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Enacting Video-Annotated Peer Review (VAPR) of Faculty in a First-Year Engineering Department

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Enacting Video-Annotated Peer Review (VAPR) of Faculty in a First-Year Engineering Department

The Video-Annotated Peer Review (VAPR) project addresses a growing need to support the diffusion of research-based instructional practices and to create a formative feedback process to enhance faculty development. Supported by the National Science Foundation (DUE #1244852), the project has developed an asynchronous, video-based peer feedback process using existing software to record post-secondary faculty in their teaching practice, followed by a network of faculty members reviewing the videos using the software to subsequently annotate the video with time-stamped comments and flags. This process enables participating faculty and their peers to identify specific instances of good practices, opportunities for improvement, and opportunities where research-based instructional practices can be included in their classroom.

The VAPR process has been integrated into a first-year engineering department. Utilizing a mixed-methods case-study that includes interviews, observations, and quantified classroom observation protocols, faculty change as a result of peer-review is explored across a three-year period. Exploration of faculty change is being guided by the Concerns-Based Adoption Model (CBAM). This paper will discuss the current status and major findings of the work to date.

Project & Research Goals

Video-Annotated Peer Review (VAPR) creates an approach to faculty peer evaluation that supports the diffusion of research-based instructional practices that can be used to supplement or support student evaluations of instruction, and support student learning. This activity advances the knowledge of learning communities within the context of higher education and faculty development by integrating it with the use of educational technology and social reflexivity's support of diffusion. The evaluation and research projects are yielding a measure of the rate of diffusion of research-based instructional practices and findings related to the impact that peer feedback has on student learning through direct assessments used for program accreditation, general education assessments, and student end-of-term evaluations.

The overriding goal of the project is to enhance teaching and learning in engineering courses through an annotated video peer-review system that encourages the adoption of research-based instructional practices. Based on prior studies, the project seeks to achieve the following outcomes:

1. Practicing faculty will implement new research-based instructional practices in their post-secondary education.
2. The number of participating faculty using research-based instructional practices in their post-secondary engineering classrooms will increase through participation in the annotated video peer feedback system.
3. The use of each unique research-based instructional practice will increase as participating faculty both review and are reviewed by different peers each semester.
4. Students of peer-reviewed participating faculty will be more satisfied with instruction.
5. Students of peer-reviewed participating faculty will be more engaged in the classroom.

6. Students of peer-reviewed participating faculty will exhibit deeper understandings of concepts.

While the project draws on existing research to develop VAPR, the project offers additional opportunities to expand the knowledge associated with learning communities and the adoption of innovations. Prior research in engineering education has examined the concerns faculty face when incorporating innovations[1] and several studies have examined the implication that video-cases have on professional development[2-5]. This project seeks to bridge the two concepts and fields of research to address the following over-arching research question: **How do learning communities, established through video peer review, impact the adoption of research-based instructional practices?** The research question is further broken down to explore how the level of concern, level of use, and innovation configurations of the participating faculty change over the three year duration of VAPR:

1. How is faculty level of *concern* of research-based instructional practices influenced by learning communities?

2. How is faculty level of *use* of research-based instructional practices influenced by learning communities?

3. How do faculty innovation configurations vary from course to course?

VAPR (Video with Annotations for Peer Review) Process

The design of the VAPR method draws on the literature associated with diffusion, the use of video cases in professional development, learning communities, and CBAM to limit the negative aspects of peer feedback and draw out opportunities of diffusion that are not readily addressed in current dissemination practices. In addition, this project draws on the principles outlined by Marx, Blumenfeld, Krajcik, and Soloway[6]. As a result, an iterative process that incorporates annotated video and diffusion identification (Figure 1) is proposed.

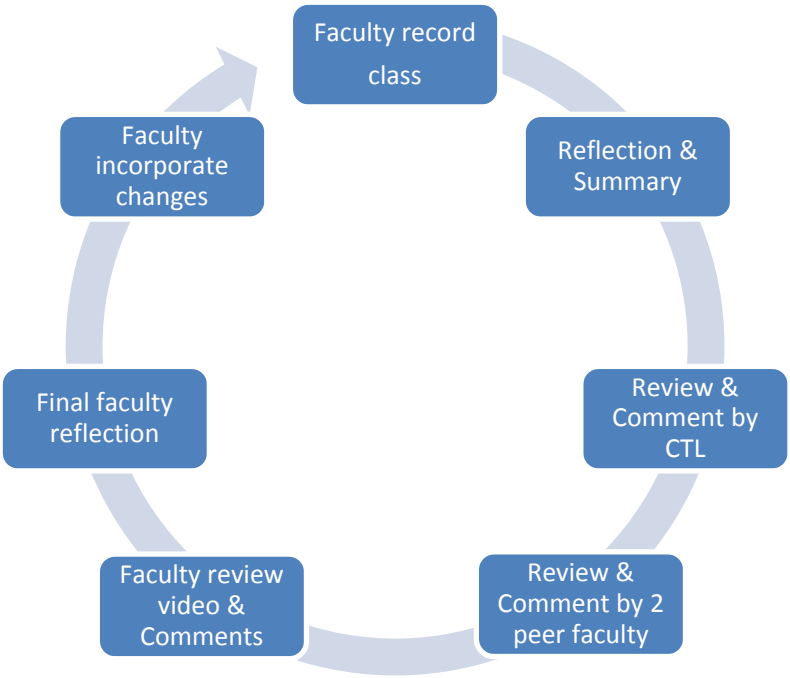

Figure 1. VAPR method

The process begins by faculty selecting one of their class session to be recorded. The video recording equipment is set up by either the faculty member being reviewed or an undergraduate research assistant in a location where the entire class and subject faculty member can be seen for a majority of the class duration. This method of observation through video does not deviate from the intended peer review process, and may alleviate the concern of the "observer effect," wherein the presence of the observer affects the performance of the instructor and potentially the students[7]. In addition, the faculty can choose a class that they deem typical, thereby avoiding a test period or other anomaly that would deviate from their normal instructional approaches. The faculty member can also choose to delete the video before it is reviewed, if they decide it was not typical. Following the class, the faculty member will attach the video to the video annotation software and upload it to the department and VAPR server. Once uploaded, the faculty member completes a pre-observation summary prior to the class session and summarizes the purpose or the intent of that class session. This approach allows the faculty to consider the course goals and learning objectives while situating the reviewer in the context of the class. A brief request is provided to the instructors to prompt them for the pre-observation summary. This reflection later allows the instructor to compare their original intentions and perceptions to their actual execution of those intentions, encouraging a meta-cognitive element to the self-reflection.

After the class session, the instructor uploads their pre-observation summary and invites reviewers to observe and annotate the session. This allows multiple reviewers to review the video at their leisure and convenience. The pre-observation summary provided by the subject faculty member is appended to the 00:00 timestamp of the video, so that the reviewers will see the summary before the video is played. As a result, the reviewers will have the opportunity to familiarize themselves with the instructor's concerns, expected outcomes, and intentions for the class session prior to viewing the video.

The faculty member is then reviewed by staff in the institution's Center for Teaching and Learning (CTL) and then by two other faculty within the learning community. As the feedback from a single reviewer observing a single class session can be unreliable and provides little useful information[7], the VAPR method provides a convenient vehicle for multiple reviewers to review multiple sessions. Muchinsky[8] recommends a minimum of two different sessions be reviewed by two reviewers for any given course during any given semester. CTL reviews the video with the sole purpose of identifying innovative research-based instructional practices within the video and opportunities for the inclusion of research-based instructional practices. This provides models of practice to reviewing faculty that are identified to be highly influential on the way faculty teach[9].

The faculty reviews are conducted after the initial review by CTL and are guided by a peer review form, developed prior to the implementation of the video-annotated peer review system for the existing paper-based faculty peer review and feedback system, that identifies a table of attributes that include the instructor's organization, knowledge of subject matter, clarity and pace, atmosphere of the classroom, and professionalism.

Following the faculty peer reviews, the subject faculty member reviews the video with the asynchronously annotated feedback of CTL and faculty peers in the learning community at specific time stamps corresponding to events in the class session to which individual CTL and faculty peer comments pertain. Following the reviews, the subject faculty member completes a final reflection. As weeks have potentially passed since the subject faculty member has reflected on his or her teaching practice, this final review by the subject faculty member allows that participant to examine the original intent of the class and reflect on how their fellow faculty perceived the class session.

The VAPR feedback process is then repeated one additional time throughout the term. It is intended that reviews will take place during the first and fourth quarters of an academic term, allowing enough time for the review process and an opportunity to begin to integrate some of the comments into participating faculty teaching.

Participants

The participants involved in this project include nine faculty that make up a learning community in the first-year engineering department at a medium sized university in the southeast. The first-year engineering department is a non-degree granting service department in the College of Engineering responsible for teaching core first year engineering courses that cover the introduction to the engineering profession, programming and problem solving, and graphical communication. Faculty participants in the department are summarized in Table 1.

Table 1. Profile of participating faculty (N_{Total} = 9)

Participant Demographics	**(N)**
Rank	
Associate Professor	3
Assistant Professor	5
Instructor	1
Tenure	
Tenured	0
Tenure Track	5
Non-Tenure Track	4
Education	
Ph.D.	5
M.S.	4
Sex	
Male	5
Female	4

The participating faculty primarily teach the courses housed within the department; however, several of the faculty teach outside of the department as well and at the sophomore, junior, senior, and graduate level courses. These courses cover topics ranging from Aerodynamics, Fluid Mechanics, Fundamentals of Programming to Applied Ergonomic Design, Analysis and Evaluation. The participants include both tenure-track and non-tenure track faculty. There are faculty dedicated solely to teaching while others are also involved in engineering education research, primarily supported by University funding.

Evaluation Plan

Felder et al.[10] outlined three levels of evaluation for instructional development from Chism and Szabo[11] and offered suggestions for assessments. Level 1 consists of questioning how satisfied the participants are with the program. Common level 1 assessments include end of program interviews and satisfaction surveys. Level 2 evaluations identify the impact that the professional development had on teaching knowledge skills, attitudes, and practices, and are typically assessed using assessments of student centeredness, pre-and post-program student ratings, and peer ratings. Level 3 specifically addresses impact on student learning. The most common assessments for level 3 include standardized instruments and assessments of course learning objectives and outcomes. Felder et al.[10] note that Level 3 evaluations are difficult to answer and therefore require the previous two levels to fully understand the implications of the intervention. Therefore, this project seeks to include assessments that address all three levels related to the outcomes of the VAPR (Table 2). The primary forms of data used to evaluate VAPR include the recorded videos of the classroom, faculty interviews at the end of the academic years, student focus groups of each recorded classroom, student evaluations, and end of year grades.

Table 2. Evaluation Plan: Project outcomes, related theoretical frameworks, and evaluation methods

Outcomes	Data Collection	Data Evaluation	Success Criteria
1. Diffusion of practices	Recorded Video Faculty Interviews	# of uses of innovation Depth of implementation Description of why faculty implemented the innovation	Increase of overall number of faculty in learning community implementing a specific innovation in their courses
2. Implementation of research-based practices	Recorded Video Faculty Interviews	# of uses of innovation Depth of implementation Description of how faculty implemented the innovation	Identification of not previously used innovation being implemented and sustained in a single faculty's course
3. Change in faculty approaches to teaching	Recorded Video Faculty Interviews	Comments with respect to peer review form Description of how and why faculty changed practices that are not research-based specific	Positive change in faculty peer reviews Indication of prior comments being addressed
4. Improved student satisfaction	Student focus groups Student Evaluations	Trend analysis of change in individual faculty student evaluations Trend analysis of learning community aggregate student evaluation	Overall increase in student evaluations Student identification of faculty changing their approaches and positive student comments
5. Improved student engagement	Recorded Video End of year grades	# and depth of questions being asked # of students actively engaging in course Trend analysis of student grades	Increase in depth of questions Increase in # of questions asked by one student Increased # of students asking questions overall Increase in student grades

Methods

This study employs a mixed methods design where qualitative data is used to address each of the research questions. The primary sources of data include the faculty interviews and recorded videos from the VAPR process. The videos provide in-depth descriptions of how the RBIS are implemented and how this implementation varies across time, course context, and participants. The interviews are conducted with each of the participants at the conclusion of the Fall semester. The interviews utilize a modified version of an interview protocol developed and implemented by Cutler[12] in her assessment of the use of research-based instructional strategies (RBIS). The interviews follow a pattern of requesting faculty to describe a typical day in their course, description of teaching experience, interactions with colleagues, and an identification of which of the RBIS they used, how they use them, and why they decided to use them. This identification of RBIS is guided by the identified four main RBIS groups (Table 3): active learning, group learning RBIS, self-regulated learning RBIS, and real-time assessment RBIS. Included in the interviews, participants are provided with a table that identifies each group, specific RBIS associated with the group, and a description of each of the RBIS.

In addition to identification of RBIS's, as described during the interviews and confirmed by observations, the interviews are a-priori coded with respect to the Concerns-Based Adoption Model (CBAM)[13]. The faculty interviews also include a protocol that incorporates feedback on VAPR, how they used VAPR, and VAPR's impact on their instruction. The data are analyzed using the analysis methods specified by CBAM to identify the level of change, level of use, and innovation configurations along with open-coding for patterns in usage and perspective of VAPR.

The remaining data collected as part of the evaluation plan (student focus groups, evaluations, and end of course grades) along with observations and interviews serve as triangulation and therefore validation of the research findings.

Table 3. Overview of RBIS groups and descriptions[12]

RBIS	Description of RBIS as presented in interviews
Active Learning	A very general term describing anything course-related that all students in a class session are called upon to do other than simply watching, listening, and taking notes
Collaborative Learning	Asking students to work together in small groups towards a common goal
Cooperative Learning	A structured form of group work where students pursue common goals while being assessed alone
Think-Pair-Share	Posing a problem or question, having students work on it individually for a short time and then forming pairs and reconciling their solutions. After that, calling on students to share their responses
Inquiry Learning	Introducing a lesson by presenting students with questions, problems, or a set of observations and using these to drive the desired learning
Just-in-Time Teaching	Asking students to individually complete homework assignments a few hours before class, reading through their answers before class, and adjusting the lessons accordingly
Problem-Based Learning	Acting primarily as a facilitator and placing students in self-directed teams to solve open-ended problems that require significant learning of new course material
Concept Test	Asking multiple-choice conceptual questions with distracters (incorrect responses) that reflect common student misconceptions
Peer Instruction	A specific way of using Concept Tests in which the instructor poses the conceptual question in class and then shares the distribution of responses with the class. Students form pairs, discuss their answers and vote again.

Major Accomplishments

To date, the followings components have been completed:

- Baseline data observations (3) and interviews collected for all nine participants
- Baseline interviews and observations coded
- Software selected to facilitate VAPR
- 3 semesters of VAPR conducted

Ongoing analysis is currently leading to publications that 1) characterize the implementation of the VAPR process and underlying theoretical frameworks that guide the implementation and 2) the characterization of peer review comments based on academic background and familiarity with the subject matter.

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