Examining Learners' Cognitive Engagement in Danmaku comment

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Abstract

As an emerging commenting system of video platforms, Danmaku displays users' comments on the top of the video. Limited studies have been conducted on learners' cognitive engagement demonstrated in educational videos that embed Danmaku. In this paper, we used a content analysis method to categorize instructional behaviors that cause learners' responses and further evaluate learners' cognitive engagement. We identified that certain instructional behaviors cause more responses and higher-level learners' cognitive engagement.

Introduction

Aside from MOOC, User-Generated Content video platforms are becoming an important part of online informal learning. Commenting systems are embedded in video platforms to facilitate collaborative learning among audiences. Danmaku is a commenting system that allows viewers to post comments while watching a video. Comments will be displayed at the top of the screen for all current and future viewers. Though first introduced for interactive entertainment purposes, Danmaku has found its way into educational videos on a wide range of topics during the last ten years (Zhang & Cassany, 2018). This research explores the following questions: What types of instructional behaviors lead to more Danmaku discussions? How do learners' comments reflect their levels of cognitive engagement?

Reference

Chi M. T. (2009). Active-constructive-interactive: a conceptual framework for differentiating learning activities. Topics in cognitive science, 1(1), 73–105.
Zhang, L.-T., & Cassany, D. (2020). Making sense of danmu: Coherence in massive anonymous chats on bilibili.com. Discourse Studies, 22(4), 483–502.

Methods and Data Collection

We used Bilibili's official API to crawl Danmaku comments from educational video lectures uploaded to the platform. We collected 10,383 Danmaku comments from 4 video lectures. Our data analysis procedure follows three steps: 1) Identify comment peaks (N=10) in each video. 2) Use Instructional Behavior Scheme to categorize the instructional behaviors. 3) Use Chi's ICAP framework to categorize user comments in each comment peak and evaluate their cognitive engagement (see Figure 1).

Figure 1 Data Analysis Procedure

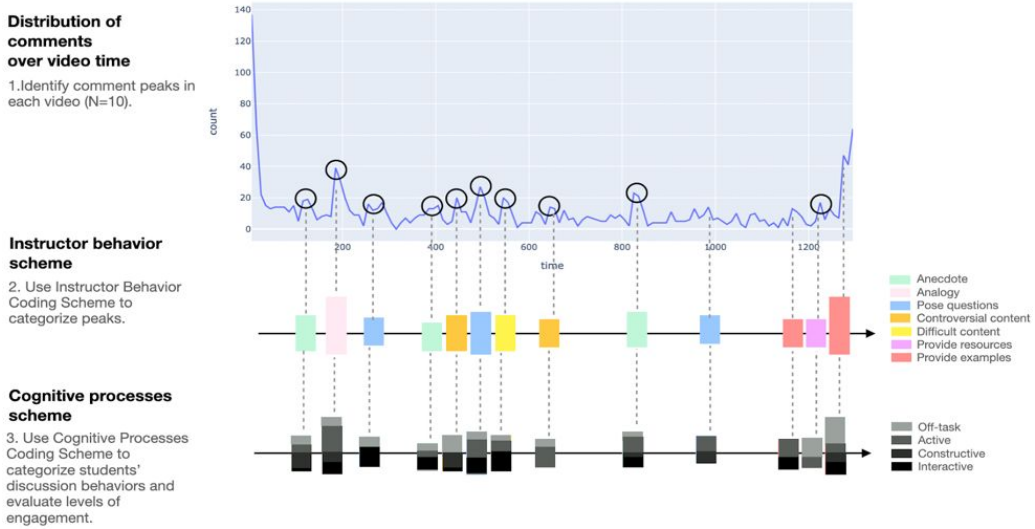

Table 2 *Coding scheme of types of instructor behaviors that incite audiences' participation*

Instructional Behaviors	Description
Anecdote	Introduce an account of an interesting incident.
Analogy	Compare a concept with information that is familiar to learners.
Pose questions	Raise a question about a concept or idea to encourage discussion.
Controversial content	Talk about ideas or express opinions that lead to disagreement.
Difficult content	Introduce abstruse or abstract concepts that require prerequisite knowledge to understand.
Provide examples	Give examples to explain certain concepts.
Provide resources	Use physical or graphic education tools to assist teaching.

Table 3 *Coding scheme for evaluating learners' cognitive engagement*

Cognitive engagement	Behaviors	Description
Active (score = 1)	Endorse	Repeat the video content or endorse instructors' opinions.
	Paraphrase	Use their own words to repeat the concepts.
	Correct	Point out obvious flaws, such as pronunciations and typos.
Constructive (score = 2)	Explain	Add supplement information to help others understand an idea.
	Connect	Express thoughts linking to prior knowledge or experience.
Interactive (score = 3)	Meaningful Question	Post a relevant question that requires other viewers' answers.
	Meaningful Response	Answer questions raised by instructors and other viewers.
	Argue/defend	Defend a statement with specific arguments or references.
Off-task (score = 0)		Post comments that are irrelevant to the lecture content

Findings

Different instructional behaviors lead to different levels of cognitive engagement. Posing questions (Mscore=2.51, SD=0.51), introducing difficult content (Mscore=1.67, SD=0.57), and discussing controversial issues (Mscore=1.55, SD=0.78) lead to higher-level cognitively relative commenting behaviors, meaning learners are more engaged with the lecture content and take steps further to construct knowledge actively. Telling anecdotes (Mscore=0.53, SD=0.17) and making analogies (Mscore=0.62, SD=0.14) score much lower. In one video lecture with advanced materials, learners respond to anecdotes (40%) and analogies (20%) more often. This might be because anecdotes and analogies require lower cognitive thresholds for discussion. In the video with more advanced content, the ratio of off-task comments over total comments is the highest (36.67%, Mean = 27.19%) and the cognitive engagement score is the lowest (0.92, Mean = 1.33).

Our study suggests that Danmaku has the potential to benefit both instructors and learners in online video-centric learning environments. For instructors, Danmaku comments help them estimate what types of instructional behaviors cause positive discussions such that they can plan or redesign their course content and teaching strategies accordingly. For learners, Danmaku comments not only enable positive interaction between beginners and more experienced learners but also work as a rich resource for future learners.