *Tool Functionality (post-pilot ratings under 3)*

- I think I would like to use the tool frequently
- The interface supported my work style and workflow
- I think this tool is sustainable within Abrams AIT

During the pre-pilot launch discussions (i.e., immediately following initial training), instructor feedback was minimal yet largely favorable. For example, they liked the comprehensiveness and simplicity of the tool and the user-friendly and intuitive navigation. After the completion of the pilot, instructors indicated that while the tool content was comprehensive, easy to use, and relevant, the recommended instructional strategies were too elementary for experienced instructors. As a result, the instructors requested the addition of resource links to more advanced instructional strategies for handling learner problems. Such advanced resources would help facilitate tool evolution and promote instructor development, and consequently improve tool sustainability over time.

Feedback was also gathered on workflow. Instructors indicated that they were unable to use the tool in real time given the high pace and structural rigidity of the course. This is especially true for hands-on exercises or during testing where instructors are required to maintain uninterrupted focus on students. The instructors indicated that they were instead able to occasionally reference the tool during breaks and at the beginning or end of day. Additionally, it was noted that the tool would be the most beneficial during critical course transitions (e.g., introduction to course, turret familiarization).

While the tool could serve as a refresher and self-check for experienced instructors, it would be the most beneficial to new instructors coming into this program of instruction, especially to those with no experience being in charge of Soldiers. For example, the tool can be integrated into the FIFC curriculum and Abrams-specific Instructor Certification Course as a way to prepare instructors for the course (e.g., learn about common student challenges during critical times in the course). Last, instructors suggested that the tool be referenced during monthly instructor AARs to share lessons learned as part of a group.

Conclusion. Following the completion of the pilot and consolidation of instructor feedback, the following refinements to the instructional tool were made: (a) added resources for more advanced strategies, and (b) adjusted authoring tab features to enable addition of more instructional strategies, and (c) completed development of behavior and strategy tracking tools capability. The final tool contained a total of 29 learner behaviors indicative of a potential problem and 80 unique instructional strategies (i.e., 145 strategies with overlaps). Sample screenshots of the final instructional tool are included in Appendix P, and sample screenshots of the supplemental user guides (instructor and training manager versions) are included in Appendix Q. The research team conducted training with all Abrams AIT instructors on the final tool and guides. A separate, more targeted training session was conducted with the Training Manager who would be implementing a process for obtaining instructor notes and revising tool content based on instructor feedback. The final set of delivered training materials included the following: 45 copies of the Adaptive Instructional Tool (Instructor version); Master Adaptive Instructional Tool with authoring capability for the Training Manager; Master Tracking Tool for the Training Manager where all instructor notes are automatically compiled and summary data is tallied; Instructor version of the User Guide; and Training Manager version of the User Guide. The instructional tool is included as a DVD.

General Discussion

The research presented here describes the development of an interactive instructional tool that represents one step forward in helping instructors meet some of the challenges associated with a Soldier-centered approach to learning -- specifically, adapting instruction approach to the needs of individual students through a cyclical sense-assess-adapt process. Based on end-user feedback, the tool would most likely be used during breaks or at the beginning or end of day whenever problems arise. The tool can be used proactively or reactively depending on the nature of the learner problems and associated context. For example, certain strategies can be applied in an effort to anticipate and prevent common mistakes or learner issues during challenging portions of the course (i.e., proactive approach). Other strategies can be used after an instructor recognizes the presence of a learner problem and applies the strategy in an effort to alleviate the problem (i.e., reactive approach).

While the approach was developed and validated for the Abrams Tank Maintenance AIT instructors and students (MOS 91A), the research process can be reused for any instructional setting (e.g., Bradley AIT, Advanced Leader Course, Initial Entry Training, and Officer Candidate School). The findings from the initial evaluations were favorable and indicated that the Abrams AIT instructors found the instructional tool helpful, especially for brand new or novice instructors. As such, one recommendation is to incorporate the instructional tool into the FIFC curriculum and Abrams Instructor Certification course. Doing so would raise awareness about the importance of adaptive facilitation and help new instructors learn how to recognize and address student problems in near-real time. Instructors would still need to identify an optimal workflow for using and evolving the tool. For example, instructors may study the tool in advance, and refer to it occasionally when needed during downtime. A monthly AAR could also take place for editing of the tool content and to provide a regular opportunity for instructors to learn from one another. Instituting a standardized process about how to update the tool and share information may aid in the creation of a sustainable workflow.

Whereas the explicit focus of this research was on helping instructors adapt at the micro-level in a predominantly reactive manner, future research could focus on macro-level adaptations and proactive instructional approaches. Furthermore, due to the strong interest in student tracking tool capabilities, a tool can be developed to consolidate student-related notes among instructors to assist in the transition process to new instructors as students advance in the course. For example, a digital profile can be developed that would accumulate evidence on each student in real/near real time and from other sources (e.g., from instructional tool or an automated version of the currently paper-based student progress books, small group peer assessment results). Such a tool would enable transferability of student-related knowledge and facilitate continuity across instructors and course potions.

Additional future areas of opportunity that were identified as part of this research include the presence of company-related issues that play a role in emergence of learner problems manifested in the Abrams course. For example, a student may appear discouraged due to a stressful event that took place in the barracks rather than factors specific to the course. Exploring company-related stressors and identifying associated remedial strategies could be a fruitful avenue to pursue in future research. Another area of opportunity that was identified by the instructors is restructuring the Abrams course schedule and curriculum in such a way that adds

instructional time and more hand-on opportunities to challenging portions of the course (e.g., turret), while reducing unnecessary excess time in less complex portions of the course (e.g., hull).

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Appendix A

Overview of Data Collection Sessions

Data collection session	Date	Abrams AIT participants	Focus
1 (Phase 1, Study 1)	February 2016	29 instructors and 3 training developers	Begin identifying learner problems; also gather initial insights into student behaviors
2 (Phase 1, Study 2)	April 2016	19 instructors, 2 training managers, 1 training developer	Elicit feedback on relevance, accuracy, and comprehensiveness of learner problems; continue gathering insights into student behaviors
3 (Phase 1, Study 3)	July 2016	24 instructors, 2 training developers	Elicit feedback on the relevance, importance, accuracy, comprehensiveness and frequency of student behaviors
4 (Phase 2, Study 1)	September 2016	20 instructors, 2 training developers	Elicit feedback on effectiveness, frequency of use, and implementation difficulty for specific instructional strategies
		13 students	Gather initial insights into common learner problems and effective instructional strategies
5 (Phase 3, Study 1)	March 2017	7 instructors; 1 training manager	Conduct initial testing of tool usability and utility
6 (Phase 3, Study 2)	April 2017	9 instructors; 1 training manager	Conduct tool training and pilot; gather feedback on tool utility and usability

Appendix B

Refined List of Learner Problems, Subcategories, and Learner Behaviors

Learner problem categories	Learner problem subcategories	Learner behaviors
Lack of Motivation	Resorts to self-preservation tactics	• Blames others for own errors; Throws others under the bus • Doesn't respond to correction / Thinks his/her way is the best • Acts defensively
	Disinterested in content and/or job	• Consistently ignores instructions or feedback • Pays more attention to things outside of the course; actively seeks out distractions; frequently requests, or reminds instructor of, breaks • Surfs internet (e.g., Facebook); uses Blackboard for purposes other than intended (e.g., gossip, online chat) • Does bare minimum to get by (e.g., has minimal/no activity on Blackboard) • Acts out and distracts others (e.g., sighs with exasperation, carries on side conversations that are unrelated to course) • Makes up excuses to avoid work (e.g., broken laptop); procrastinates • Dozes off; struggles to remain alert; moves slowly • Does not want job (but was given it anyway) • Has no interest in learning the material, just completing the course
	Discouraged	• Is excessively disappointed in self due to poor performance on a test despite high effort (e.g., verbalizes, starts crying, shows frustration) • Has unrealistically high expectations/goals of performance • Shares negative circumstances outside of the course that have contributed to a reduced desire to succeed • Has declining scores on tests or assignments • No longer sees the significance or purpose of the job • Quits or becomes indifferent at the first sign of defeat (e.g., without trying to apply constructive feedback)
Anxiety	Social anxiety	• Behaves out of character or becomes flustered when observed by instructor or peers during test or practical exercise (e.g., shuts down, grinds to a halt) • Appears unusually passive or quiet during an activity; Does not want to stand up and project voice • Appears embarrassed when called upon (e.g., face turns red, looks flustered) • Prefers to ask peer/instructor questions in private rather than raising hand during class • Avoids engaging with the instructor; reluctant to ask questions despite not understanding (esp. due to fear of belittlement)

Learner problem categories	Learner problem subcategories	Learner behaviors
		• Fears criticism (esp., from peers, instructor); afraid to ask or answer questions (because fears being belittled)
	Academic (test) anxiety	• Has difficulty settling on an answer (goes back and forth); double and triple checks work • Appears frustrated while working through a test problem (e.g., may give up, shut down, or grind to a halt) • Has poor test scores compared to assignments and practical exercises • Makes silly mistakes; more errors in work where there were few before • Expresses avoidance and fear of testing situations (e.g., says heart is beating very fast) • Ruminates over potential negative consequences of poor performance (e.g., recycled, reduced privileges or pay, leaving Army) • Appears nervous, distraught, or overwhelmed, esp. right before/during testing (e.g., perspires, taps, fidgets, cries, rapid speech, shakes, twitches, pale, jittery) • Struggles to adapt to new testing formats • Does not read and follow instructions carefully; misunderstands instructions; overlooks details
Lack of Comprehension	Ineffective learning strategies	• Makes little improvement in performance on assignments or tests; consistently gives incorrect answers • Ineffectively or inappropriately uses available resources (time, learning tools) • Engages in passive learning (e.g., fails to take notes, participate) • Does not plan ahead/outline what needs to be done (lack of planning ahead and organizing) • Has difficulty learning new information and completing assignments despite honest efforts • Attempts to memorize steps or simply locating the right answer rather than seeking to understand the concepts • Consistently struggles to complete homework or classwork (e.g., doesn't turn in assignments, wrong answer and/or no answers on assignments)
	Overloaded	• Has trouble getting started or progressing when solving a problem (e.g., doesn't know where to start or the right questions to ask) • Information doesn't sink in; struggles to retain info (e.g., keeps asking questions or requests info to be repeated, reads material over and over) • Stops doing assignments or participating in Blackboard discussions; has stopped coming prepared for class; falls behind the pace of course/instructor

Learner problem categories	Learner problem subcategories	Learner behaviors
		• Complains that there is too much going on in his/her life outside of the classroom; usually engages/participates but chooses not to • Expresses frustration with or being overwhelmed by large amounts of material (Blackboard, manual, quizzes, tests, handout) • Shuts down; puts head down; begins to fall apart (appears frustrated, fatigued, stressed, cries, glazed over/deer in headlights look, zones out) • Appears lost in the reading; struggles to understand the reading
	Incongruence between expectations/past experiences and reality	• Struggles to break bad habits; Keeps making same mistakes over and over • Complains about teaching style, course content, method of instruction, & syllabus • Makes frequent suggestions on how to do something • Struggles to follow/adjust to new procedures and instructions • Doesn't understand what the instructor is looking for/expecting • Doesn't understand cultural nuances / struggles with language barrier • Says that s/he was taught/told something else before • Doesn't understand the purpose of learning the material • Does not understand assignment or test format/questions • Cannot keep up with the pace of the instructor • Continuously confirms instructions and expectations • Continuously asks questions for clarification and guidance • Keeps asking for feedback
	Difficulty incorporating previously learned knowledge into new material/ lessons	• Struggles to solve novel problems by drawing on learned material • Blindly follows procedures or looks for keywords rather than extracting meaning from material • Does not realize (slow to realize) when a mistake has been made in the process flow chart (does not backtrack) • Goes with gut reaction rather than understanding (during testing); misses important information/steps because not thinking through procedure • Does not become more efficient at conducting tasks (e.g., diagnostics) with time • Consistently asks questions about basic foundational material or concepts from previous lessons • Asks the wrong question at the wrong time; asks questions that are not relevant to the current lesson • Reads directly from the manual rather than explaining in own words • Unable to grasp whole system (treats each task independently); struggles to connect the dots and see big picture

Learner problem categories	Learner problem subcategories	Learner behaviors
		• Skips or forgets about previous blocks of conditions (in manual)
Lack of Confidence	Lacks initiative and/or perseverance	• Does not ask any 'why' questions or seek to gain a better 'big picture' understanding when going through steps • Awaits to be spoon-fed info; Sits back while other students find the right answers or do the work • Has no self-drive or sense of responsibility for own work and learning (e.g., does not seek out opportunities to learn, does not make necessary use of study tools during down time) • Consistently fails to volunteer to lead • Only concerned with getting the right answer rather than understanding the material; satisfied with achieving minimum standards
	Struggles with self-concept issues (insecurity, low self-esteem/ efficacy)	• Unaware of own growth or improvement in learning or performance • Verbally questions performance and progress (esp. on tasks done before); seeks unnecessary assistance from others • Is quiet/shy (e.g., prefers for others to take charge, avoids participating in class or answering questions) • Engages in self-doubt (e.g., second guesses, talks self out of correct answer, easily swayed when given options) • Makes self-deprecating remarks/negative self-statements; has a pessimistic outlook about succeeding in MOS

Appendix C

Learner Problem Questionnaire

Specific problem	Description	To what extent would this problem impede learning in students? Please rate each problem on a 1-5 scale (1=Not at all; 3=Somewhat; 5=A great deal)	How often do you see this problem in students? Please rate each problem on a 1-5 scale (1=Never; 3=Sometimes; 5=All the time)
Lack of Motivation: Lack of interest or desire to learn and perform successfully in the course.			
Resorts to self-preservation tactics	Engages in behaviors that protect the self emotionally or psychologically in uncertain or high-risk contexts		
Disinterested in content and/or job	Sees little value in the course or its content; has other priorities		
Discouraged	Loss of enthusiasm over learning course content; loss of determination to succeed		
Anxiety: Uncomfortable feelings of apprehension, worry, or nervousness impairing one's learning capacity and performance.			
Social anxiety	High degrees of nervousness and self-consciousness in social situations		
Academic (Test) Anxiety	High degrees of nervousness in performance situations		
Lack of Comprehension: Inability to fully understand material.			
Ineffective learning strategies	Inability to improve performance despite efforts to learn		
Overloaded	Experiences cognitive demands that are too much to handle; Feels overwhelmed with amount of material		
Incongruence between expectations/past experiences and reality	Requirements of instructional environment are incompatible with previous study habits or expectations, thus hindering ability to attain/apply new knowledge in a timely manner		
Difficulty incorporating previously learned knowledge into new material/lessons	Struggles to integrate multiple pieces of information from various sources in order to gain a 'big picture' understanding		

Specific problem	Description	To what extent would this problem impede learning in students? Please rate each problem on a 1-5 scale (1=Not at all; 3=Somewhat; 5=A great deal)	How often do you see this problem in students? Please rate each problem on a 1-5 scale (1=Never; 3=Sometimes; 5=All the time)
Lack of Confidence: Low degree of reliance, trust, and faith in self and own abilities to learn and perform successfully.			
Lacks initiative and/or perseverance	Lack of foresight and ability to plan, begin, and sustain a task for a period of time		
Struggles with self-concept issues (insecurity, low self-esteem/efficacy)	Low belief in own ability to succeed in certain situations		

Appendix D

Learner Behaviors Questionnaire

Problem subcategory	Learner behavior	To what extent is this behavior indicative of a learning problem in students? Rate each on a 1-5 scale (1=Not at all; 3=Somewhat; 5=A great deal)	How often do you come across this behavior in students? Rate each on a 1-5 scale (1=Never; 3=Sometimes; 5=All the time)	Rank-order the behaviors within a subcategory (1=Most important / highest priority behavior for subcategory)
Anxiety: Uncomfortable feelings of apprehension, worry, or nervousness impairing one's learning capacity and performance.				
Academic (Test) Anxiety (High degrees of nervousness in performance situations) * 10 listed behaviors	Appears frustrated while working through a test problem (e.g., gives up, shuts down, or grinds to a halt)			
	Has difficulty settling on an answer (goes back and forth); Double or triple checks work			
	Has difficulty concentrating, organizing thoughts, and clearly communicating answers; Easily forgets material or previous instruction			
	Has poor test scores compared to assignments and practical exercises Makes silly mistakes; More errors in work where there were few before Expresses avoidance or fear of testing situations (e.g., says heart is beating very fast)			
	Ruminates over potential negative consequences of poor performance (e.g., recycled, reduced privileges/pay, leaving Army)			
	Appears nervous, distraught, or overwhelmed, esp. right before/during testing (e.g., perspires, taps, fidgets, cries, rapid speech, shakes, twitches, pale)			
	Struggles to adapt to new testing formats			
	Does not read/follow instructions carefully; Misunderstands instructions; Overlooks details			
Social Anxiety (High degrees of nervousness and self-consciousness in social situations) * 7 listed behaviors	Behaves out of character or becomes flustered when observed by instructor/peers during test/practical exercise (e.g., shuts down, grinds to a halt)			
	Appears unusually passive or quiet during an activity			

Problem subcategory	Learner behavior	To what extent is this behavior indicative of a learning problem in students? Rate each on a 1-5 scale (1=Not at all; 3=Somewhat; 5=A great deal)	How often do you come across this behavior in students? Rate each on a 1-5 scale (1=Never; 3=Sometimes; 5=All the time)	Rank-order the behaviors within a subcategory (1=Most important / highest priority behavior for subcategory)
	Appears embarrassed when called upon (e.g., face turns red, looks flustered)			
	Only asks questions in private rather than raising hand during class Does not want to stand up and project voice			
	Avoids engaging with the instructor			
	Reluctant to ask or answer questions (e.g., due to fear of belittlement by instructor or peers)			
Lack of Confidence: Low degree of reliance, trust, and faith in self and own abilities to learn and perform successfully.				
Lacks Initiative (Lack of foresight and ability to plan, begin, and sustain a task for a period of time) * 6 listed behaviors	Does not ask any 'why' questions or seek to gain a better 'big picture' understanding when going through steps			
	Awaits to be spoon-fed info by instructor or peers; Sits back while other students find the right answers or do the work			
	Has no self-drive or sense of responsibility for own work and learning (e.g., does not seek opportunities to learn or make necessary use of study tools during down time; overly dependent on others to guide him/her)			
	Consistently fails to volunteer to lead			
	Only concerned with getting the right answer rather than understanding the material; Satisfied with achieving minimum standards			
	Quick to give up when faced with roadblocks; Does not try to find a workaround			
Insecure about own Ability to Learn and Perform (Low belief in own ability to succeed	Unaware of own growth or improvement in learning or performance			
	Verbally questions performance and progress (esp. on tasks done before); Seeks unnecessary assistance from others			

Problem subcategory	Learner behavior	To what extent is this behavior indicative of a learning problem in students? Rate each on a 1-5 scale (1=Not at all; 3=Somewhat; 5=A great deal)	How often do you come across this behavior in students? Rate each on a 1-5 scale (1=Never; 3=Sometimes; 5=All the time)	Rank-order the behaviors within a subcategory (1=Most important / highest priority behavior for subcategory)
in certain learning situations) * 7 listed behaviors	Avoids taking charge or making decisions; Is hesitant or reluctant to lead when assigned a leadership role			
	Avoids participating in class or answering question			
	Engages in self-doubt (e.g., second guesses, talks self out of correct answer, easily swayed when given options)			
	Makes self-deprecating remarks/negative self-statements; Has pessimistic outlook about succeeding in MOS			
	Puts down, blames, or disrespects others; Acts defensively or aggressively			
Lack of Motivation: Lack of interest or desire to learn and perform successfully in the course.				
Disinterested in Content or Job	Consistently ignores instructions or feedback			
(Sees little value in the course/job or its content; has other priorities)	Pays more attention to things outside of the course; Actively seeks out distractions; Frequently requests breaks			
* 9 listed behaviors	Surfs internet (e.g., Facebook); Uses Blackboard for purposes other than intended (e.g., gossip, online chat) Does bare minimum to get by (e.g., minimal/no activity on Blackboard)			
	Acts out and distracts others (e.g., sighs with exasperation, carries on side conversations that are unrelated to course)			
	Makes up excuses to avoid work (e.g., broken laptop); Procrastinates			
	Dozes off; Struggles to remain alert; Moves slowly			
	Does not want job (but was given it anyway)			
	Has no interest in learning the material, just completing the course			
Discouraged	Is excessively disappointed in self due to poor performance on a test despite high effort (e.g., verbalizes, starts crying, shows frustration)			
(Loss of enthusiasm over learning course				

Problem subcategory	Learner behavior	To what extent is this behavior indicative of a learning problem in students? Rate each on a 1-5 scale (1=Not at all; 3=Somewhat; 5=A great deal)	How often do you come across this behavior in students? Rate each on a 1-5 scale (1=Never; 3=Sometimes; 5=All the time)	Rank-order the behaviors within a subcategory (1=Most important / highest priority behavior for subcategory)
content; loss of determination to succeed)	Has unrealistically high expectations/goals of performance			
* 6 listed behaviors	Shares negative circumstances outside of the course that have contributed to a reduced desire to succeed			
	Has declining scores on tests or assignments			
	No longer sees the significance or purpose of the job			
	Quits or becomes indifferent at the first sign of defeat (e.g., without trying to apply constructive feedback)			
Lack of Comprehension: Inability to fully understand material.				
Ineffective Learning Habits	Makes little improvement in performance on assignments or tests; Consistently gives incorrect answers			
(Inability to improve performance despite efforts to learn)	Ineffectively or inappropriately uses available resources (e.g., time, learning tools)			
* 7 listed behaviors	Engages in passive learning (e.g., does not take notes/participate)			
	Does not plan ahead/outline what needs to be done (lack of planning ahead and organizing)			
	Has difficulty learning new information and completing assignments despite honest efforts			
	Attempts to memorize steps; Simply locates the right answer rather than seeking to understand concepts			
	Consistently struggles to complete homework or classwork (e.g., does not turn in assignment, wrong answers and/or no answers on assignments)			
Cognitive Overload	Has trouble getting started or progressing when solving a problem (e.g., does not know where to start or the right question to ask)			
(Experiences cognitive demands that are too much to handle; Feels overwhelmed with	Information does not sink in; Struggles to retain info (e.g., keeps asking questions or requests info to			

Problem subcategory	Learner behavior	To what extent is this behavior indicative of a learning problem in students? Rate each on a 1-5 scale (1=Not at all; 3=Somewhat; 5=A great deal)	How often do you come across this behavior in students? Rate each on a 1-5 scale (1=Never; 3=Sometimes; 5=All the time)	Rank-order the behaviors within a subcategory (1=Most important / highest priority behavior for subcategory)
amount of material) * 7 listed behaviors	be repeated, reads material over and over)			
	Stops doing assignments or participating in Blackboard discussions; Has stopped coming prepared for class; Falls behind pace of course/instructor			
	Complains that there is too much going on in his/her life outside of the classroom; Usually engages/participates but chooses not to			
	Expresses frustration with or being overwhelmed by large amounts of material (Blackboard, manual, quizzes, tests, handout, PowerPoints)			
	Shuts down; Puts head down; Begins to fall apart (appears frustrated, fatigued, stressed, cries, glazed over/deer in headlights look, zoned out)			
	Appears lost in the reading; Struggles to define terms, pronounce words, and/or express sentences fluently			
Difficulty Integrating Knowledge (Struggles to integrate multiple pieces of info from various sources in order to understand the 'big picture') * 8 listed behaviors	Struggles to solve novel problems by drawing on learned material			
	Blindly follows procedures or looks for keywords rather than extracting meaning from material			
	Does not realize (slow to realize) when a mistake has been made (does not backtrack in process flow chart)			
	Goes with gut reaction rather than understanding (during testing); Misses important information/steps because not thinking through procedure			
	Does not become more efficient at conducting tasks (e.g., diagnostics) with time			

Problem subcategory	Learner behavior	To what extent is this behavior indicative of a learning problem in students? Rate each on a 1-5 scale (1=Not at all; 3=Somewhat; 5=A great deal)	How often do you come across this behavior in students? Rate each on a 1-5 scale (1=Never; 3=Sometimes; 5=All the time)	Rank-order the behaviors within a subcategory (1=Most important / highest priority behavior for subcategory)
	Consistently asks questions about basic foundational material or concepts from previous lessons			
	Asks the wrong question at the wrong time; Asks questions that are not relevant to the current lesson			
	Reads directly from the manual rather than explaining in own words			

Appendix E

Descriptive Statistics for SME Ratings Associated with Depicted Learner Behaviors

Learner problem categories, subcategories, behaviors	Severity *M (SD)*	Frequency *M (SD)*	Rank *M (SD)*, Median, Mode
Anxiety			
Academic (Test) Anxiety			
• Appears frustrated while working through a test problem (e.g., gives up, shuts down, or grinds to a halt)	3.32 (1.04)	3.23 (1.02)	4.24 (2.43), 4, 4
• Has difficulty settling on an answer (goes back and forth); Double or triple checks work	3.18 (1.10)	3.68 (0.89)	4.86 (2.18), 4, 4
• Has difficulty concentrating, organizing thoughts, and clearly communicating answers; Easily forgets material or previous instruction	3.32 (1.00)	3.27 (1.03)	5.48 (2.29), 5, 7
• Has poor test scores compared to assignments and practical exercises	2.86 (1.17)	2.82 (1.30)	6.43 (2.66), 7, 7
• Makes silly mistakes; More errors in work where there were few before	3.14 (1.21)	3.91 (1.23)	3.95 (2.06), 3, 2
• Expresses avoidance or fear of testing situations (e.g., says heart is beating very fast)	3.00 (1.16)	2.96 (1.17)	7.00 (2.24), 7, 9
• Ruminates over potential negative consequences of poor performance (e.g., recycled, reduced privileges/pay, leaving Army)	2.55 (1.01)	2.77 (1.52)	7.43 (2.48), 8, 9
• Appears nervous, distraught, or overwhelmed, esp. right before/during testing (e.g., perspires, taps, fidgets, cries, rapid speech, shakes, twitches, pale)	3.32 (1.29)	3.59 (1.37)	5.52 (2.56), 5, 5
• Struggles to adapt to new testing formats	2.41 (1.26)	2.18 (1.30)	7.71 (2.94), 9, 10
• Does not read/follow instructions carefully; Misunderstands instructions; Overlooks details	4.18 (1.01)	4.27 (0.99)	2.05 (1.80), 1, 1
Social Anxiety			
• Behaves out of character or becomes flustered when observed by instructor/peers during test/practical exercise (e.g., shuts down, grinds to a halt)	3.18 (1.14)	3.18 (1.01)	3.52 (1.69), 3, 3
• Appears unusually passive or quiet during an activity	2.86 (1.25)	3.05 (1.17)	4.24 (1.79), 4, 3
• Appears embarrassed when called upon (e.g., face turns red, looks flustered)	2.73 (1.03)	3.00 (1.11)	4.38 (1.47), 4, 4
• Only asks questions in private rather than raising hand in class	2.59 (1.22)	2.96 (1.25)	4.95 (1.50), 5, 5
• Does not want to stand up and project voice	3.14 (1.21)	4.05 (1.05)	4.91 (2.34), 6, 7
• Avoids proactively engaging with the instructor	3.18 (1.22)	2.91 (1.02)	3.43 (2.29), 3, 1
• Reluctant to ask or answer questions (e.g., due to fear of belittlement by instructor or peers)	2.96 (1.36)	3.36 (1.36)	2.57 (1.86), 2, 1
Lack of Confidence			
Lacks Initiative			
• Does not ask any ‘why’ questions or seek to gain a better ‘big picture’ understanding when going through steps; Asks ‘why’ questions about the wrong things	3.09 (1.48)	3.50 (1.26)	4.05 (1.47), 4, 5
• Awaits to be spoon-fed info by instructor or peers; Sits back while other students find the right answers or do the work	3.91 (1.15)	4.09 (0.97)	2.76 (1.26), 2, 2

Learner problem categories, subcategories, behaviors	Severity *M (SD)*	Frequency *M (SD)*	Rank *M (SD)*, Median, Mode
• Has no self-drive or sense of responsibility for own work and learning (e.g., does not seek opportunities to learn or make necessary use of study tools during down time; overly dependent on others to guide him/her)	4.00 (1.16)	4.05 (1.09)	2.43 (1.33), 2, 1
• Consistently fails to volunteer to lead	3.23 (0.69)	3.91 (0.97)	4.67 (1.71), 5, 6
• Only concerned with getting right answer rather than understanding material; Satisfied with achieving minimum standards	3.55 (1.26)	3.68 (1.32)	3.81 (1.60), 4, 4
• Quick to give up when faced with roadblocks; Does not try to find a workaround	3.91 (1.07)	3.46 (1.14)	3.29 (1.93), 3, 1
Insecure about own Ability to Learn and Perform			
• Unaware of own growth/improvement in learning/performance	2.77 (1.07)	2.86 (1.21)	5.24 (1.87), 5, 7
• Verbally questions performance and progress (esp. on tasks done before); Seeks unnecessary assistance from others	3.05 (1.13)	3.23 (1.19)	4.57 (1.94), 5, 6
• Avoids taking charge or making decisions; Is hesitant or reluctant to lead when assigned a leadership role	2.96 (0.90)	3.73 (1.03)	4.38 (2.09), 5, 6
• Avoids participating in class or answering question	3.41 (1.10)	3.68 (0.84)	3.24 (1.76), 4, 4
• Engages in self-doubt (e.g., second guesses, talks self out of correct answer, easily swayed when given options)	3.68 (0.84)	3.77 (0.97)	2.43 (1.66), 2, 1
• Makes self-deprecating remarks/negative self-statements; Has pessimistic outlook about succeeding in MOS	3.29 (1.23)	2.95 (0.97)	3.33 (1.56), 3, 5
• Puts down, blames, or disrespects others; Acts defensively or aggressively	3.09 (1.07)	2.50 (1.06)	4.81 (1.75), 5, 7
Lack of Motivation			
Disinterested in Content or Job			
• Consistently ignores instructions or feedback	3.86 (1.17)	3.23 (1.02)	5.48 (2.44), 6, 7
• Pays more attention to things outside of the course; Actively seeks out distractions; Frequently requests breaks	3.73 (1.16)	3.50 (1.26)	4.52 (2.75), 5, 1
• Surfs internet (e.g., Facebook); Uses Blackboard for purposes other than intended (e.g., gossip, online chat)	3.64 (1.22)	3.64 (1.43)	4.71 (2.97), 5, 1
• Does bare minimum to get by (e.g., minimal/no activity on Blackboard)	3.68 (1.21)	3.86 (1.04)	4.95 (2.27), 4, 4
• Acts out and distracts others (e.g., sighs with exasperation, carries on side conversations that are unrelated to course)	3.55 (1.22)	3.32 (1.25)	6.52 (2.04), 7, 8
• Makes up excuses to avoid work (e.g., broken laptop, can't get on Blackboard); Procrastinates	3.59 (1.14)	3.23 (1.31)	4.91 (2.07), 5, 3
• Dozes off; Struggles to remain alert; Moves slowly	4.14 (1.08)	3.82 (1.01)	4.76 (2.23), 4, 3
• Does not want job (but was given it anyway)	3.96 (1.33)	3.42 (1.26)	4.57 (2.84), 4, 2
• Has no interest in learning the material, just completing course	3.86 (1.25)	3.50 (1.34)	4.38 (3.09), 4, 1
Discouraged			
• Is excessively disappointed in self due to poor performance on a test despite high effort (e.g., verbalizes, starts crying, shows frustration)	3.14 (1.08)	3.05 (1.00)	3.00 (1.67), 3, 1
• Has unrealistically high expectations/goals of performance	2.86 (1.25)	2.55 (0.67)	4.05 (1.53), 4, 6
• Shares negative circumstances outside of the course that have contributed to a reduced desire to succeed	2.91 (1.34)	2.27 (0.99)	4.48 (1.40), 5, 5
• Has declining scores on tests or assignments	3.23 (1.34)	2.59 (1.05)	4.38 (1.36), 5, 5
• No longer sees the significance or purpose of the job	3.32 (1.29)	2.41 (0.96)	3.14 (1.71), 3, 2

Learner problem categories, subcategories, behaviors	Severity *M (SD)*	Frequency *M (SD)*	Rank *M (SD)*, Median, Mode
• Quits or becomes indifferent at the first sign of defeat (e.g., without trying to apply constructive feedback)	3.41 (1.10)	2.64 (1.18)	1.91 (1.18), 1, 1
Lack of Comprehension			
Ineffective Learning Habits			
• Makes little improvement in performance on assignments or tests; Consistently gives incorrect answers	3.32 (1.09)	3.14 (1.13)	4.95 (1.88), 6, 6
• Ineffectively or inappropriately uses available resources (e.g., time, learning tools)	3.59 (1.10)	3.73 (1.08)	3.86 (1.82), 4, 5
• Engages in passive learning (e.g., does not take notes/participate)	3.64 (1.09)	3.55 (1.22)	3.71 (1.82), 3, 2
• Does not plan ahead/outline what needs to be done (lack of planning ahead and organizing)	3.73 (0.89)	3.91 (0.92)	4.43 (1.72), 5, 5
• Has difficulty learning new information and completing assignments despite honest efforts	3.59 (1.10)	3.32 (1.13)	4.24 (2.32), 4, 7
• Attempts to memorize steps; Simply locates the right answer rather than seeking to understand concepts	4.00 (0.82)	4.27 (0.88)	2.67 (2.01), 2, 1
• Consistently struggles to complete homework or classwork (e.g., does not turn in assignment, wrong answers and/or no answers on assignments)	3.82 (0.85)	3.41 (1.05)	4.14 (1.91), 3, 3
Cognitive Overload			
• Has trouble getting started or progressing when solving problem (e.g., does not know where to start or right question to ask)	3.59 (0.96)	3.50 (0.86)	3.91 (2.10), 4, 7
• Information does not sink in; Struggles to retain info (e.g., keeps asking questions or requests info to be repeated, reads material over and over)	4.14 (0.78)	3.50 (0.91)	3.14 (2.18), 2, 2
• Stops doing assignments or participating in Blackboard discussions; Has stopped coming prepared for class; Falls behind pace of course/instructor	3.36 (0.95)	2.50 (0.96)	4.81 (1.94), 5, 6
• Complains that there is too much going on in own life outside of the classroom; Usually engages/participates but chooses not to	3.36 (1.14)	2.73 (0.99)	4.29 (1.77), 6, 6
• Expresses frustration with or being overwhelmed by large amounts of material (Blackboard, manual, quizzes, tests, handout, PowerPoints)	3.36 (1.09)	3.23 (1.07)	4.33 (2.03), 5, 5
• Shuts down; Puts head down; Begins to fall apart (appears frustrated, fatigued, stressed, cries, glazed over/deer in headlights look, zoned out)	3.64 (1.05)	2.77 (1.15)	3.67 (2.00), 3, 3
• Appears lost in the reading; Struggles to define terms, pronounce words, and/or express sentences fluently	3.93 (1.05)	3.32 (1.17)	3.86 (1.91), 4, 5
Difficulty Integrating Knowledge			
• Struggles to solve novel problems by drawing on learned material	3.14 (1.04)	3.14 (1.17)	5.00 (2.03), 5, 8
• Blindly follows procedures or looks for keywords rather than extracting meaning from material	3.59 (0.96)	3.77 (1.15)	3.24 (2.10), 3, 1
• Does not realize (slow to realize) when a mistake has been made (does not backtrack in process flow chart)	3.68 (0.95)	3.64 (1.00)	3.05 (1.72), 3, 3
• Goes with gut reaction rather than understanding (during testing); Misses important information/steps because not thinking through procedure	3.18 (1.22)	3.00 (1.20)	4.76 (2.07), 5, 6
• Does not become more efficient at conducting tasks (e.g., diagnostics) with time	3.73 (1.03)	3.09 (1.12)	3.81 (2.21), 4, 4

Learner problem categories, subcategories, behaviors	Severity *M (SD)*	Frequency *M (SD)*	Rank *M (SD)*, Median, Mode
• Consistently asks questions about basic foundational material or concepts from previous lessons	2.96 (1.00)	3.14 (1.21)	5.10 (2.21), 5, 5
• Asks the wrong question at the wrong time; Asks questions that are not relevant to the current lesson	3.27 (0.99)	3.36 (1.26)	5.57 (1.86), 6, 7
• Reads directly from manual rather than explaining in own words	3.23 (1.19)	3.96 (1.17)	5.48 (2.80), 7, 8

Note. Participants were asked to rate: (a) to what extent is this behavior indicative of a learning problem in students on a 5-point scale ranging from 1=*Not at all* to 5=A great deal (i.e., severity), (b) how often do you come across this behavior in students on a 5-point scale ranging from 1=*Never* to 5=*All the time* (i.e., frequency), and (c) rank-order the behaviors within a subcategory based on degree of importance where 1=*the most important/highest priority* behavior for that particular subcategory. Lack of Motivation, Anxiety, Lack of Comprehension, and Lack of Confidence are conceptualized, for the purposes of this research, as overarching learner problem categories consisting of the specific learner subcategories listed underneath each respective category. Means (*M*), standard deviations (*SD*), medians, and modes are provided at the behavior level.

Appendix F

Refined List of Learner Problems and Associated Behaviors

Learner problem	Learner problem subcategory	Learner behavior
Anxiety	Social Anxiety	Appears embarrassed when called upon (e.g., face turns red, looks flustered) Avoids proactively engaging with the instructor Reluctant to ask or answer questions (e.g., due to fear of belittlement by instructor or peers)
	Test Anxiety	Expresses concern over potential negative consequences of poor performance (e.g., recycled, reduced privileges/pay, leaving Army) Has poor test scores compared to assignments and practical exercises Expresses avoidance or fear of testing situations (e.g., says heart is beating very fast) Appears nervous, distraught, frustrated, or overwhelmed, esp. right before/during testing (e.g., perspires, taps, fidgets, cries, rapid speech, shakes, twitches, pale, shuts down, grinds to a halt, gives up while working through a test problem) Makes silly mistakes; More errors in work where there were few before
Comprehension	Ineffective Learning Habits	Engages in passive learning (e.g., does not take notes/participate) Ineffectively or inappropriately uses available resources (e.g., time, learning tools) Does not plan ahead/outline what needs to be done (lack of planning ahead and organizing)
	Difficulty Integrating Knowledge	Consistently asks questions about basic foundational material or concepts from previous lessons Struggles to solve novel problems by drawing on learned material Goes with gut reaction rather than understanding; Misses important information/steps because not thinking through procedure Does not realize (slow to realize) when a mistake has been made (does not backtrack in process flow chart) Has trouble getting started or progressing when solving a problem (e.g., does not know where to start or the right question to ask)
	Cognitive Overload	Expresses frustration with or being overwhelmed by large amounts of material (Blackboard, manual, quizzes, tests, handout, PowerPoints) Information does not sink in; Struggles to retain info (e.g., keeps asking questions or requests info to be repeated, reads material over and over) Appears lost in the reading; Struggles to define terms, pronounce words, and/or express sentences fluently
Confidence	Lack Initiative	Awaits to be spoon-fed info by instructor or peers; Sits back while other students find the right answers or do the work

Learner problem	Learner problem subcategory	Learner behavior
		Does not ask any 'why' questions or seek to gain a better 'big picture' understanding when going through steps; Asks 'why' questions about the wrong things
	Insecure about own Ability to Learn and Perform	Puts down, blames, or disrespects others; Acts defensively or aggressively
		Makes self-deprecating remarks/negative self-statements; Has pessimistic outlook about succeeding in MOS
		Has difficulty settling on an answer (goes back and forth); Double or triple checks work
		Engages in self-doubt (e.g., second guesses, talks self out of correct answer, easily swayed when given options)
Motivation	Discouraged	Quits or becomes indifferent at the first sign of defeat (e.g., without trying to apply constructive feedback)
		Quick to give up when faced with roadblocks; Does not try to find a workaround
	Disinterested	Has no interest in learning the material, just completing the course
		Surfs internet (e.g., Facebook); Uses Blackboard for purposes other than intended (e.g., gossip, online chat); Actively seeks out distractions

Appendix G

Instructional Strategies Extracted from Literature based on the Learner Problem Categories and Subcategories

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
Anxiety	Social Anxiety	Rewards		
		Verbal rewards delivered by an instructor, or by the Soldier themselves (self-rewards), to aid in building confidence and reducing social anxiety. In the classroom, instructors use verbal praise to reinforce progress, build self-efficacy (the belief in your own capacity to execute behaviors), and reduce anxiety. Verbal rewards are one of many techniques used in Cognitive Behavioral Therapy (CBT).	Reinforce the actions of your Soldiers with verbal rewards to curb social anxiety. Use forms of praise such as "Great Job!", "Excellent Strategy!", and "Keep it Up!" to reinforce each Soldier's progress. Encourage Soldiers within pairs to verbally reward one another to help build their confidence and reduce social anxiety. As an instructor, one must be aware of their students' mindset. Providing critical, yet constructive feedback is key. Couching criticism within praise can be a valuable method. 'What you have here is really good. Next time you may want to consider x, y, and z, and see how the outcome is different. But this is a good start.'	Work on actively praising yourself as you progress through your study material. Identify a number of verbal rewards you might give yourself such as "I am really proud of myself!", "Good Going!", or "I really handled that well!" Set achievable goals and when you reach your goals, give yourself a healthy dose of verbal praise to help reduce stress and boost confidence. While practicing maintenance in pairs, exchange verbal praise with your partner to build rapport, bolster teamwork, and reduce any social anxiety you have around them.
Anxiety	Test Anxiety	Competence Priming Manipulations Visual or verbal prompts that unobtrusively prompt a positive construct or stereotype leading to a student feeling more competent. Implementing positive competence primes can bolster self-efficacy (belief in your capacity to execute behaviors) and confidence, which	Use competence priming manipulations throughout the course to boost Soldiers' self-efficacy and reduce anxiety. Comment on the impressive skills or aptitudes of this specific class, and highlight any and all demonstrations of competence among the Soldiers to reduce their nervousness or self-consciousness. Learn about the backgrounds and skills of each individual	N/A

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
		in turn, reduce a Soldier's test anxiety.	coming into the class and use that as a basis for promoting success and confidence. Communicate to them that while the tank maintenance course is quite challenging, everything will be fine if they follow instructions. Instructors can prime students by stating that "individuals with similar expertise, as yours have been very successful in this course."	
Anxiety	Test Anxiety	Deep Breathing Relaxation technique centered on drawing large, full breaths that fully utilize the strength of the abdomen. Deep breathing is an excellent way to reduce tension, feel relaxed, and reduce stress. Relaxation is one of many techniques used in Cognitive Behavioral Therapy (CBT).	Reduce stress by allotting time for deep breathing throughout instruction and testing. While lecturing or during practice, schedule a "breather" at the midpoint and require all of the classmates to stand up and take several long deep inhales and exhales for one minute. If desired Soldiers may incorporate stretching. Mention the benefits such deep breathing exercises can have on reducing stress before or while taking a test and encourage your Soldiers to incorporate deep breathing while they are learning and practicing. Should individuals or the class as a whole begin to become frustrated, instructors can pause the curriculum and ask students to take a deep breath and refocus, combined with praise and encouragement.	Any chance you get, allow some time for deep breathing. Deep breathing is a huge stress buster and can help refocus you. Before any exercise or examination, take several prolonged breathes using the full strength of your abdomen to inhale and then slowly exhale. Think of all the extra oxygen your brain is getting. Working deep breathing into your study routine, your pre-test rituals, and even during tests can be effective at keeping test anxiety at bay.

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
Anxiety	Test Anxiety	Breaks		
		Short, planned periods of rest, meant to break up lengthy periods of lecture, practice, or studying. Regular breaks not only help a student's focus upon return, spacing out instruction or study sessions can have a marked effect on comprehension and retention versus massed (cramming) sessions, leading to greater confidence, and reduced test anxiety.	Schedule a number of breaks for your Soldiers to reduce stress. Ensure the breaks occur with regularity and do not break up or cut discussions of major concepts short. Breaks should occur at logical stopping points with respect to the lecture material. Allow Soldiers the freedom to walk outside if possible, get a soft drink, visit the restroom, ask questions, chat in the hall, and in general, break away from the material for a time. Discourage cramming sessions that feature little if any time for breaks.	Never discount the importance of breaks. While it is important that you cover all of the material when prepping for an exam, the worst thing you could do in terms of retaining the information and reducing stress is to "cram" all night, and take little to no breaks. Space out your studying across several nights and plan to take regular, short breaks throughout the study sessions. Spacing out study sessions aids in retaining the information into your memory. When on Blackboard or studying on your laptop, plan to take a physical break away from the computer, and avoid surfing the internet, which will only increase the impulse to continue surfing when you are not on a break. Set a timer on your phone for ten minutes to ensure your break does not derail you for hours. There are even apps on your phone that can time your study sessions and notify you at regular intervals when it is time to take a break.
Anxiety	Test Anxiety	Strategy Instruction		
		Technique for reducing test anxiety that prompts students to think and elaborate on what strategies they will use for various sections of an examination. Preplanning one's test	Prompt Soldiers to generate and reflect upon strategies they will use during an examination. Provide some insight from previous classes on the optimal strategies they used to prepare and perform well	Strive to understand the class requirements, set goals for completion, and develop strategies to achieve those goals. Identifying precisely "what" will be on the exam is important, but remembering

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
		taking strategy can have massive benefits on reducing stress before, during, and after a test.	during the test. Be very descriptive in explaining that the majority of tests are hands on with a fair but not infinite amount of time allotted. Tackle the issue of test anxiety due to the unexpected by asking the Soldiers how they will confront solving problems they have not seen before during the turret examination. Communicate that the hull portion of the examination is very similar to their practical exercises, requiring them to remember what they learned from practice. The turret portion, while open book, will feature novel problems not encountered in practice.	"how" the examination will progress is often a skipped step in test preparation. If possible, reduce the possibility for any surprises. Ask your instructor to walk you through the process of each paper and hands-on section of the examination if you are unsure or missed something earlier. Have an action plan ready. For example, if you encounter a test dilemma on the turret portion you are unsure about, plot how you will utilize your maintenance manual to troubleshoot the problem. Rehearse your strategy while practicing so you are organized enough to pull it off during the real test.

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
Lack of Comprehension	Ineffective Learning Habits	Graphic Organizers		
		Concept webs, charts, diagrams, or storyboards meant to organize thoughts in a way suitable for individual learner characteristics and promote active learning. Graphic organizers can assist students in understanding the functions and relationships of concepts rather than passively reading or memorizing them.	Encourage your Soldiers to create their own graphic organizers. If possible, provide an in-class demonstration of how you would take a long list of procedural steps and graphically organize them to aid in memorization and convey more meaning about each concept's relationship to one another. Emphasize to your Soldiers that when they just routinely comb through the manual, they are not engaging in active learning, which could greatly aid in their comprehension of the material and boost their test performance.	Create your own graphic organizers to aid in comprehension and promote active learning. When studying, arrange the terms into concept webs, diagrams, or even storyboards. By graphically organizing the terms into functional relationships, you are engaging in active learning that has been proven to enhance comprehension, and can boost enjoyment while alleviating boredom. Many graphic organizer templates are available online so you can find the organizer that best fits for you and the terms you need to tackle. Online dictionaries or resources may also be able to provide definitions to terms you do not fully understand as you actively construct your organizers.
Lack of Comprehension	Ineffective Learning Habits	Recall Strategies		
		Tactics used while preparing for a test to enhance memory of concepts during a later examination. Includes rehearsal, repetition, rereading, and mnemonic strategies. Students can better recall concepts through active learning, such as identifying terms with a location, creating summaries, engaging in prose, using symbols (math), or using mind maps (that	Discuss with and educate Soldiers on the optimal strategies that promote recall of information on a test. Request Soldiers to share what memorization strategies they utilize when studying in order to help recall material on test day. Point out effective and ineffective methods, as well as discuss proven strategies such as chunking, graphic organizers, visualization, association, rhyming,	Recalling information on test day can be greatly helped by effective memorization habits. Work on rereading difficult material, and rehearse the material by restating it without glancing at your manual. Increase the likelihood of memorization by using mnemonics, associations, diagrams, mind maps and other tools.

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
		meaningfully link concepts together).	storytelling, acronyms, etc. If possible, provide examples of each strategy using material within the course as the subject matter.	Plan ahead which recall trick you will utilize to access the information you need on the test day.
Lack of Comprehension	Ineffective Learning Habits	Diagnostic Information This strategy emphasizes providing the student further elaboration on what specifically they are doing wrong when they make an error. Diagnosing errors is not meant to punish the student, but rather aims to be constructive by illuminating precisely what the student needs to improve upon for next time.	Aid Soldiers' comprehension by diagnosing their recent errors to highlight specific areas for improvement. During the course of instruction, continually drill Soldiers on material. Undoubtedly, Soldiers will provide incorrect responses. Ensure that your response is not a simple "right" or "wrong" affirmation, but instead, deliver diagnostic feedback as to what specifically the Soldier is misunderstanding about the topic. Follow up diagnosis of the error with a detailed description of the correct response and emphasize that Soldiers, while practicing, work on identifying what concepts they have a poor understanding of so they can actively seek out the correct answer themselves.	When encountering difficulties during practice, stop and try to diagnose exactly what you are having trouble with. Write down questions you have or highlight particular sections that are giving you the most trouble. These observations can help guide your future studying. Communicate these difficulties to your partner. Ask if they are suffering from the same problems. Bring your notes on problematic sections to your instructor so they can diagnose and correct the exact issues you are having. Work diagnostic feedback you received from your instructor into what you are studying at home.
Lack of Comprehension	Ineffective Learning Habits	Reciprocal Teaching Comprehension building strategy where students are paired or grouped to discuss and teach course concepts to one another. Students may read material silently and then aloud to each other and discuss the material presented. As comprehension grows,	Encourage Soldiers to teach small sections of the material to one another. When Soldiers are placed in pairs to proactive hull and turret maintenance, have them read directions aloud to one another and have a discussion on the material presented.	Plan to have a meaningful discussion about the material and attempt to teach or coach one another. Studying with a friend or classmate can be a risky proposal as the risk of discussions getting off track or goofing off may be higher than if you were studying alone. With

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
		the students are encouraged to "teach" (summarizing and clarifying concepts) one another. Reciprocal teaching is one form of active learning, as it requires efforts to carefully and meaningfully link together and relate concepts rather than rote memorization.	As the pairs practice, encourage your Soldiers to actively discuss the material with one another outside of class. Mention that if learning with a buddy and teaching them seems to be helping, it might be beneficial to schedule some time to continue practicing with a friend outside of class. Force Soldiers in each pair to switch roles between teacher and learner and verbalize their feelings and emotions.	planning and dedication, however, teaching a buddy can be a very helpful study habit. Try your hand at "teaching" your friend the material by using your notes to help. When you really start to understand a concept, gradually decrease your reliance on written resources and try your hand at teaching class material off the top of your head.
Lack of Comprehension	Cognitive Overload	Worked Examples Strategy during which students are given problems that are partially solved, and are required to supply the missing parts of the solution. The degree to which the first problem is solved depends on the individual or classes' general problem solving performance or some form of diagnostic testing. The worked example is than "faded" (i.e., the number of steps the student has to complete in each problem gradually increases) based on their ability to correctly complete preceding example.	Incorporate worked examples into our instruction and require Soldiers complete more of the problem as their comprehension grows. A Soldier's first encounter with the more complicated portions of the course (turret maintenance) can be a very intimidating experience. Work through example problems that further elaborate on the concepts while allowing time for the Soldiers to familiarize themselves with the content. Carefully scale back the difficulty of complex engineering problems or lengthy repair routines by gradually supplying less and less steps to the solution, which will slowly shift the burden of comprehension to the Soldiers without risking overload.	If you encounter a difficult problem or procedure, see if you can find a worked out version of the problem. Working through a simpler problem with more of the steps completed can help prepare you for the more complicated problem. Ask if your instructor or a fellow Soldier can complete all or some of the problem for you to help get you started, but then dedicate time to completing more and more of it by yourself.

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
Lack of Comprehension	Cognitive Overload	Scaffolding		
		Method of instruction that allows students to ask questions, provide feedback, and support their peers in learning new material. When incorporating scaffolding in the classroom, the instructor becomes more of a facilitator of knowledge rather than the dominant content expert. This teaching style provides the incentive for students to take a more active role in their own learning which greatly aids in comprehension. Students share the responsibility of teaching and learning through scaffolds that require them to move beyond their current skill and knowledge levels, and take ownership of the learning event.	Provide instructional scaffolding that promotes Soldiers to take an active role in their own learning. Make an attempt to serve as a facilitator of knowledge, particularly during the hands on exercises and practices. Encourage each Soldier to take control of their learning experiences and attempt to teach themselves or their partners. During practical exercises, make your rounds as the Soldiers work and offer timely assistance and feedback as needed to prevent them from becoming overwhelmed with information.	N/A
Lack of Comprehension	Difficulty Integrating Knowledge	Modelling		
		This strategy attempts to correct errors during the practicing of a complex behavior by demonstrating the correct behaviors for the class. To further refine correcting the performance, an instructor might prompt the student themselves to model the behavior to the best of their ability (termed participant modelling). Groups of students can model the target behavior and provide	Model out advanced procedures in front of the class, and encourage students to model our procedures amongst themselves. Whether modelling a procedure, behavior, or a hypothetical scenario, ensure that every step or dimension is evident to the Soldiers. Repetition of the modelling may be required and the opportunity for Soldiers to ask questions or request elaboration from instructor should be readily available.	N/A

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
		diagnostic feedback to each other based on their recent performance.	In the case of modelling a procedure or technique, it may be paramount that the Soldiers themselves attempt to model the operation. Allow the Soldier multiple attempts to model the procedure, correct errors but pair these responses with rich diagnostic feedback. Prompt Soldiers to assist one another in modeling within their pairs.	
Lack of Comprehension	Difficulty Integrating Knowledge	Questioning Classroom strategy where an instructor directs inquiries at students purposely devised to challenge them at varying levels of difficulty and complexity. When given by the instructor, questions best serve to check on comprehension, and reiterate a recently introduced topic. Questions can help increase a student's familiarity and engagement with a topic, for instance, upon beginning a more difficult topic, it would be beneficial to start with a couple of easier questions the students are more likely to correctly answer to capture their attention and open up dialogue. Students should also be encouraged to ask many questions to ensure they key the instructor into what topics are giving them trouble.	Ask Soldiers a variety of questions throughout the presentation of material and encourage that questions be asked by them. During a more difficult section, Soldiers may find it challenging to integrate such a large amount of information. An effective strategy for combatting this is to continually ask your Soldiers questions as more material is added. Devising specific questions at varying levels of difficulty throughout instruction can aid Soldiers in integrating the material. Remember to include questions about past material to aid in rehearsal, particularly after a considerable gap in time between lectures. In class, encourage and reward Soldiers for asking their own questions. Use their questions as an opportunity to elaborate on a topic further, or link the question to something	To prevent becoming overwhelmed with information, be sure to ask plenty of questions. Do not be afraid to ask about any particular topic, because it is likely your fellow classmates are lost as well. Your instructor wants to know when you are having trouble understanding something.

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
			familiar to that particular Soldier.	
Lack of Comprehension	Difficulty Integrating Knowledge	Self-Regulatory Skills This strategy focuses on promoting a student's abilities to observe and control their own learning process, including diagnosis, planning, strategy choice, and monitoring. Self-regulatory skills can adjust the way one thinks (cognitive), feels (emotional), acts (behavioral), or even reflects on their own learning (metacognitive). A failure to integrate knowledge can often stem from neglecting to properly diagnose, monitor, and reflect upon one's own learning strategies. Moreover, students who are involved with analyzing requirements, planning work, working toward milestones, and monitoring activities tend to be more motivated.	Promote self-regulatory learning both directly and indirectly during your instruction. Directly suggest the Soldiers take time to plan, monitor, and reflect upon the strategies they are using to learn the material. Ask if the strategies are useful and how the Soldiers could improve upon them. Instructors can foster this mindset with students by discussing task requirements, setting goals, and discussing the strategies to achieve those goals. Indirectly embed exercises and discussions into the classroom that require Soldiers to detect and scrutinize their own learning strategies. Encourage Soldiers to think critically and avoid spoon-feeding them information. Emphasize the importance self-regulation will have during the examination, particularly during the turret portion, which will feature non-practiced, novel problems to solve.	Think up a plan or strategy you will use to regulate how you study or take a test and commit to it to the best of your ability. Before studying, ensure you spend a minute or two considering how you are going to approach the material. At the conclusion of your study session, take another minute or two to reflect on your performance. Were you able to stick to your plan? How good were you at monitoring your strategy as you continued to learn? Decide what worked well for you and whether there are any changes in strategy you can make that would ensure your next study session is even more successful.
Lack of Comprehension	Difficulty Integrating Knowledge	Contextualize Instruction This strategy focuses on sharing the overarching goals of the instruction as well as placing the content learned in the course into a broader context. Instructors can state the desired	Contextualize instruction so that Soldiers see the big picture and why the material really matters to overall mission success. Share the goals of your instruction, whether it be for the entire course, a single	N/A

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
		outcomes of successful instruction and present overviews and organizers that detail precisely when and how these outcomes will be met.	lecture, or one exercise. Explicitly state the desired outcomes of instruction, and present advanced organizers or syllabi to the Soldiers so they are able to see where each new section of material fits into the larger framework of the class. Encourage Soldiers to ask questions if they are unsure how the instruction fits into the larger scheme of things. Students should be explained the impact that their work will have on the Army as a whole, from saving money on maintenance, to saving lives in theatre.	
Lack of Confidence	Lacks Initiative	Debriefing (AAR) Immediately following an exercise, this strategy leads participants through a purposeful discussion of recent experience so they can reflect upon it. Students hear what they did wrong, and how they might fix it, increasing their confidence in performing correctly the next time they complete the exercise. The conversation should focus on what went right, what went wrong, and what can be improved upon the next time the exercise is performed.	Following the completion of a group practice exercise, lead the class in an after-action review (AAR). The goal of an AAR is to have a purposeful discussion on the recent operations and outcomes of an exercise, including conversation on what went right, what went wrong, and what can be improved upon the next time the exercise is performed. Engage Soldiers in active discussion and reflection while assuring them that an AAR is a safe venue in which to express their opinion on the functioning of the recent activity.	Following a group exercise, it is good practice to reflect and debrief your partners what happened. Volunteer to lead an after-action review (AAR) with your group members. Discuss what went right, what went wrong, and where things can be improved. Discuss if each group member successfully handled their responsibilities. Encourage your group members to be honest and respectful when expressing their opinion about the recent exercise.

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
Lack of Confidence	Lacks Initiative	Enactive Mastery Experience		
		This technique involves a performance event that is reflected on and shapes self-efficacy (i.e., belief in your capacity to execute behaviors necessary to produce specific performance attainments). Successes build a robust sense of efficacy while failures undermine it, especially if failures occur before a sense of efficacy is firmly established. Timing is crucial; students will have their confidence bolstered the most if they are asked to reflect upon successes immediately after they occur.	Encourage your Soldiers to reflect upon their recent positive experiences in a course (go's rather than no-go's). Guide the reflections and discussions in such a way that each Soldier's confidence is not critically damaged, reiterate that even the best Soldiers will receive no-go's from time to time. If Soldiers receives a no-go, emphasize the inherent difficulty of the exercise, and assure them that with further training and attempts, they will perform it correctly. The timing of encouragement is important. If too much time passes after a failed attempt, the Soldier will rapidly lose confidence in their own abilities and lack the initiative to attempt new challenges.	N/A
Lack of Confidence	Insecure about Ability	Drill and Practice		
		Technique of repeating concepts or procedures until students have memorized the content or behavior. While drill and practice is more rote memorization than a form of active learning, it does have the benefit of greatly increasing a student's confidence in self after sufficient practice.	Drill and practice course content and exercises to sharpen comprehension and cement Soldiers' confidence. Repeatedly quiz Soldiers until their success rate reaches a high level. Shuffle the timing and ordering of drilled items so Soldiers are always on their feet and comfortable with surprises.	Boost your confidence before an upcoming exam by drilling and practicing difficult concepts as much as possible. Repeatedly quiz yourself on material but be sure to shuffle the items and space them out in time. Flashcards can be great tools for drilling several items, the more cards you answer right, the more confident you will be. Practice makes perfect.

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
Lack of Motivation	Disinterested in Job	Familiarization		
		Strategy of relating new course content or procedures to familiar topics or activities. Drawing upon students' interests when you plan your teaching can greatly enhance how interested or motivated students are in learning about a particular topic. Familiar topics, when used as examples or anecdotes, can also aid in comprehension when topics are very unfamiliar or do not relate to common experiences.	Motivate Soldiers by familiarizing a class topic using subject matter that Soldiers enjoy or easily understand. Prior to teaching the course, poll your Soldiers to get a grasp on subjects that matter to them (for example, football, videogames, and hunting). Work on integrating the class material with the polled subjects in the form of examples, metaphors, jokes, or in-class activities. Several Soldiers will have no interest in the tank mechanic MOS, or have expectations that do not meet the reality of the course. Listen to what is driving their dissatisfaction, and attempt to relate the disappointing material to topics the Soldiers are comfortable with.	N/A
Lack of Motivation	Disinterested in Job	Creativity		
		Technique of presenting course content in novel or surprising ways in order to recapture students' attention and increase their engagement. Can also be characterized by supplementing existing materials with inventive instructional techniques such as scheduling imaginative exercises or group activities to break up the monotony of lectures.	Inject creativity into the course instruction by supplementing required course material with inventive techniques. Standard course material can be delivered in a creative format or be enhanced with additional creative activities, exercises, or discussions. Creative thought exercises or group activities will relieve Soldiers' frustration and disinterest with the course content that, at times, may lack excitement or surprise.	N/A

Problem category	Problem sub-category	Remediation strategy	Recommended instructor actions	Tell Soldiers
Lack of Motivation	Discouraged	Benchmarks		
		Clear points of reference across the course of instruction that are provided to prevent students from becoming discouraged or hopeless during a particular long and challenging section of material. Benchmarks let students know when a notable milestone has been passed in the class, and successfully reaching them should be noted and praised.	Establish meaningful benchmarks within the course to help motivate the Soldiers. Make sure benchmarks are clear and visible so that during each topic, Soldiers are able to see the "light at the end of the tunnel." Sidestep discouragement by providing manageable requirements for students to work towards and achieve by each benchmark. Highlight and congratulate the class as each course benchmark is reached in order to strengthen each Soldier's resolve.	N/A
Lack of Motivation	Discouraged	Healthy Environment		
		Method of establishing a friendly, open atmosphere that shows students they will take part in a positive and meaningful educational experience. As an instructor, this requires adjusting the level of work to meet the level of importance of the objective, and set the difficulty high enough to challenge participants, but not so high that they become frustrated by information overload.	Establish an open, friendly setting that assures Soldiers know they are taking part in training that is crucial to mission success. Adjust the level of work to match the level of importance for objective accordingly and set the difficulty high enough to challenge the Soldiers, but not so high that they become discouraged. Assure Soldiers that while they are expected to rise to the challenge of the course, they can ask questions and express any concerns they are having concerning their understanding. Avoid poking, belittling, or making fun of Soldiers. Set an example and discourage these behaviors among the classmates.	N/A

Appendix H

Instructional Strategy Questionnaire

Problem Subcategory	Instructional Strategy	How effective is this strategy at reducing the indicated student problem? Rate each on a 1-5 scale (1=Not at all effective; 3=Somewhat effective; 5=Very effective)	How often have you used this approach in the past with students? Rate each on a 1-5 scale (1=Never; 3=Occasionally; 5=A great deal)	Given the current instructional environment, how challenging is it to implement this strategy? Rate each on a 1-5 scale (1=Not at all challenging; 3=Somewhat challenging; 5=Very challenging)
Anxiety: Uncomfortable feelings of apprehension, worry, or nervousness impairing one's learning capacity and performance.				
Academic (Test) Anxiety (High degrees of nervousness in performance situations)	Learn about each student coming into your class (through class discussion, word of mouth, personnel files), and use that knowledge to identify best approach for helping individual students.			
	Comment on the impressive skills/aptitude of the class by pointing out displayed examples of competence.			
	Set expectations early on in class by communicating to students that the course is challenging but everything will be fine if they follow instructions or a particular method to accomplish tasks.			
	During lecture or practice, pause and ask students to take a breather, stand up, and stretch to help refocus.			
	Schedule a number of breaks at logical stopping points; Discourage cramming of material.			
	Break up the routine or monotony of a task by changing up format or location of instruction.			
	Have a discussion with students and ask them to reflect on effective test prep methods and test-taking strategies (e.g., share what has worked well for other classes or should work for a given test).			
Social Anxiety (High degrees of nervousness and self-consciousness in social situations)	Use general praise (e.g., Great Job, Excellent Strategy, Keep it Up) to reinforce each student's progress. Encourage students within pairs to verbally encourage one another to help build their confidence.			
	Provide critical, yet constructive feedback; Sandwich critical statements in between praise statements.			

Problem Subcategory	Instructional Strategy	How effective is this strategy at reducing the indicated student problem? Rate each on a 1-5 scale (1=Not at all effective; 3=Somewhat effective; 5=Very effective)	How often have you used this approach in the past with students? Rate each on a 1-5 scale (1=Never; 3=Occasionally; 5=A great deal)	Given the current instructional environment, how challenging is it to implement this strategy? Rate each on a 1-5 scale (1=Not at all challenging; 3=Somewhat challenging; 5=Very challenging)
	Provide more verbal encouragement to students whom you know are struggling with social anxiety.			
Lack of Confidence: Low degree of reliance, trust, and faith in self and own abilities to learn and perform successfully.				
Lacks Initiative (Lack of foresight and ability to plan, begin, and sustain a task for a period of time)	After practical exercises, conduct an AAR with students to discuss what went right, what went wrong, and what can be improved upon next time.			
	Create a 'safe' space where students can engage in active discussion and reflect on recent performance on a given activity.			
	Encourage students to reflect upon their recent positive experiences in a course rather than low scores or poor performance.			
	If a student receives a low score or performs poorly on an exercise, emphasize the inherent difficulty of the exercise and provide encouragement (e.g., performance will increase with further training).			
	Reiterate that even the best students will receive low scores or No-Go's from time to time.			
	Provide students with attainable goals to help promote student success.			
Insecure about own Ability to Learn and Perform (Low belief in own ability to succeed in certain learning situations)	Repeatedly quiz students until their success rate reaches a high level; Start with easy questions and when they get the answers right, increase difficulty level.			
	Shuffle the timing and ordering of drilled items so students are always on their feet and comfortable with surprises.			
	Encourage students to use different methods for learning material (e.g., flashcards, have students quiz each other in pairs).			
Lack of Motivation: Lack of interest or desire to learn and perform successfully in the course.				

Problem Subcategory	Instructional Strategy	How effective is this strategy at reducing the indicated student problem? Rate each on a 1-5 scale (1=Not at all effective; 3=Somewhat effective; 5=Very effective)	How often have you used this approach in the past with students? Rate each on a 1-5 scale (1=Never; 3=Occasionally; 5=A great deal)	Given the current instructional environment, how challenging is it to implement this strategy? Rate each on a 1-5 scale (1=Not at all challenging; 3=Somewhat challenging; 5=Very challenging)
Disinterested in Content or Job (Sees little value in the course/job or its content; has other priorities)	Prior to teaching the course, poll your students to get a grasp on subjects that matter to them (for example, football, videogames, or hunting).			
	Work on integrating the class material by using a subject matter that students enjoy or understand (e.g., in the form of examples, metaphors, jokes, storytelling, or in-class activities).			
	Listen to what is driving students' dissatisfaction, and attempt to relate any disappointing material to topics that matter to students.			
	Deliver standard course material in a creative format or variety of modalities to stimulate engagement and interest (e.g., 'thought' exercises, group activities, discussions, hands-on exercises, games).			
	Allow students to provide feedback on activities or come up with their own creative ways to engage with the content.			
Discouraged (Loss of enthusiasm over learning course content; loss of determination to succeed)	Establish meaningful, clear, and visible benchmarks within the course and for each topic; Help students see the "light at the end of the tunnel."			
	Provide manageable requirements for students to work towards and achieve course objectives/benchmarks (e.g., set intermediate goals).			
	Highlight and congratulate the class as each course objectives/benchmarks/milestones are reached.			
	Set difficulty level of activities high enough to challenge the students, but not so high that they become discouraged.			
	Communicate to students that they are expected to rise to the challenge of the course; Assure students that they are in a safe space to ask questions and express any concerns about course.			

Problem Subcategory	Instructional Strategy	How effective is this strategy at reducing the indicated student problem? Rate each on a 1-5 scale (1=Not at all effective; 3=Somewhat effective; 5=Very effective)	How often have you used this approach in the past with students? Rate each on a 1-5 scale (1=Never; 3=Occasionally; 5=A great deal)	Given the current instructional environment, how challenging is it to implement this strategy? Rate each on a 1-5 scale (1=Not at all challenging; 3=Somewhat challenging; 5=Very challenging)
	Avoid poking, belittling, or making fun of students; set an example and discourage these behaviors among the classmates.			
Lack of Comprehension: Inability to fully understand material.				
Ineffective Learning Habits (Inability to improve performance despite efforts to learn)	Encourage students to use multiple active learning strategies rather than passively combing through manuals (e.g., take notes, draw concept maps/diagrams, color-code/highlight, or use storyboards).			
	Request students to share what memorization strategies they use when studying for tests.			
	Point out effective methods for memorizing material (e.g., visualizations, storytelling, acronyms, and mnemonic devices); Provide examples of each method by using course content.			
	Advise students on how to best study and be successful in this course (e.g., # hours studying, doing homework, preparing for next lesson, etc.)			
	When a student provides a wrong answer to a question, probe further to identify what specifically the student is misunderstanding.			
	Following incorrect/no responses to questions, provide students with a detailed explanation of correct response and refer them to the appropriate resources to learn more.			
	Have students actively seek out the correct answers themselves, especially on concepts that they do not understand.			
	Provide feedback in a non-judgmental and constructive way; Use a positive phrase or point out to students what they did right to help them be more receptive to feedback.			

Problem Subcategory	Instructional Strategy	How effective is this strategy at reducing the indicated student problem? Rate each on a 1-5 scale (1=Not at all effective; 3=Somewhat effective; 5=Very effective)	How often have you used this approach in the past with students? Rate each on a 1-5 scale (1=Never; 3=Occasionally; 5=A great deal)	Given the current instructional environment, how challenging is it to implement this strategy? Rate each on a 1-5 scale (1=Not at all challenging; 3=Somewhat challenging; 5=Very challenging)
	Pair students and ask them to teach material to each other (e.g., role play as teacher/learner, take turns reading/following directions, actively discuss material with one another outside of class).			
Cognitive Overload (Experiences cognitive demands that are too much to handle; Feels overwhelmed with amount of material)	When students encounter a complicated portion of the course, walk them through some examples that further elaborate the concepts.			
	Slowly scale up the difficulty of complex problems or procedures so students have time to adjust.			
	Facilitate hands-on exercises while balancing direct instruction with having students take control of their learning experience.			
	Make your rounds as students work, and offer timely assistance/feedback as needed.			
Difficulty Integrating Knowledge (Struggles to integrate multiple pieces of info from various sources in order to understand the 'big picture')	Continuously ask student questions as more new material is added to help connect the dots (incl. varying difficulty levels of the questions, incorporating questions about past material).			
	Encourage and verbally praise students for asking their own questions in class.			
	Use student questions as opportunity to elaborate further on material or topic; Link question to something specific the student is already familiar with.			
	Suggest that students take time to plan, monitor, and reflect upon the strategies they are using to learn the material; Encourage students to think critically about own learning.			
	Ask students if they think their current learning strategies are working, and help them brainstorm ways to improve as needed (especially in the context of a specific goal).			

Problem Subcategory	Instructional Strategy	How effective is this strategy at reducing the indicated student problem? Rate each on a 1-5 scale (1=Not at all effective; 3=Somewhat effective; 5=Very effective)	How often have you used this approach in the past with students? Rate each on a 1-5 scale (1=Never; 3=Occasionally; 5=A great deal)	Given the current instructional environment, how challenging is it to implement this strategy? Rate each on a 1-5 scale (1=Not at all challenging; 3=Somewhat challenging; 5=Very challenging)
	Share the goals of your instruction, whether it be for the entire course, a single lecture, or one exercise.			
	Explicitly state the desired outcomes of instruction (e.g., course syllabus, curriculum, sequence of topics, course framework)			
	Encourage students to ask questions if they are unsure how the instruction fits into the larger scheme of things (e.g., Army as a whole)			

Appendix I

Descriptive Statistics for SME Ratings Associated with Depicted Instructional Strategies

Learner problem categories, subcategories, and corresponding instructional strategies	Effectiveness *M (SD)*	Frequency *M (SD)*	Challenging *M (SD)*
Anxiety			
Academic (Test) Anxiety			
1. Learn about each student coming into your class (through class discussion, word of mouth, personnel files), and use that knowledge to identify best approach for helping individual students.	3.94 (1.03)	4.00 (0.97)	2.47 (1.12)
2. Comment on the impressive skills/aptitude of the class by pointing out displayed examples of competence.	3.94 (1.03)	4.06 (1.06)	1.94 (0.97)
3. Set expectations early on in class by communicating to students that the course is challenging but everything will be fine if they follow instructions or a particular method to accomplish tasks.	4.00 (0.94)	4.69 (0.70)	1.82 (0.95)
4. During lecture or practice, pause and ask students to take a breather, stand up, and stretch to help refocus.	3.06 (1.52)	3.44 (1.15)	2.06 (1.43)
5. Schedule a number of breaks at logical stopping points; Discourage cramming of material.	3.88 (0.86)	3.38 (0.96)	2.24 (1.35)
6. Break up the routine or monotony of a task by changing up format or location of instruction.	3.00 (1.46)	2.69 (1.45)	3.47 (1.33)
7. Have a discussion with students and ask them to reflect on effective test prep methods and test-taking strategies (e.g., share what has worked well for other classes/should work for given test).	3.82 (1.38)	3.31 (1.35)	2.47 (1.33)
Social Anxiety			
1. Use general praise (e.g., Great Job, Excellent Strategy, Keep it Up) to reinforce each student's progress.	3.76 (1.25)	3.81 (0.98)	1.47 (1.12)
2. Ask students within pairs to verbally encourage one another to help build their confidence.	3.71 (1.26)	3.88 (1.20)	1.94 (1.48)
3. Provide critical, yet constructive feedback; Sandwich critical statements in between praise statements.	3.56 (1.26)	3.53 (1.41)	1.69 (1.08)
4. Provide more verbal encouragement to students whom you know are struggling with social anxiety.	4.00 (1.00)	3.44 (1.21)	2.06 (1.64)
Lack of Confidence			
Lacks Initiative			
1. After practical exercises, conduct an AAR with students to discuss what went right, what went wrong, and what can be improved upon next time.	3.71 (1.31)	3.88 (1.20)	1.94 (1.25)
2. Create a 'safe' space where students can engage in active discussion and reflect on recent performance on a given activity.	3.75 (1.18)	3.67 (1.11)	2.13 (1.26)
3. Encourage students to reflect upon their recent positive experiences in a course rather than low scores or poor performance.	3.71 (1.16)	3.69 (1.14)	2.06 (1.20)
4. If a student receives a low score or performs poorly on an exercise, emphasize the inherent difficulty of the exercise and provide encouragement (e.g., performance will increase with further training).	3.59 (1.50)	3.81 (1.17)	1.65 (1.11)
5. Reiterate that even the best students will receive low scores or No-Go's from time to time.	3.29 (1.40)	3.50 (1.59)	1.41 (0.80)

Learner problem categories, subcategories, and corresponding instructional strategies	Effectiveness *M (SD)*	Frequency *M (SD)*	Challenging *M (SD)*
6. Provide students with attainable goals to help promote student success.	3.88 (1.26)	3.60 (1.40)	1.88 (1.41)
Insecure about own Ability to Learn and Perform			
1. Repeatedly quiz students until their success rate reaches a high level; Start with easy questions and when they get the answers right, increase difficulty level.	4.41 (0.87)	4.31 (0.87)	1.82 (1.38)
2. Shuffle the timing and ordering of drilled items so students are always on their feet and comfortable with surprises.	3.47 (1.28)	2.75 (1.06)	2.47 (1.28)
3. Encourage students to use different methods for learning material (e.g., flashcards, have students quiz each other in pairs)	3.94 (1.14)	3.25 (1.61)	1.82 (1.13)
Lack of Motivation			
Disinterested in Content or Job			
1. Prior to teaching the course, poll your students to get a grasp on subjects that matter to them (for example, football, videogames, or hunting).	3.19 (1.11)	2.60 (1.12)	2.25 (1.34)
2. Work on integrating the class material by using a subject matter that students enjoy or understand (e.g., in the form of examples, metaphors, jokes, storytelling, or in-class activities).	3.88 (1.26)	3.87 (0.99)	2.06 (1.34)
3. Listen to what is driving students' dissatisfaction, and attempt to relate any disappointing material to topics that matter to students.	4.13 (1.02)	3.27 (1.33)	2.00 (1.21)
4. Deliver standard course material in a creative format or variety of modalities to stimulate engagement and interest (e.g., 'thought' exercises, group activities, discussions, hands-on exercises, games)	4.06 (0.85)	3.27 (1.28)	2.19 (1.47)
5. Allow students to provide feedback on activities or come up with their own creative ways to engage with the content.	3.75 (1.06)	2.80 (1.52)	2.13 (1.31)
Discouraged			
1. Establish meaningful, clear, and visible benchmarks within the course and for each topic; Help students see the "light at the end of the tunnel."	4.25 (1.24)	3.47 (1.36)	2.13 (1.31)
2. Provide manageable requirements for students to work towards and achieve course objectives/benchmarks (e.g., set intermediate goals).	3.88 (1.36)	3.53 (1.25)	1.75 (1.06)
3. Highlight and congratulate the class as each course objectives/benchmarks/milestones are reached.	4.06 (1.18)	3.47 (1.30)	1.69 (1.20)
4. Set difficulty level of activities high enough to challenge the students, but not so high that they become discouraged.	3.75 (1.13)	3.33 (1.23)	2.44 (1.31)
5. Communicate to students that they are expected to rise to the challenge of the course; Assure students that they are in a safe space to ask questions and express any concerns about course.	4.44 (0.96)	4.00 (1.41)	1.50 (1.10)
6. Avoid poking, belittling, or making fun of students; set an example and discourage these behaviors among the classmates.	4.38 (1.20)	3.80 (1.37)	1.19 (0.54)
Lack of Comprehension			
Ineffective Learning Habits			
1. Encourage students to use multiple active learning strategies rather than passively combing through manuals (e.g., take notes, draw concept maps/diagrams, color-code/highlight, or use storyboards).	4.53 (0.74)	3.93 (1.27)	1.80 (1.21)

Learner problem categories, subcategories, and corresponding instructional strategies	Effectiveness *M (SD)*	Frequency *M (SD)*	Challenging *M (SD)*
2. Request students to share what memorization strategies they use when studying for tests.	3.88 (1.15)	3.13 (1.51)	1.63 (1.26)
3. Point out effective methods for memorizing material (e.g., visualizations, storytelling, acronyms, and mnemonic devices); Provide examples of each method by using course content.	3.81 (1.05)	3.13 (1.64)	1.44 (0.81)
4. Advise students on how to best study and be successful in this course (e.g., # hours studying, doing homework, preparing for next lesson, etc.)	4.44 (1.15)	3.87 (1.51)	1.69 (1.08)
5. When a student provides a wrong answer to a question, probe further to identify what specifically the student is misunderstanding.	4.31 (1.14)	3.67 (1.68)	1.50 (0.82)
6. Following incorrect/no responses to questions, provide students with a detailed explanation of correct response and refer them to the appropriate resources to learn more.	4.38 (0.89)	3.67 (1.23)	1.38 (0.72)
7. Have students actively seek out the correct answers themselves, especially on concepts that they do not understand.	4.31 (0.87)	3.87 (1.30)	1.69 (0.87)
8. Provide feedback in a non-judgmental and constructive way; Use a positive phrase or point out to students what they did right to help them be more receptive to feedback.	4.13 (0.89)	3.53 (1.06)	1.75 (1.13)
9. Pair students and ask them to teach material to each other (e.g., role play as teacher/learner, take turns reading/following directions, actively discuss material with one another outside of class).	3.88 (1.20)	2.80 (1.26)	2.38 (1.45)
Cognitive Overload			
1. When students encounter a complicated portion of the course, walk them through some examples that further elaborate the concepts.	4.38 (0.96)	4.00 (1.25)	2.31 (1.25)
2. Slowly scale up the difficulty of complex problems or procedures so students have time to adjust.	4.06 (0.85)	3.60 (1.35)	2.25 (1.39)
3. Facilitate hands-on exercises while balancing direct instruction with having students take control of their learning experience.	4.25 (1.39)	3.60 (1.59)	1.75 (1.06)
4. Make your rounds as students work, and offer timely assistance/feedback as needed.	4.25 (1.18)	3.67 (1.45)	2.19 (1.17)
Difficulty Integrating Knowledge			
1. Continuously ask student questions as more new material is added to help connect the dots (incl. varying difficulty levels of the questions, incorporating questions about past material).	4.25 (0.86)	4.13 (1.19)	1.63 (1.02)
2. Encourage and verbally praise students for asking their own questions in class.	4.25 (0.86)	3.47 (1.19)	1.94 (1.24)
3. Use student questions as opportunity to elaborate further on material or topic; Link question to something specific the student is already familiar with.	4.25 (0.86)	3.73 (1.44)	1.88 (1.20)
4. Suggest that students take time to plan, monitor, and reflect upon the strategies they are using to learn the material; Encourage students to think critically about own learning.	3.88 (1.20)	3.13 (1.41)	2.06 (1.44)
5. Ask students if they think their current learning strategies are working, and help them brainstorm ways to improve as needed (especially in the context of a specific goal).	4.00 (1.21)	2.53 (1.06)	1.69 (1.20)
6. Share the goals of your instruction, whether it be for the entire course, a single lecture, or one exercise.	4.13 (0.96)	3.07 (1.33)	1.44 (0.73)
7. Explicitly state the desired outcomes of instruction (e.g., course syllabus, curriculum, sequence of topics, course framework)	4.19 (0.91)	3.60 (1.24)	1.56 (0.89)

Learner problem categories, subcategories, and corresponding instructional strategies	Effectiveness *M (SD)*	Frequency *M (SD)*	Challenging *M (SD)*
8. Encourage students to ask questions if they are unsure how the instruction fits into the larger scheme of things (e.g., Army as a whole).	4.44 (0.81)	4.13 (1.19)	1.19 (0.54)

Note. Lack of Motivation, Anxiety, Lack of Comprehension, and Lack of Confidence are conceptualized, for the purposes of this research, as overarching learner problem categories consisting of the specific learner subcategories listed underneath each category. Means (*M*) and standard deviations (*SD*) are provided at the individual strategy level. Lower ratings on the "Challenging" dimension indicate that the instructional strategy is easier to implement in this course.

Appendix J

Learner Problems, Behaviors, and Instructional Strategies

Problem subcategory	Learner behaviors	Instructional strategies
Anxiety: Uncomfortable feelings of apprehension, worry, or nervousness impairing one's learning capacity and performance.		
Academic (Test) Anxiety (High degrees of nervousness in performance situations)	• Appears frustrated while working through a test problem (e.g., gives up, shuts down, or grinds to a halt) • Has difficulty settling on an answer (goes back and forth); Double or triple checks work • Has difficulty concentrating, organizing thoughts, and clearly communicating answers; Easily forgets material or previous instruction • Has poor test scores compared to assignments and practical exercises • Makes silly mistakes; More errors in work where there were few before • Expresses avoidance or fear of testing situations (e.g., says heart is beating very fast) • Ruminates over potential negative consequences of poor performance (e.g., recycled, reduced privileges/pay, leaving Army) • Appears nervous, distraught, or overwhelmed, esp. right before/during testing (e.g., perspires, taps, fidgets, cries, rapid speech, shakes, twitches, pale) • Struggles to adapt to new testing formats • Does not read/follow instructions carefully; Misunderstands instructions; Overlooks details	1. Learn about each student in your class especially when subbing for another instructor (through conversation, class discussion, word of mouth, student records). Use that knowledge to identify best approach for helping individual students. For example, students with mechanical background are likely to benefit from a technical introduction/ explanation of material. However, if no such background, you may need to use metaphors or tie concepts back to a topic student is familiar with. 2. Have a discussion with students about effective test prep methods and test-taking strategies (e.g., share what has worked well for self or other classes, share tips and 'secrets of the trade'). Review learned topic areas that will be tested. Avoid giving students last minute surprises about what will be tested. Give students plenty of opportunities to ask questions. Indicate that test will not be on anything not covered in training. 3. Set expectations early on in class by communicating to students that the course is challenging but everything will be fine if they follow instructions, put in sufficient effort, and do the assignments. 4. Early on in the course, acknowledge that some students might be feeling anxious, but this is normal and should fade with time and more practice. Later on in the course, address anxiety issues on an individual case basis. 5. On test day, if you notice that a student seems very anxious, try to get to know student by initiating a conversation. Ask questions to distract them like "where are you from, what music do you like, what is your background?" Use non-threatening humor to lighten up the atmosphere. Give students a pep talk. Ask if anyone has any questions. 6. Have students talk with other students, run through procedures together, and quiz one another while waiting for test. 7. When giving testing instructions in the morning of test day, keep in mind that some students may experience heightened anxiety as a result. Anxiety cannot be eliminated but can be reduced to the point where students can operate at the functional level. If a student is overly anxious during a practical exam, tell them to pause, breathe, imagine their 'happy place', and encourage them with a short phrase like 'you've got this.' If student remains visually upset, take them off tank, give them a few minutes until they have regained composure, and reassure them when putting them back on. Ensure that you are consistent and fair to all students in your application of these techniques. 8. If you know a student typically experiences debilitating anxiety on test day, get them into testing early in the day so anxiety doesn't continue building up as the student waits for his/her turn. 9. Listen to and validate students' concerns about consequences of failure. Help them move past fears and focus instead on specific actions they could take to succeed in the course. 10. Keep in mind that some students do well with written tests, while others do well with hands-on exercises. Let students practice hands-on

Problem subcategory	Learner behaviors	Instructional strategies
		tasks when opportunities arise or create such opportunities when possible. When tasks are performed correctly, provide positive feedback and highlight displayed examples of competence. 11. Do practice tests/drills to help desensitize students to time pressure. Explain the 'why' behind the time restriction. 12. Allow students to figure things out on their own but provide real time feedback as student is progressing. Help student better understand the process and rationale behind the procedure. Provide suggestions for next time or point student to manual/study aids to better grasp concepts. Do not wait until AAR at the end to provide feedback. 13. Remind students that the course structure is designed to help set them up for success and many people have been able to pass the course before them. Reiterate that enough time is allotted to complete the test, even if they make a mistake. During drills or practice runs, advise students on how to get unstuck or out of a rabbit hole if they go down the wrong path during test (e.g., take a breath, pull self together, calmly retrace steps and double check your work). Ask the students questions in a supportive manner to encourage problem solving skills and create ownership of the solution.
Social Anxiety (High degrees of nervousness and self-consciousness in social situations involving instructors or peers)	• Behaves out of character or becomes flustered when observed by instructor/peers during test/practical exercise (e.g., shuts down, grinds to a halt) • Appears unusually passive or quiet during an activity • Appears embarrassed when called upon (e.g., face turns red, looks flustered) • Only asks questions in private rather than raising hand during class • Does not want to stand up and project voice • Avoids proactively engaging with the instructor • Reluctant to ask or answer questions (e.g., due to fear of belittlement by instructor or peers)	1. Build trust with students by providing verbal encouragement and praise (e.g., "Great job, Excellent strategy, Keep it up, You've got this") to reinforce each student's progress and performance. Where possible, tie praise to a specific action rather than only using a generic statement. 2. Have battle buddies work together (esp. on turret). Encourage students to verbally encourage one another and help each other learn the material as a way to mutually build confidence. 3. Give genuine, truthful feedback. Make an effort to give more positive feedback than negative. Sandwich negative feedback between positive and provide suggestions for improvement. Avoid joking around with students when they have failed. 4. Encourage students to approach you or another instructor when they have questions or need more support in the course. Remind students that instructors are here to help and want to see their students succeed so they should be confident to come up and talk (or share thoughts in BlackBoard journals). Allow students to get to know the instructors and their specialty area so they know who to go to with what type of question. 5. Put all students on the spot equally rather and consistently picking one or two. Ensure all students are challenged equally so that they can all feel comfortable to seek each other's support. Avoid singling out any one student over others. 6. Enforce zero tolerance policy for making fun of fellow students who fail. Remind students that the Army Values of Duty and Loyalty mandate that one supports their teammate. Help students see how the Warrior Ethos ("I will never leave a fallen comrade") and the Soldier's Creed ("I am a warrior and a member of a team") manifest in everyday activity, and that even though individuals' skills vary, being a responsible member of a team is critical for mutual success. 7. Create an environment where students can freely discuss material or issues among themselves and with the instructor(s).

Problem subcategory	Learner behaviors	Instructional strategies
Lack of Confidence: Low degree of reliance, trust, and faith in self and own abilities to learn and perform successfully.		
Lacks Initiative (Lack of foresight and ability to plan, begin, and sustain a task for a period of time)	• Does not ask any 'why' questions or seek to gain a better 'big picture' understanding when going through steps; Asks 'why' questions about the wrong things • Awaits to be spoon-fed info by instructor or peers; Sits back while other students find the right answers or do the work • Has no self-drive or sense of responsibility for own work and learning (e.g., does not seek opportunities to learn or make necessary use of study tools during down time; overly dependent on others to guide him/her) • Consistently fails to volunteer to lead • Only concerned with getting the right answer rather than understanding the material; Satisfied with achieving minimum standards • Quick to give up when faced with roadblocks; Does not try to find a workaround	1. After wrapping up for the day (or upon completion of an exercise, test, annex), recap what was learned, how it fits into the big picture, what went right, what went wrong, and what can be improved upon next time. Supplement group AARs with one-on-one discussions with students where the focus is their own specific deficiencies and opportunities. 2. Encourage students to engage in active discussions and reflect on recent performance on a given activity. Let students know that it is okay to make mistakes, as that will help them learn. 3. Point students to additional resources or study aids that they can review if they have completed their assignments or appear bored during downtime. 4. Encourage and verbally praise students for actively thinking through material and come up with questions to ask in class (e.g., "Thank you for asking that question," or "That is an excellent question!"). 5. Suggest that students take time to plan, monitor, and reflect upon the strategies they are using to learn the material; Encourage students to think critically about own learning and decide how they will best prepare self for life after graduation.
Insecure about own Ability to Learn and Perform (Low belief in own ability to succeed in certain learning situations)	• Unaware of own growth or improvement in learning or performance • Verbally questions performance and progress (esp. on tasks done before); Seeks unnecessary assistance from others • Avoids taking charge or making decisions; Is hesitant or reluctant to lead when assigned a leadership role • Avoids participating in class or answering question • Engages in self-doubt (e.g., second guesses, talks self out of correct answer, easily swayed when given options) • Makes self-deprecating remarks/negative self-statements; Has pessimistic outlook about succeeding in MOS • Puts down, blames, or disrespects others; Acts defensively or aggressively	1. Repeatedly quiz students until their success rate reaches a high level; Start with easy questions and when they get the answers right, increase difficulty level. 2. When possible, create opportunities for struggling students to practice hands-on tasks. Let students display their hands-on competence. 3. Help students get past mistakes or recent failures. Encourage students to instead think about how to improve rather than dwell on the past. Provide suggestions for next steps. Have student think about overall positive growth rather than focus on individual low scores. 4. Build confidence through repeated drills, practical exercises, peer discussions, reading, and other available methods. Use same standards for practical exercises/practice tests as for the actual tests. Give students the opportunity to see that they are improving (finishing drills faster and faster each time; getting back on their feet after messing up on a fault the first time around) 5. Allow students to figure things out on their own but provide real time feedback as student is progressing. Help student better understand the process and rationale behind the procedure. Provide suggestions for next time or point student to manual/study aids to better grasp concepts. Do not wait until AAR at the end to provide feedback. 6. Encourage students to use different methods for learning material (hands-on, discussions, diagrams, games, students quizzing each other in pairs).

Problem subcategory	Learner behaviors	Instructional strategies
	Lack of Motivation: Lack of interest or desire to learn and perform successfully in the course.	
Disinterested in Content or Job (Sees little value in the course/job or its content; has other priorities)	• Consistently ignores instructions or feedback • Pays more attention to things outside of the course; Actively seeks out distractions; Frequently requests breaks • Surfs internet (e.g., Facebook); Uses Blackboard for purposes other than intended (e.g., gossip, online chat) • Does bare minimum to get by (e.g., minimal/no activity on Blackboard) • Acts out and distracts others (e.g., sighs with exasperation, carries on side conversations that are unrelated to course) • Makes up excuses to avoid work (e.g., broken laptop, can't get on Blackboard); Procrastinates • Dozes off; Struggles to remain alert; Moves slowly • Does not want job (but was given it anyway) • Has no interest in learning the material, just completing the course	1. When teaching the course, try to get a grasp on subjects that matter to the students (e.g., ice breakers). Insert stories, jokes, history lessons, reference to hobbies or sports if students appear disengaged. 2. Work on integrating the class material with a subject matter that students enjoy or understand (e.g., in the form of examples, metaphors, jokes, storytelling, or in-class activities). Try to associate current task training with another known task (may be outside of Abrams). 3. Listen to what is driving students' dissatisfaction, and attempt to relate any disappointing material to topics that matter to students (e.g., success once in unit). Have 'higher purpose' discussions (e.g., about what they are doing here matters and fits into the big picture, how skills learned will help them be successful later in life). 4. If schedule allows, supplement prescribed course assignments with alternative formats or modalities to stimulate engagement and interest (e.g., 'thought' exercises, group activities, discussions, hands-on exercises, games). 5. Allow students to provide feedback on course activities or come up with alternative ways to engage with content during downtime. Encourage students to take ownership over their learning. Incorporate input from student critiques to the extent possible. Exchange ideas with other instructors.
Discouraged (Loss of enthusiasm over learning course content; loss of determination to succeed)	• Is excessively disappointed in self, due to poor performance on a test despite high effort (e.g., verbalizes, starts crying, shows frustration) • Has unrealistically high expectations/goals of performance • Shares negative circumstances outside of the course that have contributed to a reduced desire to succeed • Has declining scores on tests or assignments • No longer sees the significance or purpose of the job • Quits or becomes indifferent at the first sign of defeat (e.g., without trying to apply constructive feedback)	1. Establish meaningful, clear, and visible benchmarks within the course and for each topic; Help students see the "light at the end of the tunnel." Assure them that as they go through material little by little, day by day, the puzzle will start coming together and material will become less daunting. 2. Help students set attainable sub-goals and expectations above, but not too far above, current capabilities to help promote student success. Set difficulty level of questions/activities high enough to challenge the students, but not so high that they become discouraged. 3. Highlight and congratulate the class as each course objectives/benchmarks/milestones are reached (e.g., write congratulatory note on board). 4. Communicate to students that they are expected to rise to the challenge of the course; Assure students that they are in a supportive command/ learning environment and should feel comfortable asking questions and expressing any concerns about course. 5. Avoid poking, belittling, or making fun of students especially after failing. Be a positive example and discourage these behaviors among the classmates. Rather, recognize students as individual and where their strengths lie rather than putting them down. 6. Demonstrate empathy and understanding for any non-course related issues that students voluntarily share. 7. Help students understand the 'why' behind policies and procedures. 8. Reiterate that even the best students will receive low scores or No-Go's from time to time. Ensure this is done in a non-patronizing manner. Provide encouragement that with practice and extra effort,

Problem subcategory	Learner behaviors	Instructional strategies
		performance will improve. If failed drill/test, have student reflect on what they did, where they think things went wrong. Assure student that faults will become less intimidating with practice, and that that they'll get it next time 9. Ask students for their opinions, validate and draw out what they're saying. Be respectful and demonstrate understanding. Set boundaries in the beginning of course so they perceive you as a leader who has their best interest in mind.
Lack of Comprehension: Inability to fully understand material.		
Ineffective Learning Habits (Inability to improve performance despite efforts to learn)	• Makes little improvement in performance on assignments or tests; Consistently gives incorrect answers • Ineffectively or inappropriately uses available resources (e.g., time, learning tools) • Engages in passive learning (e.g., does not take notes/participate) • Does not plan ahead/outline what needs to be done (lacks organization) • Has difficulty learning new information and completing assignments despite honest efforts • Attempts to memorize steps; Simply locates the right answer rather than seeking to understand concepts • Consistently struggles to complete homework or classwork (e.g., does not turn in assignment, wrong answers and/or no answers on assignments)	1. Encourage students to use multiple active learning strategies rather than passively combing through manuals (e.g., take notes, draw concept maps/diagrams, color-code/highlight, write down in own words, use storyboards). Use multiple activities and examples to help students learn (draw pictures, use analogies to compare content to material they already know). 2. Point out effective methods for learning and memorizing material (e.g., visualizations, storytelling, acronyms, and mnemonic devices); Provide examples of each method by using course content. Request students to share with others what strategies they use when studying. 3. Advise students on how to best study and be successful in this course (e.g., # hours studying, doing homework, preparing for next lesson, etc.). Follow up to see if students are applying this advice and probe into what may be the reason why not. 4. When a student provides a wrong answer to a question, probe further to identify what specifically the student is misunderstanding. Drill down on wrong answer to try to diagnose points students may have mis-learned. Following incorrect/no responses to questions, provide students with a detailed explanation of correct response and refer them to the appropriate resources to learn more. 5. Have students actively seek out and find the answers themselves, especially on concepts that they do not understand. Let students figure things out on their own but track what they're doing and provide support when student is stuck (e.g., give hints or ask probing questions to allow student to come to conclusion him/herself). 6. Provide feedback in a non-judgmental and constructive way; Use a positive phrase or point out to students what they did right to help them be more receptive to feedback. 7. When possible, arrange to have at least one session during both hull and turret portions of the course where all of the instructors and Soldiers are in one room. One instructor can lead the lesson while the other ones support the students by chiming in with specific information, providing a different perspective, or explaining concepts in a different way when necessary. 8. Have battle buddies teach material and explain concepts to one another. Encourage to ask each other questions and discuss material with peers during downtime.
Cognitive Overload	• Has trouble getting started or progressing when solving a problem	1. When students encounter a complicated portion of the course, walk them through some examples that further elaborate the concepts.

Problem subcategory	Learner behaviors	Instructional strategies
(Experiences cognitive demands that are too much to handle; Feels overwhelmed with amount of material)	(e.g., does not know where to start or the right question to ask) • Information does not sink in; Struggles to retain info (e.g., keeps asking questions or requests info to be repeated, reads material over and over) • Stops doing assignments or participating in Blackboard discussions; Has stopped coming prepared for class; Falls behind pace of course/instructor • Complains that there is too much going on in his/her life outside of the classroom; Usually engages/participates but chooses not to • Expresses frustration with or being overwhelmed by large amounts of material (Blackboard, manual, quizzes, tests, handout, PowerPoints) • Shuts down; Puts head down; Begins to fall apart (appears frustrated, fatigued, stressed, cries, glazed over/deer in headlights look, zoned out) • Appears lost in the reading; Struggles to define terms, pronounce words, and/or express sentences fluently	2. Track to see if students are adjusting to more complex course material (do knowledge checks, refer to assignment answers/grades). Pause to explain how concepts fit together, and review past material that students have difficulty grasping before moving to next topic. 3. Facilitate hands-on exercises while balancing direct instruction with having students take control of their learning experience. 4. If students seem very overwhelmed, pause and allows students to take a breather. Break up material into smaller, more manageable parts to facilitate understanding. Use alternative modalities to convey material (draw pictures, use analogy, or tell a story). Encourage students to take baby steps and focus on each annex one step at a time. 5. Reading level of some material may be too high. Explain material and concepts to students using less complex language and in layman's terms especially when students have no mechanical background. 6. Make your rounds as students work, and offer timely assistance/feedback as needed. Stick with a student until they get it, and if not, call another instructor over to try to explain concept in another way. 7. During challenging portions of the course, hold 'after-hours' study block or tutoring sessions when possible (e.g., while on CQ/staff duty, over the weekend). Offer students the opportunity for more hands-on practice and content review, especially in preparation for a test.
Difficulty Integrating Knowledge (Struggles to integrate multiple pieces of info from various sources in order to understand the 'big picture')	• Struggles to solve novel problems by drawing on learned material • Blindly follows procedures or looks for keywords rather than extracting meaning from material • Does not realize (slow to realize) when a mistake has been made (does not backtrack in process flow chart) • Goes with gut reaction rather than understanding (during testing); Misses important information/steps because not thinking through procedure • Does not become more efficient at conducting tasks (e.g., diagnostics) with time • Consistently asks questions about basic foundational material or concepts from previous lessons • Asks the wrong question at the wrong time; Asks questions that are not relevant to the current lesson • Reads directly from the manual rather than explaining in own words	1. Continuously ask student questions as more new material is added to help connect the dots (incl. varying difficulty levels of the questions, incorporating questions about past material). 2. Verbally praise students for asking their own questions in class in order to encourage critical thinking and facilitate integration of material. 3. Use questions as opportunity to elaborate further on material/topic. Link question to something specific the student is already familiar with. 4. Ask students if they think their current learning strategies are working, provide feedback, and help them brainstorm ways to improve as needed (especially in the context of a specific goal). 5. Clearly state the goals of your instruction, whether it be for the entire course, a single lecture, or one exercise. 6. Explicitly state the desired outcomes of instruction early on in the course (e.g., course syllabus, curriculum, sequence of topics, course framework) 7. Encourage students to ask questions if they are unsure how the instruction fits into the larger scheme of things (e.g., Army as a whole). 8. Use the 85-15 principle. Students already understand about 85% of material, so concentrate on ensuring students grasp the remaining 15%. 9. Occasionally pause when practicing faults to explain why you are doing what you are doing.

Appendix K

Main Tool Content Used in the Tool Pilot

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Embarrassed: Appears embarrassed when called upon (e.g., face turns red, looks flustered)	Class	Social Anxiety	1. Create an environment where students can freely discuss material or issues among themselves and with the instructor(s), such as by role modeling fairness and respect, having students to do the same (e.g., take turns, be patient, recognize own/others' individual strengths and areas of opportunity), and preventing/discouraging poor treatment of others.	2. Avoid poking, belittling, or making fun of students especially after failing. Be a positive example and discourage these behaviors among the classmates. Rather, recognize students as individual and where their strengths lie rather than putting them down.	3. Put all students on the spot equally rather and consistently picking one or two. Ensure all students are challenged equally so that they can all feel comfortable to seek each other's support. Avoid singling out any one student over others.
Avoidant: Avoids proactively engaging with the instructor	Class	Social Anxiety	1. Put all students on the spot equally rather than consistently picking one or two. Ensure all students are challenged equally so that they can all feel comfortable to seek each other's support. Avoid singling out any one student over others.	2. Encourage and verbally praise students for actively thinking through material and coming up with questions to ask in class (e.g., "Thank you for asking that question," or "That is an excellent question!").	3. Verbally praise students for asking their own questions in class to encourage critical thinking and facilitate integration of material.
Quiet: Reluctant to ask or answer questions (e.g., due to fear of belittlement by instructor or peers)	Class	Social Anxiety	1. Avoid poking, belittling, or making fun of students especially after failing. Be a positive example and discourage these behaviors among the classmates. Rather, recognize students as individual and where their strengths lie rather than putting them down.	2. Ask students for their opinions validate and draw out what they're saying. Be respectful and demonstrate understanding. Set boundaries in the beginning of course so they perceive you as a leader who has their best interest in mind.	3. Build trust with students by providing verbal encouragement and praise (e.g., "Great job, Excellent strategy, Keep it up, You've got this") to reinforce each student's progress and performance. Where possible, tie praise to a specific action rather than only using a generic statement.

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Passive: Engages in passive learning (e.g., does not take notes, participate or ask questions)	Class	Ineffective Learning Habits	1. Encourage students to use multiple active learning strategies rather than passively combing through manuals (e.g., take notes, draw diagrams, color-code/highlight, write down in own words, use storyboards, quiz each other in pairs, discussions). Use multiple activities and examples to help students learn (draw pictures, use analogies to compare content to material they already know).	2. Have battle buddies teach material and explain concepts to one another. Encourage them to ask each other questions and discuss material with peers during downtime.	3. Facilitate hands-on exercises while balancing direct instruction with having students take control of their learning experience.
Distracted: Surfs internet (e.g., Facebook); Uses Blackboard for purposes other than intended (e.g., gossip, online chat/shopping) ; Actively seeks out distractions	Class Downtime	Disinterested	1. Increase engagement by encouraging students to take ownership over their learning. Have students make the course their own by providing input on what is being done well/poorly and designing activities or coming up with alternative ways to learn/practice material.	2. Demonstrate empathy and understanding for any non-course related issues that students voluntarily share and remind student of the importance of being 'present' in the course.	3. Listen to what is driving students' dissatisfaction, and attempt to relate any disappointing material to topics that matter to students (e.g., success once in unit). Have 'higher purpose' discussions (e.g., about what they are doing here matters and fits into the big picture, how skills learned will help them be successful later in life).

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Falls Behind: Consistently asks questions about basic foundational material or concepts from previous lessons	Class Downtime Practice	Difficulty Integrating Knowledge	1. Track to see if students are adjusting to more complex course material. Continuously ask student questions as more new material is added to help connect the dots (incl. varying difficulty levels of the questions, incorporating questions about past material, referring to assignment answers/grades). Pause to explain how concepts fit together, and review past material that students have difficulty grasping before moving to next topic.	2. Use questions as opportunity to elaborate further on material/topic. Link question to something specific the student is already familiar with.	3. Reading level of some material may be too high. Explain material and concepts to students using less complex language and in layman's terms especially when students have no mechanical background.
Frustrated: Expresses frustration with or being overwhelmed by large amounts of material (Blackboard, manual, quizzes, tests, handout, PowerPoints)	Class, Downtime Practice	Cognitive Overload	1. If students seem very overwhelmed, pause and allows students to take a breather. Break up material into smaller, more manageable parts to facilitate understanding. Use alternative modalities to convey material (draw pictures, use analogy, or tell a story). Encourage students to take baby steps and focus on each annex one step at a time.	2. Help students set attainable sub-goals and expectations above, but not too far above, current capabilities to help promote student success. Set difficulty level of questions/activities high enough to challenge the students, but not so high that they become discouraged.	3. Establish meaningful, clear, and visible benchmarks within the course and for each topic; Help students see the "light at the end of the tunnel." Assure them that as they go through material little by little, day by day, the puzzle will start coming together and material will become less daunting.
Passive: Awaits to be spoon-fed info by instructor or peers; Sits back while other students find the right answers or do the work; Does not actively try to move around	Class, Downtime Practice	Lack Initiative	1. Have students actively seek out and find the answers themselves, especially on concepts that they do not understand. Let students figure things out on their own but track what they're doing and provide support when student is stuck (e.g., give hints or ask probing	2. Facilitate hands-on exercises while balancing direct instruction with having students take control of their learning experience.	3. Allow students to figure things out on their own but provide real time feedback as student is progressing. Help student better understand the process and rationale behind the procedure. Provide suggestions for next time or point student

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
simulator to get a good view of demonstration			questions to allow student to come to conclusion him/herself).		to manual/study aids to better grasp concepts. Do not wait until AAR at the end to provide feedback.
Gives Up: Quick to give up when faced with roadblocks; Does not try to find a workaround (e.g., throws manual down, red eyes, rubs eyes)	Class, Downtime Practice	Discouraged	1. Make your rounds as students work, and offer timely assistance/feedback as needed. Stick with a student until they get it, and if not, call another instructor over to try to explain concept in another way.	2. Help student build self-efficacy by helping him/her break up problem into smaller, more easily achievable sub-problems/steps on the way to tackling the bigger problem. Provide constructive feedback and explain to the student that s/he has the skills, capabilities, and resources needed to succeed.	3. Allow students to figure things out on their own but provide real time feedback as student is progressing. Help student better understand the process and rationale behind the procedure. Provide suggestions for next time or point student to manual/study aids to better grasp concepts. Do not wait until AAR at the end to provide feedback.
Bored: Has no interest in learning the material, just completing the course (e.g., stares into space in class; appears disengaged; falls asleep; does not ask questions)	Class, Downtime Practice	Disinterested	1. Listen to what is driving students' dissatisfaction, and attempt to relate any disappointing material to topics that matter to students (e.g., success once in unit). Have 'higher purpose' discussions (e.g., about what they are doing here matters and fits into the big picture, how skills learned will help them be successful later in life). Try to elicit student critique and incorporate any actionable input to the extent possible.	2. When teaching the course, try to get a grasp on subjects that matter to the students (e.g., ice breakers). Insert stories, jokes, history lessons, reference to hobbies or sports if students appear disengaged.	3. Work on integrating the class material with a subject matter that students enjoy or understand (e.g., in the form of examples, metaphors, jokes, storytelling, or in-class activities). Try to associate current task training with another known task (may be outside of Abrams).

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Aggressive: Puts down, blames, or disrespects others; Acts defensively or aggressively	Class Downtime Practice Testing	Insecure about own Ability to Learn and Perform	1. Enforce zero tolerance policy for making fun of fellow students who fail. Remind students that the Army Values of Duty and Loyalty mandate that one supports their teammate. Help students see how the Warrior Ethos ("I will never leave a fallen comrade") and the Soldier's Creed ("I am a warrior and a member of a team") manifest in everyday activity, and that even though individuals' skills vary, being a responsible member of a team is critical for mutual success.	2. Avoid poking, belittling, or making fun of students especially after failing. Be a positive example and discourage these behaviors among the classmates. Rather, recognize students as individual and where their strengths lie rather than putting them down.	3. Learn about each student in your class especially when subbing for another instructor (through conversation, class discussion, word of mouth, student records). Use that knowledge to identify best approach for helping individual students. For example, students with mechanical background are likely to benefit from a technical introduction/ explanation of material. However, if no such background, you may need to use metaphors or tie concepts back to a topic student is familiar with.
Confused: Information does not sink in; Struggles to retain info (e.g., keeps asking questions or requests info to be repeated, reads material over and over)	Class Downtime Practice	Cognitive Overload	1. Ask students if they think their current learning strategies are working, provide feedback, and help them brainstorm ways to improve as needed (especially in the context of a specific goal). Use probing questions to assess mental model.	2. Point out effective methods for learning and memorizing material (e.g., visualizations, storytelling, acronyms, and mnemonic devices); Provide examples of each method by using course content. Request students to share with others what strategies they use when studying.	3. If schedule allows, supplement prescribed course assignments with alternative formats or modalities to stimulate engagement and interest (e.g., 'thought' exercises, group activities, discussions, hands-on exercises, games).
Concerned: Expresses concern over potential negative consequences of poor performance (e.g., recycled, reduced	Downtime	Test Anxiety	1. Listen to and validate students' concerns about consequences of failure. Help them move past fears and focus instead on specific actions they could take to succeed in the course.	2. Remind students that the course structure is designed to help set them up for success and many people have been able to pass the course before them. Reiterate that enough time is	3. Ask the students questions in a supportive manner to encourage problem solving skills and create ownership of the solution.

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
privileges/pay, leaving Army)				allotted to complete the test, even if they make a mistake.	
Ineffective: Ineffectively or inappropriately uses available resources (e.g., time, learning tools)	Downtime	Ineffective Learning Habits	1. Point students to additional resources or study aids that they can review if they've completed their assignments or appear bored during downtime.	2. Advise students on how to best study and be successful in this course (e.g., # hours studying, doing homework, preparing for next lesson, etc.). Follow up to see if students are applying this advice and probe into what may be the reason why not.	3. Encourage students to use different methods for learning material (hands-on, discussions, diagrams, games, students quizzing each other in pairs).
Lost: Appears lost in the reading; Struggles to define terms, pronounce words, and/or express sentences fluently	Downtime Practice	Cognitive Overload	1. Reading level of some material may be too high. Explain material and concepts to students using less complex language and in layman's terms especially when students have no mechanical background.	2. When students encounter a complicated portion of the course, walk them through some examples that further elaborate the concepts.	3. Encourage students to use different methods for learning material (hands-on, discussions, diagrams, games, students quizzing each other in pairs).
Pessimistic: Makes self-deprecating remarks/negative self-statements; Has pessimistic outlook about succeeding in MOS	Downtime Practice Testing	Insecure about Ability to Learn and Perform	1. Build trust with students by providing verbal encouragement and praise (e.g., "Great job, Excellent strategy, Keep it up, You've got this") to reinforce each student's progress and performance. Where possible, tie praise to a specific action rather than only using a generic statement.	2. Help students get past mistakes or recent failures. Encourage students to instead think about how to improve rather than dwell on the past. Provide suggestions for next steps. Have student think about overall positive growth rather than focus on individual low scores.	3. Set expectations early on in class by communicating to students that the course is challenging but everything will be fine if they follow instructions, put in sufficient effort, and do the assignments.

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Lost: Has trouble getting started or progressing when solving a problem (e.g., does not know where to start or the right question to ask)	Practice	Difficulty Integrating Knowledge	1. Encourage students to approach you or another instructor when they have questions or need more support in the course. Remind students that instructors are here to help and want to see their students succeed so they should be confident to come up and talk (or share thoughts in BlackBoard journals). Allow students to get to know the instructors and their specialty area so they know who to go to with what type of question.	2. Allow students to figure things out on their own but provide real time feedback as student is progressing. Help student better understand the process and rationale behind the procedure. Provide suggestions for next time or point student to manual/study aids to better grasp concepts. Do not wait until AAR at the end to provide feedback.	3. Make your rounds as students work, and offer timely assistance/feedback as needed. Stick with a student until they get it, and if not, call another instructor over to try to explain concept in another way.
Confused: Struggles to solve novel problems by drawing on learned material; Has superficial knowledge (e.g., recognizes components but does not know function or how they fit into larger system)	Practice	Difficulty Integrating Knowledge	1. Allow students to figure things out on their own but provide real time feedback as student is progressing. Help student better understand the process and rationale behind the procedure. Provide suggestions for next time or point student to manual/study aids to better grasp concepts. Do not wait until AAR at the end to provide feedback.	2. Learn about each student in your class especially when subbing for another instructor (through conversation, class discussion, word of mouth, student records). Use that knowledge to identify best approach for helping individual students. For example, students with mechanical background are likely to benefit from a technical introduction/ explanation of material. However, if no such background, you may need to use metaphors or tie concepts back to a topic student is familiar with.	3. Work on integrating the class material with a subject matter that students enjoy or understand (e.g., in the form of examples, metaphors, jokes, storytelling, or in-class activities). Try to associate current task training with another known task (may be outside of Abrams).

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Gut Reaction: Goes with gut reaction rather than understanding; Misses important information/steps because not thinking through procedure	Downtime Practice	Difficulty Integrating Knowledge	1. Help students understand the 'why' behind procedures. For example, explain why going through each step is necessary, what each step means and adds to the big picture, how system works beyond just finding the fault, and encourage detail-orientation when reading diagrams and instructions.	2. Have a discussion with students about effective test prep methods and test-taking strategies (e.g., share what has worked well for self or other classes, share tips and 'secrets of the trade'). Review learned topic areas that will be tested. Avoid giving students last minute surprises about what will be tested. Give students plenty of opportunities to ask questions. Indicate that test will not be on anything not covered in training.	3. Help students understand the 'why' behind what is being taught and practiced (e.g., procedures, faults, processes, policies).
Skims: Does not realize (slow to realize) when a mistake has been made (does not backtrack in process flow chart); skims test questions and rushes through exam; glosses over important steps; auto private mode (skips over steps because used to routine)	Practice	Difficulty Integrating Knowledge	1. When a student provides a wrong answer to a question, probe further to identify what specifically the student is misunderstanding. Drill down on wrong answer to try to diagnose points students may have mis-learned. Following incorrect/no responses to questions, provide students with a detailed explanation of correct response and refer them to the appropriate resources to learn more.	2. When possible, create opportunities for struggling students to practice hands-on tasks. Let students display their hands-on competence.	3. Suggest that students take time to plan, monitor, and reflect upon the strategies they are using to learn the material; Encourage students to think critically about own learning and decide how they will best prepare self for life after graduation.

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Confused: Does not ask any 'why' questions or seek to gain a better 'big picture' understanding when going through steps; Asks 'why' questions about the wrong things	Practice	Lack Initiative	1. After wrapping up for the day (or upon completion of an exercise, test, annex), recap what was learned, how it fits into the big picture, what went right, what went wrong, and what can be improved upon next time. Supplement group AARs with one-on-one discussions with students where the focus is their own specific deficiencies and opportunities.	2. Encourage students to ask questions if they are unsure how the instruction fits into the larger scheme of things (e.g., larger system, or even Army as a whole).	3. Occasionally pause when practicing faults to explain why you're doing what you're doing.
Quits: Quits or becomes indifferent at the first sign of defeat (e.g., without trying to apply constructive feedback)	Practice Testing	Discouraged	1. Have battle buddies work together (esp. on turret). Encourage students to verbally encourage one another and help each other learn the material as a way to mutually build confidence.	2. Set expectations early on in class by communicating to students that the course is challenging but everything will be fine if they follow instructions, put in sufficient effort, and do the assignments.	3. Remind that even the best students will receive low scores or No-Go's from time to time. Ensure this is done in a non-patronizing or condescending manner. Provide encouragement that with practice and extra effort, performance will improve. If failed drill/test, have student reflect on what they did, where they think things went wrong. Assure student that faults will become less intimidating with practice, and that that they'll get it next time.

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Anxious: Has poor test scores compared to assignments and practical exercises	Testing	Test Anxiety	1. Have a discussion with students about effective test prep methods and test-taking strategies (e.g., share what has worked well for self or other classes, share tips and 'secrets of the trade'). Review learned topic areas that will be tested. Avoid giving students last minute surprises about what will be tested. Give students plenty of opportunities to ask questions. Indicate that test will not be on anything not covered in training.	2. Keep in mind that some students do well with written tests, while others do well with hands-on exercises. Let students practice hands-on tasks when opportunities arise or create such opportunities when possible. When tasks are performed correctly, provide positive feedback and highlight displayed examples of competence.	3. Repeatedly quiz students until their success rate reaches a high level; Start with easy questions and when they get the answers right, increase difficulty level.
Anxious: Expresses avoidance or fear of testing situations (e.g., says heart is beating very fast)	Testing	Test Anxiety	1. If you know a student typically experiences debilitating anxiety on test day, get them into testing early in the day so anxiety doesn't continue building up as the student waits for his/her turn.	2. Early on in the course, acknowledge that some students might be feeling anxious, but this is normal and should fade with time and more practice. Later on in the course, address anxiety issues on an individual case basis.	3. Do practice tests/drills to help desensitize students to time pressure. Explain the 'why' behind the time restriction.

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Anxious: Appears nervous, distraught, frustrated, or overwhelmed, esp. right before/during testing (e.g., perspires, taps, fidgets, cries, rapid speech, shakes, twitches, shuts down, gives up, bites nails, false bravado, rubs eyes)	Testing	Test Anxiety	1. When giving testing instructions in the morning of test day, keep in mind that some students may experience heightened anxiety as a result. Anxiety cannot be eliminated but can be reduced to the point where students can operate at the functional level. If a student is overly anxious during a practical exam, tell them to pause, breathe, imagine their 'happy place', and encourage them with a short phrase like 'you've got this.' If student remains visually upset, take them off tank, give them a few minutes until they've regained composure, and reassure them when putting them back on. Ensure that you are consistent and fair to all students in your application of these techniques. Help student regain composure through a quick break (e.g., take a deep breath, go to your happy place, reflect on progress).	2. On test day, if you notice that a student seems very anxious, try to get to know student by initiating a non-threatening conversation about student interests. Ask questions to distract them like "where are you from, what music do you like, what is your background?" Use non-threatening humor to lighten up the atmosphere. Give students a pep talk. Ask if anyone has any questions.	3. Have students talk with other students, run through procedures together, and quiz one another (e.g., while waiting for test).

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
Mistakes: Makes silly mistakes; More errors in work where there were few before	Testing	Test Anxiety	1. When possible, create opportunities for struggling students to practice hands-on tasks. Let students display their hands-on competence.	2. During drills or practice runs, advise students on how to get unstuck or out of a rabbit hole if they go down the wrong path during test (e.g., take a breath, pull self together, calmly retrace steps and double check your work).	3. Build confidence through repeated drills, practical exercises, peer discussions, reading, and other available methods. Use same standards for practical exercises/practice tests as for the actual tests. Give students the opportunity to see that they are improving (finishing drills faster and faster each time; getting back on their feet after messing up on a fault the first time around).
Disorganized: Does not plan ahead/outline what needs to be done (lack of planning ahead and organizing)	Testing	Ineffective Learning Habits	1. Suggest that students take time to plan, monitor, and reflect upon the strategies they are using to learn the material; Encourage students to think critically about own learning and decide how they will best prepare self for life after graduation.	2. Advise students on how to best study and be successful in this course (e.g., # hours studying, doing homework, preparing for next lesson, etc.). Follow up to see if students are applying this advice and probe into what may be the reason why not.	3. Establish meaningful, clear, and visible benchmarks within the course and for each topic; Help students see the "light at the end of the tunnel." Assure them that as they go through material little by little, day by day, the puzzle will start coming together and material will become less daunting.
Indecisive: Has difficulty settling on an answer (goes back and forth); Double or triple checks work; Slow pace on exam; Many corrections on paper	Testing	Insecure about Ability to Learn and Perform	1. Build confidence through repeated drills, practical exercises, peer discussions, reading, and other available methods. Use same standards for practical exercises/practice tests as for the actual tests. Give students the opportunity to see that they are improving (finishing drills faster and faster each time; getting back on their	2. Repeatedly quiz students until their success rate reaches a high level; Start with easy questions and when they get the answers right, increase difficulty level.	3. Build trust with students by providing verbal encouragement and praise (e.g., "Great job, Excellent strategy, Keep it up, You've got this") to reinforce each student's progress and performance. Where possible, tie praise to a specific action rather than only using a generic statement.

Learner behavior	Context/ Setting	Learner problem	Recommendation 1	Recommendation 2	Recommendation 3
			feet after messing up on a fault the first time around).		
Self-doubt: Engages in self-doubt (e.g., second guesses, talks self out of correct answer, easily swayed when given options)	Practice Testing	Insecure about Ability to Learn and Perform	1. Give genuine, truthful feedback. Make an effort to give more positive feedback than negative. Sandwich negative feedback between positive and provide suggestions for improvement. Avoid joking around with students when they have failed.	2. Encourage students to engage in active discussions and reflect on recent performance on a given activity. Let students know that it's okay to make mistakes, as that will help them learn.	3. Build trust with students by providing verbal encouragement and praise (e.g., "Great job, Excellent strategy, Keep it up, You've got this") to reinforce each student's progress and performance. Where possible, tie praise to a specific action rather than only using a generic statement.

Appendix L

Evaluation Materials Used Following the Initial Instructor Training (Pre-Pilot)

Usability and Utility Questionnaires

Tool Content

1. I think the behaviors are easy to understand.
2. I think the behaviors are easy to navigate.
3. I think the list of behaviors is comprehensive.
4. I found the strategies to be unnecessarily complex. (r)
5. I think the strategies are relevant.
6. I would feel confident using the strategies.
7. I intend to use these strategies in the future.

Scale. 1=strongly disagree to 5=strongly agree
(r)=reverse-coded item.

Tool Functionality

8. I intend to use this tool in the future.
9. I think the tool is unnecessarily complex. (r)
10. I think the tool would be easy to use.
11. I think I would need support of a technical person to be able to use tool. (r)
12. I would feel confident using the tool.
13. The interface is easy to read.
14. The interface has too much information on it. (r)
15. I think this tool is sustainable within Abrams AIT.
16. I can easily see the benefit of having this tool.

Scale. 1=strongly disagree to 5=strongly agree
(r)=reverse-coded item.

Semi-Structured Interview Questions

Perceived Utility/Usability

1. What are your first impressions of the user interface and the workflow of the tool?
2. What aspects/components of the tool do you think would help you perform your job more effectively?
3. What aspects/components of the tool do you think would make your job more difficult?

Use

4. Would you use the tool and when?
5. How frequently do you intend to use the tool?

Impact

6. Do you think the tool would help you better identify learner problems?
7. Do you think the tool would help you better tailor your instructional approach?
8. Do you think the tool would help you provide better feedback?
9. Do you think the tool would work better for one part of training versus another?

Appendix M

Evaluation Materials Used Following the Tool Pilot (Post-Pilot)

Usability and Utility Questionnaires

Tool Content

1. I found the behaviors to be unnecessarily complex. (r)
2. I found the behaviors to be easy to understand.
3. I found the behaviors to be easy to navigate.
4. I found behaviors to be missing. (r)
5. I think the list of behaviors is comprehensive.
6. I found the strategies to be unnecessarily complex. (r)
7. I found the strategies to be relevant.
8. I found the strategies were easy to implement.
9. I found the strategies to be effective.
10. I believe the strategies have nothing to do with the selected behaviors. (r)
11. I felt confident using the strategies.
12. I would use these strategies in the future.
13. I would recommend these strategies to another instructor.

Scale. 1=strongly disagree to 5=strongly agree
(r)=reverse-coded item.

Tool Functionality

14. I think I would like to use the tool frequently.
15. I found the tool to be unnecessarily complex. (r)
16. I thought the tool was easy to use.
17. I think I would need support of a technical person to be able to use tool. (r)
18. I would imagine that most people would learn to use the tool very quickly.
19. I found the tool to be very burdensome to use. (r)
20. I feel confident using the tool.
21. I needed to learn a lot of things before I could get going with this tool. (r)
22. The tool was easy to navigate.
23. It did not take me long to learn how to use tool.
24. The interface was easy to read.
25. The interface had too much information on it. (r)
26. The information provided was helpful.
27. Interface was organized well.
28. I knew exactly where to go to complete assessment.
29. I was able to use tool quickly.
30. The interface supported my work style and workflow.
31. If I made mistake it was easy to undo my error.
32. I think this tool is sustainable within Abrams AIT.
33. I can easily see the benefit of having this tool.

Scale. 1=strongly disagree to 5=strongly agree
(r)=reverse-coded item.

Semi-Structured Interview Protocol

Perceived Utility/Usability

1. What do you think of the user interface and the workflow of the tool?
2. What aspects/components of the tool helped you perform your job more effectively?
3. What aspects/components of the tool made your job more difficult?

Use

4. Would you continue to use the tool and when?
5. Do you think the tool meets the needs of Abrams instructors?

Impact

6. In what ways do you think the tool impacts (could impact) student performance?
7. Did using the tool help you better identify learner problems?
8. Did using the tool help you better tailor your instructional approach?
9. Did using the tool help you provide better feedback?
10. Did using the tool help you select appropriate strategies?
11. How frequently did you use the tool?
12. How did the tool fit in with your current workflow?
13. Did the tool work better for one part of training versus another?

Feature Requests

14. What changes would you make to the tool to help you do your job better?
15. What changes would you make to help you better identify and address learner problems?
16. How can we improve the tool?

Appendix N

Instructor Declarative Knowledge Assessment

Part 1:

1. What is the most likely reason why a student may be quick to give up and does not try to find a workaround when faced with roadblocks in the course?
    a. Test or Social Anxiety
    b. Comprehension Issues
    c. Lack of Confidence
    d. Lack of Motivation

2. What is the most likely reason why a student may engage in self-doubt such as second guessing or talking him/herself out of the correct answer?
    a. Test or Social Anxiety
    b. Comprehension Issues
    c. Lack of Confidence
    d. Lack of Motivation

3. What is the most likely reason why a student may makes silly mistakes or more errors in work where there were few before?
    a. Test or Social Anxiety
    b. Comprehension Issues
    c. Lack of Confidence
    d. Lack of Motivation

4. What is the most likely reason why a student may keep asking questions about basic foundational material or concepts from previous lessons?
    a. Test or Social Anxiety
    b. Comprehension Issues
    c. Lack of Confidence
    d. Lack of Motivation

5. What is the most likely reason why a student may appear embarrassed when called upon in class or during training (e.g., face turns red, looks flustered)?
    a. Test or Social Anxiety
    b. Comprehension Issues
    c. Lack of Confidence
    d. Lack of Motivation

Part 2:

1. Which student behavior is the most indicative of a *motivational* issue?
    a. **Surfs internet and/or uses Blackboard to gossip**
    b. Has difficulty settling on an answer (e.g., goes back and forth, double/triple checks work)
    c. Expresses avoidance or fear of testing situations (e.g., says heart is beating very fast)
    d. Misses important information/steps because not thinking through procedure

2. Which student behavior is <u>the most indicative</u> of a *confidence* problem?
    a. Pays more attention to things outside of the course (e.g., actively seeks out distractions, frequently requests breaks)
    b. **Acts defensively or aggressively (e.g., puts down, blames, or disrespects others)**
    c. Expresses no interest in learning the material, just completing the course
    d. Avoids proactively engaging with the instructor

3. Which student behavior is <u>the most indicative</u> of a test or social *anxiety* problem?
    a. Asks 'why' questions about the wrong things
    b. Keeps asking questions, requests info to be repeated, and reads material over and over
    c. **Seems nervous, distraught or overwhelmed (e.g., perspires, fidgets, grinds to a halt)**
    d. Makes negative self-statements and shares pessimistic outlook about succeeding in MOS

4. Which student behavior is <u>the most indicative</u> of a *comprehension* difficulty?
    a. **Has trouble getting started or progressing when solving a problem (e.g., does not know where to start or the right question to ask)**
    b. Has poor test scores compared to assignments and practical exercises
    c. Expresses concern over potential negative consequences of poor performance (e.g., recycled, reduced privileges/pay, leaving Army)
    d. Quits or becomes indifferent at the first sign of defeat

Part 3:

1. Which strategy is likely to be <u>the most effective</u> for helping a student who is pessimistic about succeeding in this MOS and overly critical of him/herself?
    a. Build trust with the student by providing verbal encouragement and praise (e.g., "Great job, Excellent strategy, Keep it up, You've got this") to reinforce each student's progress and performance. Where possible, tie praise to a specific action rather than only using a generic statement.
    b. Help student get any recent mistakes or failures. Encourage him/her to think about how to improve rather than dwell on fears or the past. Provide suggestions for next steps. Have student think about overall positive growth rather than focus on individual low scores.
    c. Have battle buddies work together (esp. on turret). Encourage students to verbally encourage one another and help each other learn the material as a way to mutually build confidence.

2. Which strategy is likely to be <u>the most effective</u> for helping a student who appears lost in the reading or struggles to define terms, pronounce words, and/or express sentences fluently.
    a. Facilitate hands-on exercises while balancing direct instruction with having student take control of their learning experience.
    b. When teaching the course, try to get a grasp on subjects that matter to the student (e.g., ice breakers). Insert stories, jokes, history lessons, reference to hobbies or sports if students appear disengaged.

c. **When student encounters a complicated portion of the course, walk him/her through some examples that further elaborate the concepts. Use layman's terms especially if student has no mechanical background.**

3. Which strategy is likely to be <u>the most effective</u> for helping a student who is expressing fear of testing situations (e.g., says heart is beating very fast right before or during test)?
   a. **Do practice tests/drills to help desensitize students to time pressure. Explain the 'why' behind the time restriction.**
   b. Avoid poking, belittling, or making fun of students especially after failing. Be a positive example and discourage these behaviors among the classmates. Rather, recognize students as individual and where their strengths lie rather than putting them down.
   c. Have battle buddies teach material and explain concepts to one another. Encourage to ask each other questions and discuss material with peers during downtime.

4. Which strategy is likely to be <u>the most effective</u> for helping a student quits or becomes indifferent at the first sign of defeat (e.g., without trying to apply constructive feedback).

   a. Create an environment where students can freely discuss material or issues among themselves and with the instructor(s).
   b. **Set expectations early on in class by communicating to students that the course is challenging but everything will be fine if they follow instructions, put in sufficient effort, and do the assignments.**
   c. Make your rounds as students work, and offer timely assistance/feedback as needed. Stick with a student until they get it, and if not, call another instructor over to try to explain concept in another way.

Note. Correct answers based on instructional tool are bolded.

Appendix O

Descriptive Statistics for SME Agreement Ratings on Instructional Tool Usability and Utility

Pre- and post-pilot declarative knowledge assessment results show changes in responses for at least 20% of the items, with five instructors having changed an incorrect answer in the pre-pilot assessment to the correct answer in the post-pilot assessment. Furthermore, the assessment scores increased for three experienced instructors, decreased for three novice instructors, and remained unchanged for one novice instructor. The tests was not turned in by three of the ten instructors as they were absent from the post-pilot data collection. Based on percent change calculations, the pilot appears to have solidified instructor perceptions of tool simplicity and user-friendliness. However, concerns about tool sustainability and alignment with workflow appear to have become more salient post-pilot as well. As discussed more below, some of the lower ratings may be a result of the tool being more beneficial at certain times within the course when students tend to experience more challenges and/or for newer instructors. This pattern of results points to a potential benefit to experienced instructors which is to use the instructional tool as a self-check or refresher. Novice instructors may need additional support in order to reap the benefits of the tool. It is important to note, however, that the declarative knowledge assessment items were developed based on the learner behavior, learner problem, and associated instructional strategy mapping generated as part of this research effort. Given that the "right" answer is highly dependent on the context and varies based on experience, the goal of the assessment was to identify trends or changes in responses after having used the tool rather than evaluating knowledge based on tool content. More clear gains in learning may be seen over a longer time period given that the tool is not something that is used necessarily every day. Descriptive statistics are shown in the table below.

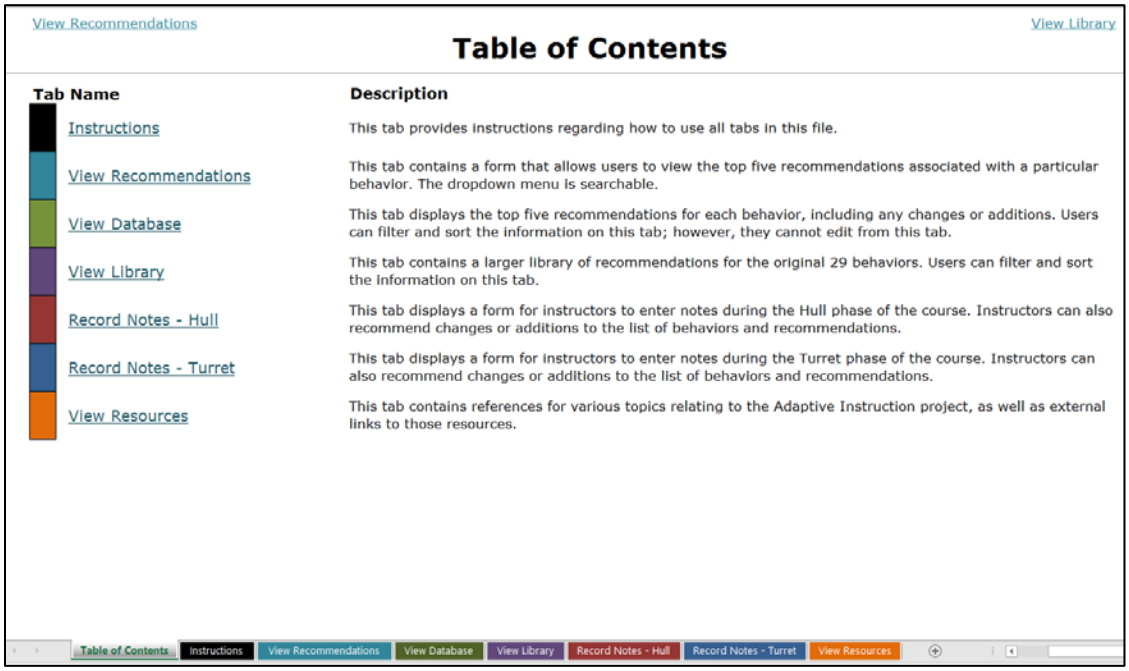
Instructional tool usability and utility items	Pre-pilot *M (SD)*	Post-pilot *M (SD)*	Change in M ratings
Tool Content			
1. I found the behaviors to be unnecessarily complex. (r)		3.71 (0.76)	
2. I found the behaviors to be easy to understand.	4.20 (0.92)	4.29 (0.49)	+2.04%
3. I found the behaviors to be easy to navigate.	4.20 (0.92)	4.14 (0.69)	-1.36%
4. I found behaviors to be missing. (r)		3.71 (0.76)	
5. I think the list of behaviors is comprehensive.	4.40 (0.70)	4.00 (0.58)	-9.09%
6. I found the strategies to be unnecessarily complex. (r)	3.80 (0.92)	3.86 (0.69)	+1.50%
7. I found the strategies to be relevant.	4.00 (0.67)	3.29 (0.76)	-17.86%
8. I found the strategies were easy to implement.		3.57 (0.79)	
9. I found the strategies to be effective.		3.14 (1.07)	
10. I believe the strategies have nothing to do with the selected behaviors. (r)		3.57 (0.79)	
11. I felt confident using the strategies.	4.10 (0.74)	4.00 (0.58)	-2.44%
12. I would use these strategies in the future.	4.10 (0.88)	3.86 (0.90)	-5.92%
13. I would recommend these strategies to another instructor.		3.86 (0.90)	

Instructional tool usability and utility items	Pre-pilot *M (SD)*	Post-pilot *M (SD)*	Change in M ratings
Tool Functionality			
14. I think I would like to use the tool frequently.	4.10 (0.88)	2.86 (1.21)	-30.31%
15. I found the tool to be unnecessarily complex. (r)	3.80 (0.79)	4.14 (0.69)	+9.02%
16. I thought the tool was easy to use.	4.20 (0.42)	4.29 (0.49)	+2.04%
17. I think I would need support of a technical person to be able to use tool. (r)	4.30 (0.95)	4.43 (0.79)	+2.99%
18. I would imagine that most people would learn to use the tool very quickly.		4.14 (0.69)	
19. I found the tool to be very burdensome to use. (r)		3.00 (1.15)	
20. I feel confident using the tool.	4.10 (0.74)	3.57 (1.40)	-12.89%
21. I needed to learn many things before I could get going with this tool. (r)		4.00 (0.58)	
22. The tool was easy to navigate.		4.29 (0.49)	
23. It did not take me long to learn how to use tool.		4.14 (0.38)	
24. The interface was easy to read.	4.50 (0.53)	4.14 (0.38)	-7.94%
25. The interface had too much information on it. (r)	3.50 (1.18)	4.00 (0.82)	+14.29%
26. The information provided was helpful.		3.57 (0.98)	
27. Interface was organized well.		4.29 (0.49)	
28. I knew exactly where to go to complete assessment.		4.00 (0.58)	
29. I was able to use tool quickly.		3.86 (0.90)	
30. The interface supported my work style and workflow.		2.57 (1.27)	
31. If I made mistake it was easy to undo my error.		3.71 (0.76)	
32. I think this tool is sustainable within Abrams AIT.	3.50 (1.08)	2.57 (1.27)	-26.53%
33. I can easily see the benefit of having this tool.	3.70 (0.95)	3.29 (1.25)	-11.20%

Note. M=Mean; *SD*=Standard Deviation; (r)=reverse-coded item. Higher scores indicate more favorable ratings on tool utility and usability. Pre-pilot questionnaire is an abbreviated version of the post-pilot questionnaire. Percent change is shown at both the item and category level.

Appendix P

Final Instructional Tool



View Recommendations | View Library

Table of Contents

Tab Name	Description
Instructions	This tab provides instructions regarding how to use all tabs in this file.
View Recommendations	This tab contains a form that allows users to view the top five recommendations associated with a particular behavior. The dropdown menu is searchable.
View Database	This tab displays the top five recommendations for each behavior, including any changes or additions. Users can filter and sort the information on this tab; however, they cannot edit from this tab.
View Library	This tab contains a larger library of recommendations for the original 29 behaviors. Users can filter and sort the information on this tab.
Record Notes - Hull	This tab displays a form for instructors to enter notes during the Hull phase of the course. Instructors can also recommend changes or additions to the list of behaviors and recommendations.
Record Notes - Turret	This tab displays a form for instructors to enter notes during the Turret phase of the course. Instructors can also recommend changes or additions to the list of behaviors and recommendations.
View Resources	This tab contains references for various topics relating to the Adaptive Instruction project, as well as external links to those resources.

Table of Contents | Instructions | View Recommendations | View Database | View Library | Record Notes - Hull | Record Notes - Turret | View Resources

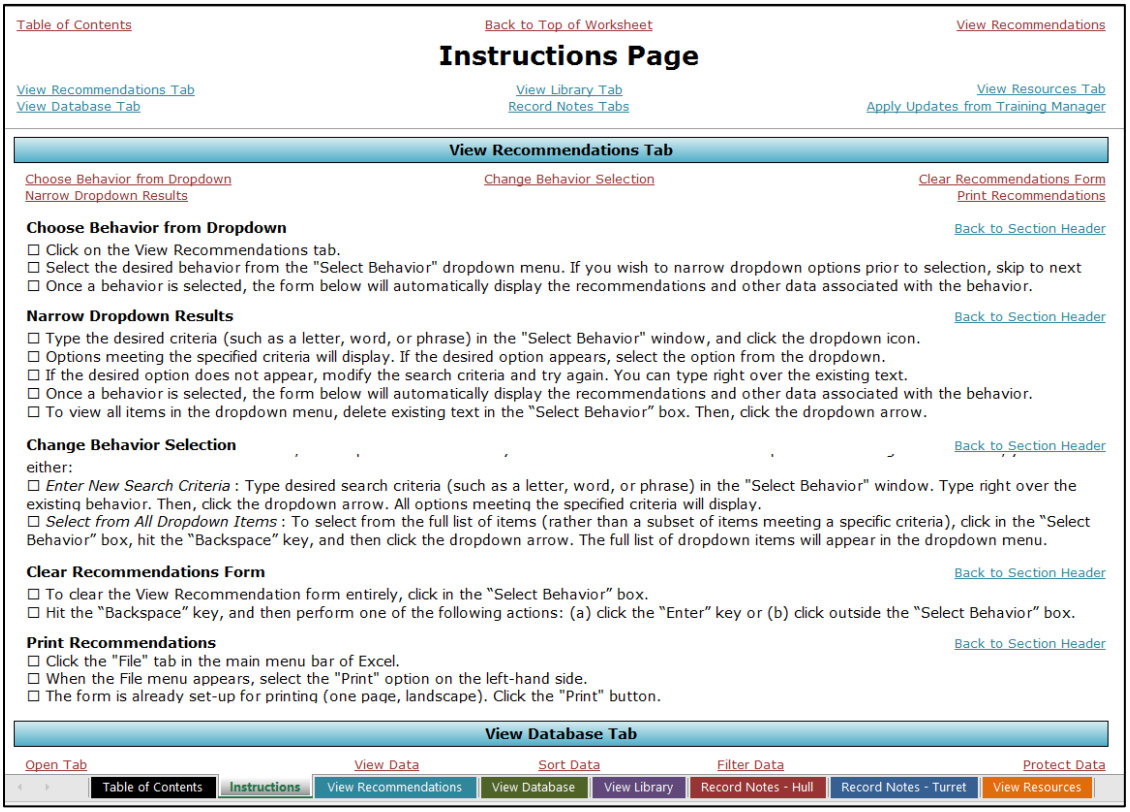


Table of Contents | Back to Top of Worksheet | View Recommendations

Instructions Page

View Recommendations Tab | View Library Tab | View Resources Tab
View Database Tab | Record Notes Tabs | Apply Updates from Training Manager

View Recommendations Tab

Choose Behavior from Dropdown | Change Behavior Selection | Clear Recommendations Form
Narrow Dropdown Results | Print Recommendations

Choose Behavior from Dropdown — Back to Section Header

☐ Click on the View Recommendations tab.
☐ Select the desired behavior from the "Select Behavior" dropdown menu. If you wish to narrow dropdown options prior to selection, skip to next
☐ Once a behavior is selected, the form below will automatically display the recommendations and other data associated with the behavior.

Narrow Dropdown Results — Back to Section Header

☐ Type the desired criteria (such as a letter, word, or phrase) in the "Select Behavior" window, and click the dropdown icon.
☐ Options meeting the specified criteria will display. If the desired option appears, select the option from the dropdown.
☐ If the desired option does not appear, modify the search criteria and try again. You can type right over the existing text.
☐ Once a behavior is selected, the form below will automatically display the recommendations and other data associated with the behavior.
☐ To view all items in the dropdown menu, delete existing text in the "Select Behavior" box. Then, click the dropdown arrow.

Change Behavior Selection — Back to Section Header

either:
☐ *Enter New Search Criteria* : Type desired search criteria (such as a letter, word, or phrase) in the "Select Behavior" window. Type right over the existing behavior. Then, click the dropdown arrow. All options meeting the specified criteria will display.
☐ *Select from All Dropdown Items* : To select from the full list of items (rather than a subset of items meeting a specific criteria), click in the "Select Behavior" box, hit the "Backspace" key, and then click the dropdown arrow. The full list of dropdown items will appear in the dropdown menu.

Clear Recommendations Form — Back to Section Header

☐ To clear the View Recommendation form entirely, click in the "Select Behavior" box.
☐ Hit the "Backspace" key, and then perform one of the following actions: (a) click the "Enter" key or (b) click outside the "Select Behavior" box.

Print Recommendations — Back to Section Header

☐ Click the "File" tab in the main menu bar of Excel.
☐ When the File menu appears, select the "Print" option on the left-hand side.
☐ The form is already set-up for printing (one page, landscape). Click the "Print" button.

View Database Tab

Open Tab | View Data | Sort Data | Filter Data | Protect Data

Table of Contents | Instructions | View Recommendations | View Database | View Library | Record Notes - Hull | Record Notes - Turret | View Resources

View Instructions

View Library

View Recommendations

Select Behavior:

Context/Setting:

Learner Problem:

Recommendations:

View Instructions

View Library

View Recommendations

Select Behavior:

Indecisive: Has difficulty settling on an answer (goes back and forth); Double or triple checks work; Slow pace on exam; Many corrections on paper

Context/Setting:

Testing

Learner Problem:

Insecure about Ability to Learn and Perform

Recommendations:

1. Build confidence through repeated drills, practical exercises, peer discussions, reading, and other available methods. Use same standards for practical exercises/practice tests as for the actual tests. Give students the opportunity to see that they are improving (finishing drills faster and faster each time; getting back on their feet after messing up on a fault the first time around).

2. Repeatedly quiz students until their success rate reaches a high level; Start with easy questions and when they get the answers right, increase difficulty level.

3. Build trust with students by providing verbal encouragement and praise (e.g., "Great job, Excellent strategy, Keep it up, You've got this") to reinforce each student's progress and performance. Where possible, tie praise to a specific action rather than only using a generic statement.

4. When possible, create opportunities for struggling students to practice hands-on tasks. Let students display their hands-on competence.

5. Allow students to figure things out on their own but provide real time feedback as student is progressing. Help student better understand the process and rationale behind the procedure. Provide suggestions for next time or point student to manual/study aids to better grasp concepts. Do not wait until AAR at the end to provide feedback.

Key	Topic	Reference	External Link	URL
1	Adaptive Teaching	Corno, L. (2008). On Teaching Adaptively. Educational Psychologist, 43(3), 161-173.	Click Here to View Resource	http://www.sad55.k12.me.us/~sday/FAV2-0010D679/1.1/On+Teaching+Adaptively.pdf
2	Adaptive Teaching	Goldberg, B., Sinatra, A., Sottilare, R., Moss, J., & Graesser, A. (2015). *Instructional Management for Adaptive Training and Education in Support of the US Army Learning Model-Research Outline* (No. ARL-SR-0345). Army Research Lab, Aberdeen Proving Ground, MD, Human Research and Engineering Directorate.	Click Here to View Resource	http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA623560
3	Adaptive Teaching	Saphier, J. & Gower, R. (1997). *The skillful teacher: Building your teaching skills* (5 ed). Acton, MA: Research for Better Teaching, Inc.	Click Here to View Resource	http://springfield.k12.or.us/cms/lib03/OR01000651/Centricity/Domain/3/GITA/The_Skillful_Teacher.pdf
4	Adaptive Teaching	Gregory, G. H. (Ed.) (2011). *Differentiated Instruction.* Thousand Oaks, CA: Corwin.	Click Here to View Resource	https://books.google.com/books/about/Differentiated_Instructional_Strategies.html?id=ZT8pJZnkAysC
5	All Topics	Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). Classroom instruction that works: Research based strategies for increasing student achievement. Alexandria, VA: Association for Supervision and Curriculum Development.	Click Here to View Resource	https://books.google.com/books?hl=en&lr=&id=c25kDO0adxwC&oi=fnd&pg=PA1&dq=instructional+strategies+to+increase+student+confidence&ots=DvwNeoUV19&sig=4YCwmXGgu7xams7yQVRdqPR5Gz4#v=onepage&q=instructional%20strategies%20to%20increase%20student%20confidence&f=false
6	All Topics	Instruction Approaches. University of Kansas.	Click Here to View Resource	http://www.specialconnections.ku.edu/~kucrl/cgi-bin/drupal/?q=instruction
7	Anxiety	Akinsola, E. F., & Nwajei, A. D. (2013). Test anxiety, depression and academic performance: Assessment and management using relaxation and cognitive restructuring techniques. *Psychology*, *4* (6), 18-24.	Click Here to View Resource	http://file.scirp.org/pdf/PSYCH_2013062411354827.pdf
8	Anxiety	Stoeber, Joachim (2004) Dimensions of test anxiety: Relations to ways of coping with pre-exam anxiety and uncertainty. *Anxiety, Stress & Coping: An international journal, 17* (3), 213-226.	Click Here to View Resource	https://kar.kent.ac.uk/4467/1/Stoeber_Dimensions_2004.pdf
9	Anxiety	Wachelka, D. & Katz, R. (1999). Reducing test anxiety and improving academic self-esteem in high school and college students with learning disabilities. *Journal of Behavior Therapy and Experimental Psychiatry, 30*, 191-198.	Click Here to View Resource	https://www.education.udel.edu/wp-content/uploads/2013/01/TestAnxiety.pdf
10	Anxiety	Boyd, R.T.C. (1988). *Improving your test-taking skills.* ERIC Digest Number 101.	Click Here to View Resource	http://www.hagerstowncc.edu/sites/default/files/documents/11-test-anxiety-tips.pdf
11	Anxiety	Testing Anxiety Toolkit. NY Association of School Psychologists.	Click Here to View Resource	http://www.nyasp.biz/pdf_files/testing_anxiety_toolkit.pdf
12	Comprehension	Instructional Scaffolding to Improve Learning. Northern Illinois University, Faculty Development and Instructional Design Center.	Click Here to View Resource	http://www.niu.edu/facdev/_pdf/guide/strategies/instructional_scaffolding_to_improve_learning.pdf
13	Comprehension	Falasca, M. (2011). Barriers to adult learning: Bridging the gap. *Australian Journal of Adult Learning*, *51* (3), 583-590.	Click Here to View Resource	http://files.eric.ed.gov/fulltext/EJ954482.pdf
14	Comprehension	Kalyuga, S., & Sweller, J. (2004). Measuring knowledge to optimize cognitive load factors during instruction. *Journal of Educational Psychology*, *96* (3), 558-568.	Click Here to View Resource	http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.465.2996&rep=rep1&type=pdf
15	Comprehension	Hartanto, T. A., Krafft, C. E., Iosif, A. M., & Schweitzer, J. B.	Click Here to View Resource	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4675699/

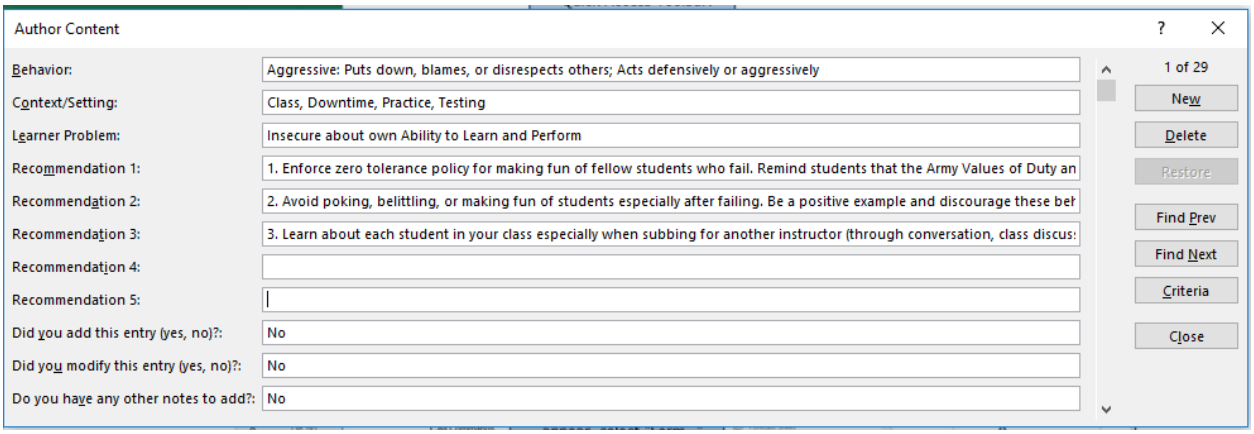
Table of Contents | Instructions | View Recommendations | View Database | View Library | Record Notes - Hull | Record Notes - Turret | View Resources

Resources tab containing links to literature on advanced instructional strategies.

Key	Behavior	Phase	Instructor ID	Class ID	Did you observe this behavior?	If yes, how many times?	How many students affected	Did you try recommended solution(s)?	If so, which one(s)?	Did the solution(s) work?	If no, why?	Do you have any suggested changes?	Do you have any additional recommendations to ad	Do you have any new behaviors to add?
1	Aggressive: Puts down, blames, or disrespects others; Acts defensively or aggressively	Hull												
2	Anxious: Appears nervous, distraught, frustrated, or overwhelmed, esp. right before/during testing (e.g., perspires, taps, fidgets, cries, rapid speech, shakes, twitches, shuts down, gives up, bites nails, false bravado, rubs eyes)	Hull												
3	Anxious: Expresses avoidance or fear of testing situations (e.g., says heart is beating very fast)	Hull												

Key	Behavior	Phase	Instructor ID	Class ID	Did you observe this behavior?	If yes, how many times?	How many students affected	Did you try recommended solution(s)?	If so, which one(s)?	Did the solution(s) work?	If no, why?	Do you have any suggested changes?	Do you have any additional recommendations to ad	Do you have any new behaviors to add?
1	Aggressive: Puts down, blames, or disrespects others; Acts defensively or aggressively	Turret												
2	Anxious: Appears nervous, distraught, frustrated, or overwhelmed, esp. right before/during testing (e.g., perspires, taps, fidgets, cries, rapid speech, shakes, twitches, shuts down, gives up, bites nails, false bravado, rubs eyes)	Turret												
3	Anxious: Expresses avoidance or fear of testing situations (e.g., says heart is beating very fast)	Turret												

<u>Notable Capability</u>: Instructors can track number of times a behavior was observed and a strategy was implemented, perceived effectiveness of used strategy, and recommended changes to the existing tool content (i.e., behaviors, strategies).



Author Content

Behavior:	Aggressive: Puts down, blames, or disrespects others; Acts defensively or aggressively
Context/Setting:	Class, Downtime, Practice, Testing
Learner Problem:	Insecure about own Ability to Learn and Perform
Recommendation 1:	1. Enforce zero tolerance policy for making fun of fellow students who fail. Remind students that the Army Values of Duty an
Recommendation 2:	2. Avoid poking, belittling, or making fun of students especially after failing. Be a positive example and discourage these beh
Recommendation 3:	3. Learn about each student in your class especially when subbing for another instructor (through conversation, class discus:
Recommendation 4:	
Recommendation 5:	
Did you add this entry (yes, no)?:	No
Did you modify this entry (yes, no)?:	No
Do you have any other notes to add?:	No

1 of 29

New

Delete

Restore

Find Prev

Find Next

Criteria

Close

Notable Capability: Training manager can edit tool content based on recommendations from instructors.

#	InstructorID	ClassID	Phase	Did you observe this behavior?	If yes, how many times?	How many students affected?	Did you try recommended solution(s)?	Did the solution(s) work?
1	0001	1000	Hull	Yes	0	0	Yes	Yes
2	0002	1001	Turret	No	1	1	No	No
3	0003	1002			2	2		
4	0004	1003			3	3		
5	0005	1004			4	4		
6	0006	1005			5	5		
7	0007	1006			6	6		
8	0008	1007			7	7		
9	0009	1008			8	8		
10	0010	1009			9	9		
11	0011	1010			10	10		
12	0012				11	11		
13	0013				12	12		
14	0014				13	13		
15	0015				14	14		
16	0016				15	15		
17	0017				16	16		
18	0018				17	17		
19	0019				18	18		
20	0020				19	19		
21	0021				20	20		
22	0022							

Note: Orange columns feed the formulas on the Totals tabs in the Master Tracking Tool, so be careful when making changes to these items.

Notable Capability: Training manager can adjust drop down menus in instructional tool as needed.

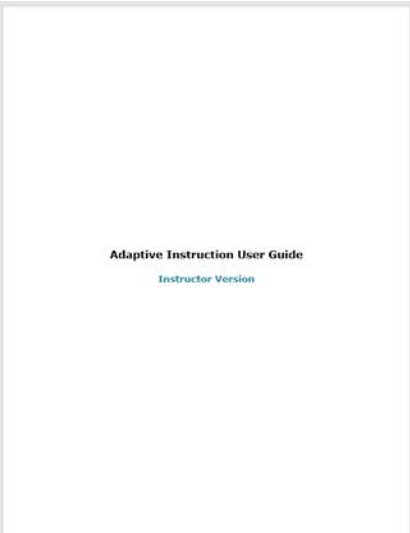
Key	Behavior	Number of times behavior was observed in class.			Number of students affected.			Number of times recommendations were applied			Number of successful interventions.		
		Hull	Turret	Overall	Hull	Turret	Overall	Hull	Turret	Overall	Hull	Turret	Overall
1	Aggressive: Puts down, blames, or disrespects others; Acts defensively or aggressively	0	0	0	0	0	0	0	0	0	0	0	0
2	Anxious: Appears nervous, distraught, frustrated, or overwhelmed, esp. right before/during testing (e.g., perspires, taps, fidgets, cries, rapid speech, shakes, twitches, shuts down, gives up, bites nails, false bravado, rubs eyes)	0	0	0	0	0	0	0	0	0	0	0	0
3	Anxious: Expresses avoidance or fear of testing situations (e.g., says heart is beating very fast)	0	0	0	0	0	0	0	0	0	0	0	0
4	Anxious: Has poor test scores compared to assignments and practical exercises	0	0	0	0	0	0	0	0	0	0	0	0
5	Avoidant: Avoids proactively engaging with the instructor	0	0	0	0	0	0	0	0	0	0	0	0
	Bored: Has no interest in learning the material, just completing the course (e.g., stares into space in class:												

Notable Capability: Summary data is automatically calculated.

Appendix Q

User Guides

Instructor Version:



Adaptive Instruction User Guide

Instructor Version

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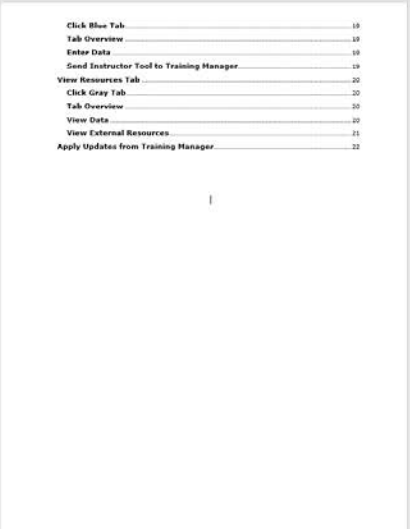

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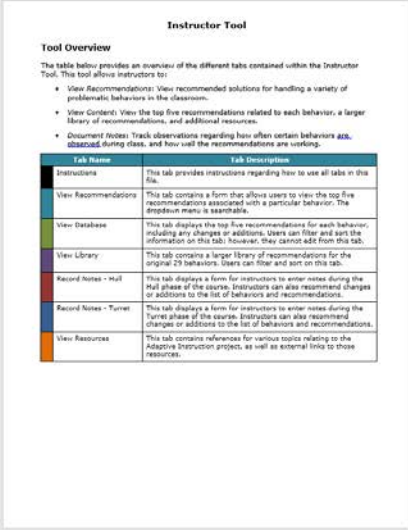
Introduction

The U.S. Army Learning Model (ALM) 2017) and the U.S. Army Human Dimension strategy (2015) advocate for a more Soldier-centered approach where instructors continuously monitor the individual state of their students and emerging learning requirements, and proactively remediate challenges by tailoring their instructional approaches to meet those needs. At the center of the ALM is the concept of adaptability in that (a) the Army must develop adaptive Soldiers; (b) training content must be adaptive such that training occurs outside of the classroom and adjusts to operational needs; and (c) content, learning methods, and technologies continuously adapt based on Soldier performance. This theme of adaptability persists within the Human Dimension strategic objectives as well, which state that Army institutions must deliver innovative solutions not only to meet needs but also in advance of those needs.

Providing individualized instruction by tailoring instructional strategies and approaches places many demands on instructors. A key challenge is identifying how to facilitate instructor performance across a range of environments so that they are able to adapt their instructional skills to meet learner needs, enabling individual Soldiers to progress on the key cognitive, physical, and social dimensions. The ability to adapt instructional skills is far from a trivial challenge. The process of actually adapting instruction to meet learner needs faces several organizational and instructor level challenges including, but not limited to the following:

- Adapting instruction while meeting *prescribed Programs of Instruction*
- Adapting instruction while effectively meeting complex training schedules that demand a *high level of throughput with rigid constraints*
- Recognizing a range of challenges that individual learners might face
- Knowing when to apply particular instructional techniques given the challenge/context
- Adapting instruction both *in real time/near real time* to meet challenges of individual students, and also over *longer timescales* to meet the needs of the larger classroom

To help meet the intent of the ALM and the Human Dimension objectives, instructors must be able to recognize if, when, and how students are struggling, and then apply alternate techniques that help achieve complex learning goals within resource and time constraints. To help instructors meet this intent and overcome some of the challenges associated with a Soldier-centered approach to learning, an interactive instructional tool was developed for Army instructors within the MOS 91A Abrams Tank Maintenance Advanced Individual Training (AIT) program. This tool is intended to help instructors adapt their instructional approach by recognizing the signs that may point to common learner challenges or problems, and provide facilitation techniques and strategies that can help the individual students and class overcome those problems. Detailed instructions for how to use and troubleshoot the instructional tool are provided as part of this user guide.



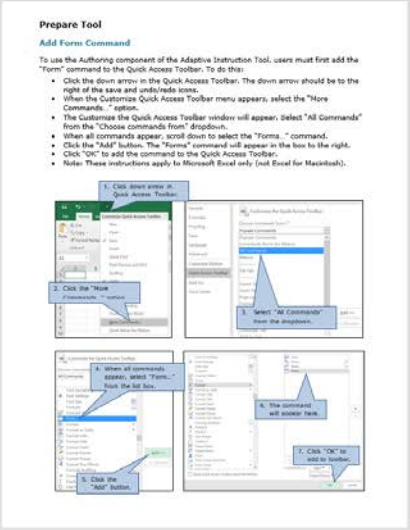
Instructor Tool

Tool Overview

The table below provides an overview of the different tabs contained within the Instructor Tool. This tool allows instructors to:

- *View Recommendations:* View recommended solutions for handling a variety of problematic behaviors in the classroom.
- *View Content:* View the top five recommendations related to each behavior, a larger library of recommendations, and additional resources.
- *Document Notes:* Track observations regarding how often certain behaviors are observed during class, and how well the recommendations are working.

Tab Name	Tab Description
Instructions	This tab provides instructions regarding how to use all tabs in this file.
View Recommendations	This tab contains a form that allows users to view the top five recommendations associated with a particular behavior. The dropdown menu is searchable.
View Database	This tab displays the top five recommendations for each behavior, including any changes or additions. Users can filter and sort the information on this tab; however, they cannot edit from this tab.
View Library	This tab contains a larger library of recommendations for the original 29 behaviors. Users can filter and sort on this tab.
Record Notes - Hull	This tab displays a form for instructors to enter notes during the Hull phase of the course. Instructors can also recommend changes or additions to the list of behaviors and recommendations.
Record Notes - Turret	This tab displays a form for instructors to enter notes during the Turret phase of the course. Instructors can also recommend changes or additions to the list of behaviors and recommendations.
View Resources	This tab contains references for various topics relating to the Adaptive Instruction project, as well as external links to those resources.

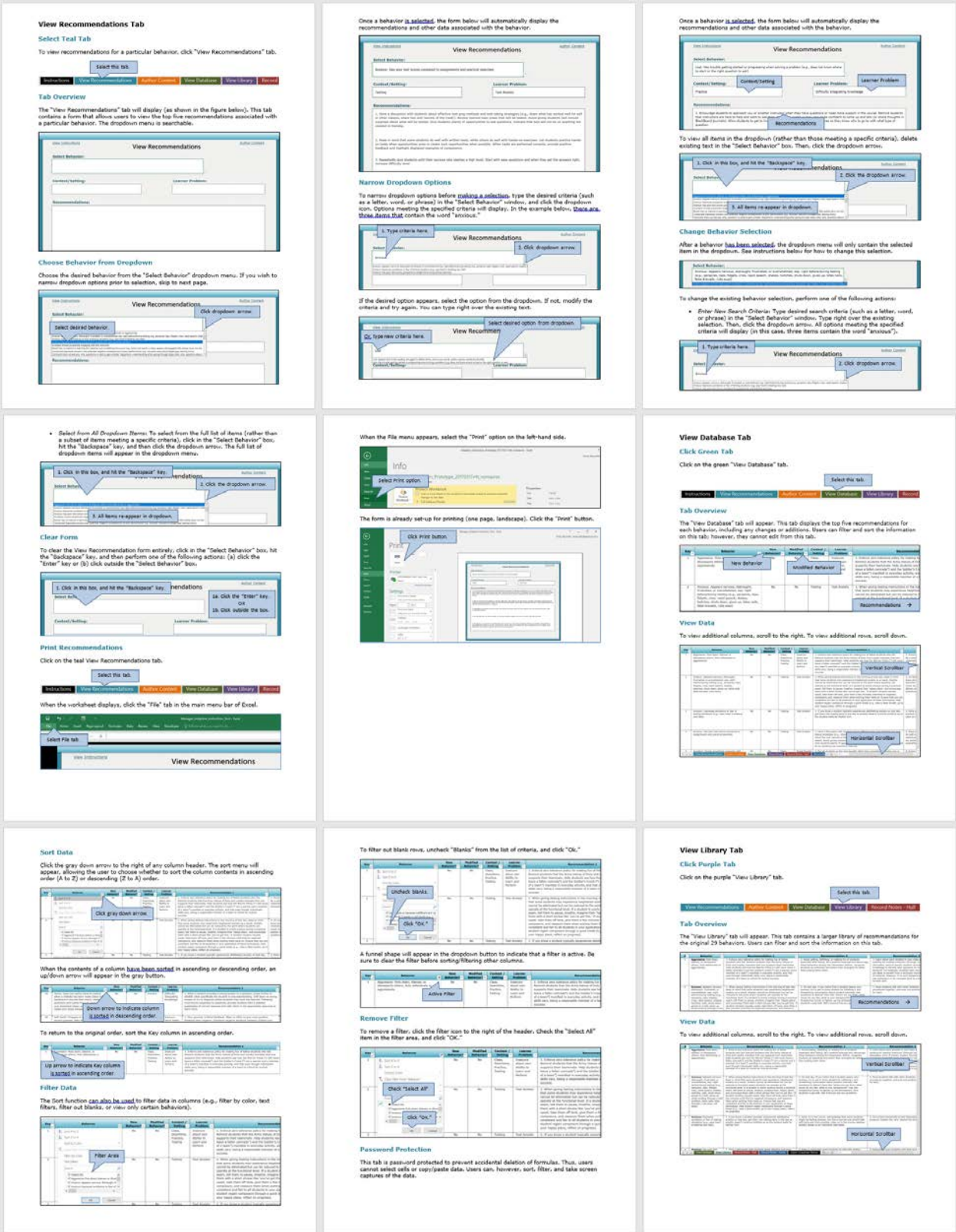


Prepare Tool

Add Form Command

To use the Authoring component of the Adaptive Instruction Tool, users must first add the "Form" command to the Quick Access Toolbar. To do this:

- Click the down arrow in the Quick Access Toolbar. The down arrow should be to the right of the save and undo/redo icons.
- When the Customize Quick Access Toolbar menu appears, select the "More Commands..." option.
- The Customize the Quick Access Toolbar window will appear. Select "All Commands" from the "Choose commands from" dropdown.
- When all commands appear, scroll down to select the "Forms..." command.
- Click the "Add" button. The "Forms" command will appear in the box to the right.
- Click "OK" to add the command to the Quick Access Toolbar.
- Note: These instructions apply to Microsoft Excel only (not Excel for Macintosh).


View Recommendations Tab
Select Teal Tab
To view recommendations for a particular behavior, click "View Recommendations" tab.
Select this tab.
Tab Overview
The "View Recommendations" tab will display (as shown in the figure below). This tab contains a form that allows users to view the top five recommendations associated with a particular behavior. The dropdown menu is searchable.
Choose Behavior from Dropdown
Choose the desired behavior from the "Select Behavior" dropdown menu. If you wish to narrow dropdown options prior to selection, skip to next page.
Click dropdown arrow
Select desired behavior.
Once a behavior is selected, the form below will automatically display the recommendations and other data associated with the behavior.
Narrow Dropdown Options
To narrow dropdown options before making a selection, type the desired criteria (such as a letter, word, or phrase) in the "Select Behavior" window, and click the dropdown icon. Options meeting the specified criteria will display. In the example below, there are three items that contain the word "anxious."
1. Type criteria here.
2. Click dropdown arrow.
If the desired option appears, select the option from the dropdown. If not, modify the criteria and try again. You can type right over the existing text.
Select desired option from dropdown.
Change Behavior Selection
After a behavior has been selected, the dropdown menu will only contain the selected item in the dropdown. See instructions below for how to change this selection.
To change the existing behavior selection, perform one of the following actions:
Enter New Search Criteria: Type desired search criteria (such as a letter, word, or phrase) in the "Select Behavior" window. Type right over the existing selection. Then, click the dropdown arrow. All options meeting the specified criteria will display (in this case, three items contain the word "anxious").
Select from All Dropdown Items: To select from the full list of items (rather than a subset of items meeting a specific criteria), click in the "Select Behavior" box, hit the "Backspace" key, and then click the dropdown arrow. The full list of dropdown items will appear in the dropdown menu.
1. Click in this box, and hit the "Backspace" key.
2. Click the dropdown arrow.
3. All items re-appear in dropdown.
Clear Form
To clear the View Recommendation form entirely, click in the "Select Behavior" box, hit the "Backspace" key, and then perform one of the following actions: (a) click the "Enter" key or (b) click outside the "Select Behavior" box.
1a. Click the "Enter" key. OR
1b. Click outside the box.
Print Recommendations
Click on the teal View Recommendations tab.
When the worksheet displays, click the "File" tab in the main menu bar of Excel.
Select File tab.
When the File menu appears, select the "Print" option on the left-hand side.
Select Print option.
The form is already set-up for printing (one page, landscape). Click the "Print" button.
Click Print button.
View Database Tab
Click Green Tab
Click on the green "View Database" tab.
Tab Overview
The "View Database" tab will appear. This tab displays the top five recommendations for each behavior, including any changes or additions. Users can filter and sort the information on this tab; however, they cannot edit from this tab.
New Behavior
Modified Behavior
View Data
To view additional columns, scroll to the right. To view additional rows, scroll down.
Vertical Scrollbar
Horizontal Scrollbar
Sort Data
Click the gray down arrow to the right of any column header. The sort menu will appear, allowing the user to choose whether to sort the column contents in ascending order (A to Z) or descending (Z to A) order.
Click gray down arrow.
When the contents of a column have been sorted in ascending or descending order, an up/down arrow will appear in the gray button.
Down arrow to indicate column is sorted in descending order.
To return to the original order, sort the Key column in ascending order.
Up arrow to indicate Key column is sorted in ascending order
Filter Data
The Sort function can also be used to filter data in columns (e.g., filter by color, text filters, filter out blanks, or view only certain behaviors).
Filter Area
To filter out blank rows, uncheck "Blanks" from the list of criteria, and click "Ok."
Uncheck Blanks.
Click "Ok."
A funnel shape will appear in the dropdown button to indicate that a filter is active. Be sure to clear the filter before sorting/filtering other columns.
Active Filter
Remove Filter
To remove a filter, click the filter icon to the right of the header. Check the "Select All" item in the filter area, and click "OK."
Check "Select All"
Click "Ok."
Password Protection
This tab is password protected to prevent accidental deletion of formulas. Thus, users cannot select cells or copy/paste data. Users can, however, sort, filter, and take screen captures of the data.
View Library Tab
Click Purple Tab
Click on the purple "View Library" tab.
Tab Overview
The "View Library" tab will appear. This tab contains a larger library of recommendations for the original 29 behaviors. Users can filter and sort the information on this tab.
View Data
To view additional columns, scroll to the right. To view additional rows, scroll down.

Sort Data

Click the gray down arrow to the right of any column header. The sort menu will appear, allowing the user to choose whether to sort the column contents in ascending order (A to Z) or descending (Z to A) order.

When the contents of a column have been sorted in ascending or descending order, an up/down arrow will appear in the gray button.

To return to the original order, sort the Key column in ascending order.

Filter Data

The Sort function can also be used to filter data in columns (e.g., filter by color, text filters, filter out blanks, or view only certain behaviors).

To filter out blank rows, uncheck "Blanks" from the list of criteria, and click "Ok."

A funnel shape will appear in the dropdown button to indicate that a filter is active. Be sure to clear the filter before sorting/filtering other columns.

Remove Filter

To remove a filter, click the filter icon to the right of the header. Check the "Select All" item in the filter area, and click "OK."

Password Protection

This tab is password protected to prevent accidental deletion of formulas. Thus, users cannot select cells or copy/paste data. Users can, however, sort, filter, and take screen captures of the data.

Record Notes – Hull Tab

Click Red Tab

Click on the red "Record Notes - Hull" tab.

Tab Overview

The "Record Notes – Hull" tab will appear. This tab displays a form for instructors to enter notes during the Hull phase of the course. This data will be sent to the Training Manager, and compiled to get a sense of what behaviors are being observed in class, how many students are affected, and how well the recommendations are working.

Enter Data

Instructors can enter data in this worksheet by: (a) selecting items from a dropdown menu where relevant (e.g., Phase, Instructor ID, Class ID) or (b) by entering notes and recommendations. Instructors may also recommend changes or additions to behaviors and recommendations.

Send Instructor Tool to Training Manager

After Instructors enter data in the "Record Notes – Hull" and/or "Record Notes – Turret" tabs, they can share a copy of the Instructor Tool with the Training Manager (via email or some other method). Training Managers: See the Manager version of the User Guide for instructions on how to easily compile Instructor notes.

Record Notes – Turret Tab

Click Blue Tab

Click on the blue "Record Notes - Turret" tab.

Tab Overview

The "Record Notes – Turret" tab will display. This tab displays a form for instructors to enter notes during the Turret phase of the course. This data will be sent to the Training Manager, and compiled to get a sense of what behaviors are being observed in class, how many students are affected, and how well the recommendations are working.

Enter Data

Instructors can enter data in this worksheet by: (a) selecting items from a dropdown menu where relevant (e.g., Phase, Instructor ID, Class ID) or (b) by entering notes and recommendations. Instructors may also recommend changes or additions to behaviors and recommendations.

Send Instructor Tool to Training Manager

After Instructors enter data in the "Record Notes – Hull" and/or "Record Notes – Turret" tabs, they can share a copy of the Instructor Tool with the Training Manager (via email or some other method). Training Managers: See the Manager version of the User Guide for instructions on how to easily compile Instructor notes.

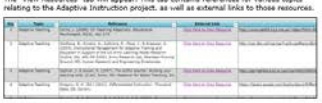
View Resources Tab

Click Gray Tab

Click on the gray "View Resources" tab.

Tab Overview

The "View Resources" tab will appear. This tab contains references for various topics relating to the Adaptive Instruction project, as well as external links to those resources.



View Data

To view additional columns, scroll to the right. To view additional rows, scroll down.

View External Resources

To view a resource, click the "Click Here to View Resource" link in the External Link column. It may take a while for the resources to open.

If the resource is a PDF file, you may get the warning below. Click "OK" to open the doc in the PDF viewer.

There is a download limit of 10 documents. When you reach the limit, it will no longer let you download resources on this tab for a while (it will reset after a few minutes).

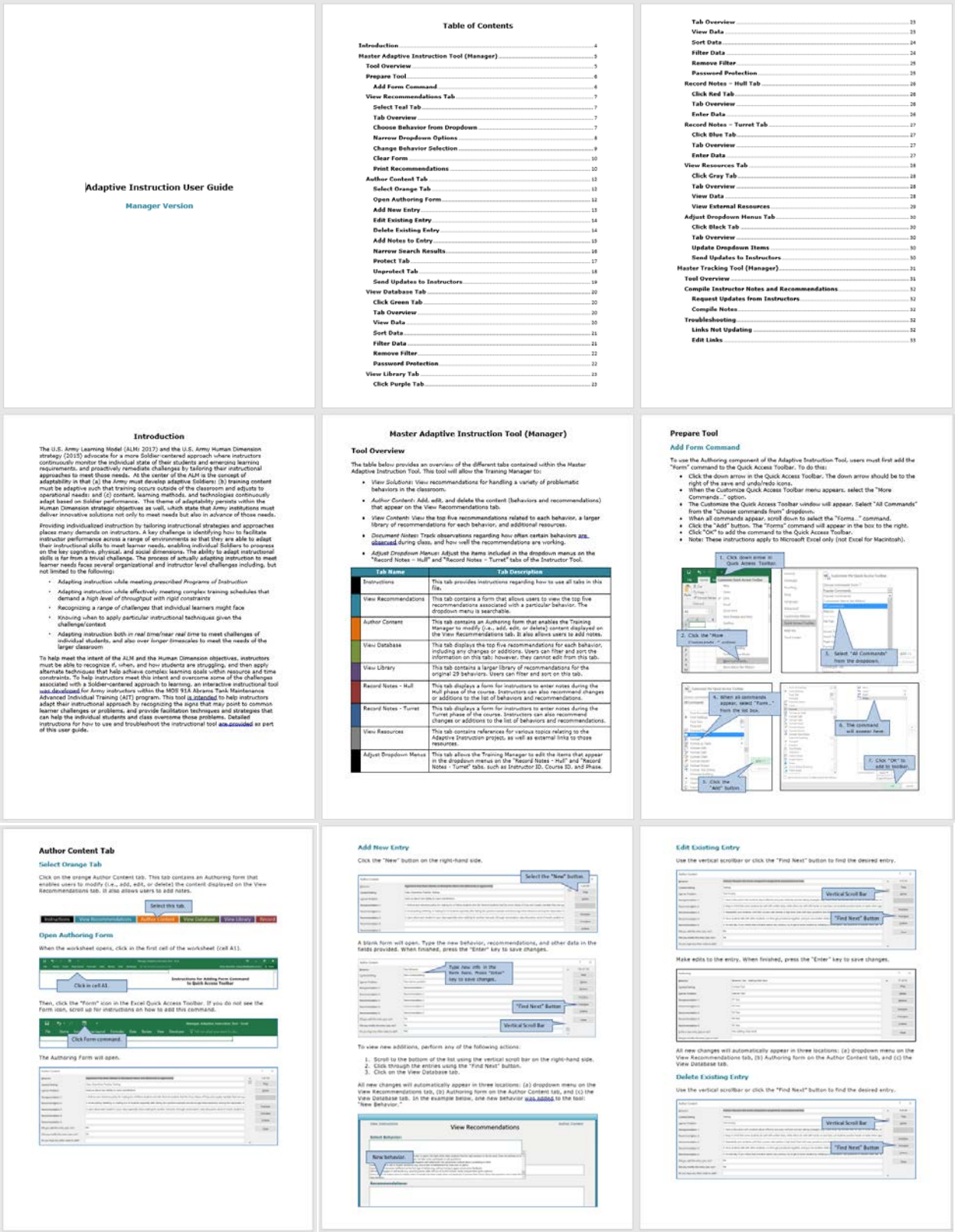
Apply Updates from Training Manager

The Training Manager will review Instructor notes and recommendations and make necessary changes in the Master Adaptive Instruction Tool. They may also update the dropdown menus on the "Record Notes – Hull" and "Record Notes – Turret" tabs. After the Master Tool has been updated, the Training Manager will share an updated version of the Master Tool with all Instructors (via email or some other method).

To apply the changes, Instructors should follow the following steps:

- *Save Master File:* Save the Master Adaptive Instructor Tool in the same folder as your Instructor Tool.
- *Open Files at Same Time:* Open the Master Adaptive Instructor Tool at the same time as the Instructor Tool.
- *Apply Updates:* The Instructor Tool will automatically update to include any changes. The updates will display in three locations: (a) in the dropdown menu on the View Recommendations tab, (b) on the View Database tab, and (c) on the Record Notes tabs.
- *Save and Close:* When finished, save and close the Instructor Tool. Close the Master Adaptive Instruction Tool.
- *Store Master File:* After updates have been applied, leave the Master Adaptive Instructor Tool in the same folder as the Instructor Tool temporarily (until you receive an updated version to replace it with). This will prevent you from getting unnecessary errors when you open the Instructor Tool.

Training Manager Version: Unique Content
(e.g., Authoring Tab, Summary Data Visualizations, Edit Dropdown, Troubleshooting Guide)



Adaptive Instruction User Guide

Manager Version

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Introduction

The U.S. Army Learning Model (ALM) 2017) and the U.S. Army Human Dimension strategy (2015) advocate for a more Soldier-centered approach where instructors continuously monitor the individual state of their students and emerging learning requirements, and proactively remediate challenges by tailoring their instructional approaches to meet those needs. At the center of the ALM is the concept of adaptability in that (a) the Army must develop adaptive Soldiers; (b) training content must be adaptive such that training occurs outside of the classroom and adjusts to operational needs; and (c) content, learning methods, and technologies continuously adapt based on Soldier performance. This theme of adaptability persists within the Human Dimension strategic objectives as well, which state that Army institutions must deliver innovative solutions not only to meet needs but also in advance of those needs.

Providing individualized instruction by tailoring instructional strategies and approaches places many demands on instructors. A key challenge is identifying how to facilitate instructor performance across a range of environments so that they are able to adapt their instructional skills to meet learner needs, enabling individual Soldiers to progress on the key cognitive, physical, and social dimensions. The ability to adapt instructional skills is far from a trivial challenge. The process of actually adapting instruction to meet learner needs faces several organizational and instructor level challenges including, but not limited to the following:

- *Adapting instruction while meeting prescribed Programs of Instruction*
- Adapting instruction while effectively meeting complex training schedules that demand a high level of throughput with rigid constraints
- Recognizing a range of challenges that individual learners might face
- Knowing when to apply particular instructional techniques given the challenge/context
- Adapting instruction both in real time/near real time to meet challenges of individual students, and also over longer timescales to meet the needs of the larger classroom

To help meet the intent of the ALM and the Human Dimension objectives, instructors must be able to recognize if, when, and how students are struggling, and then apply alternate techniques that help achieve complex learning goals within resource and time constraints. To help instructors meet this intent and overcome some of the challenges associated with a Soldier-centered approach to learning, an interactive instructional tool was developed for Army instructors within the MOS 91A Abrams Tank Maintenance Advanced Individual Training (AIT) program. This tool is intended to help instructors adapt their instructional approach by recognizing the signs that may point to common learner challenges or problems, and provide facilitation techniques and strategies that can help the individual students and class overcome those problems. Detailed instructions for how to use and troubleshoot the instructional tool are provided as part of this user guide.

Master Adaptive Instruction Tool (Manager)

Tool Overview

The table below provides an overview of the different tabs contained within the Master Adaptive Instruction Tool. This tool will allow the Training Manager to:

- *View Solutions*: View recommendations for handling a variety of problematic behaviors in the classroom.
- *Author Content*: Add, edit, and delete the content (behaviors and recommendations) that appear on the View Recommendations tab.
- *View Content*: View the top five recommendations related to each behavior, a larger library of recommendations for each behavior, and additional resources.
- *Document Notes*: Track observations regarding how often certain behaviors are observed during class, and how well the recommendations are working.
- *Adjust Dropdown Menus*: Adjust the items included in the dropdown menus on the "Record Notes – Hull" and "Record Notes – Turret" tabs of the Instructor Tool.

Tab Name	Tab Description
Instructions	This tab provides instructions regarding how to use all tabs in this file.
View Recommendations	This tab contains a form that allows users to view the top five recommendations associated with a particular behavior. The dropdown menu is searchable.
Author Content	This tab contains an Authoring form that enables the Training Manager to modify (i.e., add, edit, or delete) content displayed on the View Recommendations tab. It also allows users to add notes.
View Database	This tab displays the top five recommendations for each behavior, including any changes or additions. Users can filter and sort on the information on this tab; however, they cannot edit from this tab.
View Library	This tab contains a larger library of recommendations for the original 29 behaviors. Users can filter and sort on this tab.
Record Notes – Hull	This tab displays a form for instructors to enter notes during the Hull phase of the course. Instructors can also recommend changes or additions to the list of behaviors and recommendations.
Record Notes – Turret	This tab displays a form for instructors to enter notes during the Turret phase of the course. Instructors can also recommend changes or additions to the list of behaviors and recommendations.
View Resources	This tab contains references for various topics relating to the Adaptive Instruction project, as well as external links to those resources.
Adjust Dropdown Menus	This tab allows the Training Manager to edit the items that appear in the dropdown menus on the "Record Notes – Hull" and "Record Notes – Turret" tabs, such as Instructor ID, Course ID, and Phase.

Prepare Tool

Add Form Command

To use the Authoring component of the Adaptive Instruction Tool, users must first add the "Form" command to the Quick Access Toolbar. To do this:

- Click the down arrow in the Quick Access Toolbar. The down arrow should be to the right of the save and undo/redo icons.
- When the Customize Quick Access Toolbar menu appears, select the "More Commands..." option.
- The Customize the Quick Access Toolbar window will appear. Select "All Commands" from the "Choose commands from" dropdown.
- When all commands appear, scroll down to select the "Forms..." command.
- Click the "Add" button. The "Forms" command will appear in the box to the right.
- Click "OK" to add the command to the Quick Access Toolbar.
- Note: These instructions apply to Microsoft Excel only (not Excel for Macintosh).

Author Content Tab

Select Orange Tab

Click on the orange Author Content tab. This tab contains an Authoring form that enables users to modify (i.e., add, edit, or delete) the content displayed on the View Recommendations tab. It also allows users to add notes.

Open Authoring Form

When the worksheet opens, click in the first cell of the worksheet (cell A1).

Then, click the "Form" icon in the Excel Quick Access Toolbar. If you do not see the Form icon, scroll up for instructions on how to add this command.

The Authoring Form will open.

Add New Entry

Click the "New" button on the right-hand side.

A blank form will open. Type the new behavior, recommendations, and other data in the fields provided. When finished, press the "Enter" key to save changes.

To view new additions, perform any of the following actions:

1. Scroll to the bottom of the list using the vertical scroll bar on the right-hand side.
2. Click through the entries using the "Find Next" button.
3. Click on the View Database tab.

All new changes will automatically appear in three locations: (a) dropdown menu on the View Recommendations tab, (b) Authoring form on the Author Content tab, and (c) the View Database tab. In the example below, one new behavior was added to the tool: "New Behavior."

Edit Existing Entry

Use the vertical scrollbar or click the "Find Next" button to find the desired entry.

Make edits to the entry. When finished, press the "Enter" key to save changes.

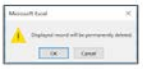
All new changes will automatically appear in three locations: (a) dropdown menu on the View Recommendations tab, (b) Authoring form on the Author Content tab, and (c) the View Database tab.

Delete Existing Entry

Use the vertical scrollbar or click the "Find Next" button to find the desired entry.

Click the "Delete" button on the right-hand side of the data form.

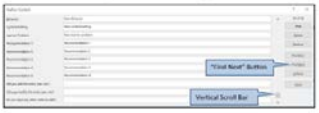
A warning will appear. Click "OK" to permanently delete the entry.



Deleting an entry will also remove the entry in the following locations: (a) dropdown menu on the View Recommendations tab, (b) Authoring form on the Author Content tab, and (c) the View Database tab.

Add Notes to Entry

Click the "Find Next" button (or use the vertical scroll bar) to find the desired entry.



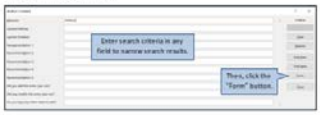
Add notes in the desired fields at the bottom of the entry. These fields will allow the Training Manager to keep track of behaviors that were modified or added.

When finished, press the "Enter" key to save changes. Notes will appear on the "View Database" tab, where the user can sort and filter based on the New Behavior and the Modified Behavior columns.

Narrow Search Results

Click the "Criteria" button on the right-hand side of the form.

A blank form will open. Type search criteria one or more data fields. In the example below, we added the word "Anxious" in the Behavior field. Then, click the "Form" button the right-hand side of the form.



The main form will appear. When the user clicks the "Find Next" and "Find Previous" buttons, it will narrow the search results to only those containing the specified criteria.

Protect Tab

Click on the orange Author Content tab.

When the sheet opens, click the "Review" tab in the main menu of Excel. Then, click the "Protect Sheet" option.

When the password prompt appears, type in a password (or leave it blank), and click "OK." If you enter a password, it will ask you to reconfirm the password, and click "OK."

Now, when the user opens the data form, certain data fields will be protected. Applying protection still allows the user to add notes for existing behaviors. However, it permits them from adding new entries, deleting entries, or editing entries.

Unprotect Tab

To unprotect the worksheet, click the "Review" tab in the main menu of Excel. Then, click "Unprotect Sheet" option.

Enter password and click "OK."

Now, when users open the data form, they can add new entries, delete entries, and/or edit entries. They can also add notes.

Send Updates to Instructors

Once the updates have been made, the Training Manager should share the new version of the Master Adaptive Instruction Tool with all Instructors (via email or another method). To apply changes, Instructors should:

1. Save the Master Adaptive Instruction Tool in the same folder on their computer as their Instructor Tool.
2. Then, they should open the two files at the same time (i.e., Master Tool and Instructor Tool). The Instructor Tool will automatically update to include any newly authored content (including additions, edits, and deletions).
3. The updates will display in three locations: (a) in the dropdown menu on the View Recommendations tab, (b) on the View Database tab, and (c) on the Record Notes tabs.
4. Lastly, they should save changes to their Instructor Tool, and close both files. They will no longer need the copy of the Master Adaptive Instruction Tool.

Adjust Dropdown Menus Tab

Click Black Tab

Click on the black "Adjust Dropdown Menus" tab.

Tab Overview

The "Adjust Dropdown Menus" tab will appear. This tab allows managers to edit what appears in the dropdown menus on the "Record Notes – Hull" and "Record Notes – Turret" tabs, such as the Instructor ID, Course ID, and Phase.

Note: The items in orange feed the formulas on the Totals tabs in the Master Tracking Tool, so you must be careful when making changes to those items.

Update Dropdown Items

The Training Manager can modify existing dropdown entries as needed. The dropdown menus are dynamic, so changes will automatically appear in the dropdown menus on the "Record Notes – Hull" / "Record Notes – Turret" tabs of the Master Adaptive Instruction Tool file. You may include up to 200 items in each dropdown menu. To apply these changes in the Instructor Tools, please follow the instructions below.

Send Updates to Instructors

The Training Manager should share an updated copy of the Master Adaptive Instruction Tool with Instructors (via email or another method). Instructors should save the Master file in the same folder as the Instructor Tool. Then, Instructors should open both files at the same time. New changes will automatically pull into the Instructor Tool. Note: For best results, this should be done in the beginning of the course, prior to the instructors tracking any notes. If this is done during the course (when instructors have already tracked some notes), it may affect the current entries.

Master Tracking Tool (Manager)

Tool Overview

The table below provides an overview of the different tabs contained within the Master Tracking Tool. This tool will allow the Training Manager to:

- View Notes: View a compiled set of notes from instructors regarding the behaviors and recommendations.
- View Statistics: View counts of how many times each behavior was observed in class, how many students were affected, the number of times recommendations were applied, and the number of successful interventions using the recommendations.

Tab Name	Tab Description
Compiled Notes – Hull	This tab contains links that will automatically compile instructor notes and recommendations from the "Record Notes – Hull" tab in the Instructor Tool. It is set-up to compile notes from 45 instructors, as needed.
Compiled Notes – Turret	This tab contains links that will automatically compile instructor notes and recommendations from the "Record Notes – Turret" tab in the Instructor Tool. It is set-up to compile notes from 45 instructors, as needed.
Compiled Notes Summary	This tab compiles the notes across instructors for both the Hull phase and the Turret phase. It is sorted by Behavior, Phase, and Instructor, so the Training Manager can more easily view the notes and recommendations across instructors/phases for each behavior.
Hull Totals	This tab provides a count of how many times each behavior was observed in class, how many students were affected, the number of times recommendations were applied, and the number of successful interventions using the recommendations. The counts are broken down by behavior, and summarized across instructors for the Hull phase of the course only.
Turret Totals	This tab provides a count of how many times each behavior was observed in class, how many students were affected, the number of times recommendations were applied, and the number of successful interventions using the recommendations. The counts are broken down by behavior, and summarized across instructors for the Turret phase of the course only.
Course Totals	This tab summarizes the data for the entire course: how many times each behavior was observed in class, how many students were affected, the number of times recommendations were applied, and the number of successful interventions. These counts are broken down by behavior, and summarized across instructors/phases of the course.

Compile Instructor Notes and Recommendations

Request Updates from Instructors

After Instructors enter data in the "Record Notes – Hull" and/or "Record Notes – Turret" tabs, they should share a copy of the Instructor Tool with the Training Manager (via email or some other method).

Compile Notes

The Training Manager can easily compile notes and recommendations across instructors in the Master Tracking Tool by performing the following steps:

- *Save Instructor Files:* Save all Instructor Tool files in the same folder as the Master Tracking Tool.
- *Open Files at Same Time:* Open the Master Tracking Tool at the same time as one or more Instructor Tool files (as many as your computer can handle at one time).
- *Compile Notes:* The Master Tracking Tool will automatically compile all relevant notes and recommendations from the "Record Notes - Hull" and/or "Record Notes – Turret" tabs. These notes will display in the Tracking file on the "Compiled Notes - Hull" and "Compiled Notes - Turret" tabs, as well as other tabs.
- *Verify Information:* Verify the Master Tracking Tool is compiling the notes and recommendations properly. The data for Instructor 1 should populate, followed by Instructor 2, Instructor 3, and so on. Between the data for each instructor, there should be about 100 blank rows to accommodate any new behaviors that are added in the tool over time.
- *Repeat:* If you have additional tools to compile, close the Instructor Tools that are currently open, and repeat this process with the remaining Instructor Tools.
- *Save and Close:* When finished, save and close the Master Tracking Tool.
- *Store Instructor Files:* After the notes have been compiled for the Hull phase, leave the saved Instructor Tools in the same folder as the Master Tracking Tool temporarily (until you receive an updated version for the Turret phase). This will prevent you from getting unnecessary errors when you open the Master Tracking Tool to view notes/statistics.

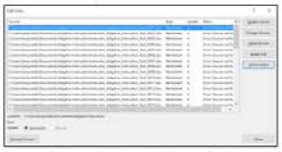
Troubleshooting

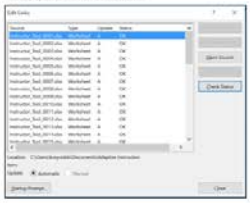
Links Not Updating

Under certain circumstances, you may get a warning that the links in the file cannot update, like the figure below. This is usually an indication that the source files (Instructor Tools) are not saved in the same folder on your computer as the Master Adaptive Instruction Tool and the Master Tracking Tool. If you've already updated the links in your document, you can ignore this warning and click "Continue."

Edit Links

Click the "Edit Links..." button. This will take you to the Edit Links screen, where you can see the source of the problem.



In this case, Excel cannot find the source files (Instructor Tools) linked to the Master Tracking Tool. The two most common reasons for this are:

- The source and/or master files were renamed. The names of the files must match the original filenames: (a) Instructor_Tool_0001 to Instructor_Tool_0045, (b) Master_Adaptive_Instruction_Tool, and (c) Master_Tracking_Tool. As you can see in the figure above, the filenames do not match the original. To fix this issue, rename the files to match the original files and reopen the Master document.
- As you can see, the Status now shows "OK." This means Excel can find all the source documents. If you open these source documents at the same time as the master, updates will now be successful.