

Assigning Learning Roles to Promote Critical Discussions During Problem-Based Learning

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19th Annual Conference on Distance Teaching & Learning
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Have you ever ... ?

- ... organized distributed learners into small groups to solve real world problems?
- ... wondered if problem-based learning is a viable strategy in distributed environments?
- ...wondered if assigning roles influences the quality of group interactions, thinking and learning?
- ... wondered how much of students' resources were used to "engage learning issues" as opposed to "coordinate" group work?

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Need & Opportunity

Analyze problem-based learning (PBL) in distributed environments:

- To document the efficacy of PBL pedagogy
- To identify competing forces for learning and coordinating group interactions
- To identify the impact of role assignment on higher order thinking
- To inform instructors, designers, and facilitators

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Problem Based Learning (PBL)

- A curriculum organizer and an instructional strategy
- Authentic, ill-structured problem
- Match for adult learners
- Strategy usually includes:
 - First, encountering the problem
 - Identify learning issues
 - Self-directed learning
 - Dialectic discourse with others
 - Assessment
 - Reflection

Savery J.R., & Duffy, J.M. (1995). Problem based learning: An instructional model and its constructivist framework. *Educational Technology*, September-October, 31-38.

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PBL in Distributed Environments

Sage (2000) reports that learners were overwhelmed by:

- Dual novelty of PBL & ACC communication
- Multiple resources
- Conceptualizing the problem
- Applying past experience

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Goal of Presentation

Show the value of role assignment during PBL by sharing the results of two research studies

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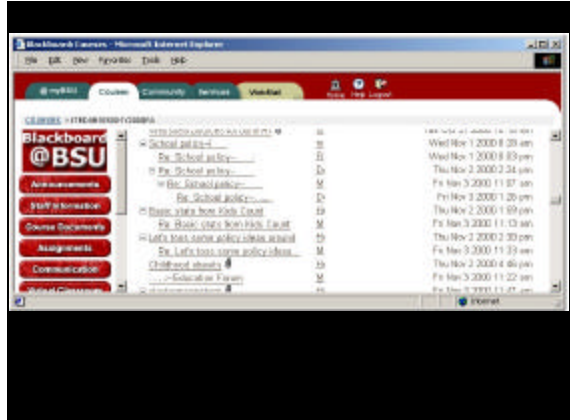
Research Context

Technology: Use & Assessment

- First and second offering of a Web-based course at a midwestern state university
- Fall 2000, Fall 2001
- Graduate level, 3-credit
- Goal of Course
 - “Students will develop the abilities to assess the impact of products and systems.”
 - ITEA, 2000, p.133



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Participants

	2000 Study	2001 Study
Participants	20 of 26 students	19 of 24 students
Major	Health and wellness (N=14)	Health and wellness (N = 9)
All Grads	Audiology (N=3) Technology Ed (N=3)	Technology Ed (N = 4) Others (N=6)
Experience	5% taken online class 80% had little to no experience with Blackboard 67% had formal training with group process 100% reported moderate to high levels of proficiency with group process skills	16% taken online class 58% had little to no experience with Blackboard 21% had formal training with group process 89% reported moderate to high levels of proficiency with group process skills

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Research Questions

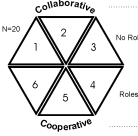
1. Are there **differences** in the productive dialogue (i.e., **function, cognitive skill, and level of processing**) and interconnectedness of messages of students based upon group structure (2000: cooperative vs. collaborative) or different learning roles (2001)?
2. Are there different **patterns** of productive interaction?
3. What are differences in the learners' **perceptions of interdependence and intersubjectivity**?

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Model of 2000 Research Study

Web-based Course

Intervention — Process — Variables — Analyses



N=20
Heterogeneous groups controlling for group process skill, academic major, and sex.

Time: 6 Weeks

Interaction
Asynchronous Conference

Function

- Cognitive
- Organization
- Social
- Metacognitive

Cognitive Skill

- Elementary Classification
- In-depth Classification
- Inference
- Judgment
- Strategy

Cognitive Level

- Surface
- In-depth

Perceptions

- Intersubjectivity
- Interdependence

Content Analysis

- Henri (1992)
- Henri & Rigault (1996)

Interaction Analysis

- Howell-Robertson & Mellor (1996)

Survey Analysis

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Problem

Conduct a technology assessment of the **health and wellness implications of computer use by children** (as if for the U.S. Department of Education.)

Deliver a formal online report that makes recommendations for school districts to promote lifelong wellness.

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Six Heterogeneous Groups

- Groups randomly assigned to treatment
 - Cooperative groups (N=3)
 - Roles & close monitoring (2 to 3 days)
 - Schools Specialist
 - Health & Wellness Specialist
 - Economics Specialist
 - Web Specialist
 - Lead Editor
 - Collaborative groups (N=3)
 - Group process is negotiated, no roles assigned
 - Monitored every 4 to 6 days

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Distribution of Messages

Study Total = 783 Messages

Instructor Significant Differences

Student Messages

No Difference

■ Instructor ■ Cooperative ■ Collaborative

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Distribution of Messages

Study Total = 704 Student Messages

of Messages

Cooperative Collaborative

Weeks

5.2 messages per student per week

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Content Analyses

- Coders Trained and Tested
 - Developed rater expertise
 - Reliability analysis (Cronbach alpha)
 - Ranged from .74 to .89
 - Cognitive skill required three training sessions
- Unitized the Message
 - First, into paragraphs
 - Then, by single variable (i.e., function or skill)
 - No smaller than a sentence
- Units coded by at least two coders
 - Disagreements judged by consensus or third coder

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Function

- Cognitive**
 - Learning process
 - Learning content, issues, and goals
- Organization**
 - Coordinating joint activity
 - Management and logistics
- Metacognitive**
 - General knowledge and skills
- Social**
 - Off-task statements

Henri, F., & Rigault, C.R. (1996) collaborative distance learning and computer conferencing. In T.I. Liao (Ed.) Advanced educational technology: Research issues and future potential (pp. 45-76). Series F: computer and Systems Sciences, 145. New York: Springer-Verlag.

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Function Over Time

Cognitive

Organization

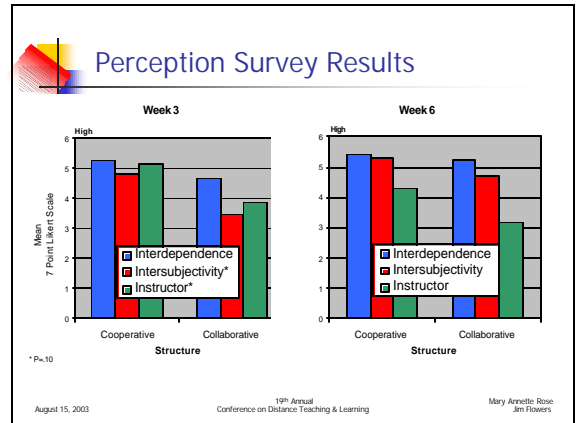
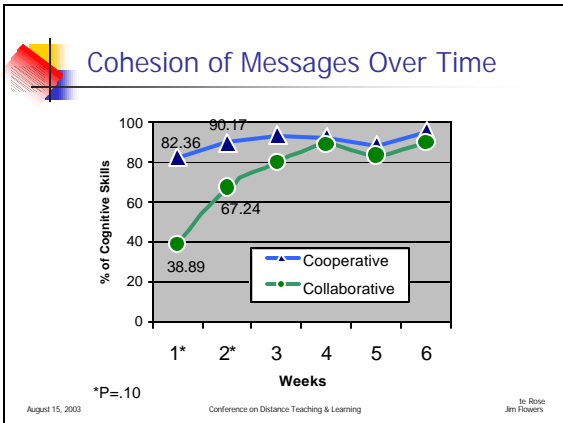
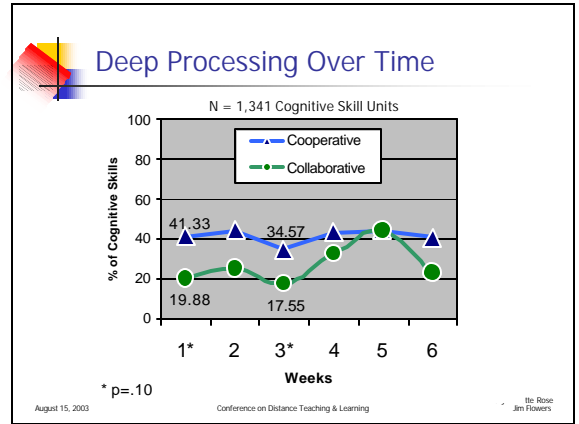
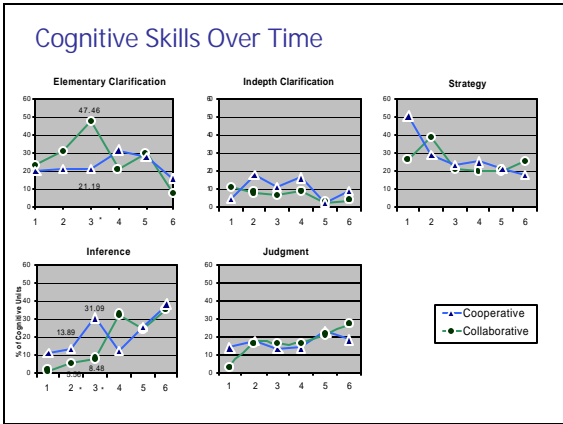
Metacognitive

Social

■ Cooperative ■ Collaborative

Weeks

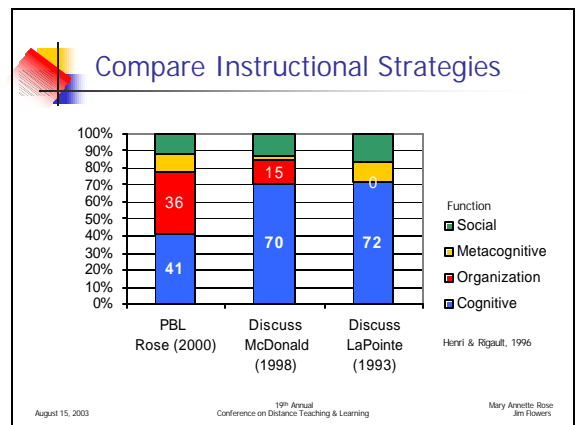
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Conclusions: 2000 Study

During the first half of the 6 week PBL activity, cooperative groups with role assignment generated

- Higher quality discussions
- More interconnected discussions
- Higher perceptions of intersubjectivity





Competing Demands

- Competing demands for learning and coordinating PBL
- Low relative evidence of deep processing (only 35% of units)
- Low evidence of indepth clarification (only 9%)

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Teaching Plan & 2001 Study

- Hypothesis:
 - Role assignment based upon **learning tasks** rather than performance tasks would promote more productive interaction
 - Scaffolds for roles offered in a Jigsaw fashion would provide initial support to help learners more quickly engage learning issues

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Jigsaw Group Structure

- Based upon Aronson et al (1978)
- 6 teams (forums), each with one:
 - Inferencer
 - Possibility Generator
 - Strategist
 - Summarizer
- Separate Role Forums for each of the four roles

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Problem

Conduct a technology assessment of:

Non-Occupational Hearing Protection
(as if for the Committee on Health, Education, Labor and Pensions of the United States Senate.)

Deliver a formal online report that makes recommendations for at least four viable legislative options.

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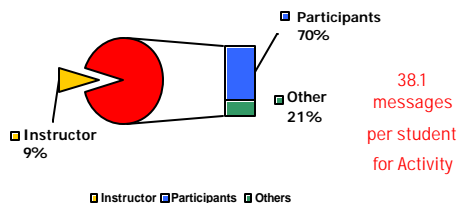
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Distribution of Messages

Student Messages in Study = 724 Messages



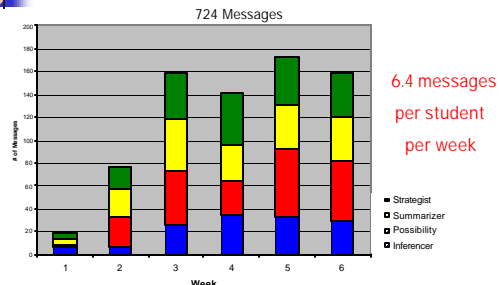
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Distribution of Messages



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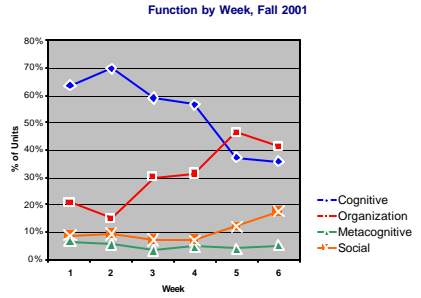
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Were there differences in the productive dialogue based upon learning roles?

Variable	Role	Conclusion
Function		No Difference
Skill	Summarizer Strategist	Elementary Clarification
Level		No Difference
Cohesion		No Difference
Perceptions		No Difference

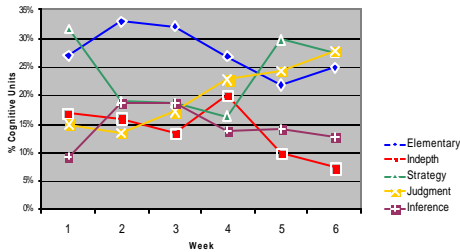
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Function Over Time



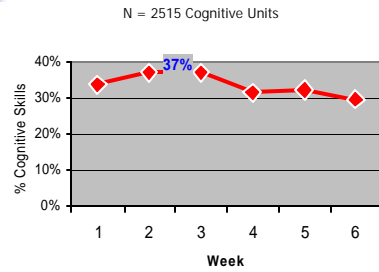
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Skill Over Time



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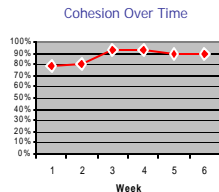
Deep Processing Over Time



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Cohesion

- Initial strategies
 - Reference to role responsibilities
 - Reference to TA concepts & techniques
- Most frequent connection
 - Reply to a request
- Closing strategies (Organizational)
 - Editing
 - Referencing
 - Uniformity

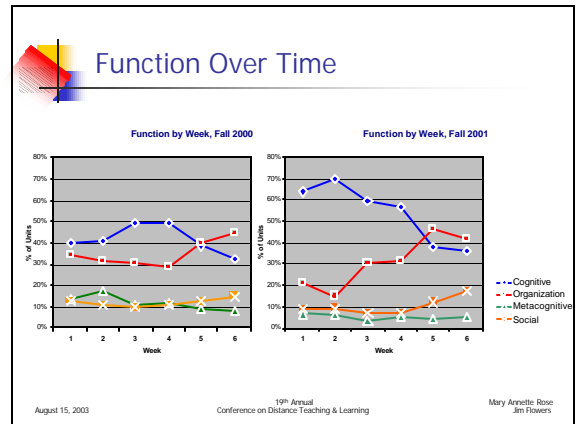
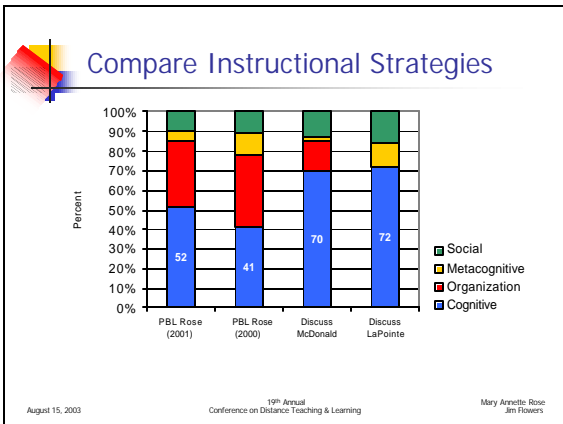


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Conclusions for 2001 Study

- Summarizer employed more elementary clarification than the strategist
- No other differences in the productive interactions between learning roles on function, skill, level of processing, and perceptions
- Perceptions of intersubjectivity and interdependence were moderately high and consistent
- However...

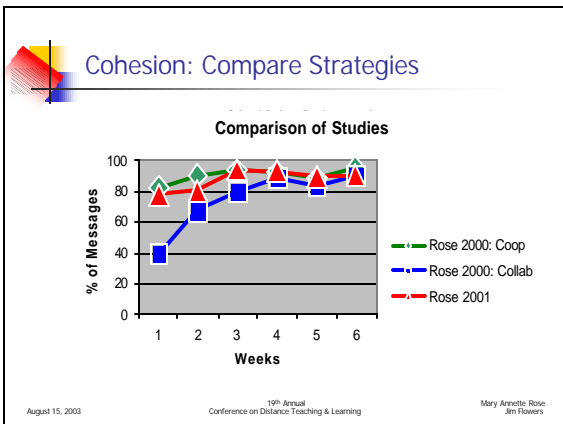
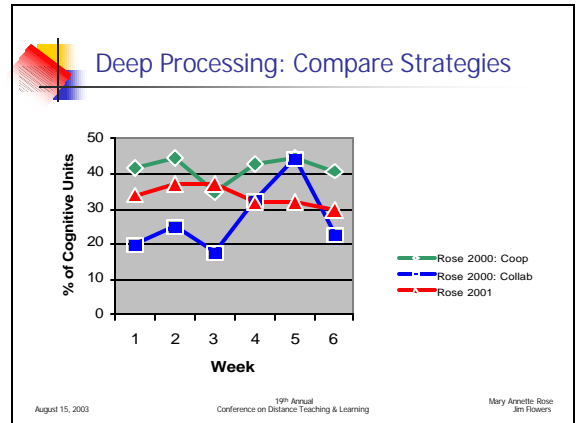
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Study Comparisons: Cognitive Skill

	E. Clarify	Indepth Clarify	Inference	Judge	Strategy
PBL, 2001 Rose	29%	14%	16%	20%	22%
PBL, 2000 Rose	28%	9%	22%	18%	24%
Starter-Wrapper Hara, et al. 2000	14%	11%	23%	34%	19%

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- ### Limitations
- Case study, generalize to similar others
 - Picture not perfect
 - Nonparticipants:
 - 2000: 20 of 26 students participated
 - 2001: 19 of 24 students participated
 - Communication occurred in other modes
 - Reliability issues with Cognitive skill dimension
 - Hawthorne effect, students aware of observation
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Conclusions: Overall

ACC supports PBL among distributed learners

- Conferences were **student- and learning-driven**
 - students contributed 90% of messages
 - an average of 4.8 to 5.2 messages/student/week
 - 41 to 52% of dialogue was cognitive
- Role assignment promotes
 - Higher levels of intersubjectivity
 - Cohesion or More interconnected messages
 - Catalyst to begin discussions
- Learning role assignment promotes
 - Use of indepth clarification skills

PBL presents a challenge for online students


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What were the patterns over time?

- Functions and cognitive skills changed over time
 - Cognitive more prominent during first four weeks
 - Organization more prominent during last two week
 - Strategies consistently high at the beginning
 - Judgment increases over time
- Assigning learning roles assignment influenced cognitive discussions earlier in the PBL process
- Deep processing was fairly consistent across studies and over time
- Cohesion increased over time

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What were the perceptions of interdependence and intersubjectivity?

- Interdependence was high
 - Regardless of role or time
 - Supports literature that interdependence is a function of the task
- Intersubjectivity
 - Higher for groups with role assignment
 - Intersubjectivity increases over time

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Implications for Facilitators

Assign **learning roles** because ...

- emphasize learning issues and process
- establish common understandings about
 - learning issues and strategies
 - individual responsibility
- alleviate learners' concerns about coordinating joint learning activity
- provide the catalyst on which others can interconnect messages

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Implications for Facilitators

Initially **explain and model** substantive communication


- Define learning roles and strategies
- Provide examples and nonexamples of substantive dialogue
- Interrelate or weave postings

Use **specific interventions and supports** to encourage deep processing and indepth clarification skills where learners:

- Identify and question assumptions
- Entertain possibilities and defer judgment
- Justify assertions and conclusions
- Detect and classify relationships
- Interrelate information

Separate support for role assignment from group discussion

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Implications for Research

- Control for other learner attributes, such as learning style and preferences. Does role assignment based upon learner attributes influence patterns of function, skill, and level?
- Do other types of roles influence the patterns of function, skill, and level?
- What interventions promote deep processing, indepth clarification, and intersubjectivity?
- What is the optimal balance between cognitive and organizational dialogue during PBL in distributed environments?

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