An Integrated Theory for After Action Review

Thomas W. Mastaglio, Ph.D., Phillip Jones
MYMIC LLC
Portsmouth, VA 23714
tom.mastaglio@mymic.net, phillip.jones@mymic.net

James P. Bliss, Ph.D. , Elizabeth Newlon
Old Dominion University
Norfolk, VA 23529
jbliss@odu.edu, enewlin@odu.edu

ABSTRACT

The concept of providing After Action Review (AAR) has been partially responsible for the effectiveness of military training events conducted over the past two decades in Live, Virtual and Constructive environments. However, the practice and quality of AAR varies considerably based on the experience and expertise of training facilitators or unit leaders. Good AARs are most often an art, the result of craftsmanship as practiced by the training facilitator, such as an Observer/Controller at NTC, and not usually based on a standard set of principles or established practices. What is needed is a practical theoretical foundation that can be used as a basis for teaching the practice of AAR, informing the development of AAR tools, and guiding future cognitive science learning research as it relates to training approaches.

Today, AAR research lacks a single, overarching theory that integrates knowledge about performance appraisal, learning, cognition, and team interaction. This paper will present an integrated model for AAR that was developed for the Joint National Training Capability (JNTC) at Joint Forces Command under a Small Business Innovative Research effort. We will present a model that incorporates past research about the facilitator, the learner, and the use of performance appraisals which are relevant and show how they can be integrated into a theoretical framework.

There are key aspects to the integrated theory taken from learning theory, social psychology, and cognition that will be discussed. We will then discuss relevant research findings in those areas within the context of an integrated theory of AAR based upon the facilitator's role, the role of feedback, the importance of goal setting and the use of an instructional plan. The integrated theory presented herein suggests that AAR would benefit from implementing an instructional plan in which leaders express attainable yet challenging goals prior to training

ABOUT THE AUTHORS

Dr. Thomas W. Mastaglio is the President of MYMIC LLC, a high technology start up specializing in modeling, simulation and visualization solutions to support training, military analysis, experimentation and business decision-support. Dr. Mastaglio was the Executive Director of the Virginia Modeling, Analysis and Simulation Center from November 1996 to June 2000. He is a 1969 graduate of the U.S. Military Academy, retired from the Army in 1991 then worked in the defense industry as a senior engineer, program manager, and scientist. Dr. Mastaglio earned a Doctor of Philosophy degree from the University of Colorado in Computer and Cognitive Science in 1990.

Phillip N. Jones is the Manager of the Training & Assessments laboratory within MYMIC LLC. Mr. Jones has over twenty-two years of professional experience as an Army combat-arms officer. He has Army and Joint operational and training experience training Active and Reserve Component units from platoon to the national level, training Dutch Marines en rout to Cambodia and serving as the advisor to the Kuwaiti Armed Forces J3.

Dr. James V, Bliss is an Associate Professor and Program Director of Psychology at Old Dominion University. Ph.D., Human Factors Psychology. He earned his Ph. D. at the University of Central Florida. Dr. Bliss is interested in two primary areas of research the factors contributing to the development of mistrust, andthe use of virtual environments in training for complex tasks such as firefighting, soldiering, and navigating unfamiliar environments.

Elizabeth Newlon is a doctoral candidate in the Department of Psychology at Old Dominion University. Her research interests include human-computer interaction and design of training systems.

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INTRODUCTION

This is a conceptual paper which reports on efforts to survey the underpinnings of After Action Review to determine the underlying principles and then describes an integrated theory based on cognitive science and the practice of providing training feedback as instantiated in After Action Review (AAR) practice in the U.S. military. The concept of providing AAR has been partially responsible for the effectiveness of military training events conducted over the past two decades in Live, Virtual and Constructive environments. The practice and quality of AAR varies based on the experience and expertise of training facilitators or unit leaders. Good AARs are often an art, the result of the craftsmanship of the training facilitator. They are not usually based on a standard set of principles or established practices. The practice of AAR needs a practical theoretical foundation that can be used as a basis for teaching it, informing the development of AAR tools, and guiding future cognitive science learning research as it relates to training approaches.

There are three sections to this paper: a discussion of the foundations of AAR, the objective of this research, and the integrated theory as it has been developed to date. There are several key aspects to the integrated theory taken from learning theory, social psychology, and cognition that will each be discussed. We will then contextualize relevant research findings in those areas within an integrated theory of AAR based upon the facilitator's role, the role of feedback, the importance of goal setting and the use of an instructional plan.

THE FOUNDATIONS OF AAR

After Action Review, as a key element of training as it is practiced within the armed forces of the United States, was initially conceptualized and developed within the Army training community. The other services have adapted the approach and tailored it to their specific training needs. We discuss in this section first the Army perspective followed by an analysis of current Army practice, and finally relate those discussions to the other services AAR policy and training doctrine.

The Army Perspective

The United States Army developed the AAR over time as a process to support collective training. AARs have been culturally ingrained at all Army leadership levels and are seen as an essential part of Army training transformation (Culkin 2005). The importance given to AARs by junior Army leadership was measured in two studies on the effectiveness of the Army's Close Combat Tactical Trainer (Jones and Mastaglio 2006). In these studies, typical small unit leaders stated that AARs were critical to extremely critical to training success. Further, small unit leaders stated that 25-35% of the total training benefit occurred in the AAR.

Field Manual 25-4, How to Conduct Training Exercises (1984)—which is still available as doctrine from Army Knowledge On-Line (AKO)—has an appendix on post-exercise activities, which describes conducting AARs. Training Circular 25-20, A Leader's Guide to After Action Reviews (1993) is the Army's stand-alone document describing AARs and provides guidance on their conduct. Field Manual 7-1, Battle Focused Training (2003) has an appendix on the AAR, which mirrors the information found in TC 25-20. The definition of an AAR found in TC 25-20 is (italics added):

> An after-action review (AAR) is a professional discussion of an event, focused on performance standards, that enables soldiers to discover for themselves *what happened, why it happened, and how to sustain strengths and improve on weaknesses*. It is a tool leaders and units can use to get maximum benefit from every mission or task.

In Foundations of the After Action Review Process (1999), John Morrison and Larry Meliza provided a history of the AAR, which they traced back to the work of SLA Marshall during World War II. Essential to the evolution of the AAR was the development of simulation based training systems such as the Tactical Engagement System (TES), the Military Integrated Laser Engagement System (MILES), and the Simulation Network (SIMNET) system.

From Morrison's and Meliza's work, and that of others, one can conclude that training modalities and the AAR have had a symbiotic relationship. The technological advances in training modalities have allowed corresponding advances in AARs. The amount, accuracy, and thoroughness, combined with the increasing ability to analyze and present the data, has allowed an evolution of the AAR process, as well as AAR related products, such as the Take Home Packet (Taylor and Gentner 1999). An example is the evolving concept of a During-Action Review (DAR), enabled by data available in friendly-force tracking systems and analyzable in real time (Adin et al 2005).

The other side of the symbiotic relationship is demonstrated in the various means developed to access and use data available within SIMNET. This includes such mean as the Unit Performance Assessment System and the Automated Training Analysis and Feedback System (Morrison and Meliza 1999). The requirements to support the AAR drove the conceptualization and development of analytical tools.

After Action Review Analyzed

Army AAR doctrine contained in the three previously mentioned doctrinal documents is very sparse on describing detailed conduct of an AAR, let alone providing AAR practitioners with AAR process knowledge required. The documents discuss the when and where to conduct AARs, but not the how. This is in line with development of the AAR process. The AAR initially evolved in reaction to advancements in data availability, as opposed to advancements in learning science. Further, AAR experts become proficient through apprenticeship and practice rather than through study and reflection.

There has been serious effort to study the AAR process to determine its components and capabilities. In 1999 Drs. Morrison and Meliza, identified theories and techniques from successful AARs. The authors did a similar study in 2005, from a different perspective: examining elements of the AAR process to determine how they interact to achieve synergistic results.

AAR Theories and Techniques

The AAR is not an end, it's a means. The end is a trained and ready force. The AAR process supports this end by improving the efficiency of training. Integral to a training event, the AAR compliments and leverages the training event actions to insure maximum training. To obtain these results, the AAR combines multiple learning tools. In their 1999 study, Morrison and Meliza published a table listing these tools. This table is included below (Morrison and Meliza 1999).

A Different Perspective: Elements of the AAR

MYMIC looked at the AAR and its inclusion of learning theory from a different perspective, taking four elements of the AAR; Goals, Feedback, Performance Appraisal, and Knowledge, and showing how they must interact for a successful AAR effort. Table 2 shows those interactions.

The After Action Review: Other Perspectives

The AAR process, started within the Army, has migrated in mixed form to the other uniformed training audiences: the services and the joint community.

The United States Air Force

The Air Force Glossary, Air Force Doctrine Document 1-2 (2006) does not contain a reference to the AAR. The Air War College web page on lessons learned refers to the Army's TC 25-20 for instructions on writing "AARs" (Air War College, accessed 1 Feb 2007). The Air Force Instruction 10-204, Readiness Exercises and After-Action Reporting Program (2002), also referred to on the Air War College lessons learned web page, mentions only the After Action Report as an integral part of exercises and does not mention the After Action Review. According to this document, the After Action Report

> "…focuses on the exercise objectives, documents exercise results, and provides feedback…to determine whether or not exercise objectives have been met. If not, the analysis should identify and define deficiencies or shortcomings and provide suggestions for possible changes to existing plans, policies, procedures, and systems. If the objectives were met, the analysis should document that current plans, policies, procedures, and systems are adequate. It should also identify any successful work-arounds exercise players developed."

Air Force sources recognize the After Action Review but do not specify any After Action Review doctrine or policy. The Air Force After Action Report is in integral part of training, though done external to the training event. It includes identification of deficiencies, but does not include the exchange between event participants found in an After Action Review.

Research Area	Theories & Techniques	AAR Methods, Practices, or Products
Information Feedback	Intrinsic Feedback	Development of live simulation systems to provide realistic BDA
		Use of AAR to determine fidelity requirements
		Live feedback requirements for emerging weapon systems
	Extrinsic Feedback	Design that minimizes delay of feedback
		Improvements to take-home packages
		Intervention guidelines for providing coaching and mentoring
Performance Measurement	Process vs. product measurement	Incorporation of process with product measures to aid diagnosis of performance problems
	Automated performance measurement technology	Unit Performance Assessment System
		Automated Training Analysis and Feedback System
		Standardization of AAR through input to STAARS
	Self-assessment techniques	Experimental methods for providing feedback for multi-force exercises
Memory and Cognition	Transfer of training	Focus on tactics, not gaming
	Memory aiding	Initial review of "what happened" to refresh participants' memories
		Use of summaries to reinforce AAR points
		THPs to refresh memory after AARs
	Problem-solving/decision-making	Determination of causes of performance problems (why)
		Determination of training solutions (how to improve)
	Mental Models	Benefits of multiple points of view
		Participation of OPFOR
Group Processes and Dynamics	Social facilitation and social loafing	Exploiting the positive effects of group context
		Minimizing irrelevant distractions during AAR
		Monitoring participation to prevent "social loafing"
	Group identity and cohesiveness	Establishing positive, non-threatening atmosphere
		Minimizing "finger-pointing"
		AAR Leader acting as moderator, not discussant
Communication Theory and Techniques	Descriptive communication	Use of specific statements instead of abstractions
		References to task goals and objectives
	Questioning techniques	Emphasis on open-ended questioning
	Form and content of feedback	Prescriptive model of feedback that stresses; • Performance, not personal characteristics • Importance of rationale • References to goals and objectives • Strategies for improving performance
Instructional Science	Guided discovery learning	Active identification and solution of problems by unit members
		Unit control of AAR content, with AAR leader guiding the process
	Experiential learning	Active learning in a realistic group context
		Importance of iterative cycles of exercises and AARs
	Cooperative learning	Encouragement of group participation in discussions
	Systems concepts	Analysis of AAR processes and sub processes

Table 1: AAR Methods, Practices, and Products Developed from Behavioral Science Principles

Aspect	Impact
Goals…	support **feedback** with criteria development
	structure **knowledge** dispersement
	permit **performance appraisal**
Feedback…	supports **knowledge** with mental model assimilation
	provides an assessment for **performance appraisal**
	enables self monitoring of **goals**
Knowledge…	allows refinement of **performance appraisal** content
	facilitates **goal** setting
	supports **feedback** through post training discussion
Performance appraisal…	is the mechanism for **feedback**
	enables tangible **goal** monitoring
	creates **knowledge** through shared mental models

Table 2: Interaction between the Four Elements of the AAR

The United States Navy

The Navy Supplement to the DOD Dictionary of Military and Associated Terms, NTRP 1-02 (2006) does include AAR as an acronym for After Action Review, as well as After Action Report. It does not define After Action Review or Report, though the Navy manual states, as a supplement to DoD level dictionaries, it only defines terms not already defined in Joint publications.

The Navy does have a formal lessons learned system. Central to the system is a database of lessons learned, after action reports, remedial action program reports, and other inputs. Data submitted to the lessons learned system must be associated to tasks from the Navy or joint task lists. The database is a reference source for Navy researchers (OPNAV Instruction 3500.37C 2001).

United States Joint Doctrine

The Joint Training Policy of the United States, CJCSI 3500.01B (1999) has the following definition of the After Action Review:

> A process designed to provide commanders direct feedback on the accomplishment of selected joint mission essential tasks, conditions, and standards stated in terms of training objectives for the commander to evaluate training proficiency. 2. An analytical review of training events that enables the training audience, through a facilitated professional discussion, to examine actions and results during a training event. Also called AAR.

The Joint Training Manual for the Armed Forces of the United States, CJCSM 3500.03A (2002) states that the AAR "…as part of the event, provides the commander direct feedback and allows the training audience, through facilitated discussion, to examine actions and results."

The joint community includes the After Action Review as an integral part of the training event, contained within the training event. In fact, the AAR is seen as the culmination of a training event: the last step performed during the execution phase of the Joint Exercise Life Cycle (Joint Training Manual 2002).

The joint community vision of the AAR is less specific than the Army vision. It focuses on the identification of "what happened" without specific reference to sustaining or improving behavior. Joint training events have historically focused on higher level operations, especially operational and strategic, and this might account for the less specific perspective on AARs.

Direct observation of the preparation of a JFCOM-facilitated, corps level AAR showed a significant amount preparatory work done by observers over the duration of the multi-day training event. This level of work and nature of conclusions implied a highly directed AAR execution.

OBJECTIVE: AN INTEGRATED THEORY

The ultimate objective of this research is developing an Integrated Theory of AAR (ITAAR). The ITAAR will serve as a basis for further research and advancement of the AAR process. More importantly, the ITAAR can inform a program of instruction for AAR practitioners, which would include any leader involved in collective training. As seen above, within the Army, AARs are seen as integral to all levels of training. However, as a 2005 study demonstrated, leaders today learn to facilitate AARs

mostly through experience. The only institutions seeming to provide a formal AAR course are the Combat Training Centers and the Master Gunners Course. Further, significant numbers of leaders from platoon sergeant to battalion commander reported no AAR training (Jones & Mastaglio 2006).

Theoretical Foundations of AAR

AAR facilitators lead the AAR process and should provide goal referenced feedback to trainees. Goal setting theories proposed by behavioral scientists support establishing clear and challenging goals that focus group members' attention on performance standards. Learning goals guide trainees during training performance by describing the appropriate action, clearly identifying the environment, accessible tools, and the acceptable parameters for performance (Mager, 1984). Facilitators analyze trainee performance and guide trainees to mutually discover performance norms and problems. Expert facilitators often construct and utilize chunks of relevant information in short-and long-term memory to enable the recognition of factors preceding critical training events (Gobet, 1998). Chunking theory proposed by cognitive scientists suggests that experienced facilitators will generally identify critical events more quickly than inexperienced facilitators (Gobet, 1998). A facilitator should also effectively communicate this information to learners and appear open to input from trainees (Dyer, 1986). Smith (2001) suggests that implicit knowledge in the form of cognitive chunks is convertible into explicit knowledge and vice versa. The facilitator should present information to trainees and guide them to identify and subsequently demonstrate effective performance actions.

Groups are defined as combinations of people with different perspectives and knowledge working towards mutual goals (Katzenbach & Smith, 1993). The joint AAR's focus is to optimize group learning and performance by properly utilizing group members' skill assets and compensating for deficits. Group member interactions can improve performance especially when group members share knowledge (Saavedra, Earley & Van Dyne, 1993). The team interaction model refers to group members effectively anticipating other group members' actions through shared mental models (Minionis, Zaccaro & Perez, 1995). Shared mental models reduce the need for explicit communication, thereby increasing performance efficiency. Training performance improves when task feedback, task characteristics and goal types are analogous, so that the goals relate to the training task and the feedback describes how training performance meets training goals. Therefore group goals and group feedback are conducive to group performance (Saavedra et al., 1993).

Performance appraisal, a central area of scientific study by industrial psychologists, provides information about group performance and is used to direct future performance (Patrick, 1992). In the AAR context, groups may work together to achieve performance goals. It is important to assess collective performance during a training exercise based on established performance standards and how constituent groups interact. Cohen's model combines objective measures of group performance with subjective measures of group processes and member interactions (Cohen, 1994). It is also important to assess individual and group performance to maximize training performance benefits. Parallel appraisals incorporate both individual and group evaluations. Past research has demonstrated that group performance can improve when presented with both individual and group feedback (Matsui, Kakuyama & Onglatco, 1987).

INTEGRATED THEORY OF AAR

A primary purpose of this paper is to present a global theory that integrates past research from cognitive psychology with theories on training and learning. We propose these can be combined into an Integrated Theory of AAR (ITAAR) that includes relevant behavioral constructs, such as goals, feedback, knowledge, and performance appraisal. These are all interrelated because goals drive performance criteria development. Performance appraisal and feedback affect goals, trainees can self-evaluate by comparing performance criteria to actual task performance (Saavedra et al., 1993; Matsui et al., 1987). Performance appraisal and feedback influence knowledge and enable shared mental models by providing knowledge of training performance. Figure 1 is a graphical depiction of ITAAR.

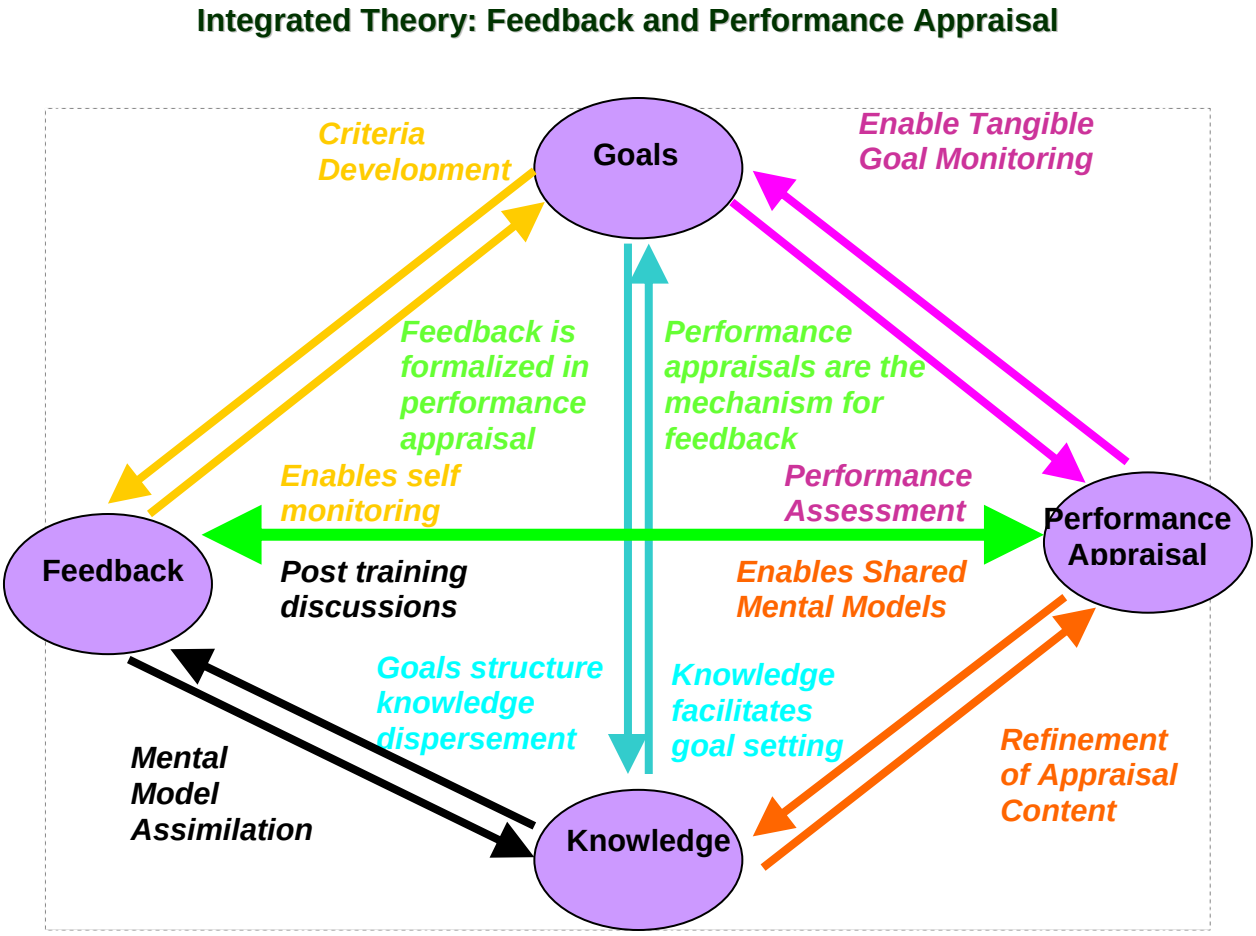

Figure1: An Integrated Theory of AAR (ITAAR)

Integrated Theory

At present, there is no integrative behavioral theory to support the AAR processes. This research uses ITAAR is to summarize, integrate and present theoretical aspects relevant to joint AAR programs. Research findings relating to cognition, learning and training were compiled to explain how trainees from diverse backgrounds acquire knowledge and improve performance. Several domain-specific theories discuss behavioral constructs relevant to joint AAR; these may be combined into an Integrated Theory of AAR. Our theory includes relevant behavioral constructs such as goals, feedback, knowledge and performance appraisal. First, goals relate to the other three themes, then performance appraisal, followed by knowledge and finally feedback.

Performance goals influence feedback, performance appraisal and knowledge. The following research supports how goals influence training performance.

- Goal setting theory (Locke & Latham, 2002; Matsui et al., 1987; Saavedra et al., 1993
- Expectancy theory (Rosenthal & Jacobson, 1968; Eden & Shani, 1982)
- Pygmalion effect (Eden, 1990)
- The goal model from organizational effectiveness (Kahn, 1977)
- Cohen's (1994) model from organizational effectiveness

Together AAR goals and feedback influence training performance. Goals refer to performance standards set before a training exercise. These goals may be individual or group. Trainees receive knowledge of performance through feedback after a training exercise. Feedback may include individual or group feedback and come from a variety of sources. Performance goals affect feedback because goals drive performance criteria development and feedback references these goals. Mager (1984) found that goals identify the acceptable parameters for group performance. Schmidt and Kleinbeck (1990) suggest

clearly stating performance goals in an instructional plan so trainees understand the performance standards. Feedback should compare training performance to performance standards. Goals structure what is included in feedback.

Feedback also influences goals because group performance improves when feedback references goals. Feedback enables trainee goal monitoring. Matsui et al (1987) found that feedback is most effective when task characteristics, feedback and performance goals correspond. Trainees receive feedback from the facilitator; however they should also assess themselves in comparison to their performance standards. Goal referenced feedback allows trainees to evaluate themselves individually and collectively. Matsui et al. (1987) found that group performance improves when groups set goals together and feedback relates to these collective goals.

Performance appraisal relates to goals by providing information about group effectiveness during a training exercise (Kahn, 1977). Performance appraisal may occur at the individual or group level and contain subjective and objective measures. Goals also influence performance appraisal by determining the types of measures used and providing performance assessment criteria. Depending on the training goals, different performance measures assess group effectiveness. Some group goals focus on quantifiable performance outputs and require objective performance measures (Levy & Steelman, 1997). Other group goals focus on interactions and coordination between different military branches and use subjective measures to evaluate group cohesion and cooperation (Kinlaw, 1991; Coulter, 1979). Other group's goals require both objective and subjective measures to evaluate group effectiveness (Cohen, 1994). Performance appraisal measures should adequately assess group goals.

Performance appraisals also affect goals by enabling tangible goal monitoring (Jones, 1997; Nieva et al., 1978). Performance appraisals measure performance behaviors to evaluate group effectiveness in relation to performance standards. Nieva et al. (1978) developed a model of team performance that measured group interactions, task performance and the dispersement of knowledge among trainees. It is important to evaluate group productivity and interactions (Cohen, 1994). Diverse groups of trainees can adjust their future performance and goals based on their knowledge of performance (Patrick, 1992).

Goals and knowledge influence group performance because trainee goals affect how knowledge is dispersed among group members and different units (Saavedra et al., 1993). Knowledge may include shared mental models or explicit or implicit task knowledge. Saavedra et al (1993) and Cannon-Bowers & Salas (2001) found that group's effectiveness improves when groups share knowledge. In joint AAR different units should share information about how the different groups support each other. Some trainees or units may possess complimentary or similar task knowledge; therefore group arrangements and task assignments often depend on performance goals. Dyer (1986) suggested assessing trainees' knowledge prior to training. Group performance is maximized when trainees assign tasks based on their knowledge of group member abilities. The group structure and allocation of assignments among units should match the performance goals.

Knowledge also facilitates goal setting because knowledge of group members' abilities and task knowledge influences the performance objectives. Goals may include assigning tasks based on trainees' shared and dispersed knowledge (Cannon-Bowers & Salas, 2001). Other group goals may focus on increasing group cohesion and coordination. Salas, Cannon-Bowers and Converse (1990) could predict behavioral responses based on distribution of knowledge in a group. Therefore, trainees' knowledge guides goal setting among diverse groups.

Performance appraisals facilitate group knowledge in joint AAR. Trainees and diverse units further develop shared mental models when they receive group knowledge of performance. Matsui at al. (1987) and Levy and Steelman (1997) found that parallel performance appraisals improved group performance because parallel appraisals include individual and group performance appraisals. This presents the same information to all trainees and military units, thereby increasing their shared knowledge (Cannon-Bowers & Salas, 2001). Marquardt (1999) devised an appraisal method called action learning. Action learning combines learning skills with performance evaluation. Trainees collectively analyze performance data, thus increased shared knowledge and group cohesion. Trainees also discuss solutions to performance problems and focus on learning performance skills. Saavedra et al. (1993) showed that group performance, coordination and communication improve with shared knowledge.

Knowledge relates to performance appraisal by refining the appraisal content. Dyer (1986) suggests assessing group member's knowledge prior to training so post training discussions can better match trainee knowledge. Performance appraisal assesses the transfer of knowledge from training based on the trainees' baseline knowledge.

Knowledge is presented to trainees through feedback (Wiener, 1948). Feedback content contains information about the trainees' performance related to training goals (Downs et al., 1987). Behavioral role modeling is a form of feedback where the facilitator conveys information to trainees and shows them effective training behaviors (Goldstein & Socher, 1974). This method presents knowledge to trainees so they can observe and attempt it. Feedback also should include information about the effectiveness of performance behaviors (Downs et al., 1987).

Feedback influences a group's knowledge similarly to how performance appraisal influences knowledge. Hogan et al. (1986) showed that collective feedback increases shared knowledge and group cohesion. Cannon-Bowers and Salas (2001) showed that trainees who similarly value feedback may better integrate knowledge and improve performance.

Performance appraisals are the mechanism for feedback and feedback is formalized within the performance appraisal (Patrick, 1992). Performance appraisal provides information about group effectiveness in training. Feedback presents knowledge of results to trainees so they may adjust their performance based on the appraisals results. Cohen (1994) stipulates that objective and subjective measures assess group effectiveness and Levy and Steelman (1997) suggest providing individual and group assessments. Feedback should include knowledge of results about group output and interactions.

CONCLUSION

In conclusion, past research related to cognition, learning and training is relevant for joint AAR; our integrated theory represents a compilation of some of the key research findings from those areas. ITAAR applies what research shows about how humans learn, coordinate, integrate feedback and perform effectively. Our recommendations for those responsible for designing and implementing after action reviews are:

- Groups should collectively develop challenging goals and receive goal-referenced feedback to improve performance (Locke et al., 1981; Matsui et al., 1987). The combination of individual and group feedback improves group and individual performance (Matsui et al., 1987).
- Facilitators should formally state performance standards in an instructional plan so trainees understand and share learning goals. This is important in joint AAR when different groups have group specific goals that may support common goals (Schmidt & Kleinbeck, 1990).
- Assess trainees' knowledge prior to training and organization based on their knowledge of group member's abilities (Nieva, Fleishman and Rieck, 1978; Dyer, 1986).
- Performance appraisals should assess group and individual performance; feedback should provide individual and group feedback. Performance appraisals should use objective measures to assess task performance goals and subjective measures for group interactions (Cohen, 1994).
- When transferring knowledge, facilitators should communicate their implicit and explicit knowledge to fit the trainees' frame of reference. This helps trainees integrate knowledge and enables shared mental models (Smith, 2001).
- Trainees should become aware of their own assumptions during action learning so they may generate self feedback (Marquardt, 1999).
- Trainees should verbalize newly acquired knowledge and then focus on it until errors are eliminated. Increased practice leads to increased automaticity and generalization. Once skills become automatic, trainees should focus on increasing speed and efficiency despite multiple tasks, task complexity or time pressure (Fitts, 1962; Gobet, 1998, Logan, 1988; Gonzalez, Lerch & Lebiere, 2003; Patrick, 1992).
- Facilitators should guide trainees to mutually discover performance norms, collectively brainstorm ideas and share self generated solutions to performance errors (Gist, 1989). An AAR facilitator must communicate to group members that their opinions are essential to the AAR process (Raynor & Rubin, 1971). Increased participation will increase shared knowledge (Saavedra et al., 1993).
- In joint AAR diverse groups should relate within the larger organization in accordance with the overall purpose. A mission statement can focus trainees on shared goals while maintaining connected yet independent groups (Shea and Guzzo, 1987; Sundstrom et al., 1990).

- Generalization improves when learners are given theoretical information about how all the diverse groups work together rather than understanding only their task specific knowledge (Patrick, 1992; Hendrickson & Schroeder, 1941).

Performance appraisal is necessary to evaluate group performance following an AAR. Trainees should receive both individual and group performance feedback. Objective and subjective training performance measures create a more complete evaluation. Subjective measures include group cohesion and cooperation, which is especially important when combining groups from different military branches. Feedback is often based on performance appraisal.

In summary, the primary purpose of this research is to develop a global theory for AAR that integrates pieces of past research from cognitive psychology and theories on training and learning. Several domain-specific theories discuss behavioral constructs relevant to joint AAR; these may be combined into an Integrated Theory of AAR (ITAAR). Our theory includes relevant behavioral constructs such as goals, feedback, knowledge and performance appraisal. Goals, feedback and performance appraisal interrelate because goals drive performance criteria development. Performance appraisal and feedback also affect goals because trainees can self-evaluate by comparing performance criteria to actual task performance (Saavedra et al., 1993; Matsui et al., 1987). Together, performance appraisal and feedback influence knowledge and enable shared mental models by providing knowledge of training performance. We believe ITAAR promises to be a beneficial contribution to the theory and practice of joint after action review. However, ITAAR should be further developed and validated through application to joint AAR.

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