Using the Video Mosaic Repository for Creating Multimedia Artifacts with the VMCAnalytic

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Abstract

The Video Mosaic Collaborative (VMC) is a collaboration portal that integrates the Robert B. Davis Institute for Learning Video Collection, that captures mathematics learning experiences across a range of grades, schools and a time span of 20+ years, with a collaboration platform and tools designed to transform mathematics research, teaching and learning. The VMC combines research into teaching and learning process with videos and tools that enable teachers, teacher educators and researchers to analyze and use the videos to make new discoveries in math education and the learning sciences. The VMC provides opportunities for teaching and learning through using the VMCAnalytic tool to create multimedia artifacts. This poster will illustrate the design of the VMCAnalytic technology and the preliminary analysis of defining a framework to study the multimedia artifacts created.

VMCAnalytic Tool

The VMCAnalytic tool (available at http://videomosaic.org) allows users to edit and annotate videos. The tool has the ability to provide a new means for engaging learners with video as collaborative project work. It also provides new and powerful opportunities for learners to create artifacts that are tools to think with. Participants in this study used the tool to explore ideas in mathematics.

Theoretical Perspective

- In mathematics it is particularly important to attend to emergent forms of reasoning as children express justifications using their own language. To build teacher capacity for attending to the developing ideas of students, they must not only know the variety of ways students build solutions to problems, but must also recognize and understand the reasoning that undergirds those solutions (Palius & Maher, 2011).
- Our research shows that teachers can successfully build an understanding of the mathematical ideas as well as the arguments posed by students for their solutions (Maher, 2011).
- Advancing teacher learning to the next level is engaging them in the construction of multimedia artifacts for sharing what they have come to understand about the development of mathematical reasoning (Hmelo-Silver et al., 2014).

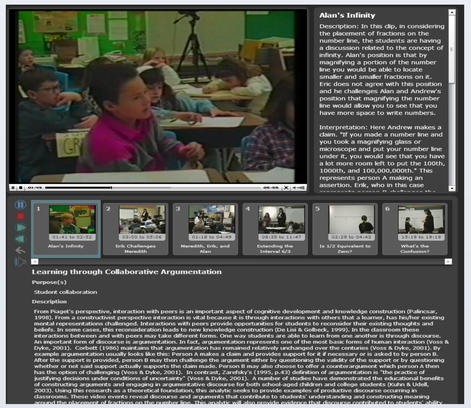
Methodology

- Data collected for 63 participants across 7 courses.
- VMCAnalytics were graded by two coders (IRR=89.88%) on an integer scale from 0 to 3 on two levels: a local individual event level and a global level.
- VMCAnalytic consists of multiple events played one after another. Individual events were graded on the relevance of the event in relation to the VMCAnalytic.
- An event consists of a section of video with accompanying user inputted text. High scoring events included text that explained how the video lent support to overall description.
- On the global level VMCAnalytics were rated on:
  - Overall description – we considered their overall argument and how well they supported it with the literature.
  - How well the events connecting meaningfully to each other – higher scores if the events were in a logical sequence that built off each other.
  - Are the claims made being backed with evidence – higher scores for VMCAnalytics that backed all the claims in overall description with appropriate video and text descriptions.
  - Overall clarity and coherence – how well the author was clear about their VMCAnalytic purpose and expressed themselves coherently.
  - Mathematical and learning sciences depth – how well their VMCAnalytic built on the literature in the learning science and mathematics education domain.

Results

Class	n	Overall description	The events connect meaningfully	Claims are backed with evidence	Overall clarity and coherence	Mathematical depth	Learning Science depth	Number of events	Event relevance average
Early Algebraic Learning	7	2.57 (0.53)	2.29 (0.48)	2.14 (0.69)	2.14 (0.38)	1.86 (0.69)	1.71 (0.76)	6.86 (2.03)	2.06 (0.50)
Design Based Research Fall 2011	3	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	3 (3)	0.78 (0.69)
Design Based Research Fall 2012	4	2 (0.82)	2 (0.82)	2 (1.15)	1.75 (0.96)	1.75 (0.5)	2.25 (0.5)	7 (2.45)	1.94 (0.92)
Reasoning and Critical Thinking	8	2 (0.76)	2.06 (0.68)	2.13 (0.64)	2.13 (0.64)	2 (0.76)	2 (0.53)	9.38 (5.78)	2.27 (0.55)
Introduction to Mathematics Education Spring 2012	11	2.55 (0.82)	2.64 (0.67)	2.46 (0.69)	2.73 (0.61)	2.19 (0.61)	1.64 (0.50)	4.09 (0.70)	2.71 (0.86)
Introduction to Mathematics Education Fall 2012	19	2.52 (0.61)	2.42 (0.61)	2.47 (0.70)	2.42 (0.61)	2.21 (0.71)	1.95 (0.78)	7.26 (2.58)	2.35 (0.53)
Introduction to Mathematics Education Spring 2013	11	2.46 (0.52)	2 (0.89)	2 (0.89)	1.91 (0.83)	2.37 (0.81)	1.27 (0.65)	8.27 (2.69)	2.12 (0.63)

Example VMCAnalytic



VMCAnalytic "Learning through Collaborative Argumentation", viewable at http://www.rbdil.org/analytics.html

"Just knowing that this is here [the VMCAnalytic tool], I think that it is important for someone like me who currently does not have the opportunity to do research in an elementary classroom, but I want to do research related to that. So to have the opportunity to see an actual classroom is really helpful. The ability to pause, rewind, and re-watch the videos is really useful. When I would watch a video for the 3rd or 4th time I would notice things I did not see the first couple of times. " – Author of the VMCAnalytic

Feedback from VMCAnalytic Users

"The process of creating the analytic while being interviewed was interesting. I found that the opportunity to think aloud and provide justifications for my selections actually helped me think deeper about those selections. The process of justifying to another person coaxed me into articulating my own reasoning in a more elaborated way and forced me to take a little closer look at some of the theoretical framework I was bringing to bear on the problem." - Ph.D. student in Learning Sciences

"For the construction of the analytics, there were at least two important components that I recognized during the process. The first is that if you go into the process with the intent to have a particular focus for the analytic, it can develop into another as you critically search the media for points that validate that focus and attest to it. With analytics, it is almost critical to remember that many perspectives exist. No two people will look at the same data in the same manner or to the same degree – this is a fact that translates synonymously to teaching students, as we learn that no two students are built or think the same way – we have to account for their individuality and unique styles of mathematical reasoning." - Undergraduate student pursuing a degree in Secondary Mathematics Education

"I also loved all of the Stephanie videos. I selected her leadership skills to be the focus of my analytic and it amazing to see her strong personality show from first grade all the way through high school, from taking charge and informing Dana that outfits do not have to match, to telling Shelly to take out her calculator quickly in High School. The videos and the VMCAnalytic are a great tools, and I will use them in workshops and presentation in the future." - Middle school Mathematics teacher

Discussion

The VMCAnalytic shows promise of being a useful tool in a system of formative and summative assessment. It makes thinking visible and open for discussion and revision. However, equally important is the kinds of structures and scaffold provided by the instructor as the case study shows. The rubric provides clear expectations and a roadmap for students in the creation of the multimedia artifact. For instructors, students evolving understanding is transparent and provides opportunities to see student's intellectual journey in thinking critically about children's mathematical thinking.

Related Publications

Agnew, G., Mills, C. M., & Maher, C. A. (2010). VMCAnalytic: Developing a collaborative video analysis tool for education faculty and practicing educators. In R. H. Sprague, Jr. (Ed.), *Proceedings of the 43rd Annual Hawaii International Conference on System Sciences (HICCS-43): Abstracts and CD-ROM of Full Papers*. IEEE Computer Society, Conference Publishing Services: Los Alamitos, CA.

Hmelo-Silver, C. E., Maher, C. A., Palius, M, F., & **Sigley, R**. (2014, accepted). Showing what they know: Multimedia artifacts to assess learner understanding. *Submitted to the 12th International Conference of the Learning Sciences (ICLS 2014)*

Hmelo-Silver, C. E., Maher, C. A., Palius, M. F., **Sigley, R.**, Alston, A., Agnew, G., Mills, C. (2013). Building multimedia artifacts using a cyber-enabled video repository: The VMCAnalytic. *Proceedings of the 46th Hawaii International Conference on System Sciences* (pp. 3078-3087). Hawaii: IEEE.

Maher, C. A., Palius, M. F., Maher, J. A., Hmelo-Silver, C. E. & **Sigley, R.** (2014, accepted). Teachers Can Learn to Attend to Students' Reasoning Using Videos as a Tool. To appear in *STEM education theme issue of Issues in Teacher Education*.

Maher, C. A. (2011). Supporting the development of mathematical thinking through problem solving and reasoning. In Ubuz, B. (Ed.), *Proceedings of the 35th Conference of the International Group for the Psychology of Mathematics Education 1*, 85-90. Ankara, Turkey: PME.

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Acknowledgements

Research and development funded by NSF awards 0822204 and 1217087. Views expressed herein are those of the authors and do not necessarily reflect those of the National Science Foundation.

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