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1. INTRODUCTION TO AWOC

The Warning Decision Training Branch (WDTB) is currently implementing its first ever large-scale training program on warning decision making to all National Weather Service (NWS) field staff. This course is known as the Advanced Warning Operations Course (AWOC). As AWOC addresses all seven Government Performance Results Act (GPRA) goals on warnings, NWS upper management has cited the training as critical for all forecasters with warning responsibility.

The goal of the AWOC is to increase expertise among NWS forecasters in order to better serve the public in warning situations. As such, AWOC is a course designed to provide every NWS forecaster advanced training on warning decision making knowledge, skills, and abilities (KSAs). These KSAs deal with aspects of science, technology, and human factors in warning decision making. The prerequisite for enrolling in the AWOC is that students must have completed either the Distance Learning Operations Course (DLOC) or the in-residence WSR-88D Operations Course (taught from 1991-1997). These prerequisite courses were designed to improve a forecaster's ability to effectively use radar data in forecasts and warnings.

Instruction in AWOC consists of ten instructional components (ICs), which use a blend of distance learning techniques (web, teletraining, simulations and in-office facilitation). The ICs, which consist of approximately 30 hours of instruction, are divided into two tracks based on subject matter, Core and Severe. To accommodate the flexible working schedules of operational staff, AWOC training is designed to allow students to complete all ICs at their office. For more details on the AWOC course curriculum, see <http://wdtb.noaa.gov/courses/awoc/awoc.html>.

2. EVALUATION METHODOLOGY

A significant part of the AWOC is the incorporation of Science and Operations Officers (SOOs) and Development and Operations Hydrologists (DOHs) as facilitators to help forecasters in the local administration, training, and evaluation duties of the Course. Facilitator workshops were held from August – October to allow all SOOs and DOHs to develop a partnership with the instructors at WDTB. At the workshop, SOOs and DOHs learned about the objectives of the Course, the roles of the facilitator, various evaluation techniques, and how to use the Learning Management System (LMS).

Another important reason WDTB adopted the local facilitator approach in AWOC was to ensure a high degree of training transfer. A local facilitator is in the best position to assess training transfer. Determining the degree of training transfer is known as the level 3 evaluation process, or simply performance evaluation. There are generally four well-accepted levels of training evaluation (Kirkpatrick, 1994). Performance evaluation provides the best opportunity for the training community and its associated organizations to determine the extent to which trainees have been able to apply or transfer knowledge gained, or skills acquired on the job (Hodges, 2002).

Figure 1 shows how performance evaluation relates to the overall program evaluation process. While each component is an area of expertise unto itself, the performance evaluation component is an area that the NWS training organization, including the WDTB, has never accomplished. Thus, as a part of the AWOC, WDTB is measuring behavior changes of forecasters due to the training. Note that data from reaction evaluation (level 1), and learning evaluation (level 2) are also being collected in AWOC, but this paper will not discuss these components. Behavior changes (level 3) are directly linked to improved job performance and are best achieved by management support. This manuscript will discuss the unique approach WDTB is using to accomplish level 3 training evaluation for AWOC.

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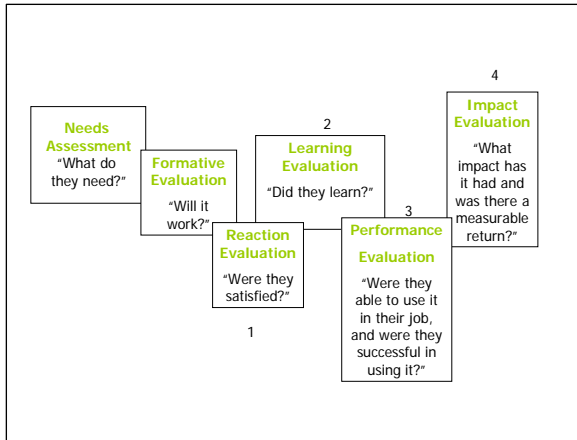


Figure 1. Components of a program evaluation, with different levels of evaluation labeled (after Hodges, 2002).

3. FACTORS TO SUPPORT PERFORMANCE

The goal of any organizational learning activity is transfer of training to the desired performance that produces the desired organizational result (Broad, 2004). Effective performance (such as *NWS forecasters making accurate and timely warning decisions*) requires much more than just KSAs. Specific performance requirements require additional factors which may include the following (adapted from Rummler and Brache, 1995):

- Clear performance specifications
- Necessary support
- Clear consequences
- Prompt feedback
- Individual capability
- Necessary skills and knowledge

For the top 4 factors in the list, management is ultimately responsible for making sure these factors are in place. Learners control capacity and the skills and knowledge base. Trainers can help define the training procedures, standards and evaluation criteria, but to be successful in performance, management is the responsible stakeholder. AWOC has developed strategies in its evaluation plan to address this fact (see section 4).

Performance improvement (or training transfer) is difficult to achieve from training alone,

especially when training is voluntary (see figure 2). In a study of best practices, training alone was found to not be very effective in achieving on-the-job application of KSAs (Stolovitch, 2000). The transfer rates in their study ranged from 10-30% with most rates on the lower end of that range. Why is this a problem? In a analysis of 31 trainers from a diverse range of organizations Broad and Newstrom (1992) found several factors which were barriers to transfer of learning to performance. The following barriers were rated in terms in order of importance.

- Lack of reinforcement on the job
- Difficulties in the work environment
- Nonsupportive organizational climate
- Learners said new skills were impractical, irrelevant
- Learners' discomfort with change
- Separation from instructional source
- Poor instructional design, delivery
- Negative peer pressure

The implementation of transfer management, which involves developing strategies for stakeholders to support training transfer involvement, can be effective in overcoming these barriers. Numerous research results in training over the past 20 years indicate that stakeholder involvement significantly raises transfer of learning, which leads to improved performance.

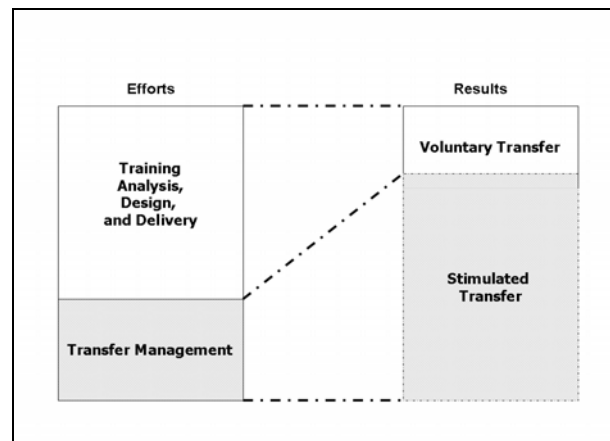


Figure 2. Enhanced transfer of training following transfer management efforts (after Broad and Newstrom, 1992).

For example, Feldstein and Boothman (1997) found success factors in learners they studied. The learners that turned training into high performance had prior use and experience with software before training. They had pre- and post-discussions with their boss, which gave them a clear idea of how to apply the news skills. In addition, they had frequent practice after training. The managers/supervisors in Feldstein and Boothman's study had reasonable expectations for behavior change and they complimented the learners on behavior change after training. Low performance learners and their supervisors demonstrated none of the above factors supporting use of new skills.

Managers can also encourage the use of new training by strong internal marketing in advance, providing incentives, and making the training program mandatory (ASTD and the MASIE Center, 2001). WDTB used some of these findings and the requests from the local facilitators (SOOs and DOHs) to help develop a marketing strategy for AWOC. The local facilitators (SOOs and DOHs) in AWOC had strongly recommended at the workshops that upper level management in the NWS make the AWOC training mandatory.

4. WDTB STRATEGIES FOR PERFORMANCE EVALUATION IN AWOC

The first phase in developing a level 3 evaluation plan was to identify reasonable performance objectives for each IC. Instructors at WDTB developed these performance objectives, which were precise, measurable statements of the behaviors that participants would be able to demonstrate on the job. An example of an AWOC performance objective is, "Using any or all of the three base moments in radar, participants will demonstrate the ability to detect and then mitigate anomalous propagation, range folding, and improperly dealiased velocities" (from AWOC Core Track IC 4).

During the final stages of training development, WDTB met with key personnel in the NWS training community to determine responsible stakeholders for AWOC. These folks were identified as being keenly interested in the success of the course. Next, using Broad's (2004) frequently used stakeholder strategies, WDTB constructed a transfer of training matrix (See

Table 1) with input from stakeholders. This table identified potential actions before, during, and after training that would be important to support learning and performance. As an example, one of the key stakeholders, the NWS Director, was asked to distribute a memo to all regions endorsing AWOC and asking them to include AWOC training into their local office training plans for the upcoming year. This action was accomplished in October of 2004. Additional strategies identified in the matrix will be helpful to WDTB to ensure the training is successful in meeting its learning and performance objectives.

Early course completion rates (see figure 3) indicate that efforts to promote AWOC and establish an organized transfer management system have been initially successful.

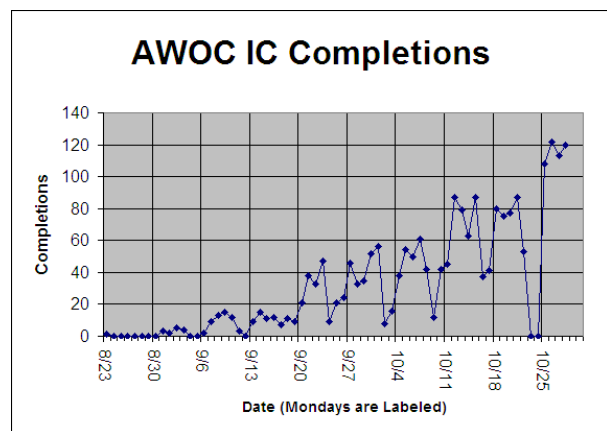


Figure 3. AWOC IC completions from start of course to late October.

After all the training in AWOC has been completed by October of 2005, WDTB will distribute surveys to learners, facilitators, and supervisors. These instruments will be used to gather evidence of use of training on the job. Direct observations of forecasters applying the KSAs taught in the course will also be important measures of training transfer. The AWOC facilitators will again be in a good position to gather this information. In addition to training transfer, the follow-up survey will ask about any barriers and support systems that were in place during the training. This information will help

WDTB determine the extent that job performance may have been improved from training efforts.

5. SUMMARY

The Warning Decision Training Branch is in the midst of delivering an unprecedented distance learning course (AWOC) on warning decision making. This course, targeted to forecasters, is designed to be completed all on-site. AWOC will be extremely important to forecasters with warning responsibility as it directly ties to warning performance. WDTB will be evaluating the effectiveness of this course with both learning and performance evaluation techniques. Performance (level 3) evaluation which is a direct measure of training transfer will be supported by a transfer matrix. In this matrix, various stakeholders have actions which support learning and transfer before, during, and after AWOC. Management up and down the supervisory "chain of command" has important actions which support transfer. The matrix has already been important in getting AWOC off to a good start because it has identified strategies to support learning and transfer. One strategy identified a key action which was accomplished from the NWS Director. It is hoped that the AWOC training solution will not only improve the NWS Warning Program by increasing job performance of its forecasters but also by helping to make training resources and programs more accountable.

6. REFERENCES

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**Transfer of Training Matrix
AWOC Stakeholder Strategies**

AWOC Stakeholders	Before training	During Training	After Training
NWS Director	<ul style="list-style-type: none"> • Announce high priority of AWOC and stress strategic mission link to goals • Participate in video that promotes AWOC 	<ul style="list-style-type: none"> • Receive progress reports of AWOC from Office/Regional Directors 	<ul style="list-style-type: none"> • Report AWOC success stories to NOAA execs
OCWWS Director	<ul style="list-style-type: none"> • Report to Corporate Board on metrics of AWOC completion 	<ul style="list-style-type: none"> • Authorize appropriate recognition and rewards for completion 	<ul style="list-style-type: none"> • Support additional measures to improve performance
Regional Directors	<ul style="list-style-type: none"> • State high priority of AWOC • Ensure local office AWOC progress reports are submitted 	<ul style="list-style-type: none"> • Ensure that offices report progress 	<ul style="list-style-type: none"> • Report success stories • Receive level 3 eval reports
MICs/HICs	<ul style="list-style-type: none"> • State AWOC as one of the top training priorities and best opportunities to improve warning performance • Allow dedicated training time for all forecasters to complete training • Put AWOC in local office training plans 	<ul style="list-style-type: none"> • Monitor office progress • Schedule periodic briefings with the SOO (or DOH) • Work with staff on scheduling and attendance commitments • Provide dedicated training time for AWOC completion • Provide regular reports to Regional Directors on status of AWOC completion 	<ul style="list-style-type: none"> • Report success stories • Schedule periodic briefings with the SOO (or DOH) on further performance requirements
Regional SSD Chiefs	<ul style="list-style-type: none"> • Market AWOC • Receive AWOC scheduling milestones 	<ul style="list-style-type: none"> • Track AWOC progress for each office (milestones are met) • Encourage office completion • Compare office to office completion rates 	<ul style="list-style-type: none"> • Report success stories
OS6 Director	<ul style="list-style-type: none"> • Work with FRG (Field Requirements Group) to define future AWOC requirements and implementation 	<ul style="list-style-type: none"> • Work with FRG (Field Requirements Group) to define future AWOC requirements and implementation 	<ul style="list-style-type: none"> • Provide a centralized evaluation function for standardizing practices across OS6
WDTB	<ul style="list-style-type: none"> • Provide an orientation session to MICs and Regional HQs on importance of management support for successful AWOC training transfer • Develop and distribute a video to advertise and promote AWOC <ul style="list-style-type: none"> • Develop training • Provide ample opportunities in scheduling teletraining sessions • Develop evaluation practices and instruments 	<ul style="list-style-type: none"> • Deliver training • Collect Level 1 and 2 evaluation measures • Reporting rates of completion 	<ul style="list-style-type: none"> • Collect Level 3 data on performance measures • Provide reinforcement exercises to maintain proficiency
DOHs/SOOs	<ul style="list-style-type: none"> • Attend the Workshop • Go through the Course • Help assess learner needs • Choose appropriate lessons in each track 	<ul style="list-style-type: none"> • Facilitate the Course • Track course completion of each forecaster via LMS • Schedule periodic briefings with the MIC on student performance • Reporting success stories 	<ul style="list-style-type: none"> • Support the Level 3 evaluation collection process • Meet with each forecaster to discuss additional training needs • Reinforce AWOC objectives with seasonal drills

WCMS	<ul style="list-style-type: none"> • Market AWOC internally and externally 	<ul style="list-style-type: none"> • Take the AWOC training • Help SOO monitor progress of students in AWOC 	<ul style="list-style-type: none"> • Solicit feedback from customers on NWS performance • Work with MIC and SOO to assess forecaster performance issues • Record local success stories of warning performance
Forecasters	<ul style="list-style-type: none"> • Plan with SOO how to best complete the course 	<ul style="list-style-type: none"> • Working with co-workers and local management on scheduling and attendance commitments • Complete training completion requirements <ul style="list-style-type: none"> • Complete level 1 and 2 evaluation • Develop a personal action plan to correct weak areas 	<ul style="list-style-type: none"> • Complete 2 WES simulations • Implement action plan to improve personal performance.
Union Rep	<ul style="list-style-type: none"> • Review AWOC plan for 2004 – 2005 with WDTB 		

Table 1. AWOC Transfer Matrix