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Modeling Interactive Skills: Addressing Student Learning Outcomes and Pre-Professional Development in Forestry

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ABSTRACT: In response to demands from natural resource employers who desire new employees with critical thinking and problem-solving skills in addition to strong professional and interactive skills, some forestry and natural resource degree programs include such abilities as part of their student learning outcomes. Use of cooperative, collaborative, and interactive learning approaches in college classrooms often increases student competence in both critical thinking and interactive skills, and enhances students' success in the workplace after graduation. Opportunities for students to learn and practice interactive skills can be provided in a purposeful and progressive sequence embedded in both single courses and across curricula. Incorporating this approach requires effort by instructors to design activities that assist students in developing important technical skills and knowledge while practicing interactive skills with both their peers and instructors. We have used learning theory and classroom research over a six-year period to construct a novel approach to pre-professional development for students in our forestry program.

INTRODUCTION

Emerging trends in resource management problems have led to a broader range of desired competencies among new employees. In addition to technical competency (such as ecosystem assessment skills, knowledge of silvicultural systems, valuation of market and non-market outputs, use of computer technology, and analysis of inventory and remotely sensed data), employers of recent college graduates have indicated the need for interactive competency (including the ability to work in teams, to listen to and address questions and concerns, and to seek innovative and collaborative approaches to resource management). In their report on a survey conducted in 1998, Sample and others (1999) indicated that there were gaps between employers' ratings of skill importance and their ratings of the performance of recent graduates, especially in the areas of collaboration, communication skills, and managerial skills.

Educators understand that changes are also needed in higher education to provide future professionals with this new mix of needed skills. Many four-year programs have

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developed sets of desired student learning outcomes that include competencies in communication, problem-solving, and critical thinking in addition to technical skills and knowledge. However, relatively few institutions have taken a deliberate approach in assisting students to develop professional interactive skills which are explicitly tied to stated student learning outcomes. Opportunities for students to learn and practice interactive skills can be provided in a purposeful and progressive sequence embedded in single courses and across the curriculum, and in the context of assisting students in learning important technical skills.

Beginning in 1996, several forestry faculty in the Department of Natural Resource Ecology and Management at Iowa State became involved in a University-wide faculty development program (Project LEA/RN[TM]) aimed at improving student learning (Licklider et al.,1997). Based on our participation in workshops and learning groups, we adopted the collaborative learning approach of Johnson and Johnson (1989) as a vehicle to deliver learner-centered education (Jungst et al., 2000). This approach relies heavily on student development of interactive skills to enhance learning in a cooperative context. Initially, we viewed our efforts to teach interactive skills as the means to an end, that is, productive student engagement in collaborative learning exercises. However, we now realize that enhanced interactive skills are a worthy end in and of themselves, one that addresses the needs of employers, and truly can improve many dimensions of students' lives after leaving institutions of higher education (Thompson et al., 2003b).

STUDENT LEARNING OUTCOMES

Many degree programs are in the process of identifying desired student learning outcomes, partially driven by accreditation processes and new calls on the academy to address accountability through outcomes assessment. Although this is an iterative process, subject to discussion and revision, we offer a current draft of general learning outcomes for NREM graduates of Iowa State University to frame the following discussion of interactive skills (Table 1). Some outcomes, such as "the ability to anticipate, analyze, and evaluate natural resource issues and explain the ecological, economic, and social consequences of natural resource actions at various scales and over time" are primarily aimed at student learning with respect to the technical skills of the discipline. Other outcomes, such as "the ability to communicate clearly and effectively with different types of audiences using appropriate oral, visual, electronic, and written techniques" place the primary emphasis on interactive skills. Our approach to both kinds of outcomes has been to teach them in the context of the technical content of the forestry discipline.

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Table 1. Draft version of student learning outcomes for the Department of Natural Resource Ecology and Management, Iowa State University. Department faculty have identified these abilities as central to the success of students as they pursue professional careers in natural resources.

1. The ability to develop, explain and evaluate their own beliefs, values and behavior in relation to professional and societal standards of ethics.

2. The ability to anticipate, analyze and evaluate natural resource issues and explain the ecological, economic, and social consequences of natural resource actions at various scales and over time.

3. The ability to actively seek the input and perspectives of diverse stakeholders regarding natural resource problems and issues.

4. The ability to assess, analyze, synthesize, and evaluate information fairly and objectively.

5. The ability to work effectively, both individually and with others, on complex, value-laden natural resource problems that require holistic problem solving approaches.

6. The ability to formulate and evaluate alternative solutions to complex problems and recommend and defend best alternatives.

7. The ability to communicate clearly and effectively with different types of audiences using appropriate oral, visual, electronic, and written techniques.

8. The ability to recognize and interpret resource problems across spatial scales from local to global.

9. The ability to appreciate cultural diversity and understand the impact of the global distribution of people and wealth on natural resource use and valuation.

10. The ability to exercise life-long learning skills developed before graduation.

MODELING INTERACTIVE SKILLS

There are three assumptions that underlie efforts to teach interactive skills (Johnson et al., 1991). The first is that these skills are to be taught in a cooperative and safe context, where it is clearly understood that learning is a collaborative venture. The second assumption is that these skills must be directly taught. Most students do not possess the strong interactive skills necessary to enhance group work when they enter college degree programs. Although many of them have worked in groups in academic as well as extra-curricular settings, most have not received any formal training with respect to professional collaborative skills requisite for effective teamwork. Because collaborative pedagogy depends on productive teamwork to enhance student learning, it is imperative that all students in a cohort be given opportunities to learn and practice new interactive skills and engage in effective team work.

The third assumption is that after an instructor carefully structures cooperation on learning tasks and defines the skills required to be successful, it is team members who will provide important subtle feedback to each other to reinforce skill use and help all members internalize the skills. Instructor feedback is also important, but may not be as effective as peer feedback.

We have focused on a series of skills that progresses from those that help groups form and function to those that contribute to collaborative problem-solving, critical thinking, and evaluation and analysis of difficult resource management issues (Thompson et al., 2003a; see also Figure 1).

We follow the method described by Johnson et al. (1993) to engage students in learning interactive skills. This entails demonstrating the need for the skill, helping students define the skill, showing students how to use the skill, setting up situations for students to practice the skill, inviting students to reflect on the skill, building a "T-chart", and lastly, providing feedback to students as they practice to help them persevere, improve and interalize skill use. Students need to practice a number of times before they integrate specific skills in their behavioral repertoires for doing team work.   These steps are described for a three specific skills in the paragraphs that follow.

LINKING INTERACTIVE SKILLS TO STUDENT LEARNING OUTCOMES

Active Listening

One basic interactive skill (a group forming skill) that is modeled very early in cooperative learning is active listening (Johnson et al., 1993; Figure 1). This links directly to a student learning outcome that we have identified, the ability to communicate clearly and effectively with different types of audiences (Table 1, item 7).

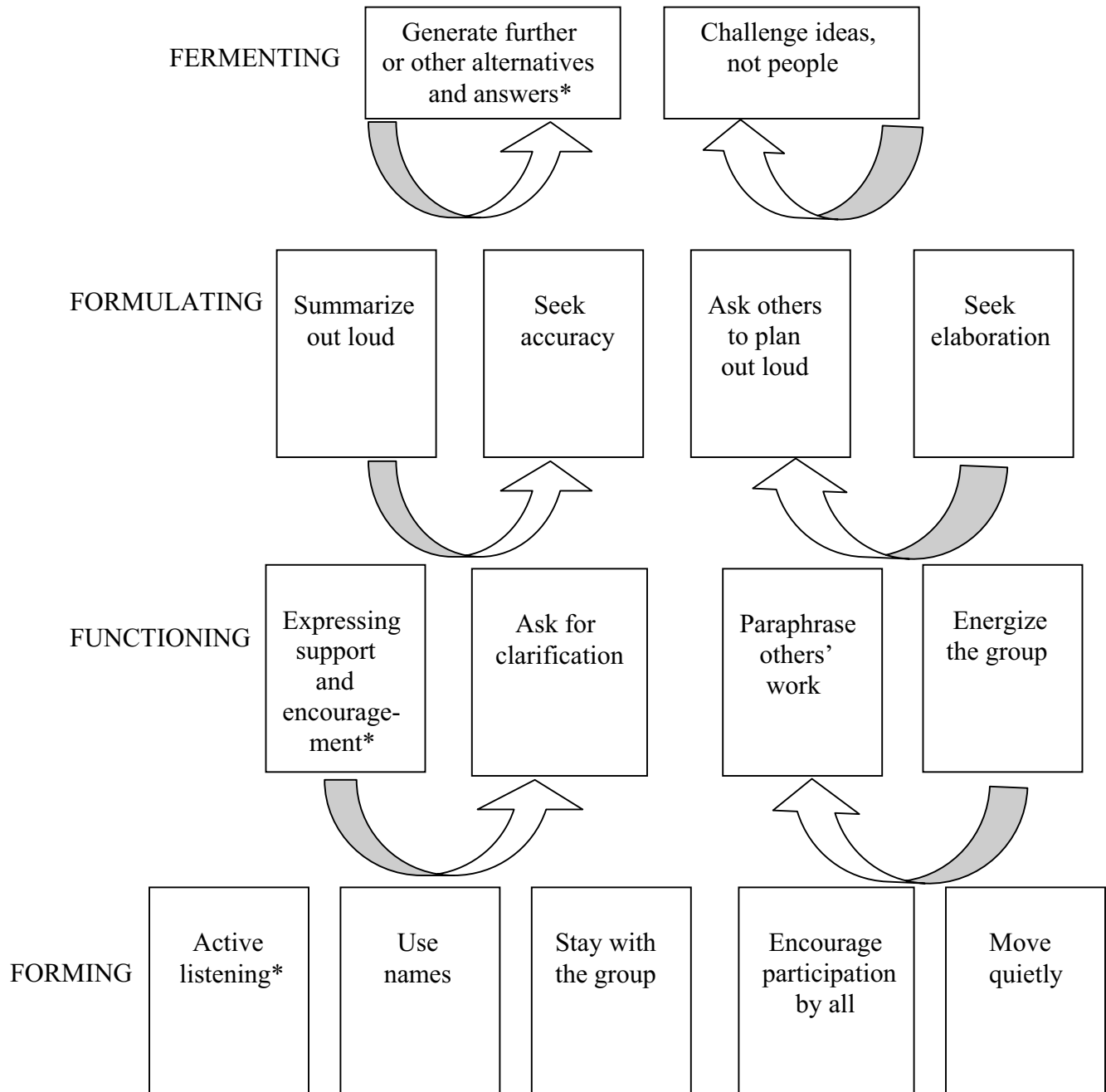| FERMENTING	Generate further or other alternatives and answers*		Challenge ideas, not people	
FORMULATING	Summarize out loud	Seek accuracy	Ask others to plan out loud	Seek elaboration
FUNCTIONING	Expressing support and encourage-ment*	Ask for clarification	Paraphrase others' work	Energize the group
FORMING	Active listening*	Use names	Stay with the group	Encourage participation by all	Move quietly

Figure 1. Interactive skills taught in the Forestry curriculum at Iowa State. Team forming skills are taught early in a sequence that progresses to rich, collaborative "fermenting" skills (modified from Thompson et al., 2003a, and adapted from Johnson and Johnson, 1989).

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Active listening involves hearing what is said, thinking about what is said, and then indicating whether or not there has been understanding of what is said. Listening skills are often forgotten when helping students learn how to communicate effectively (the focus is more often placed on oral, visual, and written presentation). However, listening has been emphasized as a much-needed skill among employees, and is certainly necessary for success in contemporary participatory and collaborative resource management.

Active listening can be taught through role-playing. Students are placed in teams of two for the exercise. Each student, in turn, describes a recent important event or activity that they have undertaken to one of their peers. The other student in the pair is assigned the role of listening intently to the speaker (without the knowledge of the speaker). When the students change roles, the second listener is instructed to ignore the speaker (again, without the knowledge of the speaker). The non-listener's role becomes uncomfortable for both students before the instructor ends the activity. Immediately following the activity, students are asked to discuss their thoughts and feelings related to their assigned roles, as both speakers and listeners.

This role-playing activity is followed by defining what active listening is, and building a T-chart that describes what active listening looks like and sounds like based on students' experience (Table 2). We often post the T-chart in the classroom as a reminder of the importance of the skill, and the forms of evidence that it is being used (Thompson et al., 2003b). This is followed by additional opportunities for students to practice the skill with supervision and feedback from their instructors, until skill use becomes automatic. In the context of cooperative and collaborative learning, we have found active listening to be a profoundly important skill among instructors as well as students.

Table 2. A "T-Chart" developed by students after an activity designed to show the need for active listening. Students develop lists in columns that characterize what active listening looks like and sounds like. (There is no direct relationship between the two columns.)

Active Listening

Looks like…..	Sounds like
Nodding, shaking head	"Did you say…?"
Leaning forward	"Yes,…."
Eye contact	"Are you sure…?"
Eyebrows up	"I hear you"
Gestures (thumbs up)	"Would you repeat…?"
Smiling	"Do you think…?"

Expressing Support and Encouragement

A skill that enhances team functioning is that of expressing support (Figure 1). In our work with student teams, we introduce this skill after groups have been working together for several weeks, and after they have been invited to reflect on both effective and ineffective behaviors within their groups. At that time, most teams are ready to move to a higher level of cooperation.   This skill is linked to the student learning outcome identifying the ability to work effectively, individually and with others, on specific problems (Table 1, item 5).

Expressing support and encouragement involves acknowledging and encouraging individual team members' ideas and contributions, and often serves as powerful motivation for additional idea generation and contribution to team work. Use of this skill among peers is linked to many of the positive outcomes of cooperative learning, such as greater motivation to learn, more positive relationships with others, and improved self-esteem.

Depending on classroom context, this skill may also be introduced via a role-playing exercise, where partners have a specific task to accomplish, and go through a process in which one member attempting the task is criticized, followed by the second member attempting a similar task who is given positive guidance, support and encouragement. At the end of this exercise, students define the skill, and then evaluate both their performance on the task (usually much better for those who have been encouraged) as well as their thoughts while attempting the task. Again, this activity is followed by

construction of a T-chart (which may include "looks like" items such as thumbs up, smiling, and nodding, and "sounds like" items such as "Way to go!", "I like that idea", and "keep up the good work"). As with active listening, the expressing support T-chart may be left posted in the classroom until students have begun to make routine use of the skill.

Generating Further or Other Alternatives

After students have gained mastery of group forming and functioning skills, it is possible to introduce skills that lead to rich collaborative work within their groups, such as the skill of generating further alternatives or answers to address problems or issues (Figure 1). Although the instructor may choose to impose a specific strategy for teams to accomplish this work (e.g. a process for productive brainstorming or another group protocol for promoting generation of ideas), often teams that have been working together through the forming and functioning stages will have developed their own process for performing this type of task.

Generating further alternatives enables students to see that there is more than one way to solve resource management problems and allows them to examine issues and perspectives of several stakeholder groups. This skill is particularly crucial in participatory and collaborative resource management, where compromise and identification of alternative solutions are often required to move projects and programs forward.

In our program, this skill is introduced in a set of sophomore-level courses in the forestry curriculum (Jungst et al., 2000, Thompson et al., 2003a). However, more deliberate effort to enhance this skill takes place in a senior-level capstone course in which student teams develop management plans for real-world clients. In this course, students work together to practice several problem recognition and identification strategies such as brainstorming, role-playing, "Camelot" scenarios (identifying an ideal situation and then comparing it to reality and examining the differences between the two), and why/why not diagrams (Higgins, 1994). Teams also practice collaborative problem solving by applying strategies such as "upsides and downsides", and features and benefits (Ricchiuto, 1996) to identify root causes(s)of the problem(s), generate alternative solutions, and to guide articulation and quantification of effects. Depending on the actual practice situation, student teams are provided feedback by peers, instructors, and clients.

CONCLUSION

There is a growing body of cognitive research indicating that collaborative and active learning-centered pedagogies lead to a number of desireable outcomes for students in addition to the student learning outcomes that we have identified (e.g. higher achievement and increased retention, more on-task behavior, greater motivation to learn, more positive relationships with others, and more positive self esteem; Gough, 1987,

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Johnson and Johnson, 1989, Natasi and Clements, 1991, and Slavin, 1990, 1992). However, students don't always possess the skills to effectively engage with their peers in a cooperative context. Deliberately teaching these skills provides the basis for much more productive team work and lays the foundation for skills that will be important for students throughout their careers.

Although we often introduce a skill via role-playing, skill reinforcement occurs in the context of dealing with more technical forestry-related content. We have been successful in introducing a progression of interactive skills in both individual classes, and have also coordinated this approach among a group of classes (Jungst et al., 2000, Thompson et al., 2003), and have to a lesser degree coordinated this approach across our entire curriculum (e.g. from 100- to 400- level classes). We have begun the process of specifically identifying the links between interactive skills and our desired student learning outcomes. A task that remains is to design the means to uniformly assess student mastery of interactive skills as a part of ongoing outcomes assessment activities.

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