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ABSTRACT

Despite the increased emphasis on team work in the academic environment, managing a student team so that the team process is effective remains problematic. In fact, some professors believe students are being taught ineffective team behavior such as "free loading" or relying on star performers and procrastination . Most research on student team process uses students as surrogates for business world teams and draws conclusions for that domain. This study examines prior research on student teams, performs a meta-analysis of this literature, derives a set of interventions found to be effective with student teams, and proposes a planned application of these interventions. Includes three tables: Siciliano's (1999, 263) ideal team member criteria; meta-analysis of prior research interventions for improving effectiveness of student teams; and phased application of interventions. (Contains 20 references.) (Author)

A META-ANALYSIS OF RESEARCH ON STUDENT TEAM EFFECTIVENESS: A PROPOSED APPLICATION OF PHASED INTERVENTIONS

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ABSTRACT

Despite the increased emphasis on team work in the academic environment, managing a student team so that the team process is effective remains problematic. In fact, some professors believe we are teaching students ineffective team behavior such as "free loading" or relying on star performers and procrastination. Most research on student team process uses students as surrogates for business world teams and draws conclusions for that domain. This study examines prior research on student teams, performs a meta-analysis of this literature, derives a set of interventions found to be effective with student teams, and proposes a planned application of these interventions.

INTRODUCTION

According to Jones (1996, 80), "inappropriate use of teams can undermine the educational process so badly that learning does not take place, students learn how not to learn, students build an attitude of contempt for the learning process." Indeed, satisfaction with a team-based MBA program was negatively associated with the cognitive abilities as measured by GMAT scores of students (Baldwin et al, 1997, 1382, 1384,1385):

> It seems likely that the most talented students may feel burdened with responsibility for helping others and feel they are minimizing their own learning or development . . . Conversely, the students performing at the lowest level enjoy a more naturally occurring level of support in a team-based structure and may consequently report higher levels of satisfaction with their experience . . .
>
> The negative association of workload sharing with team grades suggests that in a significant number of teams, a few stars carried disproportionate shares of the teams' workloads. This finding would also help account for the lower satisfaction reported by students with high cognitive ability. It may also confirm the fear of the M.B.A. instructors that say a bright student skilled in finance might end up doing most of the financial analysis for team assignments at the expense of the learning of others.

Jones (1996, 85) concurs and finds that "the high performing members of the [student] team get a workout." He cautions against "confusing business and education environments." Many of the business controls for performance are lacking in the education environment. For example, "People build a history of accomplishment in a company. They carry their reputations with them and non-performers eventually get their due. There are a whole host of incentives built into the business environment that fosters a high level of team commitment."

An ABI Inform search on the broad term "student teams" over the past fifteen years produced 451 articles. Yet despite the face validity of Jones' argument that student teams differ significantly from teams in the business environment, almost all of these articles used student teams as a surrogate for business teams and drew conclusions linked to business team performance. Only

six articles focused on learning how to make student teams more effective and recognized that differences in students versus experienced professionals, differences in work environment versus classroom, and differences in the incentives for behavior make student teams a special case for researchers. This study examines prior research on student teams, including some of the research which uses student teams as surrogates for professionals. Then, a meta-analysis of this literature is performed, deriving a list of interventions which prior researchers have found to be effective with student teams.

PRIOR RESEARCH

Applying systems principles from Senge's *The Fifth Discipline*, Jones (1996, 85) identifies systemic problems and solutions for student teamwork. The delay in feedback is a root cause of non-performance on student teams. Because "student teams do not have ready-made structures and procedures through which accountability and authority can function to quickly identify and correct poor performance" and because "it takes time to build consensus to deal with non-performance," non-performers rarely get feedback within the severe time constraints of a quarter or semester. Therefore, non-performers rarely improve their performance. Jones seeks to develop "robust team systems" which will "promote patterns of behavior that support the goals of the education process."

One important structural component of a robust team system is the use of frequent, scheduled team meeting. According to Jones (1996, 85), "the fewer the meetings, the more delay or sluggishness in feedback." The lack of feedback means that there is rarely an attempt "to get non-performers to do their share." Frequent regularly scheduled meetings increase feedback and thus the opportunity to increase workload sharing.

Jones' (1996, 87) experience has been that "even a small amount of training [on working in teams] can produce dramatic increases in team effectiveness and efficiency." Other quasi-experimental studies (Mennecke et al., 1998) have reached the same conclusion. Regular, frequent feedback from team members and the instructor are critical for effective student teams.

Rapid and frequent feedback is the first principle for effective student teams according to Jones. This feedback is facilitated by frequent meetings and training on team process. This feedback pertains not only to the project content but to project team processes. The second principle is "individual accountability and responsibility [which] extends beyond the boundaries of the team" (Jones, 1996, 87). Students receive individual and team grades, with many components of the project being graded. Thirdly, Jones (1996,88) has found that student teams must have "an early and high level of team member interaction." He finds that "frequent team meetings" and "frequent small outputs from the team" increases feedback and allows performance problems with individual team members to surface more quickly and early in the academic term.

When teams are diverse, "periodic process feedback may be a key" to effective teamwork (Watson et al., 1998, 164). They find preconditions for teams becoming more instead of less effective over time: time for team discussion, feedback on both interpersonal and task performance, and linkage of individual to team performance. Although their research uses student teams as a surrogate for industry teams in a study of team diversity, they used peer evaluations at midterm and at the end of the term. The feedback provided by peer evaluation "can remove students' fear of having to choose between either low grade or having to do most of the group work (if other members fail to do their fair share" (Roebuck, 1998, 40). Students evaluated each other on both interpersonal and task dimensions. Instruction was also provided on effective teamwork topics.

McKendall (2000, 281) has found that when team process is employed, students find that working in teams takes much longer than their previous experience with group work. Part of the difference may be because team projects without processes to ensure workload sharing result in a few students devoting time to the project while others have much less of a time investment. However, the team processes themselves take time. So Kendall incorporates meeting time into class time and assigns people to teams based on their schedules and ability to meet at the same times. However, she still finds that instructors who employ team processes must "be prepared for a lot of disgruntlement over the project grade" (McKendall, 2000, 281). Students believe that the time invested in the project makes them deserve an A. She cites the following problems with projects that do not deserve an A:

> They chose a problem too quickly without fully investigating whether it is indeed a problem, they leapt too quickly to a solution, they did not interview a key person, they wrote their action plan but forgot to pace themselves and burned out before completion of the project, they failed to confront those who were not producing . . . Given the large amounts of time and effort invested, however, they are not willing to see the errors reflected in their grade.

Still, she (2000, 281) finds that "approximately two thirds of the teams report that their group worked better than any other group in which they had participated (some of them seem to attribute this to a happy fluke, which can be a bit frustrating)." A reflective essay on the team experience provides some evidence of increased self-awareness. Team process constraints employed by McKendall include a team contract, instruction in individual differences, collaboration, listening, problem solving, decision making, action plans, group roles and leadership, team communication patterns, conflict and cohesion. Each team presents its completed project and team members evaluate each other.

Gardner and Korth (1998) find it important to address problems students have experienced with teamwork in the academic environment (mainly that a few students do all the work) and to stress the use of teams in the work environment. They assign students to teams based on learning styles.

Siciliano (1999) established team ground rules by having the class develop a profile of an ideal team member. The profile consisted of four major components with detailed descriptors of those components. At midterm, each team member was evaluated by team peers using the four major components and a scale from 1 to 5 (Siciliano, 1999, 263):

5 = always performed this way
4 = often performed this way
3 = occasionally performed this way
2 = rarely performed in this way
1 = never satisfied this criteria

Average peer ratings were calculated for each student and shared with each student. Class averages and team averages were provided. Students were asked to develop a plan for improving their team performance. At the end of the term, the evaluation was repeated and became a grade component. Ratings were confidential for both administrations. Rajlich et al. (2000) found a statistically significant gap between how students perceive their performance on a team and how other students on that team perceive their performance. Although not empirically tested in this study, midterm evaluations shared with each student in summary form should work to lesson that gap and improve performance, as was Siciliano's experience. Rajlich et al. were not focusing on student teams but using student teams as surrogates for professional application development teams.

TABLE 1
SICILIANO'S (1999, 263) IDEAL TEAM MEMBER CRITERIA

1. Do your part	Complete the tasks assigned to you
	Be willing to put in the time necessary to complete your team assignment
	Ask if there is anything you can do
	Pull your own weight and do your share of the assignments
2. Share your ideas	Express your opinions
	Respond to other group members' ideas
3. Work toward agreement (consensus)	Be open to other ideas, opinions, and perspectives
	Be willing to work together
	Work as a team (not solely on an individual basis)
4. Keep a positive attitude	Maintain a sense of humor
	Be courteous
	Give feedback in the form of constructive criticism

Prior researchers have found meeting management as well as meeting frequency to be important for effective team process. Shrage (1995) in his book, *No More Teams!*, a reaction to the misuse and mismanagement of teams in the work world, coined the term "meeting ecology," emphasizing attention to factor promoting productive meetings, hospitable meetings, and meetings which generate commitment rather than apathy. Clark (1998) focuses his research on improving student team meetings. He begins his work with students by assigning readings on the importance of learning to work in teams and the importance of effective meetings for teamwork. He cites the estimated $37 billion (Kayser, 1990) lost annually in the United States due to poor meeting management. Studies have shown that people gain enthusiasm or commitment when they play a predefined role at a meeting. Clark (1998) cites the use of the scribe role or the scheduler role. Meetings are more productive if they are planned with agendas issued prior to the meeting. Meetings are more productive when each member has prepared prior to the meeting, often sharing documents with each other prior to the meeting. Finally, Clark finds that meetings are more productive when the focus is on an action items not information sharing. Clark finds that detailed meeting minutes and the role of scribe are essential for productive meetings. They prevent rehashing old issues or debating decisions already made.

McKeague et al. (1999) require weekly meetings and weekly reports in their marketing/engineering project, and they count these meetings with an accompanying weekly project report as 5% of the course grade. Each meeting must also be recorded in a meeting journal. Each student on the team must keep this journal. A key finding of their study was that the grade on the project journals, used an independent variable in a regression analysis, is a significant predictor of the final project grade. During the term, student teams make five oral presentations of project progress to a faculty panel, so each student team receives frequent feedback before delivering the final written report.

In a study of meeting agendas in the group support system context (Niederman and Volkema, 1999) found three benefits of employing agendas: improvement in the quality of meeting deliverables, increased group satisfaction with meeting results, and increased satisfaction with the overall process. These benefits were empirically tested using a survey of 238 group facilitators.

Mennecke and Bradley (1997) used predefined roles for team members and find that group cohesion is significantly improved. Other interventions, such as weekly meetings and frequent feedback structures, were not employed in this study. Porter and Bryan (1996) find cohesion to be a problematic measure because it is not correlated with performance. Eighty project teams and 464 students participated in their study. Their findings indicate a moderating affect for the cohesion dimension related to performance. Cohesion has three dimensions: "commitment to task, group attractiveness, and group pride" (Festinger, 1950). They focus on task commitment as a positive impact on student team performance. Instead, they find a direct impact comes from task process, "behaviors aimed at organizing members to get work done . . . setting goals, prioritizing work, developing workable plans that facilitate task accomplishment" (Porter and Bryan, 1996, 364). Although Porter and Bryan are using student teams, they seek to empirically test theory concerning work team performance. Their "findings suggest that management would do well to structure the team [task processes] so that [negative, unproductive] task conflict is minimized" (1996, 374). Mennecke et al. (1998, 110) subsequently added two interventions: "1) training on group process and 2) role assignment." Again, they found higher cohesion and better project grades when roles were assigned compared to a control group. The highest cohesion and highest grades came from the teams where the added lessons on group process and roles were also employed.

Stephens and Myers (2000) adapted the use of defined roles (Mennecke and Bradley, 1997), removing the role of student liaison with the professor. Instead, they implemented structural interaction of the entire team with the professor throughout the term. Cohesion was not used as an outcome measure. They added a structure of weekly team process constraints designed to solve key problems: procrastination and free loading (Stephens and Myers, 2000). Constraints included regularly scheduled weekly meetings preceded by an agenda and followed by minutes. A weekly action list was also required in which the distribution of specific work tasks among the team was identified by student and time lined. Finally, they added peer evaluation with each team member rating the contribution of peers on each project component. Satisfaction with the team experience was significantly higher with the treatment group than with the control group who were simply assigned the project in teams with no role or process constraints applied. The

treatment group perceived the roles to be valuable and found the weekly meetings with action lists to be particularly valuable.

INTERVENTIONS FOR EFFECTIVE STUDENT TEAMS

Based upon this prior research, instructors may choose to exert control over task process through using interventions. Table 2 summarizes the interventions employed to increase the effectiveness of student teams.

Instead of assigning a team project and then grading the deliverable at the end of the term, the instructor may address workload sharing and thus learning for individual students providing rapid, frequent feedback. This feedback can be based on project deliverables, weekly meeting agendas, minutes, and action lists,

TABLE 2
META-ANALYSIS OF PRIOR RESEARCH
INTERVENTIONS FOR IMPROVING EFFECTIVENESS OF STUDENT TEAMS

Interventions	Source(s)
Rapid, frequent feed-back on team process (documentation in form of reports, minutes, agendas, action lists, meeting journals) and project content (reports, presentations, project deliverables)	Jones (1996), Watson et al. (1998), McKeague et al. (1999)
Frequent, regularly scheduled meetings	Jones (1996), McKeague et al. (1999), Stephens and Myers (2000)
Training on working in teams	Jones (1996); Mennecke et al. (1998); McKendall (2000), Siciliano (1999)
Individual as well as team accountability	Jones (1996), McKeague et al. (1999)
Peer evaluation	Watson et al. (1998),Roebuck (1998), McKendall (2000), Siciliano (1999), Rajlich et al. (2000), Stephens and Myers (2000)
Team contract	McKendall (2000)
Reflection on team experience	McKendall (2000)
Student evaluation of other team projects	McKendall (2000)
Lessons on importance of teamwork	Gardner and Korth (1998)
Discussions of prior problems with teamwork	Gardner and Korth (1998), Siciliano (1999)
Assign to teams based on leaming styles	Gardner and Korth (1998)
Development of ideal team member profile	Siciliano (1999)
Attention to meeting management	Clark (1998), Stephens and Myers (2000)
Weekly scheduled meetings	McKeague et al. (1999), Stephens and Myers (2000)
Meeting time in class	McKendall (2000)
Defined roles in meetings	Clark (1998), Mennecke and Bradley (1997), Stephens and Myers (2000)
Use of meeting agendas	Clark (1998), Stephens and Myers (2000)
Use of meeting minutes, journals	Clark (1998), McKeague et al. (1999), Stephens and Myers (2000)
Team process as grade component	Stephens and Myers (2000)
Meeting management as grade component	McKeague et al. (1999)
Use of e-mail for information sharing prior to meetings	Clark (1998), Stephens and Myers (2000)
Use of action lists in meeting	Stephens and Myers (2000)

meeting journals, milestone presentations, and midterm peer evaluations. Predefined roles for team members, training on team process, discussion about what makes for an ideal team member have all been shown to improve team performance. Linking the rapid, frequent feedback components to the project grade at an individual level helps to make individuals as well as teams accountable and provides external intervention for non-performers, the same kind of intervention a project manager would provide in the business environment.

CONCLUSIONS AND FURTHER RESEARCH

The interventions identified in the meta-analysis may be grouped by interventions appropriate for project initiation, for work on project deliverables, and for project closure. Table 3 provides a guide for the phased application of interventions shown to be effective through prior research.

Much work remains to be done on increasing student team effectiveness. Business schools continue to employ student teams in many courses, and to emphasize the importance of teamwork. Certainly, teamwork is an integral part of an information systems majors' education. Research supports the view that students do not learn to work in teams effectively by simply being given a team project or assignment. They may, in fact, learn the opposite from intended lessons. We need to establish a body of research on interventions for effective student teams, given the constraints of the academic environment, by tracking interventions employed and results achieved. Clearly, more empirical research is needed on student teams as student teams and not as surrogates for professionals in the business environment.

TABLE 3
PHASED APPLICATION OF INTERVENTIONS

Project Phase	Interventions
Initiation	Assign or allow to self-assign to teams based on schedules, profile of ideal team member, learning styles, personality type or some rational criteria.
	Discuss importance of teamwork, problems experienced with student teams, ways to resolve these problems, meetings management.
	Teams formulate a contract which specifies criteria for non-performance.
	Require meetings early in the term (allowing some class time for meetings to observe interactions) for project identification, contract formulation. Frequent meetings early in the term help to identify low performers and influence their behavior.
Work on Project Deliverables	Required regularly scheduled weekly meetings with weekly reporting in the form of agendas, minutes, action lists, meeting journals. Allow some class time for meetings.
	Predefined roles in meetings and in project activities.
	Weekly grades based on meeting deliverables.
	Individual grades on some deliverables which should be prepared prior to the team meeting where the team version will be developed.
	Use of e-mail to facilitate information sharing.
	Periodic brief lessons on effective team process topics.
	Milestone presentations in which students evaluate other teams and receive feedback from the instructor (3 recommended).
	Mid-term peer evaluations with feedback summarized for each student.
Closure	Peer evaluation.
	Assessment of how well feedback was used.
	Assessment of team process.
	Assessment of project deliverables.
	Student reflection on behavior in the team, the team process, and the learning experience.
	Instructor reflection on team process effectiveness.

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