TEAMWORK FROM TEAM TRAINING:
NEW EVIDENCE FOR THE DEVELOPMENT OF TEAMWORK SKILLS DURING OPERATIONAL TRAINING

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ABSTRACT

This study was a part of the program of cooperative research on team development and maturation involving the Center for Applied Psychology Studies of Old Dominion University and the Naval Training Systems Center, Orlando, Florida. In an effort to understand the specific behavioral components comprising teamwork, 11 Combat Information Center teams in an Anti-Submarine Warfare School, ranked according to an independent final exam score, were observed over a week training period. Team instructors served as the source of critical behavior data that were collected and analyzed. Results of the behavioral analysis indicate that teamwork is behaviorally complex and evolves over time; that teamwork skills contribute to the relative success of teams; and that top-ranked teams display certain behavioral tendencies distinct from the lowest-ranked teams. A sampling of the lessons learned from this research and recommendations for interventions to improve team performance and training are presented and discussed.

INTRODUCTION

During the last three years, the Naval Training Systems Center has supported a comprehensive program of research and development *aimed at enhancing the design of team training* systems. One of the thrusts of that program is to gain an understanding of the evolution and maturation of operational teams. The hallmark of the team research has been the scope of its coverage. First, it is based on a conceptual model that postulates and has preliminary support for the existence of two distinguishable tracks that co-develop over the maturation period of the team. There is a taskwork track that involves the training-related activities associated with the specific tasks being performed by the team members. There is also a parallel teamwork track that includes those activities that are devoted to enhancing the quality of interactions, relationships, cooperation, communication, and coordination of team members. Second, *longitudinal research methods have been employed* to address directly the questions of team development and evolution that have characterized the issues underlying this program. Consequently, changes over time in team performance, the actual behavioral components of teamwork, and team members' attitudes and beliefs toward team performance could be monitored. Third, the research has involved real navy teams in the context of real operational training, thus providing authentic characterizations of the ways teams perform. Here, the principle was followed that if one wants to learn about teams, then one should observe them in situ.

In a previous I/ITSC presentation, Morgan, Salas, and Glickman[5] presented data that were *collected from 13 teams undergoing training* at the Naval Gunfire Support (NGFS) School of the Naval Amphibious School, Norfolk, Virginia. Based on the NGFS data, Morgan et al. made a number of conclusions vis a vis team training. The following points summarize their conclusions.

1. There is evidence that teams evolve through a number of developmental stages. NGFS *teams began training* with a focus on the basic skills in the area of teamwork. Following this, teams showed independent concern for teamwork and taskwork. In a final stage of development, teams showed evidence of maturing to a state where their task- and team-related activities became indistinguishable.

2. Team behaviors change as a function of training and, for the more effective teams, these changes are reflected in increasingly positive perceptions of the team.

3. Team instructors often make quick and informal pre-training assessments of the capabilities of the teams. They make these assessments on the basis of opinion, rank of team *members, reputation of the ship from which the* team comes, and a variety of other bits of information.

4. Instructors adapt their style of instruction to the individual teams on the basis of the pre-training assessment. For example, instructors pay more attention to certain teams who display "positive attitudes." On the other hand, instructors may ignore the teams whom they assess to have "poor attitudes," allowing them to "sink or swim."

5. Several recommendations were cited for the purpose of improving team training including the following: (a) A portion of team training time should be formally dedicated to the *development of mission-related teamwork skills.* (b) Formal pre-training assessment techniques should be designed and implemented to allow instructors a common and objective approach to adapting their training. (c) Performance aids

should be examined as ways to enhance instructors' ability to assess trainees, monitor critical team behaviors, provide timely feedback, conduct debriefs, and so on. (d) Finally, there is a need for thorough and formal instructor training sessions designed to help them recognize and provide corrective feedback related to critical team behavior problems.

The present paper has two goals: The first and primary goal is to analyze the critical behaviors that characterized 11 Combat Information Center teams as they progress through the six phases of instruction in the Anti-Submarine Warfare (ASW) School, Norfolk, Virginia. Unique to this analysis was its level of detail and specificity. Individual behaviors displayed by the 11 teams were carefully examined and content analyzed. Particular emphasis was placed on identifying behavioral patterns and trends that occur across the six phases of ASW training and to determine whether these trends distinguish the top-ranked from the lowest-rank teams. To date, no other such analysis has been carried out in this program of research.

The second goal is to propose interventions for improving team training based on the critical behavior analysis, analyses of data in previous Team Evolution and Maturation (TEAM) research efforts, and on data gathered during interviews with the ASW School instructors.

BACKGROUND

ASW Data Collection

Most of the specific information on the research methods and background of the TEAM research program can be found in Morgan, Glickman, Woodward, Blaiwes, and Salas[4], Glickman, Zimmer, Montero, Guerette, Campbell, Morgan, and Salas[3]; Guerette, Miller, Glickman, Morgan, and Salas[1]; and Glickman, Zimmer, Montero, and Guerette[2]. Therefore, only the highlights of the ASW research effort will be described herein.

The purpose of the research at the ASW School was to determine the degree to which results from the NGFS School generalize to other team training sites and to discover nuances in team behavior that further contribute to an understanding of team training and performance.

The research instruments used at the ASW School were similar to those used at the NGFS School. (See Glickman, Zimmer, Montero, Guerette, Campbell, Morgan, and Salas.[3]) Of primary interest for this report is the Critical Team Behaviors Form consisting of a list of 59 key behaviors which had been identified in a prior research Phase as representing important aspects of team work. In completing the form, instructors (the respondents) are required to observe team behaviors and check the appropriate place on the form to indicate (a) which behavior(s) had occurred, (b) which team members were involved in the behavior(s), (c) the frequency of the behavior(s), and (d) the behavior's impact on performance. Table 1 provides examples of three behaviors within three different teamwork dimensions that appear on the Critical Behavior Form.

Table 1. Example of Items Appearing On the Critical Behavior Form

Dimension	Sample Item
Communication	Asked for specific clarification on a communication that was unclear.
	Failed to communicate all information needed by another member.
	Stopped communicating information after a senior person spoke harshly to him.
Cooperation	Checked with other team members when uncertain about what to do next.
	Recommended a different course of action when a senior member began to make a mistake.
	Failed to correct a senior member who had made an error.
Coordination	Coordinated gathering of required information in an effective manner.
	Provided information that was needed before being asked for it.
	Was ready with information when other members needed it.

ASW Training

Training at the ASW School takes place during a five-day period and consists of simulated exercises that are categorized by six phases: baseline; single ship/single submarine; single ship/dual submarine; dual ship/dual submarine; dual ship/dual submarine high value units. These training phases represent six progressively more complex combat situations. After the last phase, teams take a final exam, scored on a 0 to 100 scale. A score of 70 is considered a passing score.

All 11 teams (from 11 ships) serving as subjects in this research attained passing scores ranging from 75.7 to 98.1. For purposes of this paper, the teams were ranked according to their final scores. The two top-ranked teams had scores of 98.1 and 97.5 while the two lowest-ranked teams had scores of 75.7 and 83.9.

During ASW training, crews are divided into four subteams: the Combat Information Center (CIC) subteam, consisting of eight members; the Sonar subteam, consisting of six members; the Passive Sonar subteam, consisting of six members; and the U/B Plot team, consisting of two members. In this paper only the CIC subteam data are presented and discussed.

The following section summarizes the behavioral patterns and trends that occurred at each Phase of the training. Please note that all

summaries are compilations of the most frequently checked items on the Critical Behaviors Form. The wording of many of the items has been retained to remain close to the data. In addition, circumstances of the training--for example, that the training progresses from easy to hard missions--were taken into account to optimize the interpretability of the data.

RESULTS

Phase 1: Getting Their Bearing

Phase 1 is the session where baseline data are collected. In a sense, it is a trial run for the instructors to determine the pre-training proficiency of the team. During Phase 1, the CIC subteams can be characterized as a "feeling each other and the situation out." The data suggest, although not definitively, that team members were exploring their own individual roles and how these roles mesh with their teammates. Members engaged in the use of improper terminology, they asked for clarification, they checked with each other when uncertain, and asked each other for help. At this point, no behaviors were checked that distinguished the top-ranked and the lowest-ranked teams.

Phase 2: Members Continue To Seek Role Clarity On the Team

The CIC subteams in Phase 2 showed behavioral trends similar to those in Phase 1 (see Table 2). Uncertainty on the part of the team members about the task led to dependency behaviors among the members. For example, individuals asked many questions during training, checked with others when there was uncertainty, and explained what to do to members who were "in the dark." Interestingly, the two top-ranked teams were not observed engaging in any of these three behaviors. Instructors did not perceive the top-ranked teams to ask many questions during training, to check with each other or to explain to each other what to do. One might surmise that the top-ranked teams were more proficient and therefore did not need to check with each other. In any event, it appears that the two top-ranked teams began to show different behavioral patterns suggesting that they indeed were more quickly "maturing" or developing both with respect to the taskwork and teamwork.

Phase 3: The "Budding" of the Top-Ranked Teams

During this phase the data suggest two points: First, for all teams, instructors apparently observed a greater number and greater variety of behaviors than before. Second, the top-ranked teams displayed distinctly different behavioral patterns from the lowest-ranked teams. These points will be covered individually.

New and varied patterns. During this phase, subteam members tended to check with each other, asked many questions during the training sessions, communicated more, failed in certain communication attempts because of difficulty getting the attention of others, and tended to repeat vital information during key communication sequences among subteam members. There was also a tendency to communicate information concisely. One gets a picture that the tensions were mounting a bit during this phase, perhaps due to the increased complexity of dual ship/dual submarine exercise.

Certain behavioral tendencies characterized several of the teams except for lowest-ranked: Members checked with each other on what to do, they asked many questions, and they directed others to carry out certain tasks. The lowest-ranked teams, therefore, stand out from the group with regard to critical key behavioral episodes--those that involve team members' backing each other up and those that involve giving direction to certain team members.

Contrasting patterns between the top- and lowest-ranked subteams. Other behavioral tendencies seemed to distinguish the top-ranked and the lowest-ranked teams. For example, top-ranked teams' members tended to ask for clarification of orders and messages when necessary while this seemed not to typify the lowest-ranked ships. The top-ranked teams' members tended to ask for help when it was needed while this apparently was not the case for the lowest-ranked ships. In contrast to the the lowest-ranked teams, the top-ranked teams showed a tendency to coordinate the gathering of critical information for successful operation. Finally, the top-ranked team members tended to be ready to provide required information while the lowest-ranked ships showed no such tendency.

There is, therefore, a picture emerging that the tensions of the exercise may mount during this phase. The better teams showed a wider range of behaviors than before. They were more adaptive to the requirements of the circumstance. Their behavioral repertoire included clarification-seeking and help-seeking behavior on the one hand and more directive type of behaviors (presumably by those in charge) on the other. The lower-ranked teams seemed to show a narrower repertoire of behaviors. They may have been stilted and stuck in a rut at this point in training. They were not observed seeking help when needed, asking for clarification, or coordinating the gathering of critical information. For some reason these teams seemed less inclined to "take a risk."

General "problem" behaviors. There were a few behavioral patterns that one might present as "problems." Most of these involved effectiveness in communicating required information. For example, there were occasions when teams were not ready to pass on required information. There were times when communication failed because of difficulty in getting the attention of a team member. These kind of lapses signify that the teams were still "green" in their teamwork skills.

Phase 4: The Budding of the Majority

In Phase 4, behaviors that had characterized only the top-ranked teams in Phase 3 became more characteristic of the teams in general. That is, the repertoire of behavioral tendencies broadened for more teams. Members checked for clarification, asked for help when needed, asked many questions during training sessions, and even asked what was wrong with a particular performance. Importantly, team members showed a tendency to ensure that their intended message was received. In other words, they showed the tendency to seek feedback on messages

Table 2. Examples of Characteristic Behaviors Displayed Over Phases*

Phase	Critical Behavior	Trend Over All CIC Teams?	Number of Top-Ranked Teams	Number of Lowest-Ranked Teams
1	- Used improper terms	Y	2	1
	- Asked many questions	Y	2	2
	- Failed to pass on all necessary information	Y	1	2
	- Explained to another what to do and why	Y	1	1
2	- Explained to another what to do and why	Y	0	2
	- Failed to communicate information to all members needing it	Y	0	1
	- Checked with other team members when uncertain about what to do next	Y	0	2
	- Assisted another when latter had difficult task to perform	N	0	2
3	- Failed to communicate all information needed by another	Y	1	2
	- Coordinated gathering of required information	Y	0	2
	- Checked with other team members when uncertain about what to do next	Y	2	0
	- Asked for clarification	N	2	0
	- Members who needed help asked for it	N	2	0
4	- Used improper terms	Y	2	2
	- Asked for specific clarification	Y	1	2
	- Members who needed help asked	Y	1	0
	- Made sure he had all information required to do job	Y	1	0
5	- Failed to communicate all necessary information	Y	1	2
	- Asked for specific clarification	Y	1	0
	- Checked with others when uncertain	N	1	0
	- Member became overloaded but failed to ask for help	N	0	1
	- Was ready with information when needed	N	2	0
6	- Assisted another in difficulty	Y	0	1
	- Praised another for doing well	Y	1	1
	- Failed to provide information unless asked	Y	1	1
	- Provided information before being asked	Y	2	0
	- Failed to communicate all necessary information	Y	1	1

* Entries in the table can be interpreted as follows:
"Y" -- the behavior is a trend over several CIC teams;
"N" -- the behavior is not a trend over several CIC teams;
"0," "1," and "2" correspond to the number of the top-ranked or lowest-ranked teams engaging in the behavior.

transmitted--a characteristic of maturing communication skills. There was also a tendency to call attention to mistakes made by certain members without focusing on the negative. This latter tendency suggests a new growth among team members. Intra-team trust levels had increased to such an extent that that CIC members could address mistakes "head-on" without threat of social reprisal.

It appears, once again, that the complexity level of this session contributed somewhat to the behavioral patterns. Observers of even the best teams apparently did not observe certain positive behavioral trends that had characterized their performance in the previous phase. For example, it was not mentioned that the better team members helped each others in difficult tasks as was the case with the other teams. Furthermore, it was not mentioned that top-ranked teams showed a tendency to provide the needed information. This changed in the next phase, however.

The most interesting behavioral patterns are those that distinguish the top-ranked from the lowest-ranked ships. The lowest-ranked teams were hesitant to ask for help and were less inclined to ensure that important information was understood. This may signify a lingering insecurity among the team members that could eventually contribute to their team's performance.

There are two important problems that emerged in Phase 4. First, lower-ranked teams' members tended not to seek feedback on the instructions that they had received. Second, these individuals were less inclined to ask for help when they needed it. It is hypothesized that these teams had less well developed trust among the members. They may have anticipated ridicule or punishment for looking incompetent to the rest of the team.

Phase 5: Growth Plateaus

In Phase 5, there was a renewed behavioral tendency on the part of the top-ranked teams to develop their teamwork competencies. Once again, they show the inclination to engage in a variety of behaviors to deal with the circumstances of the environment. They directed members on what to do and checked with others when uncertainties arose. They were likewise capable of supportive behaviors.

Other than the top-ranked teams, there seemed to be a plateauing of development. There were tendencies for several team members to speak at once, to fail in communication, to fail to get the attention of others. It is important not to over-interpret the negative here. It appears as though the non-top-ranked teams were coasting a bit. There was no evidence of a decline in effectiveness in spite of the greater challenge of this phase. But neither were there signs of skill development.

Phase 6. The Flowering

During this phase, the greatest variation of behavioral trends seemed to occur. Members tended to seek clarification from others, repeat vital information to clarify messages, and use concise communication. Instructors noted a "new" behavioral tendency in the area of expressed affect: Members tended to praise one another and to give moral support to each other. In addition, there was a coordinated effort to gather information, a tendency to change procedures when asked to change, and a tendency for members to check with others when uncertain. In sum, during this phase, the teams became fuller-functioning teams, much less stifled by former prescribed group norms. Perhaps a greater degree of trust developed within the teams and this accounted for the maturation step. This is not clear. What is clear is that there is less of a distinction between the top-ranked and the non-top-ranked teams. The only distinguishing characteristic of the top-ranked teams concerned their apparent completeness in communication. That is, top-ranked teams tended to make sure that all important information was delivered to those requesting it.

It appears that the teams in general rose to the occasion in this last phase displaying many of the same behaviors as the top-ranked teams had displayed earlier in the training.

Lessons Learned and Suggested Interventions: A Sampler

From this behavioral analysis of teamwork along with other analyses that have been carried out to date, there are a number of lessons that arise. Likewise a number of interventions for improving team training and performance are suggested. The following are a selected sample of these lessons and interventions. A complete discussion of lessons learned and suggested interventions is in preparation at the present time.

Lesson 1: Teamwork contributes to success. Behavioral trends among the 11 CIC teams at ASW indicate that through several phases of training, the top-ranked teams showed signs of teamwork skill that was unique from the rest of the teams, especially the two lowest ranked teams.

Intervention implication 1: Train teamwork skills. Morgan et al[5] suggested that teamwork should become a formal part of the training process. The data presented here likewise support this conclusion and provide additional insights about the behaviors that constitute teamwork. Methods for developing teamwork skills will be touched on below.

Lesson 2: Teamwork is complex and evolves over time. Morgan et al[5] presented a theoretical model to explain the development of teams during training. While there is no one to one correspondence between the behavioral trends discovered in the present analysis, there is ample support for the fact that team skills start at one level and progress through stages.

Some of the most critical behavioral tendencies that characterize effective teamwork are beginning to emerge. First, closed loop communication is a critical part of teamwork success. This refers to the tendency of team members to check whether their messages were received after they were sent. The top-ranked teams showed this tendency, especially during the final phase. Second, "backing up" behavioral tendencies are characteristic of effective team

performance. This refers to the team members' penchant to observe their fellow team members, including their leader, and speak up when there is trouble or provide assistance where it is needed. Third, feedback-seeking behavior seems critical. "How am I doing?" is a way of depicting this teamwork skill. This also seemed to typify both the top-ranked teams and all teams as they became more competent later in training.

Intervention implication 2: Instructor training. Resources needed to be allocated toward developing instructor training that creates within them an understanding of teamwork skills in the context of the environment in which they are training. It is not enough to say "Teamwork makes it happen here." "We are all a team--let's work together." Statements like these constitute the strategy that many instructors use to "develop" teamwork within new teams while they avoid addressing the subtleties of interaction, coordination, communication, and other team skills. Very likely, this is because instructors themselves have difficulty articulating what teamwork is. Instructors of teams, therefore, need to learn the characteristics of teamwork skills so that they are capable of providing specific instruction and feedback on teamwork skill attainment.

Intervention implication 3: Pre-training assessment. What seems apparent from the data is that different teams start at different levels of competence vis a vis teamwork skills. Morgan et al(5) recommended that a formal part of training be set aside for assessing teamwork skills. This recommendation is confirmed by the present data: Unless instructors understand where a team stands in relation to teamwork competency, they will be unable to optimize the learning that takes place during the training program. Many training environments like ASW already have set aside an initial Phase to gather baseline data. It is recommended that part of the baseline data consist of teamwork skill information.

Intervention implication 4: Teamwork behavioral standards. Because teamwork comprises a complex network of skills, as evidenced in this behavioral analysis, careful attention should be paid to portraying teamwork standards in an operational context. In the abstract, teams and team instructors have great difficulty "picturing" for themselves what is meant by effective teamwork skills. If this is the case, how can instructors develop these skills in others? Provided with teamwork standards in concrete contexts--for example, in the operational context of ASW's single ship/single sub task--instructors will be much better equipped to monitor teamwork development.

Intervention implication 5: Modeling, practice, and feedback. Finally, the standards must be communicated, practiced by the team, and evaluated by the instructors. It is strongly recommend that videotechnology be employed to demonstrate teamwork skills in the context of the operational environments. It is further recommended that teams use these videotapes as models from which they can practice effective skills. Finally, videotape technology will allow the trained instructor to provide immediate and specific feedback on the teamwork competencies. This will allow instructors to bypass the necessity of learning complex nomenclatures for designating effective and ineffective teamwork. Most importantly, it will circumvent the problem of team members' failing to remember key aspects of their performance: the video picture will be worth a thousand words!

CONCLUSIONS

What is teamwork? That three-word interrogatory encapsulates the reason for carrying out the cooperative program of research on team maturation and development. What is learned from the analyses presented in this paper is that teamwork is a complex of individual behaviors that at times can be used to designate the more successful team from the less successful team. In fact, it may be the scope of a team's behavioral repertoire more than the team's tendency to exhibit specific behaviors that explains the relative success of a team. For example, a team whose usual mode of operating is to depend on the team leader to direct its course shows signs of a restricted repertoire and thus may be ineffective. The team's capability to cope with situations probably is tied to its members' ability to customize and adapt their team-oriented behaviors to the situation. Therefore, it appears that effective teamwork has something to do with the breadth of the repertoire of behaviors that the team possesses.

That having been said, there are several behaviors that seem to stand out as essential ingredients to team success. Team members must be sufficiently aware of the social environment that they know when a fellow member needs help and know when a communique was relatively ineffectual. Team members must not only be aware of the social environment--they must be inclined to act--to back up each other. Regardless of the rank of the team member involved in a behavioral episode, if effective team members sense discontinuity in a team task or if they detect that a communications are "bottle-necking" at the locus of an individual team member's position, they must be willing to back up that team member.

Some of the ideas and conclusions in this paper are speculative because the behavioral data collected at the ASW School do not provide definitive answers to teamwork questions. Yet, progress has been made in the effort to understand and improve team performance. It is recommended that this type of research continue to pave the way toward more complete team performance intervention strategies.

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