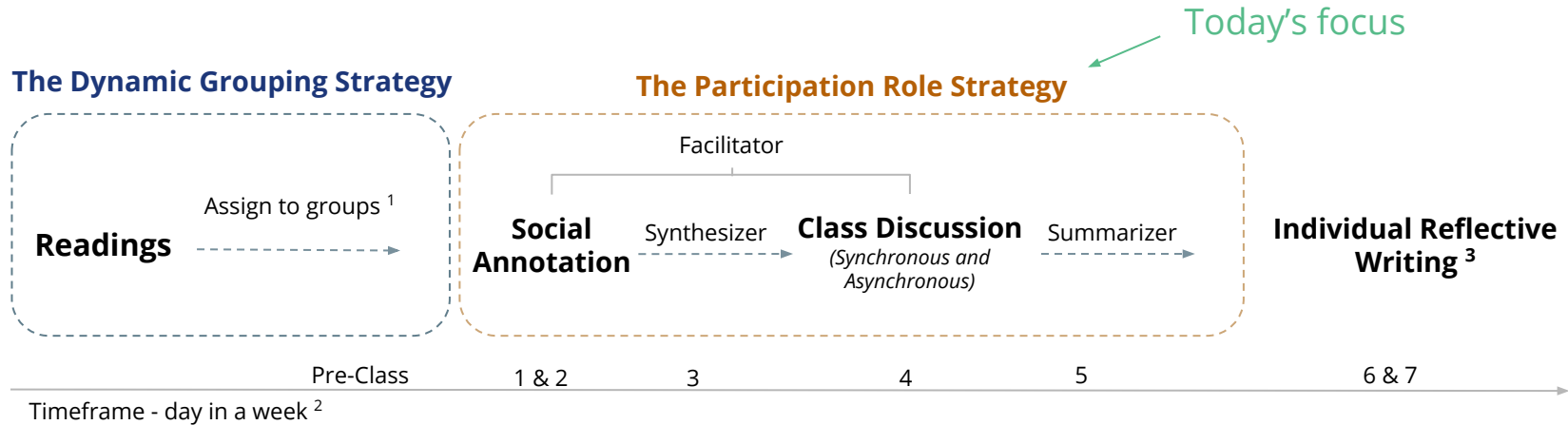


**Designing** Support for Productive Social  
Interaction and Knowledge Co-construction in  
Collaborative Annotation

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# The Design - *at a glance*



Note: Instructors may adjust the strategies accordingly.

# Why did we **design** the study?

- The study was initially conducted at the University of Minnesota in Fall 2020 when the campus shut down due to COVID-19. Many instructors pivoted to online instruction and were looking for solutions.

Replicate the face-to-face instruction?

Transform the student-teacher relationship?

Effective usage of technology  $\equiv$  Technology  $+$  Pedagogy

- Pedagogy?

There is a need to design meaningful scaffoldings - sometimes redesign of the curriculum, instead of throwing the tool directly to students (Zhu et al., 2020).

- Let students take more responsibilities in learning
- Transform the dynamic between students and teachers embraced by the technology
- Facilitate a natural space for **social interaction**
- Engage **knowledge co-construction**

# The Study Design

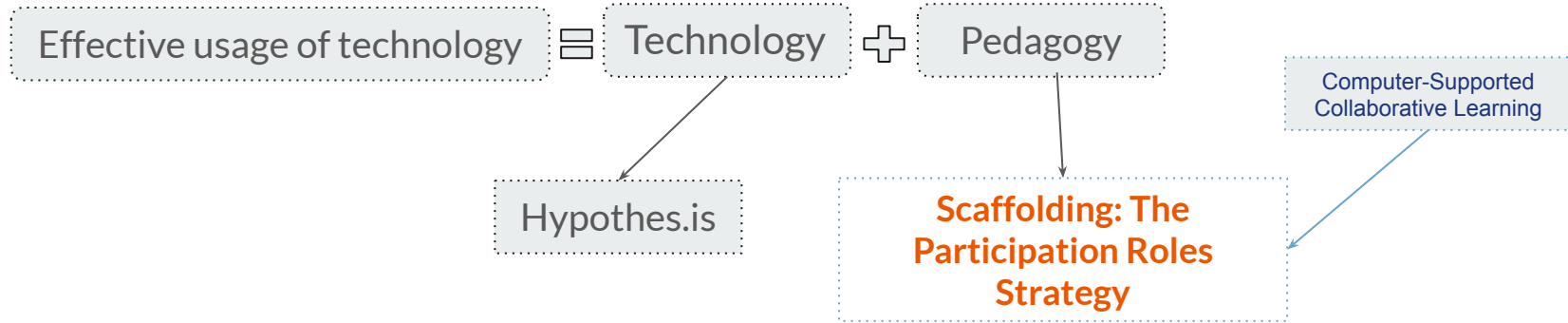
- **Goal:** Support collaborative web annotation in college classrooms by designing sophisticated participation roles.
- **Methods:** Co-design between researchers and instructors to design scaffolding roles, and support their implementation with course-specific customization.

- **Tool:**



- **Participants:** Three fully online undergraduate classes in Liberal Arts: *Introduction to Rhetorical Theory* (n=73), *The Sixties: History & Memory* (n=97), and *Dance History* (n=13).

# The Design: The Participation Roles Strategy

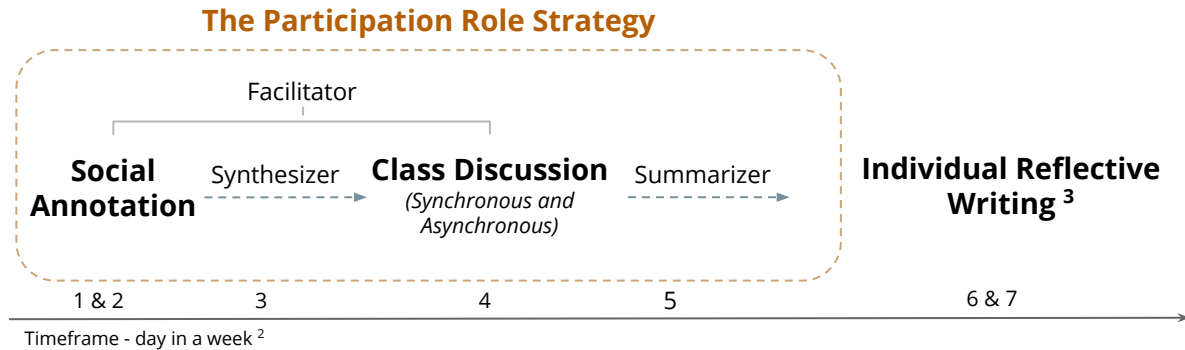


**The Participation Roles Strategy:** a generic scaffolding framework comprising three scripted participation roles based on CSCL literature (Strijbos & Weinberger, 2010; Wise et al., 2012): a *facilitator*, a *synthesizer*, and a *summarizer*.

# The Design: Scaffolding Roles

## The Scaffolding Roles Strategy:

- **Facilitator:** responsible for stimulating conversations by finding connections, seeking clarifications, and encouraging their peers to consistently tag their annotations for an entire week.
- **Synthesizer:** who synthesizes the initial ideas, highlights agreement/disagreement, and suggests directions of further discussions in the middle of the week.
- **Summarizer:** who summarizes group conversations at the end of the week for the whole class.



<sup>1</sup> Instructor may decide how to assign groups and readings.

<sup>2</sup> Example timeframe for the strategies, e.g., synthesizer completes the task on the third day, Instructors may adjust the timeframe accordingly.

<sup>3</sup> Instructors may adjust this accordingly.

# Research Questions and Data Analysis

- **Research Questions:**
  - How did the activity design facilitate social interaction?
  - How did the activity design facilitate knowledge co-construction?
- **Data Analysis:**
  - Social Network Analysis: study the social interaction, i.e. participation patterns in the collaborative annotation activity.
  - Content Analysis: study the knowledge co-construction
    - Coding scheme: Revised Interaction Analysis Model (IAM) of Collaborative Annotation - developed based on Gunawardena's IAM (1997) and Onrubia & Engel's model of collaborative knowledge construction (2009).
      - Four levels: Initiation, exploration, negotiation, and co-construction

Table 1. *Revised IAM of Collaborative Annotation*

Level	Definition
Level 1: Initiation	a) Share initial understandings b) Ask questions and share resources without elaboration or critical examination
Level 2: Exploration	a) Elaborate on the texts b) Connect personal experiences with critical reasoning c) Support existing ideas by providing additional evidence d) Make connections or ask questions without critical examination
Level 3: Negotiation	a) Answer a question through critical reasoning or proposing critical follow-up questions b) Negotiate disagreement c) Connect readings with critical reasoning d) Synthesize meanings e) Create new supporting statements by building on a previous conversation.
Level 4: Co-construction	a) Reach a consensus on a previous questions b) Apply the knowledge or way of thinking gained through the activity c) Make metacognitive statement illustrating their learning outcome

# Did the **design** work? - social interaction

## Facilitator

- The facilitators sent out more replies; reached out to more peers; received more replies.
- They were influential in the collaborative annotation activities.
- Social interaction pattern varied across the facilitators in different weeks

## Synthesizer

- The synthesizers participated more than non-role takers in terms of the numbers of posts they sent out, but not as much as the facilitators did since they tended to focus more on synthesizing the readings and annotations on their own.

## Summarizer

- The summarizers participated as same as non-role takers which is also expected since the responsibility for them was to write the weekly summary on their own.

Table 2. Mean and SD SNA Measures for Role Takers and the Whole Class.

	In Degree	Out Degree	Betweenness	Constraint	Dominance
Whole Class	0.17 (0.03)	0.17 (0.03)	8.99 (3.55)	0.46 (0.05)	0.18 (0.09)
Roles					
<b>Facilitator</b>	0.28 (0.20)	0.29 (0.17)	18.50 (15.40)	0.38 (0.17)	0.33 (0.27)
<b>Synthesizer</b>	0.15 (0.16)	0.27 (0.18)	12.60 (13.20)	0.49 (0.15)	0.24 (0.24)
<b>Summarizer</b>	0.21 (0.16)	0.16 (0.03)	8.33 (6.61)	0.43 (0.19)	0.19 (0.14)



# Did the **design** work? - knowledge co-construction

## Facilitator

- They generally asked questions or provided answers with elaboration, examples, critical reasoning, etc. to start and push the discussion.
- Knowledge construction level varied across the facilitators in different weeks

- In general, the results indicate
- the role assignment was associated
- different role takers may have
- In weeks when role takers participated in knowledge construction level from non-

**[Student A]:** Cultural syncretism means the blending of cultures to form something new. This can be in the form of religious practices, architecture, philosophy, recreation, food, etc. I think this back and forth Dunham was experiencing throughout her career is understandable. Was she in search of a right and a wrong answer? Or was she struggling to see how cultural syncretism preserved culture while simultaneously creating something new and different.

**[facilitator]:** Student 110, this is a good thought and a new word for me, too. **Student B student C talked about diaspora and assimilation a few paragraphs above.** How do you think diaspora and syncretism relate, or maybe they do not relate at all? Do you think one is more beneficial than the other for preserving the culture?

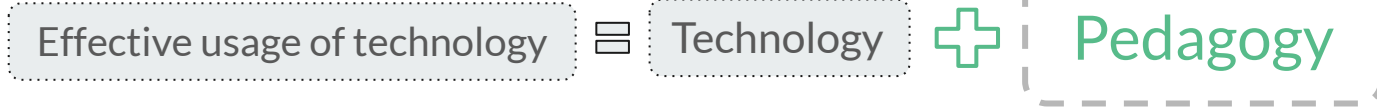
**[Student A]:** In general terms, I interpreted diaspora meaning this shift of cultures due to movement, and the intertwining of different cultures. I think syncretism focuses more on the combination of religious beliefs and an "interfaith". I don't know if one is better than the other, there always seems to be two sides to the story. In my opinion, I think the creation and development of new cultures is beautiful, but I am also someone who likes to hold onto tradition.

# Implication of the Design

- We proposed a scaffolding framework for collaborative annotation is applicable to many college-level classes.
- We developed a revised Interaction Analysis Model for collaborative annotation that is more appropriate for analysis of student discussions “anchored” in web documents. This can support teaching as well as a reference for evaluation.
- Finally, results of data analysis have shown promise of the designed scaffolding framework for facilitating productive collaborative annotation in the study context. In particular, the facilitators and synthesizers played roles in deepening collaborative annotation.

# Final Words

Rethink the relationship: What can be done as researchers, designers, and teachers?



- Students are not always natural collaborators and need to make intentional efforts to **become better collaborators** (Borge & White, 2016).
- The **instructor** needs to provide careful scaffolding and detailed guidelines for students to take various roles.
- The **technology** needs to connect students and teachers' needs to provide a natural and effective environment for collaboration.

# Thank you!

Let's chat more:

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Questions and Suggestions

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