



THE SCHOOL OF  
INFORMATIONAL SYSTEMS  
AND TECHNOLOGIES

THE SCHOOL OF  
EDUCATIONAL STUDIES

THE SCHOOL OF  
ORGANIZATIONAL AND  
BEHAVIORAL SCIENCES



# **Re-Design and Evaluation of an Anchored Discussion System**

**Evren Eryilmaz, Terry Ryan, Mary Poplin, Justin Mary**

**January 5<sup>th</sup>, 2012**

# Presentation Outline



- Introduction
  - Motivation
  - Problem Statement
  - Goal & Approach
- Theoretical Underpinning
  - Attention Guidance in Social Construction of Knowledge
- Improved Anchored Discussion Systems
  - Control Software
  - Teacher-Based Attention Guidance Software
  - Peer-Oriented Attention Guidance Software
- Research Questions & Hypotheses
- Methodology
- Results
- Conclusion & Current Work



# Motivation

- What is anchored discussion?
  - An anchored discussion system displays learning material not only side by side with chronologically organized threaded discussion messages, but also provides a linking functionality between the two.
- Prior Research: (anchored vs. regular forum)
  - Study 1 Outcome: An anchored discussion system reduces the cognitive load involved in correctly interpreting messages.
  - Study 2 Outcomes: Three reported outcomes
    - a) More individual interpretation of theoretical concepts
    - b) Less personal experience oriented replies
    - c) Stronger overall network connection

# Motivation

- **Prior Research:** (isolate two functional characteristics of anchored discussion)
  - Study 3 Outcome: Proposed and evaluated a theoretical model based on the concept of common ground.
  - Study 4 Outcome: Linking functionality enhances individual learning outcomes from online social interaction.
- **Problem Statement:** Students have a tendency to lose focus and acquire “malprioritized concepts” when they participate in online social interaction
  - Reason 1: The possibility of annotating every detail in a complex learning material can distract student’s attention
  - Reason 2: Students with low domain specific prior knowledge require instructional support

# Goal & Approach



- Goal:
  - Focus social construction of knowledge on relevant information from complex learning material.
- Approach:
  - Re-design and evaluation of an anchored discussion system with respect to two instructional design perspectives.
    - a. Teacher scaffolded attention guidance strategy
    - b. Peer-oriented attention guidance strategy

# Theoretical Underpinning



- Attention Guidance in Social Construction of Knowledge
  - The possibility of processing every detail including irrelevant information and seductive details can direct students' attention away from central domain concepts, principles, and their interrelations.
  - Attention guiding cues can focus students' attention on specific parts of complex learning material in order to support social construction of knowledge



# Improved Anchored Discussion Systems



- Control Software:
  - Hovering over an annotated text lights up both the part of the text and associated discussion in red.
  - Student's reason for making an annotation appear in a sticky message.
  - Drag and drop from text to message body.

14 **Marlene Stevens** 27-03-11 **Key Idea:** The majority of Americans- rich poor alike how can poor people believe that capitalism democratic socialism provides resources for the less fortunate? Do the majority of Americans rich and poor alike even know the difference in systems? ★★★★★

15 **Marlene Stevens** 27-03-11 **Key Idea:** Technical knowledge is the basis of m... While I believe critical theorists wo...

16 **Marlene Stevens** 27-03-11 **Key Idea:** Important research still needs to be ... I find these questions to be very imp...

17 **Marlene Stevens** 27-03-11 **Key Idea:** Schools need to be more supportive of...

The most difficult task in analyzing these negative functions of ideology is to unmask those ideological properties which insinuate themselves within reality as their fundamental components. Ideological functions which barricade themselves within the realm of common sense often manage to disguise the grounds of their operations. What is crucially important here is that domination not be left as a free-floating concept linked to the diffuse nature of power. Domination needs to be linked to the process of capitalist exploitation and the extraction of surplus-value and the reproduction of capitalist social relations of production.<sup>19</sup>

At this point it should be clear that ideology represents a vocabulary of standardization and a grammar of design sanctioned and sustained by particular social practices. All ideas and systems of thought organize a rendition of reality according to their own metaphors, narratives, and rhetoric. There is no "deep structure," totalizing logic, or grand theory pristine in form and innocent in effects which is altogether uncontaminated by the production of value through the dialectical contradiction between capital and labor, by the mediative effects of ideas, or by the way culture is shaped by social relations of production—in short, by ideology. There is no privileged sanctuary separate from culture and politics where we can be free to distinguish truth from opinion, fact from value, or image from interpretation. There is no "objective" environment that is not stamped with social presence or troubled by the insinuation of the forces of production.

If we all can agree that as individuals, we inherit a preexisting sign community, and acknowledge that all ideas, values, and meanings have social roots and perform social functions, then understanding ideology becomes a matter of investigating which concepts, values, and meanings obscure our understanding of the social world and our place within the networks of power/knowledge relations, and which concepts, values, and meanings clarify such an understanding. In other words, why do certain ideological formations cause us to misrecognize our complicity in establishing or maintaining the dialectical contradiction between capital and labor that constitutively privileges capital over labor, and provides ballast to the value form of labor.

The dominant ideology refers to the naturalization of particular subjectivities by capitalist relations of production. The majority of Americans- rich or alike—share the belief that capitalism is a better system than democratic socialism, for instance, or that men are generally more capable of holding positions of authority than women, or that women should be more passive and housebound<sup>14</sup>. Here, we must recognize that the economic system requires the ideology of consumer capitalism to naturalize it, rendering it commonsensical. The ideology of patriarchy also is necessary to keep the nature of the economy safe and secured within the prevailing hegemony. We have been "fed" these dominant ideologies for decades through the mass media, the schools, and family socialization.

# Improved Anchored Discussion Systems



- Teacher-Based Attention Guidance Software:
  - Font size represents relative importance
  - Default and big are two font sizes
  - Teacher uses the importance bar to change font size

6 14-02-11 [Icons] Reply

**Key Idea:** Kirschner's argument reminds me of Hirsch's argument that student's need foundational knowledge in order to be able to synthesize new knowledge

You can not put students into Reciprocal Teaching groups and expect them to teach each other without the background knowledge and vocabulary to discuss a subject

★★★★★ [Icon]

15-02-11 [Icons] Reply

**Statement:** I agree with you.

To be in a reciprocal teaching group and to do it well requires 4 essential skills: summarizing, questioning, predicting, clarifying

These are all very challenging skills that should not be taken for granted such as questioning and clarifying.

For example, what if the only questions that students know how to ask are close ended questions? How would that group compare to another group where the person who asks their questions asks open ended questions to clarify concepts and ideas and not just facts?

If a teacher does not or cannot properly model the techniques essential in a reciprocal teaching group, then placing them in groups will be useless.

Hirsch argues that children taught comprehending strategies but are then tested on content knowledge will undoubtedly fail and I believe this parallels what Kirschner is saying about having students acting like scientists and what you are saying about reciprocal teaching.

Herman and Gomez (Chapter 4) maintain that critics of constructivist instruction ignore such critical components of the instructional process as motivation, the social context of the classroom, and other aspects of the dynamics of instruction. They then discuss their work on supporting students' reading in science and describe tools developed to guide students' reading in that domain.

Wise and O'Neill (Chapter 5) argue that experimental "high versus low guidance" studies cannot provide a valid basis for making inferences about the fundamental merits of constructivist teaching. Reviewing some of the literature, with a special focus on worked examples, they argue that the quantity of guidance is just one dimension along which guidance can be usefully characterized.<sup>8</sup> They suggest that the context and timing in which guidance is delivered are two additional concerns that have to be considered. They then suggest research about the optimal quantity, context, and timing of guidance in ill-defined problem domains.

Spiro and DeSchrver (Chapter 6), like other constructivist authors, contend that constructivist approaches to instruction may not be ideal for all instructional purposes. They maintain that constructivist instruction will lead to superior results in ill-structured domains such as medical diagnoses, whereas explicit instructional approaches may be superior in well-structured domains such as mathematics, for example. Spiro suggests that cognitive flexibility theory leads to the best approaches for teaching in ill-structured domains.<sup>1</sup>

Sweller (Chapter 7) kicks off the section of the book devoted to chapters by advocates of explicit instruction. He argues from an evolutionary perspective that constructivists advocating discovery, problem-based, or inquiry learning among other constructivist approaches, appear to assume that evolutionary secondary knowledge, such as intentional school learning, can occur as easily as evolutionary primary knowledge, such as learning to speak, listen, or use means-end analysis when students are left to their own devices to acquire the knowledge. Reading, writing, and other evolutionary secondary subjects taught in school, Sweller argues, have evolved relatively recently, and therefore—unlike speaking—have to be taught explicitly. He argues that it seems likely that we have evolved to imitate others, hence withholding information in the constructivist approaches discussed above runs counter to such evolutionary principles.

Kirschner (Chapter 8) suggests that constructivists tend to assume that pedagogy and epistemology are similar. He points out that children differ from adult experts in many ways, hence teaching science by requiring students to act as scientists can hardly succeed. **Kirschner argues that children do not have the cognitive abilities of adult experts, such as their conditionalized knowledge, i.e., understanding of when to apply a procedure, or their ability to synthesize new knowledge rapidly. All of these,**



# Improved Anchored Discussion Systems



- Peer-Oriented Attention Guidance Software:
  - Extends the importance bar functionality to the students
  - Students must compensate for the loss of the teacher's attention guiding cues
  - There are now default, big, and bigger font sizes

**Key Idea:** How does guidance happen in an online environment?

As I read Kirschner's approach to guidance, I found myself wondering how this would happen in an online environment. For example, we all are using this online system to extract questions, comments, and meanings from the information we've read and reflected upon. Is this what Kirschner and others would call "searching of the problem space?" While Dr. Poplin has certainly been present and has guided our conversations with her comments and also the posing of questions, many of us are raising questions (a.k.a. "problems") that perhaps have risen to the surface based on our contextualized experiences and understandings. In other words, are "worked-out examples in learning" always an essential part of providing guidance? Does the answer to this depend on the student population (i.e., is it different for us because we're in graduate school)?

★★★★★

**Statement:** Guidance means an expert provides some assistance for a novice.

My understanding of guidance is someone who has some knowledge and therefore can help a person without that knowledge. So your question, "are worked-out examples in learning always an essential part of providing guidance," my answer is YES. In teaching, we provide examples, or we model for students to follow what we like them to do in the classroom. Guided learning is good because students learn in steps.

★★★★★

Kirschner and colleagues argue that human cognitive architecture and, specifically the architecture of long-term memory, is now sufficiently understood so as to "provide us with the ultimate justification for instruction. The aim of all instruction is to alter long-term memory" (Kirschner et al., 2006, p. 77). They also claim that evidence from empirical studies over the last decades indicates that minimally guided instruction (whether inquiry, project-based, discovery, etc.) is less effective based on learning outcomes than more guided instruction. Therefore, instructional regimes that offer little guidance to students should be abandoned. Another criticism of minimally guided instruction is that instructional designers have misguidedly equated the goals of learning with the means. For example, Kirschner et al. note that many science programs encourage students to engage in open-ended investigations so as to mimic the work of scientists. They deem this approach, in which students discover the problems they want to study as well as the relevant variables of interest to any particular problem, to be in conflict with what is now known about human cognitive architecture. They warn that the epistemology of science should not be the basis of the pedagogy by which students are taught about science.<sup>2</sup> Methodologically, they argue that only randomized, controlled experiments provide useful evidence about the effectiveness of instruction and that any evidence, if it exists, for the efficacy of minimally guided instruction in learning fails to meet this standard. Finally, they assert that it is the burden of those who advocate for minimally guided programs to explain how such programs are not in conflict with what is known about human cognitive architecture.

Though we will not provide an extended discussion of all aspects of the argument, we next want to analyze and clarify certain key ideas that will be discussed throughout the chapter. Guidance, as others have pointed out, remains somewhat unclear from the discussion to date (Köedinger & Alevan, 2007; Wise & O'Neill, Chapter 5, this volume). For Kirschner et al., it appears that guidance means something like using worked-out examples in learning. Also, guidance likely translates into direct instruction "searching of the problem space" by students, which was thought to put an undue burden on working memory.<sup>1011</sup>

Kirschner et al. are better able to describe and critique minimally guided instructional programs than

How does guidance happen in an online environment?

# Research Questions and Hypotheses



1. What are the effects of teacher-based attention guiding cues on social construction of knowledge in online social interactions?
  - H1a: Teacher-based attention guiding cues will increase the number of student annotations on relevant information from academic texts.
  - H1b: Teacher-based attention guiding cues will facilitate higher quality interaction patterns focusing on relevant information from academic texts.
  
2. Will students continue to carry out discussions on relevant information when they switch from a teacher-based attention guidance software environment to one which is peer-oriented?
  - H2: Students will continue to carry out discussions on relevant information when they switch from a teacher-based to a peer-oriented attention guidance software environment.

# Methodology



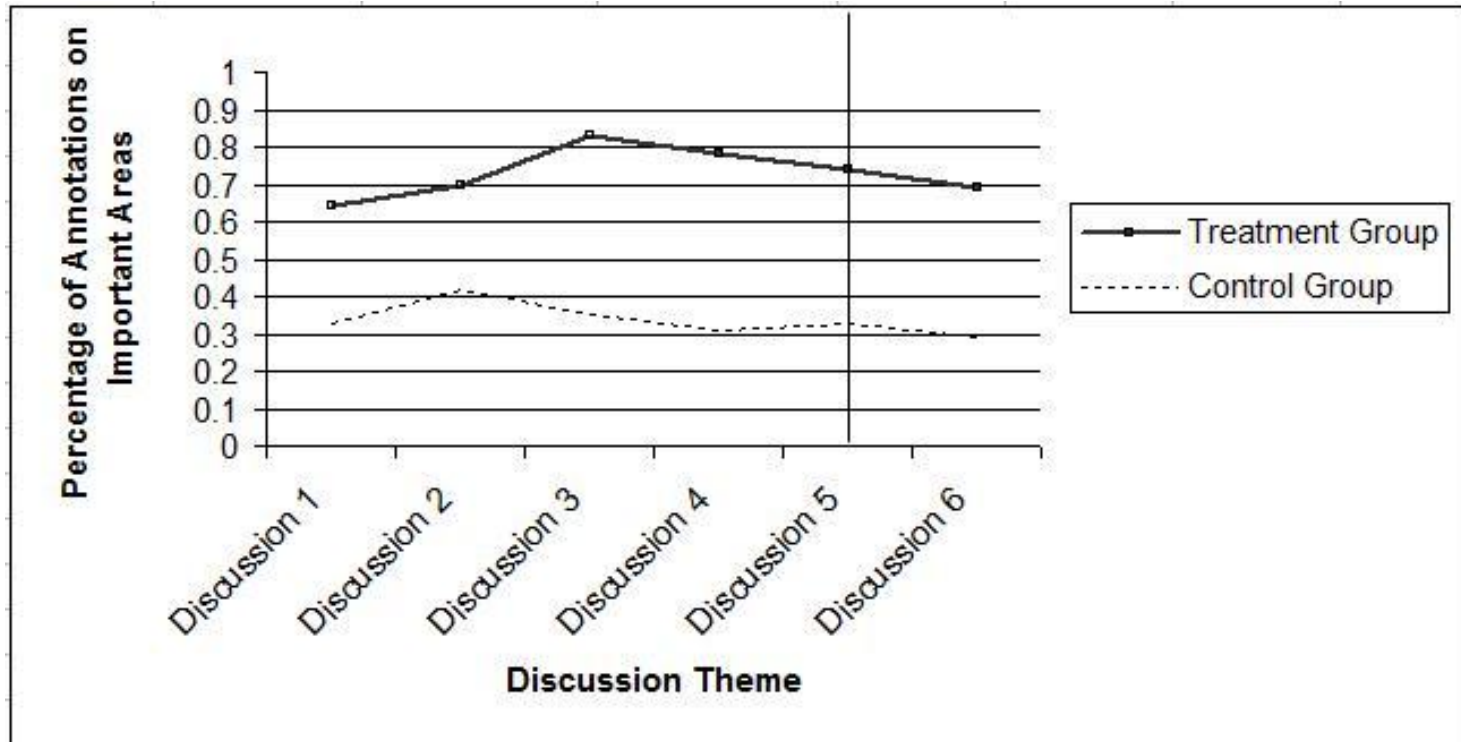
- Pilot Study: Determine which big font size captures student attention in an involuntary or obligatory fashion.
  - Participants: 8 doctoral students in a blended format research seminar.
  - Outcome: Students process the parts of a text with 150% larger font size first
- Main Study: Longitudinal quasi-experimental design with control and treatment groups.
  - Participants: 24 doctoral students in two sections of a blended format learning and pedagogical theories seminar.
  - Control group did not have access to attention guidance cues.
  - Treatment group switched from teacher to peer-oriented attention guidance

## Selecting Relevant Information

Condition	Discussion				
	1	2	3	4	5
Teacher-Based Attention Guidance Software Environment					
Number of Annotations on Important Areas	9	12	10	7	14
All Annotations per Discussion	14	17	12	9	19
Percentage of Annotations on Important Areas	0.64	0.70	0.83	0.78	0.74
Control Software Environment	Discussion				
	1	2	3	4	5
Number of Annotations on Important Areas	3	8	6	5	7
All Annotations per Discussion	9	19	17	16	21
Percentage of Annotations on Important Areas	0.33	0.42	0.35	0.31	0.33



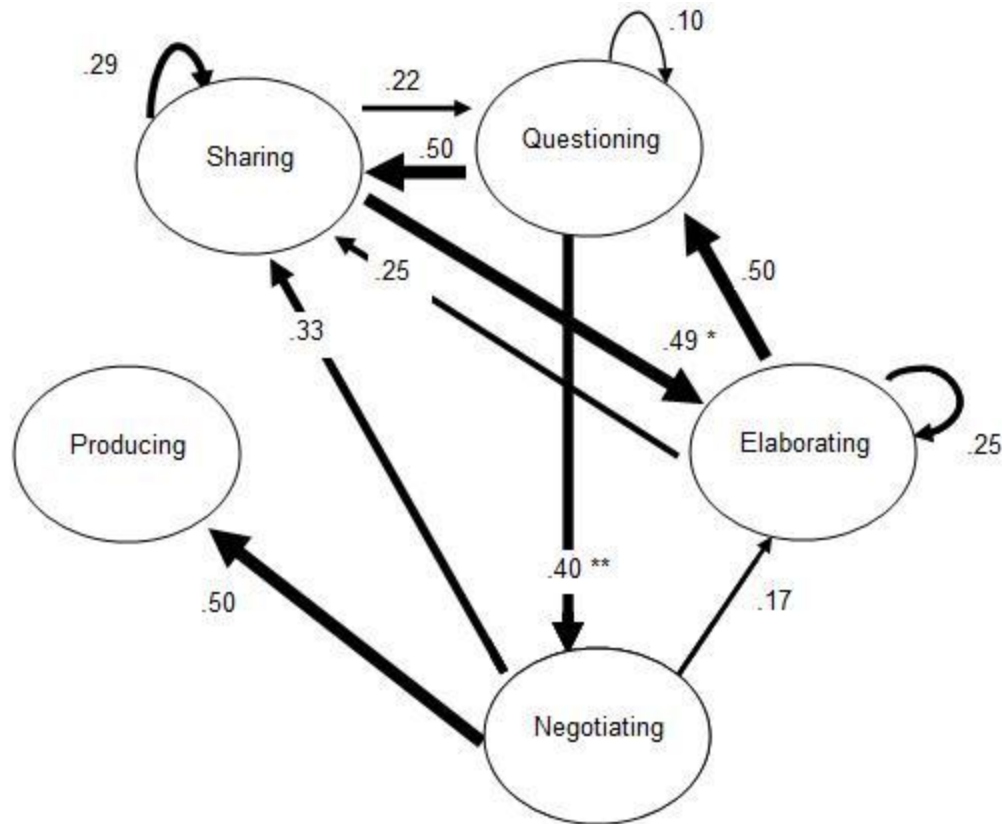
## Trends for Selecting Relevant Information



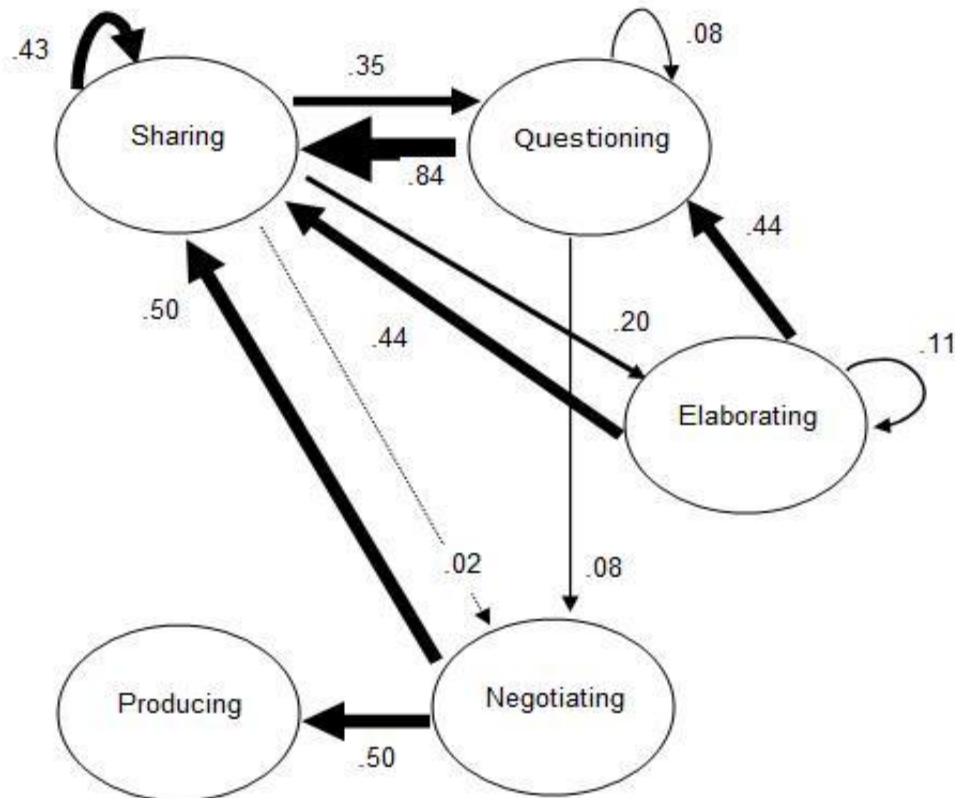
## Discussing Relevant Information

Knowledge Category	Teacher-Based Attention Guidance Software Environment		Control Software Environment	
	f	%	f	%
Sharing	66	38	76	59
Questioning	52	30	36	28
Elaborating	30	17	11	9
Negotiating	23	13	5	4
Producing	3	2	1	1
Total	174	100	129	100

## Transitional State Diagram for Teacher-Based Attention Guidance Software Environment

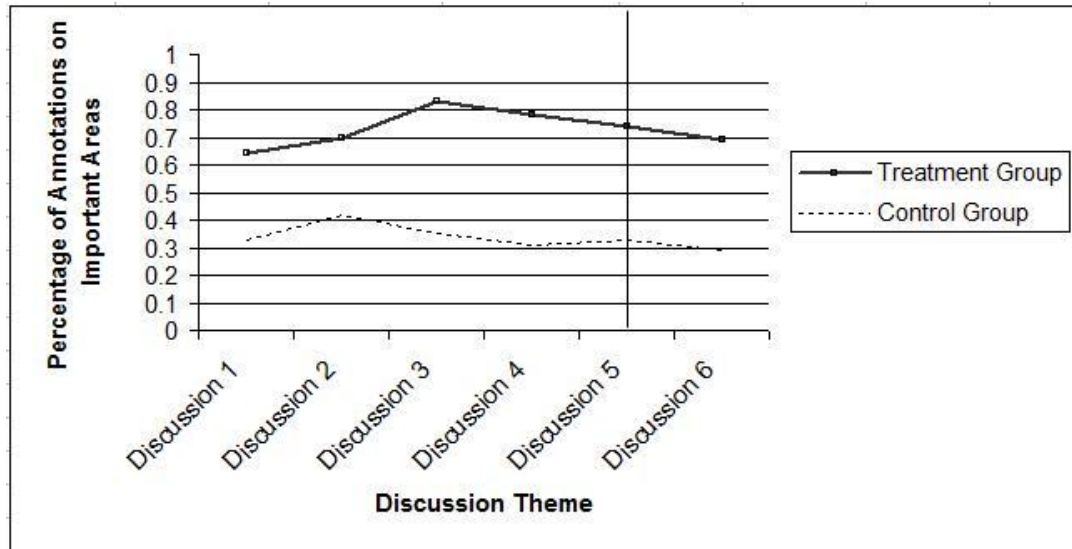


## Transitional State Diagram for Control Software Environment





## Switching from Teacher-Based to Peer-Oriented Attention Guidance (Discussion 6)



Condition	Percentage of Annotations on Important Areas
Peer-Oriented Attention Guidance Software Environment	0.69
Control Software Environment	0.29

## Content Analysis Results for Discussion 6

Knowledge Category	Peer-Oriented Attention Guidance Software Environment		Control Software Environment	
	f	%	f	%
Sharing	15	38	13	59
Questioning	13	30	6	28
Elaborating	5	17	1	9
Negotiating	6	13	2	4
Producing	0	2	0	1
Total	39	100	22	100

# Conclusion



- Teacher-based visual cueing is a viable way to direct novice students' attention to central domain principles.
- Discussion building on teacher cued areas has higher quality interaction patterns.
- Treatment group students maintained their attention on teacher determined relevant information after switching to peer-oriented attention guidance software environment.

# Current Work



- Continue further design and evaluation of anchored discussion by using larger sample sizes from different populations.
- More fine-grained analysis of interaction patterns in anchored discussion



# Thank You for Your Time



Your Comments and Questions are welcomed.

Please address feedback to:

[evren.eryilmaz@cgu.edu](mailto:evren.eryilmaz@cgu.edu) or

[eeryilmaz@csupomona.edu](mailto:eeryilmaz@csupomona.edu)