KEN HAY: Following Roy and Ricki, what a pleasure. I'm Ken Hay from the Learning Sciences Program at Indiana University. I'm going to talk about event recording, digital revolution and standards. First, I want to thank Dennis Heff for these tools that have come out a couple research projects and a professional development project, one involving kids building 3D models of the solar system in a (inaudible) based framework, a project called Apprenticeship in Cyberspace that enabled teachers to analyze their own teaching through a video case tool, and a project in collaboration with a college board. We licensed that technology and are bringing it in to mathematic classes. So I want to talk about why we talk about standards now. There's been a couple different uses of standards, but I think one of them was talked about, we had this access to cheap camcorders. Well, as a number of our elder statesmen and stateswomen have suggested, these technologies have been around for a long time. So that's probably not the key reason. Quality research standards. Certainly an important issue broadly but again we've had a fairly rich history of video and film analysis. We have some models. What I would argue, it's the digital revolution. I was struck a little bit yesterday about how infrequent kind of affordances of technology, individual
technology were used and talked about. In many ways, what was talked about could have been accomplished with a video tape or even film. So what I want to do is kind of zoom in on this issue and fortunately or unfortunately, Roy has framed a lot of this stuff already in his presentation. But I want to really look at specifics, some specific affordances of the digital revolution. So one set I'm going to argue is we should be talking about recording events not video. Now, we have a video camera in the back of the room, and I would suggest that that's recording video. It's pointed right now at me. It has a singular perspective. But that's not the event we're experiencing. We have a screen over here. Ricki had handouts. We're going to create posters. All of those comprise of what we discussions at some point and the videographer will diligently try to capture both of them, but for the most part you all, he gets the back of your heads and he gets my face. So what I suggest is that digital revolution creates an opportunity to record that entire event and capture that entire event.

And I use Roger's notion of binding all of those elements together. So we can capture now holistic event data. So what class was it? The lesson plans, instruction resources, who the participants were, field notes, etc. We
can capture participant data so student profiles, pre, posttests, student work as well as a variety of temporal data sources, video being one of them, but audio and screen captures. So what we did in a system we call ITMD, Integrated Temporal Multimedia Data Research System is tried to create an infrastructure, a way to capture and bind these elements together. So what ITMD does on one level is this binding. So typically we use eight video streams. We capture 20 screen capture streams, 21 participant audio streams. We capture three posttest items from students that are relevant to that event as well as individual student work in the form of word documents. The second affordance of digital video or the digital revolution I should say is what I'm going to call random access. Tapes are linear devices. You'd have to run through a linear path to get to a particular point. Random access allows you to get to any point in that video, a corpus of video in one click. So we have one click access to any element in the event. We can create conceptually which is between all relative, related elements of the event, temporal and non-temporal. So when a student is working on an assignment, we can actually tie the video, the audio, and the actual assignment he turned in together. We can create linkages between events through indexing and
searching, so all students that did this one particular part of this assignment. Huge digital storages create this huge, vast capability to store these videos. When I first started this work, I had this wild notion of what it would -- and tried to do a little research and see if I could get funding for a terabyte of information. That was about ten years ago, and it was $100,000 range. Now, this summer, I bought a terabyte of information for under $1,000. We're talking hours of magnitude in terms of just local capacity. But then we also have distributed capacity through the web and the internet. We also have the ability to link these intermediate representations and probably final products back to the primary event. So the second affordance of this digital revolution is this random access. So in ITMD that looks like we start by creating a set of coding schemes. So when we code a participant in an activity what that does is not just code the person but it connects that video clip to that person's audio to that person's video at that time period to his pre, posttest items relevant to that, the whole test to that clip as well as his entire student work. When we create activity codes, what we're doing is not just coding it, but we're linking it to the pre, posttest items that are related to that activity as well as a section within his student work again that's
related to that activity. And then all the other codes that we use create index to search and move across. We create VRML visualizations that link the intermediate representations, the VRML to the primary record.

So this is our flexible multimedia display window. You'll notice that above each of the videos is a pull down that allows you to grab any of the cameras or any of the computer screens and mix them flexibly. So when students go from one computer to the next when they're working in small groups, we can track that very easily. Create codes and then in the bottom right are the participants. So this is all constructed through a coding scheme, and this is the output. This is a fairly complex intermediate representation, but basically these columns, each color represents a student and the blank indicates an interval over time. Now, the unique part about this is you can click on any one of those and jump right to the primary record.

The third affordance of the digital revolution, and Roy beat me to the punch here. Thanks, Roy. Clips, it's not about clips anymore. It's about meta data on the full event. So clipping is a destructive act. It destroys the video. And because of the technology of the past whether it be film, video or even digital in the cost and
the space it took, you had to clip video, clip events and in that destroy it. I would use an analogy Fred used yesterday is it's the same thing when you talk about the natural history research of having the critters versus destroying the critters. We can now, you know, have the whole event. Fourth affordance of the digital revolution, friction free process flow all the way from event recording to research projects, whether they be scholarly or professional development. So this creates boundary objects between researchers and an entire community as well as between research and practice. So it's not all disconnected. There's this free flow and connection between those communities. This overcomes cherry picking best examples because we can provide as many examples as you want to. It doesn't have to be on the first layer of the display, but here if it's a teacher in professional development and you're looking at a questioning strategy, you can say, all right, you want math examples. Just click math. If you want English, if you want this, if you want this, boom, boom, boom. It's all there as a representation of a particular idea. We've done this with teachers actually and scaled down this research to what we call a video case tool. It enables them to record classroom events, code them, analyze them, share them, share clips
with each other and create cases that they, in turn, can share.

So you look at the way national boards are created right now. Teachers have to create, submit two 20-minute segments of a lesson. The reason why it has to be 20 minutes and it can't be cut up is because of this concern about cherry picking, that they're just going to grab real small sections. If you had this type of technology, you can say here's the whole event but here's the specific things that are important to my professional development and I'm talking about the credentialing process. And the video case tool, this is the end product, the case itself. And again it's a flexibly blended set of video streams where teachers can create annotations. They code the clips, bring them into this page and create a video case that that's online and share with their colleagues.

So what do these affordances buy us? I look at that on three levels, individual researchers, collaborative researchers, and secondary analysis research. Tools like ITMD enhance productivity for the individual research. In the book that Roy and Brigid and Ricki are putting together, we do kind of a quick and dirty study of what we call friction in the research process. By friction we mean
those things that are not intellectual and analytical but are just kind of grunt work of the process. So recording and back ups, chunking and coding, accessing and distributing. We analyzed that and found that through these systems, we can have a 94 percent reduction in this type of friction. Now, when you reduce friction that doesn't mean, oh, everything does all the intellectual work for you. Caveat. But it does help you be more efficient. So benefits to collaborative researchers is an easier ability to share data sets through geographically remote sites. And for secondary researchers, there's the potential to aggregate data sets where an entire community of researchers conduct research on recorded events and not have to collect them themselves.

So why do we create standards? There's a number of reasons why I think we should create standards. First, we have to create standards I think because we want to guide software development. Now, I've created a tool, but that tool is focused on my immediate needs. I'm trying to think through, all right, what's a broader need, but if we don't have standards as a community it's going to be focused on a set of very particular needs. It will also guide data collection systems. So we had this, in our research, we had this really intense, multi stream
recording system, and it created some real unique opportunities for us, but that's inappropriate for this teacher professional development. And so creating standards guides and frames those efforts for different purposes within a general system, general idea. Standards will help support doctoral training so people can see and move from one place to the next. So it's not just this tool here, and I go to another place and create or use an entirely different tool that will support communications and dissemination. But I think probably the most important is standards, specifically meta data standards will enable the secondary analysis.

So I want to talk a little bit about some of my ideas and a product we're trying to work through in terms of the type of meta data standards for event recording. So first, we could create specific coding schemes, a coding scheme standard. So types of events would be one thing to give examples on. The second would be more open frameworks that codes would fit into that would be easy to share. So examples, holistic event data. So you could create some --

KEN HAY: -- a field base of exercise. You could focus on particular participant attributes and field notes. Participant data could be another set of coding schemes, fifth graders, age, measures on some standard scores,
student work, things of that nature. And probably we could do some, and Kathy did this yesterday, talked about her first pass analysis. And if you look at that, it was a very kind of generic lecture, points in time or interval. I'm sorry. First is the chunking part. Could we identify how big the unit of analysis is? Is it episodes in a classroom and defining as a community defining standards of what an episode was? Are there point intervals in terms of chunking? Then I was going to do coding. So we could look at high level coding schemes that would help us in terms of looking at a lesson or a classroom in terms of here's discussion, here's group work, here's individual seat work, here's a lecture. That would be very valuable. And we could probably define it pretty as a community. These all leverage us, leverage our ability to share and aggregate data because then we could look at if I'm interested in technology based group work in mathematics classes, I could search a large database very quickly and find those events and save all the time not just recording that event but searching all those different databases or videos, individual videos.

Now, there's a point where that is going to break down where the coding schemes become individual and theoretically relevant. The way I think about this is how
we can come to share our coding schemes and how we can use -- if we have standard ways of creating coding schemes and if we have even one more person buy into that coding scheme, that creates a huge opportunity. Now, this goes down to even a single dimension. So if collectively a group who are interested in very different things, but they coded everything on questioning strategies and if they agreed to questioning strategies in a particular way, then they could search just that one dimension and do interesting work. So to kind of wrap up, what we're trying to do at IU now is to go to the second version. What I was able to do and none of these projects were focused on developing these technologies, social technologies but rather they were part of a larger issue. So they're all kind of prototypes, and so what we're trying to do is generalize, create a general technology framework to incorporate all those functions. We've completed some conceptual designs and a gooey prototype. And what we really need is feedback to look at some of these broader issues in depth of theoretical breadth. I think community based standards really help us further develop this, and then we need to find, the last thing, always find funding to architect and develop it and then have some guinea pigs to play and push on us with the new infrastructure.
So next steps and opportunities. First, a
shameless promotion. Indiana University is going to be
hosting the Seventh International Conference of Learning
Sciences in June so, please, all of you are welcome to
attend the proposals. Deadline of that (inaudible) passed,
if you'd like to be a reviewer, please give me a buzz. But
I think that the structure of the conference creates an
opportunity that I'll offer up as a way. We have a couple
days of workshops up front we can, if we're interested,
sponsor a workshop around these areas to take maybe the
next step, maybe the third step beyond what we're doing
here. And there's the URL.