



Virtual Coaching and Video Annotation: Skills-based STEM Curriculum for Rural Afterschool Educators

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Introduction

The challenge of delivering high-quality, educational coaching to rural areas has been an ongoing issue for many decades in formal education (Hillkirk, Chang, Oettinger, Saban, & Villet, 1998; Williams, Martin, & Hess, 2010). The use of the Internet and virtual coaching has emerged as one method to overcome this challenge, but much of the recent implementation and research has focused on either urban schools or formal educators in rural areas (Glover & Sheridan, 2017). While this is a growing field of research, there has been little examination of the barriers and opportunities for delivering high-quality coaching to rural afterschool educators. This project is interested in investigating how virtual afterschool coaching can be supported through the use of innovative online tools. In this case, we describe using video annotation software for peer critique, which engages participants, provides an enhanced learning experience, and is a simple and intuitive tool to use with educators in rural areas with limited Internet connectivity. Below we briefly summarize the ACRES (Afterschool Coaching for Reflective Educators in STEM) coaching program, the search for video annotation tools, and how we piloted the tool. We then analyze interviews with ACRES participants and outline barriers and opportunities for innovating and researching the use of video annotation tools moving forward.

The ACRES Model and Video Peer Critique

ACRES is a professional development opportunity for after and out-of-school providers who want to embrace STEM (Science, Technology, Engineering and Math) education more deeply. ACRES provides high-quality STEM coaching in which participants learn a skill, videotape their own work with youth in their individual settings, and reflect on their teaching practice by watching and discussing their videos with other participants in their cohort and their ACRES coach. ACRES coaching can occur in one of three formats: in-person, virtual, and blended. The in-person model allows participants to gather together at a physical site to complete the training. However, to accommodate the distance between educators in rural settings as well as to allow the training to be accessible to educators with limited flexibility to attend in-person trainings, fully virtual or blended in-person/virtual models are also available. These virtual models utilize Zoom video conferencing technology to bring educators together to learn.

ACRES modules introduce participants to select STEM facilitation skills aligned with Click2Science (C2S) and use STEM activities as a vehicle for learning and applying the skills. The strategies and techniques educators encounter can be readily put into action in their own STEM programming. The ACRES curriculum is composed of six modules which focus on providing instruction on research-based STEM skills for youth

educators. Each ACRES cohort learns and practices a customized combination of the modules, but all begin with the skill of “Asking Purposeful Questions,” which encourages educators to intentionally plan for and ask questions of youth that helps them expand, clarify, and reflect on their thinking.

Each module consists of a two-hour group workshop in which participants are introduced to the skill, watch and discuss videos of afterschool educators demonstrating the skill, and participate in an interactive STEM activity to practice the skill themselves in their group. The particular module used in this pilot study of video annotation software, “Modeling the Science Process,” teaches participants to support students in asking testable questions and planning and carrying out investigations using core science processes (asking questions, developing and using models, analyzing and interpreting data to make explanations based on evidence, etc.). As participants deepen their understanding of science processes, they consider similarities and differences with asking questions in science vs. engineering contexts. As a concrete strategy, participants practice developing testable questions together using a hands-on activity. Following the workshop, the participants are given 2-3 weeks to practice the new skill in their own programs, and using a smartphone, tablet, or other recording device, they video record themselves practicing the skill with youth. Finally, during a follow-up coaching session, participants share and critique their own videos in a group discussion.

The follow-up coaching session and discussion is at the heart of the ACRES model. It allows participants to reflect on how they have applied the STEM skills and techniques they have learned in their own practice. During the coaching session, each participant frames his/her video so others can understand the context for the activity or lesson. The participant typically describes the youth, the activity, the reason why he/she selected that particular 3-5 minute video clip, and anything else that might provide insight on the activity. After watching the video, participants and the coach take turns offering feedback to the video presenter using the structure of one strength and one opportunity or area for improvement. The participants continue to take turns presenting their videos and offering feedback, so that each person gets multiple opportunities to think about how the skill can be used and adapted to different settings and activities.

Why do We Need Video Annotation?

In an evaluation of initial ACRES cohorts, participants describe the process of receiving feedback from the coach and other participants as being one of the strengths of the professional development program. However, an interesting dynamic emerged in which some participants wish that they had received more feedback, while others describe the

difficulty in providing critique to others. The difficulty in providing feedback is often noticed by ACRES coaches as well. In a reflection after an ACRES cohort, one coach writes, “I think two of the participants are still timid to share more constructive feedback-saying a lot of positives to hide any negatives.” Another ACRES coach of a summer camp staff cohort reflects after the coaching session, “I’m not sure they were ready to critique each other yet, they were still just trying to give feedback.” Much of the feedback given is positive and doesn’t stretch participants outside of their comfort zone to improve their practice. The idea of “stretch” is essential for the learning outcomes that ACRES is trying to achieve through this coaching model. We want participants to push themselves and their practice outside of their comfort zone to affect positive and meaningful change in their STEM facilitation skills.

Another challenge that coaches notice is the difficulty participants sometimes have in getting their videos uploaded ahead of the coaching session and/or in viewing the videos of other participants in preparation for the session. Often, the first time participants see each other’s videos is during the coaching session where they have to process the content, prepare feedback, and think about how to present it to their peers in a kind and collegial way. This entire process is a heavy cognitive load for afterschool educators for whom this may be the first time they have been asked to provide feedback to their peers or even their first opportunity participating in professional development. For the participants who are sharing their videos, the anxiety of watching themselves on video may hinder their ability to process the feedback they are receiving in real-time.

We explored the potential of a technological tool to address these challenges. In the evaluation of potential tools, we decided that the tool would have to give participants more time to reflect on the videos and process their feedback. In addition, it would have to allow participants to reflect on their feedback asynchronously outside the pressure of the live sessions. By already having their feedback well-thought-out ahead of the live session, participants would be able to more deeply engage in discussion about their practice, without being distracted by the need to think up and provide feedback on the spot. We hoped that these adjustments would allow for a richer dialogue within the coaching session that would push participants to go deeper with their feedback, stretching each other to improve their practice. Finally, this technological tool would need to complement the virtual training by being intuitive and easy-to-use for participants with diverse technological abilities, as well as cost-effective.

Search for Video Annotation Software

Video annotation software (VAS) seemed to be a clear direction to take. VAS offers the ability to “annotate” a video with text markers at specific timestamps. Users can leave

annotated comments on specific video fragments directly on the video. Functionality of VAS varies widely, with some allowing users to mark a specific spot on the video clip, annotate others' comments, annotate at the same time as other users, and choose a range of a video to annotate (i.e. a comment that appears during a 30 second video clip). The software pricing varies from free for the most basic software to over \$1000 per year for the most advanced.

Video annotation software has become a common tool for teacher training and reflection activities in recent years. In a review of the literature, Perez-Torregrosa, Diaz-Martin, & Ibanez-Cubillas (2017) found that the first work on video annotation in teacher education was published in 2009. Since then, several more studies have been published, but it is clear that this is an emergent field that requires further study. Other reviews have compared the capabilities of different video annotation tools and their prices (Rich and Hannafin, 2009; Monedero-Moya, 2015). We started by testing out several of the tools outlined in these comparisons.

Given the rapid changes in technology, we also searched for newly developed video annotation tools that might be useful for the project's needs. We reviewed six different VAS tools including Torsh Talent, Vimeo Video Review, StudioCode, VideoAnt, OVA (Open Video Annotation Tool), and Edthena. After extensive discussions with the project team about privacy needs, the level of comfort with technology of the educators who will be using the tool, and the ideal functionality of the tool, we decided that Vimeo's Video Review Pages (VRP), released in the summer of 2017, were a good fit for the application.

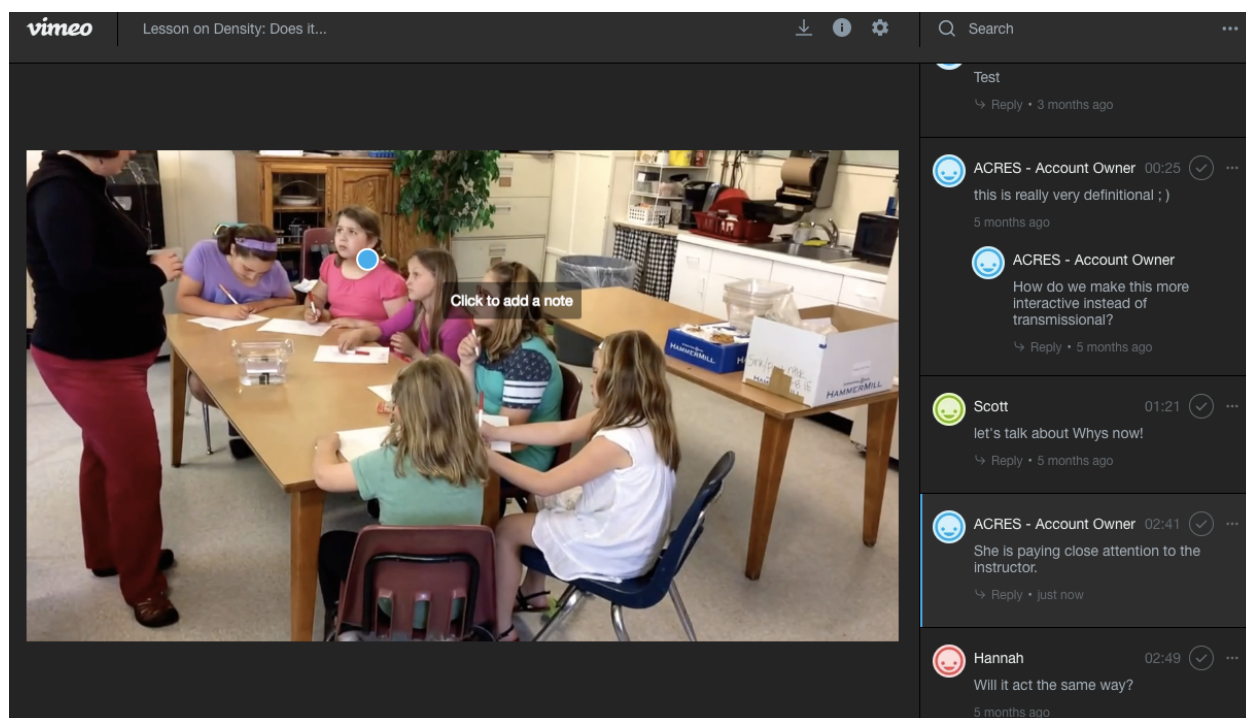
Why Vimeo Video Review Pages?

Ease of use: Of all the VAS tools we tested, Vimeo's Video Review Pages provided the most straightforward and intuitive user interface (see Image 1). The participant is given a link to the review page, and when the link is clicked a window pops up with the video and a running column of annotations to the right of the video. It should be noted that participants do not need to have a Vimeo account or "sign-in" to provide feedback on the video. Participants may sign-in as anonymous guests. As the participant watches the video they may click on any part of the video to make an annotation--in the screenshot the dot shows where the annotation will be made. The pinpointing of the annotation enables participants to specify where their feedback is directed in the video. Additionally, each annotation is time-stamped with the time at which the note was made.

The running column of annotations to the right can be searched by participants, and especially by the educator whose video has been annotated to select annotations that

they may be most interested in reading. When a participant clicks on an annotation to the right, it is highlighted (in this case the blue annotation by “ACRES” or the coach) and the video goes to the point at which the annotation was made on the video. This enables both the educator and other participants to scroll back and forth through the annotations and the video segments.

Image 1: Screenshot of a video review page in Vimeo

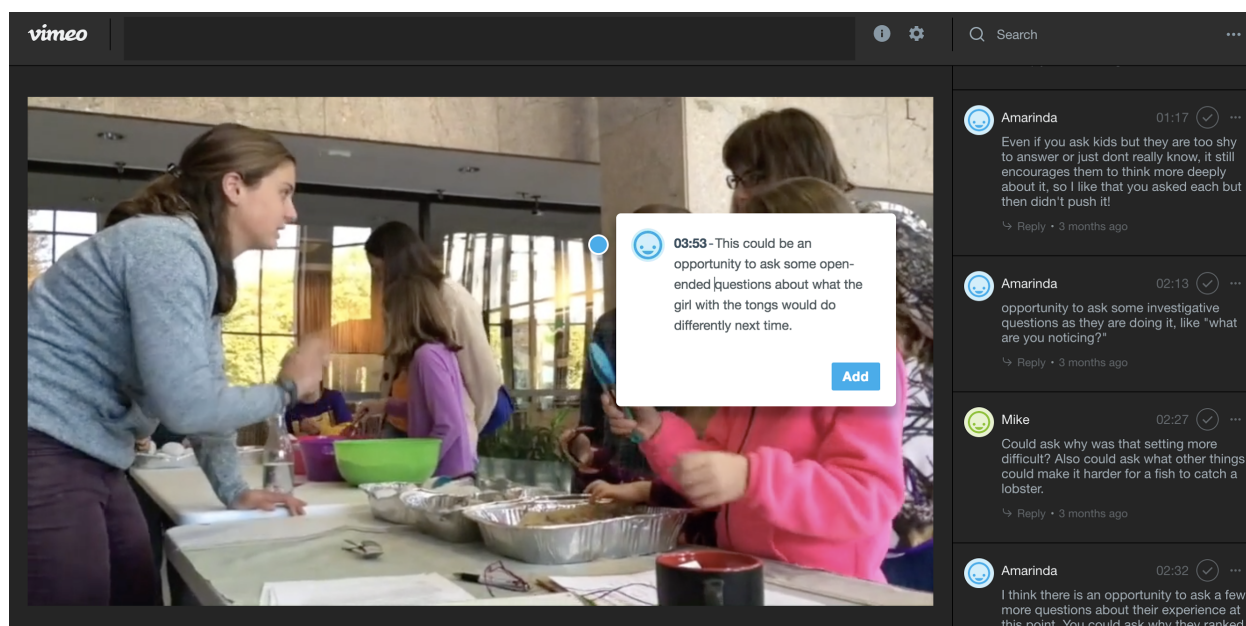


Price point: VRP comes with a Vimeo PRO membership which is \$240 a year and provides three logins and unlimited reviewers. It comes with 1 terabyte of storage per year and the ability to organize the videos in folders for coaches to use for various cohorts of educators. For the team’s needs this was a much more reasonable option than the other platforms we reviewed that were either more expensive or had fewer features. Furthermore, we feel this is a reasonable cost for most non-profit organizations, school districts, and professional learning communities.

Pinpointing feedback: While this feature is discussed above, this is where VRP excels above the other tools we tested. The ability to highlight and pinpoint feedback on a video is at the heart of what we needed for the ACRES coaching model; specifically, the focus on educators’ facilitation skills. VRP was the most intuitive and easy to use for quickly adding feedback to a short 5 minute video. In the screenshot below (Image 2) the coach is adding information about a specific opportunity in the video that the educator could try next time they facilitate this activity.

This is a real strength of VRP, offering a quick and easy platform for providing both professional and peer critique to educators in a variety of learning environments. While the educator in the video is at a tabling event where families are moving around to different stations for activities, we feel that VRPs could be applied to many different types of learning environments: educators both in and out of the classroom, camp counselors, as well as trainings for administrators and teacher leaders.

Image 2: Screenshot of an educator working with families at a tabling event



Password protection: Because the educators upload videos with children in them, maintaining privacy and anonymity is essential. This is a requirement not only for the organization but also for the Institutional Review Board to conduct research on this project. Vimeo is one of the few online video annotation tools that provides password-protected pages (the service may be turned off for public access). Each VRP can have its own password that can be sent to participants in order to provide access to the page.

Logistics and uploading: There are several barriers to rural participation with virtual tools that were considered in the testing of the various video annotation platforms. The most significant barriers are connectivity for rural participants and complexity of use. Connectivity is not only a barrier to live ACRES sessions through Zoom but also affects the ability to upload teaching videos to cloud-based storage, which can take hours in areas with lower bandwidth.

The project team uses DropBox for video uploads which has consistently provided the fastest upload speeds for any cloud-based file-sharing system. Thus, an ACRES participant will upload their teaching videos to DropBox and then Vimeo has the ability to load video files directly from DropBox. A coach may start a batch upload of several videos at once from DropBox to Vimeo and be able to essentially walk away while the two applications talk to each other without going through the coaches' Internet connection. Consequently, this is a huge advantage to the project. The coach in this case does not need to spend a significant amount of extra time uploading the videos to Vimeo. However, the coach must still go into the Vimeo website, create the review pages, and then send the links out to the participants.

The learning curve for ACRES participants we consider to be quite low. While there is a basic level of Internet and computer literacy required to annotate a video, we feel like this is a negligible requirement and find that participants actually struggle more with taking good video/audio and then editing those videos for upload. Once the VRP link is sent out, all the participant must do is click on the link which opens the VRP window and start watching and annotating the educator videos. Annotations are immediately saved to the application when created and are not lost if the participant loses Internet connectivity.

Research and evaluation: An added bonus with VRP is the ability to download the annotations with their users and timestamps included in a csv file. This enables the annotations to be easily used as data in the research and evaluation of the tool itself as well as the coaching seasons. Thus, we can examine questions related to timing of coach feedback, size of the cohort, or video content (advanced vs. beginning educator).

Description of VRP Pilot

A pilot implementation of Vimeo's Video Review Pages was conducted in Fall 2017 with a cohort of three educators who had previously participated in ACRES. They learned the "Modeling the Science Process" skill during a 90-minute workshop session and were required to film themselves in their respective educational settings modeling this skill to share with the others. The 90-minute coaching session involved discussion of each other's videos. Participants uploaded their videos to DropBox, as is customary in ACRES sessions. The coach then transferred them to Vimeo where they were able to comment on one another's videos two days in advance. The coach gave participants the following guidelines for annotating the videos in Vimeo:

Below you will find links to each of your videos on an annotation page. Here are a couple of guidelines as you watch and review each other's videos:

1. To make a comment, click anywhere on the video at the time you want to comment, and a box will pop up where you can type. You can also reply to other comments in the sidebar.
2. As you review others' videos, keep the comments structured around "strengths" and "opportunities" in their practice of Asking Purposeful Questions and Modeling Science Processes.
3. You may ask clarifying questions if you can't make out what was said. On your own video, refrain from responding to comments until we meet on Thursday. You may want to answer clarifying questions ahead of time though. You may add as many comments as you would like, but try to write at least one strength and opportunity for each person.
4. Let's try to review one another's videos by Wednesday night. Let us know if that doesn't work for you.

All participants commented on each other's videos prior to the session. In addition, the coach added her feedback immediately before the session so as not to influence the feedback from the other participants. The coach reflected that the written comments on Vimeo seemed to primarily cover general feedback for the educator. For example, participants affirmed purposeful questions or offered opportunities for questions that would help youth to deepen their reasoning around science practices. With much of the feedback in writing ahead of time, the live coaching session discussion went beyond just strengths and opportunities for improvement. The conversations and questions focused on the youth thinking that was revealed during their video, and opportunities for designing stronger science activities so that youth drive the processes.

After the coaching session, the coach asked for feedback about the use of Vimeo during the session. All three participants said they enjoyed the ease of it and the ability to get their thoughts down ahead of time and at specific points in the video.

Feedback from Participants

We conducted more in-depth interviews with each of the participants following their experience in ACRES. The participants reiterated that they thought the use of Vimeo was helpful for their ACRES experience. Some of the reasons they mentioned were:

- They didn't feel "on the spot" to give feedback

- They were able to be more careful and thoughtful about their word choices when giving feedback
- Vimeo gave them the opportunity to provide more thorough feedback without worrying about monopolizing the conversation in the coaching session
- They didn't have to worry about not having enough time to share everything because they could provide their feedback prior to the session
- On the receiving end- they felt they got more feedback and it was helpful to see the comment directly on the video for context

Additionally, the participants commented on how they received feedback from the coach on Vimeo. All three participants value the coach's feedback greatly and appreciated having her feedback right before the coaching session so it didn't influence the comments of the other participants. All three participants felt that the Vimeo comments couldn't stand alone, and suggested it was important to discuss the feedback in a coaching session. Compared to the traditional coaching session, where videos are uploaded and watched prior to meeting, participants didn't feel that using Vimeo significantly affected the time they spent on ACRES. The participants didn't have strong feelings about their comfort level providing feedback in a regular ACRES session vs. using Vimeo. They all said they were comfortable giving feedback in general. However, two of the participants mentioned that they may have been slightly more comfortable using Vimeo to provide feedback because they had the time to think about their comments more carefully.

Discussion and Opportunities for Improvement

Overall, participants felt comfortable using Vimeo Review Pages to view and comment on each other's videos prior to the coaching session. The main goal of this pilot project was to have a tool that allowed participants to reflect on their feedback ahead of time in order to provide a richer dialogue during the live coaching session. Initial feedback from the coach and participants suggests that this is happening. The ACRES team feels confident using this tool moving forward and testing it out with other cohorts. One notable feature of this cohort is their ease with technology, and we are interested to see if this tool is intuitive for educators who are less comfortable or familiar with technology.

Moving forward, participants had several recommendations that the ACRES team will take into consideration when implementing Vimeo into future cohorts.

Clearer Expectations for Commenting: One person mentioned some unease with not having any guidelines or expectations for how many comments to provide on each video. The coach did provide instructions that said, "You may add as many comments

as you would like, but try to write at least one strength and opportunity for each person.” However, the participant mentioned that it would be helpful to set some more guidelines. This would be especially important for a larger cohort, and participants suggested having guidelines that limit comments to 2-3 per person or having participants comment on a subsection of videos.

Structure of Participation: One person mentioned that because she was the first to provide comments on the videos, she didn’t get a chance to read others’ comments before the coaching session. She suggested building in 15 minutes at the start of the coaching session for participants to view feedback on their own video. She suggested this structure so there wasn’t another task/deadline outside of the course for the participants to remember.

Implementation questions for ACRES moving forward:

- Does annotating educator videos ahead of time affect the level of accountability to the course?
- How does video annotation affect the experience of advanced vs. novice ACRES participants?
- What is the effect of coaches’ comments during the annotation process?

Finally, we think that the video annotation framework provided above has many different applications to coaching projects in education. At its base, this framework could be easily adapted to formal, classroom coaching of skills-based facilitation. Additionally, the combination of asynchronous (independently working online to provide annotations and peer critique) and synchronous (meeting in-person) experiences in a coaching model may provide advantages over simple in-person meetings in the areas of enhancing peer-critiques, saving of time and resources, as well as issues of access and participation. We suggest that more work be done to implement and test VRP in a variety of learning environments. As well, the piloting of such projects should be evaluated to determine what design elements might affect learning outcomes in those environments.

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