EXPLORING A NEW TECHNOLOGY FOR TEACHING AND LEARNING: KCTCS VISUALIZATION AND IMMERSIVE EDUCATION INITIATIVE
MARCH 31, 2005
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>>PARKER: My name is Becky Parker, and I'm on staff at the National Dissemination Center for Career and Technical Education, sponsor of today's webcast presentation. Today we are pleased to have with us Jamie Justice, director of technical education and work force development from the Kentucky Community and Technical College System, frequently referred to as KCTCS.

Have you ever considered what teaching and learning was like without technology? For some viewers that may be difficult. Or how many instructors have infuse technology such as videos, interactive computer programs, or white boards into their teaching strategies. Or better yet, what new technologies will future instructors need to utilize to engage new learners in their classrooms. Jamie is going to share with us some emerging technologies that have the potential to impact teaching and learning by shortening learning cycles, reducing training costs, enhancing critical thinking skills, and much more.

After Jamie has shared his insights regarding this technology and its implications for its use, he will entertain questions from our viewers.

Jamie, welcome.

>>JUSTICE: Thank you, Becky.

Good afternoon.

Good afternoon to my fellow associates back at KCTCS and to those of you here in the audience.

Thank you for allowing me the opportunity to share with you some very exciting applications of technology that the Kentucky Community and Technical College System is exploring in the areas of visualization technology.

Currently we are exploring two technology strategies. One is a 3-D stereographic presentation model called Emergence Learning. I will share some examples of that with you later today, along with some virtual reality simulations, something which most of you may be familiar with.

I look forward to sharing the vision, the applications and demonstration of these initiatives during the remainder of the event, so to that end we want to take a look at where we are today and where we want to start with as far as the integration of technology. There are abundant challenges for educators in all fields of education, ranging from societal issues, engaging learners in a
stimulus-laden society, while attempting to meet achievement goals for all.
And to that end and add to that an ever-changing workplace, baby boomer retirement, industry readjustments, rapid technological advancements, and we're challenged to explore all of the newly innovative ways to meet the needs of all learners in an engaging process, to deliver quality instruction and to meet the needs of workforce.
Inflexible schedules must give way or integrate new and flexible schedules and delivery systems, including things such as distance learning, technology integration, or integrative modalities to best meet the needs of the learners we're working with. We have to be ready to prepare individuals for lifelong learning and to prepare learners with the skills necessary to fill the jobs that are being created and that are even unknown today. We don't even know what the next jobs are for the next century we're going to create, or for the next few years. So a few points to ponder as we begin, and most of them rhetorical questions, but, for example, in 1913 it took six weeks to build an automobile. In 2005 it takes a little over a day. The question is has technological advancement changed demands upon education and can education meet those demands to change with the exponential rate of change of technology. In 1913, for example, it took 16 weeks to teach Physics 101 or English 101 or Math 101 or whichever other course that you want to add. How long does it take in 2005? Does it still remain the 16-week model? Are we seeing some variations on that? Of course this is rhetorical. We'll see some variations on that. Today we teach 55-minute blocks or two-hour blocks in most subjects, secondary levels, still rely on the old Carnegie unit. But how long does it really take to provide engaging, effective instruction. In other words, have content requirements changed, and if so, is there a need for new delivery methods and ways to meet the needs of learners that we just discussed. In short, we ask can technology improve -- help improve instruction. It's one of the key premises behind this initiative and the research that we're doing. There are some broad educational goals that we can take a look at. Three of these come directly from the No Child Left Behind Act. For example, higher student academic achievement through integration of advanced technologies, including emerging technologies, intracurriculum, and instruction; increased access to technology for teaching and learning; use of technology to assist in the implementation of state systemic reform; and lastly, and this is more
general, is improving teaching and learning strategies and utilization of assessment data in more of the real time format and real term model.

There are some expectations we have in looking at the development of this initiative, visualization, and how it can impact in a teaching and learning environment.

Some key expectations that we hope to meet are a new way of integrating a new and existing content to bring new models, new items into the classroom.

Maybe they're high dollar.

We can't afford to replicate across multiple systems, multiple classrooms and multiple locations.

Shortened learning cycles.

We hope that through the use of visualization that we can provide shortened learning cycles and help learners become more effective, in other words, to go from being a beginning employee to a higher producing employee more rapidly, or I guess another analogy would be to become a -- go from a beginning student to a higher performing student at some level along their learning career.

We hope to increase access to training, whether it's via distance learning model or through a simulation or through some powerful presentation technique.

Ultimately we hope to meet employer and student needs and expectations.

We see opportunities for enhanced technical and academic instruction through use of visualization, and we also look for provision of a higher skilled work force with strong academic and technical skill sets.

Really a teaching and learning methodology, a model of connected instruction, a way to meet student needs.

In the graphic that I'm illustrating, you can see the triangle there. That really represents the entire student body that we work with, and instructional factors that we need to apply to meet those needs.

We have, of course, the diversity of learners.

And you'll hear later on about diversity of the workplace and how we rely upon the strength through our diversity. Relevance of instruction is very key to all learners.

Application, is it something applicable they can take home, they can use and utilize later.

Is instruction engaging.

And especially in a stimulus laden society where there is so many stimuli coming towards us, whether it's television, whether it's Internet, computer games or other types of technology.

How do you meet engagement requirements for students at all levels, and ultimately meeting student needs, whatever those are.

Well, to do that we still have two categories that we use historically, innovative instruction and assessment, but how those two work together also help to drive curriculum, the foundational
competencies we need to address, work force training and application. Core employability and occupational competencies are all key factors of a teaching a learning model, at least from the standpoint of the visualization initiative.

There are some outcomes that we focus on for our learners.

There are multiple learner outcomes that we want to address, but I want to focus on six today.

First is access.

We always have challenges of access.

How to get students to learning or take learning to students, vice versa.

Whether it's a matter of schedules.

Utilization -- utilization of distance education, or as needed sequential chunks so that if you get this piece of instruction you can build it with this piece later as you need it and ultimately roll it out into certificates, diplomas, or degrees.

Relevance of instruction is another key factor that drives learner outcomes.

Is there an immediate application.

Is there a -- are there manageable increments of instruction that can be used that will help lead them along the pathway of other education.

Ultimately what we often refer to in KCTCS, the three J's, just enough, just in time, just-for-you instruction.

Assessment is another key component that drives learner outcomes.

Attainment and mastery, how do we get measures, how do we make inferences that student learning has occurred or that learning is occurring.

That's really what you can do with an assessment in a real application.

Learning support and accountability are also key.

Not solely content, but models to make inferences about knowledge, skills, and abilities from limited data are all key factors in assessment as it drives learner outcomes.

Ultimately we look at engagement.

And you'll hear me talk about engagement from multiple points throughout the presentation.

But engagement is key.

If you don't have engagement of a learner, engaged in the learning process, will real learning ultimately take place.

Engagement points at things like technology, how we can use technology to enhance instruction and to better engage the learner in the learning process.

Location, where instruction takes place, sometimes the environment itself can have a negative effect, and I go back to the early years in education we always talked about the lawn mower principle.

It's the same kind of thing.

What other kind of things are stimuli that interrupt delivery of good instruction.
Entertainment, interest, captivation, all equal effectiveness. If you can have somewhat entertaining, interesting, and captivating presentation you will have a little bit more success in the effectiveness of your instruction.
I've heard the term coined edutainment. I don't know exactly how I feel about that as a term, but it something that we do want to focus upon. And ultimately how we appeal the senses of the learner within the educational environment. Another key factor that drives expectations -- and this holds true and will always hold true -- and that's high expectations for all learners regardless of where they are along the pathway. Some typical things that drive learner outcomes and expectations are standards, certifications, employment or transfer, core skills, occupational skills, foundational skills or employability skills. And lastly, as far as learner outcomes are concerned, we take a look at the learning skill sets themselves. That's where we teach the varied modalities, your brain-based learning models of instruction, infusing technology when appropriate, Instructional pace, are all key factors that drive learning skills and help meet the needs of learners and learner outcomes.
At this point I want to let Dennis Parker of Toyota Motor Manufacturing North America share with you some of his insights and some issues around Toyota. Toyota has been a key partner with KCTCS in the development of technology and in the development of visualization and other partnerships. At this point I'd like to allow Dennis to share with us some of his insights.

>>PARKER: NBC staff traveled to KCTCS to speak with Dennis Parker from Toyota about the plans to partner with KCTCS with its new technology. The conversation began with developing an understanding of Toyota as a company and their work force needs.
>>DENNIS PARKER: Toyota fully understands the importance of the worker, at every level, whether that's the president of one of our facilities or whether it's a team member working production on the floor, within that work force development. I'm an assistant manager in that group. Within that group I lead a group known as multiskilled maintenance development. Our primary mission is to support the total business of skilled maintenance operations in the Toyota's 13 North American plants. Our biggest challenges -- there are a number of challenges. Our biggest challenges that face Toyota today primarily stem from our rapid growth. Toyota has, for the purposes of building our vehicles and marketing and selling those vehicles, has organized the world into six major
regions.
We have the North American region, which consists of Canada, the United States, and Mexico.
That region we currently have 13 manufacturing plants.
Over the last several years now that Toyota's market share and sales volume has been increasing very rapidly, because of this increase in sales, we've also had a very rapid increase in our manufacturing capacity.
We've had to build a lot factories.
We've had to build them in various parts of the world To meet the growing demand that we have.
We have another strategy that we call regionalization, and what we want to do in a region is we want to build cars in the same region in which we sell cars.
That rapid growth has given us a number of challenges.
We -- one of the ways, among many, that Toyota achieves quality is we have the best workers in the automobile force, the best workers on the production floor, the best workers in the skilled maintenance force that we have.
We put -- we invest a tremendous amount of resources into both identifying those workers, getting them hired, and then developing them following their hire at Toyota.
Because of that rapid growth we've had to promote people quickly. We've had to change technologies quickly, and we've had to do that with people -- a lot of people who haven't been in the automobile industry that long.
That puts a great burden on training and development and mastering new technologies.
It puts a great burden on identifying the people who can come into our plants, who can learn quickly, who can be flexible, who can understand what's happening in the manufacturing process and in addition to their own learning and development who can understand that process well enough to actually bring their thinking power back into that and improve that process.
So I would say human resource management in general, development in particular, has been one of our key challenges.
In developing our work force, one item that Toyota understands clearly is that when we have a diverse work force it brings great strength to us.
Different cultures, different types of people bring different ways of thinking to the manufacturing floor and to the manufacturing office.
They will bring a different value systems in there.
And then, of course, the challenge for us, and one that I think we've met very well, is to bring the strengths from all of those cultural differences that we have, from all the different types of people we have, the different backgrounds we have together, and to weave those into a -- into basically a more holistic way of thinking that takes a more complete look at our manufacturing processes, our manufacturing
technology, our people management, our people development. It takes a look at having people work together in bringing out the best in one another.
We have this great value on diversity. We understand how that works, to strengthen our thinking processes, our work processes, the way that we envision new processes and technologies in the future. So it's one of our strongest assets.
We have to begin, because training and development costs money, we have to be very conscious of how people effectively learn, how people learn best, how people learn quickly, and in turn the types of methodologies that facilitate that learning.
And we also have to fit that to our specific types of working activities that we have, that we have in the plant.
That sounds a little bit complex, but that's because that's actually what that is.
So if I have a worker, let's say I've got a mechanic that I've hired, that mechanic can do very good work for me. We have a lot of mechanical work to do. The unfortunate thing is they're not very flexible. They can only handle my mechanical type jobs. I can only use them at that time.
And if I need -- let's say for example I also need an electrician in there, and one of our folks with electrical skills or another team member is off on a different job, we may be losing time, money, productivity and manufacturing because we don't have the right skill there.
So I need to take that mechanic and I need to basically begin training them in electrical skills. Well, how long will that take? Which is a rhetorical question, of course.
I need to find -- electricity is a very conceptual skill. Even though it has tremendous hands-on application on the manufacturing floor, in order to understand what to do on that floor and to know how to problem solve, to know in a -- in an environment that may have multiple solutions, to find that right solution in there, there's a tremendous learning curve I need to take that worker through.
If I spend eight or nine years training that worker as opposed to two or three years training that worker as opposed to six months of training that worker, that has a tremendous impact on the bottom line in the business.
How long do we take them off the manufacturing floor to do that training. That causes us to continually look at new technologies, to continually evaluate new technologies for training.
I see this new 3-D technology as being the very next significant leap forward into what we can bring into the classroom or into the learning
environment.
With something very conceptual, like electricity, with something that brings great strength to conceptual learning like 3-D visualization, I see that as -- I see a marriage there where we can shorten that training cycle from, to use my example earlier, from seven or eight years to gain the skill, maybe some of our previous technologies and methodologies brought us down to that two to three year level. Maybe now this visualization technology is going to help us make another significant reduction of that.

>> JUSTICE: So as you can see, not only do we need to be cognizant of delivering within a teaching and learning environment, but we also have to be very much aware of the needs of business and industry partners such as Toyota who are looking for a skilled work force somewhere down the road that has a broad set of skills or has a lot of cross functional skills and different skill sets, employability and foundational skills.

As we move forward in looking at the next level of development we have some key elements to consider.
And primary to those are things such as partnerships and development and application.
And I can't emphasize enough the importance of engaging partners along this process.
Not only do we have partnerships in collaboration with secondary, postsecondary, business and industry and content developers to develop and refine and implement applications of technology; we need to always be looking at other applications that this may crosswalk with where we can better deliver the instruction that we're after and meet our goals.

The next thing we have to be very aware of, or a key element, is content validation.
That's utilization of subject matter experts to validate simulations and models, to make sure that what we are trying to replicate is accurate.
I'm going to show you a model here later on of the human heart, and it's an early version of the model.

We know it needs more refining.
Looks good to me, but does it look good to a doctor, does it look good to someone who really knows something about the heart or any other type of technology, so subject matter experts and content validation is a very key component of the delivery of this initiative.
Then we have to look at the visual learning objects themselves.
Where do we get the content.
How do we develop the content, and to what level of quality does that content need to be developed.

You know, there are many models out there that are available. There are probably hundreds of thousands of models available. Some of those look really good, but when you try to delve inside of them into a little more detail, they may only have blank spaces and
not enough content, so we have to make sure that the learning objects that we create are valid and are also of quality enough to sufficiently deliver the instruction. And then again I'm going to come back to the point of student engagement.

With this technology, just like with any other technology, it's a means to an end. It's not a be all or the end all to any instructional process. It's another tool that we can use to enhance the teaching and learning process. It's very important that we are always aware of where we apply and we make good decisions with content that we do choose to develop visualizations around and to where it really fits, it fits, and if it doesn't let's not force it because we have something that has a real wow factor. That's very key.

Then lastly, work force development, that we look at ways that we can use this technology to support development of the work force and meet some of the needs such as Dennis just illustrated in his presentation. Visualization and emergence education has several things that we hope to gain from it. We see it again as an improved instructional delivery model to enhance delivery, where it fits. It's another way of engaging learners. It's a targeted instruction and assessment tool. It's increased content delivery and maximized learning. And it's really the key areas that I think where we're unique with this development at this point in time, and where we'll be in the future, we never know, because it's amazing over the two years that we've seen this develop, where we are now compared to where we were two years ago beginning the development process. But the following three areas I think are key to what we're going to accomplish with this.

One is real physics integration. We've all seen models, artist renderings, if you will, or cartoons or illustrations of machinery working or some other device. That's really just an artist's opinion of how it looks. But with the simulations that we're developing we base those on real physics.

So, for example, if we're replicating a piece of machinery and it has a hydraulic cylinder and that hydraulic cylinder requires 2500 pounds per square inch fluid pressure, if we can replicate the fluid dynamics taking place inside of that model and show if we drop the pressure or we lower the pressure, raise the pressure, something happens to that cylinder, or if we use a flow control valve to change that, we've certainly done that based on a real physics model as opposed to just an animation or design model. Also we hope to improve visual modalities, where we have different
ways for those who are visual learners that they can see the model where they can really look at it from different perspectives and see it in a broader cluster.
And ultimately we hope to shorten those learning cycles by exposing learners to opportunities of work with models and parts before they get the actual piece of equipment.
And I'll talk about that a little bit more.
What I'd also like to go back to Dennis now and finish some additional comments from him with regard to our next direction in future developments and other issues around visualization.
DENNIS >>PARKER: Another aspect in business and industry in achieving our successful goals that we want, being successful as a company, being successful as a business, taking all the myriad things that need to be done to be a success, a very key component of that is to partner with other organizations and agencies in the community that can both benefit us in our job and we in turn in some way can benefit their mission.
Probably the ideal or an ideal example of that would be the partnership that Toyota has had for many years with initially Central Kentucky Technical College and following that with the Kentucky Community and Technical College System, KCTCS, when that organization came into being.
In fact, I think it's almost a model for many people to look at. A summary of that would look like this.
When Toyota first decided to open a major manufacturing operations in the United States, the decision was made to build a manufacturing plant from the ground up in Georgetown, Kentucky.
It would be the very first large vehicle assembly plant that was entirely Toyota owned and Toyota built in the United States.
The success of that plant was critical to Toyota's plans.
If that plant was not successful in exercising its mission, it would have had a tremendous effect on everything that Toyota planned to do with North American and US manufacturing.
On the other hand, if that plant was successful, it would set a model and a standard for our manufacturing activity to grow, to grow in America.
Right from the beginning we looked to the community and technical college system in Kentucky to be a primary partner with us.
We brought that school, it was under a different name at the time, today it's Central Kentucky Technical College, we brought that school in as a partner.
We asked them to initially help us to identify and set up our first technical and skilled training programs.
We also asked them and the system they were operating under at that time if they would bring their expertise in or technical expertise in and give us assistance in our hiring processes because they had great value to add there.
Now we leap forward and look at what's happened over 18 years with
that.
And what you see is you see a continual growth that has occurred that
has brought great benefit to both parties.
The true win/win situation.
So from those very early days of identifying a method to bring
technical skills over and to apply them in our classrooms at Toyota in
the beginning and in some cases helping us to develop those classes
through the years to providing additional services to us in both
technical training and safety, and then beyond that to begin to
provide us instructors, a very high level, a very high quality level
of instructors to replace our internal instructors.
In this case they were teaching Toyota courses, but we were using
Central Kentucky and KCTCS instructors to do that in a very high
level.
And then into another step to where today we actually have replaced
all of our Toyota courses for our internal technical development
program with Central Kentucky courses, still using those instructors.
So we go from a little bit of help in the beginning to a constant
growth to today when a Toyota employee takes a course that they need
for their work on the floor, not only do they gain those skills and
ability to work on the floor that they need, at the same time they
earn college credit for that, and for those who go through our
complete development program, they come out of that with a degree.
Now we're bringing in yet another level.
Here is a technology, 3-D visualization, that has great promise for
improving training in the future, from quality to the cost of training
over a volume of people, to the time of the training cycle, and we're
looking to KCTCS, the system, as the actual experts for that, as the
ones who can provide that to us.
So Toyota can bring that expertise in and bring it in in a close,
long-established partnership rather than trying to exercise that
effort ourselves.
At the same time, what we do with that in Toyota, what we learn with
that in Toyota in the manufacturing environment, KCTCS can take some
of that out, go to their mission to support all of Kentucky business,
all of Kentucky manufacturing, and apply some of that to enhance their
product with the rest of the commonwealth.
>> JUSTICE: So we now see the value of -- we've given you a glimpse
of the vision of the implementation model that we're looking at for
visualization as a whole.
We strongly value our partnerships with business and industry,
especially partners such as Toyota, as we move forward on this
initiative.
But what I'd like to do right now is give you a brief walk-through or
an example of the software that we're using, which is called Emergence
Learning.
It's available from a company called 3-D Pipeline Simulation.
And through this technology -- we won't be able to do it in stereo
here today, obviously, you won't see it in stereo at home, but typically some of the things you may have heard us talk about this as being a stereo model. Many of you may have been exposed to it at theme parks like IMAX or somewhere where we can actually bring the image out into the room in front of you. Well, it's still a 3-D presentation, what you're going to see. I'm going to switch between screens. Typically those of you here in the audience and on the Internet at home are going to see full-screen models. That's typically what the end user would see. I will be switching back and forth between screens so that you will see what I call the GUI, or the graphic users interface that we use to drive the models, and you'll see how user friendly that is to operate. *So at that point I'd like to give you a demonstration of a few models. Typically we can set up models as you see here to spin them to move them, turn them in a variety of directions. The majority of our models are created in a product model disk called 3D Max that allows us to develop the different colors and textures and bit maps and the image shapes themselves and also to integrate other content within our software. The next model I want to go to is essentially a robot, just to give you one quick example. And we can move this object around, not unlike you've seen in CAD programs and the like, but in this format we are able to use it into a higher level presentation format for classroom. I could actually set this model up and click and have text appear around it. We could turn parts off and on, and I'll illustrate that on a couple of other models here in just a moment. We can throw in animation. We can wire frame parts and components. And again, these are just place holder models that we're using now to illustrate the software, to demonstrate the software and the applications themselves. Okay. With this model it's a standard electric motor. And typically when we are presenting in stereo mode, no matter where you are in the classroom, you will see the same first-person perspective of this model. In other words, if I take it apart -- if I were doing this demonstration in front of you and I had an actual motor here in front of me and I took that motor apart, everyone is going to see me do that. But you're not going able to see the small parts I'm taking out when I take out a key or when I take out a small part. Or you'll see it from a different angle.
Did that came out of the left end or right end. You'll have some variations.
With this model we can actually take it, bring it out in the room, and I'll do just a quick illustration of how we can begin to break down parts with an animation, where this could be a standard breakdown tool.
But you would all see it from this same I'll call it first person perspective that you see it the same, no matter where you're at in the room or in the location.
I can blow this up larger and get it off our GUI screen and bring it out.
We can change backdrops and backgrounds of the image. We can move the image around, change it from all directions. Again, this is just to give you an example of how we can pull in technical content.
You talk about distance education, some of the things I see for the future, you know, typically when you talk in technical education programs it's always been difficult to do distance education because of not being able to have the same equipment in all locations. This may be an avenue that we can use to help shorten some of that issue or resolve some of that issue of being able to deliver distance education in a technical application.
This model is one that we'll begin demonstrating the integration of physics.
Because if you look very closely -- and I hope that it's clear enough on seeing at home, but this is a standard flow control valve. Typically it would fit in the palm of my hand.
They're not very large.
What it's used for is in pneumatics or in hydraulic applications they regulate the amount of air that flows through a line or the amount hydraulic fluid that will flow through a line.
By putting animation in and at later points of development -- we are still evolving the development of this product -- you will be able to see fluid under pressure in that line.
We have a way to represent that.
And I'll show you that in a simulation later on.
But we can integrate physics.
So now I can actually take this small piece that would be very difficult for everyone to see, bring it out into the room in front of the users or at least blow it up in large-screen format, in a 3-D format, and illustrate applications of that particular device.
Talking about content validations, we look at this, we have faculty who are going to be engaged with this through KCTCS and through some of our other partners who will look at this content and say, yes, I teach flow control valves and this would be a good way for me to teach how flow control valve works and here is how I would do it.
We would some faculty input into development and support of our technology as we move forward.
Just to illustrate involvement of faculty, this actual welding device here, adjustable device, was drawn in a CAD class in one of our -- actually Central Kentucky Technical College, and just to show a few things with this model, we integrated it from Auto CAD. This was developed by students.

We brought it in from Auto CAD, converted it into 3D Max format, and I want to show you a couple of capabilities of the software.

Now, for example, if I want to talk about parts in isolation, I can talk about the base of this device.

We can show the base.

Now, keep in mind once again that this may be a simple application. This one may not be the ideal one of content to teach from, but at least I can show you how we break down the models. I can rotate the base.

I can look at it from all directions and I can begin to add other parts.

We can show the dovetail weight, for example. And we can begin adding parts back to the model.

Let's say, for example, I want to see what the dovetail weight looks like.

I can actually put the saddle itself into wire frame. Not unlike anything you've seen in most CAD programs or applications, but with this one we have the flexibility to really integrate it into a presentation model.

It's more user friendly for classroom presentation and application. So it gives you another example of how we can work with and manipulate our objects and our drawings.

One of the things that is another example, if we had a class that we wanted to teach maybe across our 64 brick and mortar locations at KCTCS and we didn't want to buy 64 jet engines, turbo fan engines at $2 million a piece, could this be a way that we could at least expose students to components and parts and some instruction, instructor validated, of course, to turbo fan engines, without having to buy multiple turbo fan engines.

Bottom line is at some point in time we do know that the user has to use the real equipment and get real hands on, but at least in the short term we can help with their awareness and give them more exposure to it.

So if I do the same things with this model, I can see those parts and now we can look at the turban itself, for example, bring it up into large detail, almost even go through it, turn it around, bring it out in the room and do a variety of discussion topics with it, whatever those may be, based upon the curriculum that's developed in support of the technology.

Some applications, there are all kinds of applications and the door is wide open on where we may apply the visualization technology, what field and what specific program, what equipment, and as administrators we give that due diligence and due thought.
This one is just a typical model of the human thorax. This could possibly be used, for example, to show anterior and posterior placement for doing an x-ray, where we tilt it forward a little bit to move the ribs out of the way so that you get a clear shot of the lungs if you're trying to determine this one has pneumonia or a growth of some type. We can rotate that model around and do the same thing for posterior x-ray.

Then another thing that we can do that's kind of neat, and I guess it's one of the wow factor things that this has is we can actually put this model in motion. This is one that works really well in stereo to take the learner inside of the model, and as we bring it out to the screen we can actually take you inside the human thorax. And that's a different perspective, I'm sure, than what you usually get in the class.

Another example that we have -- and this next two models I think are very powerful for what they can illustrate we can do. They're large databases. Again, this one is being refined a little bit more, but this is a model of the human heart. Content validation is always important, as I said before, that those who work with the technologies or structures or whatever they may be need to validate them for content. But again, we can take this human heart, we can bring it out into the room, we can laser scan components of a piece of equipment, bring it out in the room, put it into this presentation format, isolate parts, wire frame parts, solo parts, talk about specific pieces and components.

Then lastly the last of the emergence slides that I want to show to you is a rather large database but one of the things I think that are really powerful when we talk about Emergence Learning, this is a eukaryotic cell, and the way you typically learn about eukaryotic cells is you might look at them under an electron microscope or you might see pictures of them that are blown up or some slides or some other flat presentations, but how often are you able to take the learner inside of a eukaryotic cell where we can go all the way into that organism and now we're immersed in the learning process and we're engaged.

As I move further in I can go below the surface of the cytoplasm. I can look at the ribosomes, the lysosomes, the mitochondria, and we can continue to explore around. I can do as before. I can isolate certain components and if I want to look at the cell membrane, for example, maybe I want to wire frame the cell membrane. And that changes the appearance. Or I can put that back to a solid or I want to wire frame the exterior shell of the model. Now it looks quite different, but then if I want to isolate the
endoplasmic reticulum, I can solo that and now we can just look at
that and talk about the role of the endoplasmic reticulum, so there's
all kinds of applications.
I think one of the things that is very powerful with this is where we
can take those very small, minute items, electrical components, you
might even take a look at something like an IC chip and look at the
little city that's inside of that chip and look at all the
subcomponents, things that you typically can't see may be a very
strong application of this technology and that's one of the areas that
I see as being very beneficial, very beneficial.
What I'd like to do now is switch gears a little bit and take a look
at some physics-based models that are simulations.
And the simulation technologies, we're going to start with one that we
call dolphin girl, and there are several things that I want to point
out with this.
Now, first of all, we're using things that are just examples of the
technology.
I don't have an actual proof of concept project yet.
We're working on that.
As far as showing you someone's machine that we built a simulation
around.
But now we're switching gears and we talking more about simulation
applications where we introduce physics and other principles within
the development of a simulation.
And all of these presentations that I'm showing you today are done off
standard, off-the-shelf computers. There's nothing special about the
computers that I have other than the video cards.
Typically to do some of the things I'm going to do here, and you're
seeing this more commonly now on lots of applications, television
programs and the like, would cost you probably $10 million in the '80s
to do with the whole farm of rendering computers that would work and
do the rendering.
Now in real time I can right click anywhere on the object and I can
pull up a service GUI, graphic users interface, and in real time I can
change wind speed, I can change wind direction, I can look at this
from 360 degrees around, so we can do several things and do all this
rendering in real time.
Again, imagine this were a piece of equipment that we're developing
simulation around.
But beyond that, I can also go below the surface of the water, and we
have several things underneath here that we have programmed in.
And you'll notice that we have some schools of fish.
Notice that the physics that we want to talk about, the caustics, the
light reflections on the ocean floor, the terrain mapping, the
movement of the waves beneath, the light reflections off the bodies of
the fish, you may notice in a moment if I stay with the school here
that as the shark swims by you will see that the fish are programmed
that -- to fear the shark, as they would in the wild.
So you'll see that fish typically run in schools. If we get a good shot here of the shark will come towards some of the fish, you will see them running from him. In other words, the fish ran. They then reschool later on.

I can also take the same image and what we're able to do is model physical characteristics and behavioral characteristics such as, for example, if I freeze this frame and everything is frozen, you notice that we're still simulating the swimming of the shark. The reason being that if the shark doesn't swim, the shark will drown. So we want to go to that level of development when we develop the simulations.

And the reason for that is if we're going to simulate using a piece of equipment, and we have a range of pressures, let's say, that we're lifting an arm on a robot, and it takes 75 pounds per square inch of pressure to lift that arm with a pneumatic cylinder or a hydraulic cylinder, what happens when that pressure hits 50 pounds.

Does the arm fall?

And so we have to develop the models and develop very direct requirements definitions around any simulation that we do, so it's a very customized process when we get into the simulation market.

So this just illustrates we are able to capture those characteristics of both physics and behavioral characteristics. That's the fun one.

I want to show you another simulation that is of a little bit different tone.

This one actually was developed I think as a homeland security model. But it has application not necessarily within that realm.

You can imagine -- what I'm going to show you first, and then I'll come back in some more detail.

This is an aerial view of the University of Southern California, Berkeley, and the red lines that you see represent wind vectors as they move across the area.

I can preprogram either by direct weather feed from Accuweather or by the service GUI here that pops up or the users control, and I can now program some predetermined wind directions.

There are several things we can do with this model. Also have within this controller 33 known chemical/biological weapons, so we're going to use the homeland security focus, but this could also be chlorine gas, or sodium chloride, or benzene, choline, or any other type of chemical agent that's used in industrial or any other application.

And what I want to do is I want to put off three emitters of different gasses so you can see how we can simulate the dispersion of those gasses in this environment.

So I'm going to start with a little serin gas and I'm going to put off some emitters of serin gas up in this field, the yellow dots up there. At the same time I'm going to choose another gas, and I think just
I'll go with some VX. Again, this could be chlorine or any type of industrial agent or biological agent, and lastly I think I'll grab some tear gas. And I'll put that off over here. Now, in real time, based on the dynamics equation, as I understand it, we can calculate the dispersion rates of those gasses, how they will disperse based on vegetation drag, based on temperatures of buildings, humidity in the air, if it's raining or not, temperature, any factor that affects that gas can be calculated. So to kind of give you an example of how we're doing a real time simulation of all three of these, I'm actually going to interject a rain event. This could be the result of weather or it could be firemen who know how to respond or first responders who know how to respond to this condition. Notice the minute I begin turning on the rain we saw the serin gas started to dissipate and the emission wasn't as large. The VX gas is continuing to move. The chlorine is a little more contained. It's not moving much outside of the boundaries, so we're starting to contain it. I'm going to increase the rainfall amount here, more water on it, and you notice that as we get up to a rain intensity of three that the serin gas disappears immediately, the VX is continuing to emit but it's not traveling very far. It's very controlled. Notice that the tear gas is also continuing to emit. So that would be a problem for us to deal with. And there are other controlling factors that we can throw on this. We can actually do some command and control where if, for example, let's say that there was a tanker truck that was going through this intersection and it wrecked. And when it wrecked it exploded and put off a cloud of chlorine gas. How do you respond to that? Well, first of all, we could network a variety of things from the truck itself to a command and control center, to weather feeds, where we know the type of chemical it's hauling and if you knew, for example, chlorine gas, what would be the best evacuation route, would it be take East Street or West Street or where do you send everyone to, or do you send them all out into the grounds of the college. Actually chlorine only goes up to about eight feet, so you could send them up to higher elevations until the cloud moves out, based on wind direction. So we can simulate all those factors. We can build command and control into it. How the industry would use this, you could take, for example, the inside of a manufacturing facility, the HVAC system. They use some chemicals in house.
What would happen if someone drove a fork truck into a tank of some chemical and that chemical was released.
They could look at a real model to immediately shut down certain vents and controllers, and preplan gain evacuation.
Or if they're really interested in being a green facility, they could look at true weather feeds and plan how their emissions are going out daily.
They could look at real emission rates and they could also look at how it would affect the surrounding communities, so that's just another example of the simulation.
The last simulation that I want to show you, and it's a rather large database, takes just a second for it to load, but in this model I can illustrate some more applications of physics and how we integrate digital video and another components into the process.
In this digital model or simulation -- and again you can imagine this being a manufacturing piece of equipment, a punch press, a forklift, a loader, a mining machine or any other type of technology.
In this one I'm going to attempt to fly this helicopter around here for you with a mouse and a key stroke.
But a couple things that I want to illustrate.
As I fly near the water here at the bottom you can see that that's actual video footage of water that's been integrated into the program.
I can get into a lot more details.
I'm really just giving you a glimpse of our capability.
But as I hover over the water notice that something begins to happen in my viewfinder.
Now, this could be an instructor fault, an instructor's operating station could now throw in a problem, you've got a malfunction, how are you going to react to it.
But you notice I am lifting up a lot of spray in my windshield because I'm flying over the water and it's rotor wash from my rotors.
So I want to do the same thing, here, though.
I'm going to fly up over the ridge, and I want to fly towards this tree right here.
As I move towards the mountainside you can see the use of texture mapping to help give us the perception of depth and distance, and it gets more clear as I get closer.
I'm going to put this into a slow-motion sequence.
You'll notice once again I'm starting to get some rotor wash from snow.
Notice that I just blew the plant down or I'm causing it to wave in the air and as I hover here for just a minute I'm going to continue to where I'm into a complete white-out condition.
Now I've got to make a decision, which direction do I fly, do I rely on instruments, where do I go from there.
It would be the same scenario with using a piece of equipment.
Do I shut the machine down.
Do I speed it up.
Do I do something else to make it safe to be around.
Now, at the same time I'm going to fly around our model here and I'm going to put in a sequence of events to take place.
We're going to look at a 24-hour sequence as we circle around through our aerospace area here.
The domes that you see are there for purposes of showing that those clouds have true volume.
And as you look at the flashing of the dome you can see now we're into the nighttime cycle, and as I look over the valley here, and we'll just sit here and hover for just a moment, we can tell that the clouds have a volume, they have a real mass, just like you're flying through them.
We can see that our operating conditions have changed.
I don't have the visibility that I had earlier.
There are some other things I can do.
First I want to show you sunrise as we look around toward the mountain, just to show the level of physics that can be integrated into the model.
Again, this could be any process of any piece of equipment based on what we can capture the data to development the simulation for.
Notice you have glare on your windshield as you look into the morning sun and the day starts.
So just to give you just a quick overview, I can also continue to fly and now I'm in normal conditions in the middle of the day and I'm flying around the model, but the instructor could then insert some fog.
Now I'm in a foggy condition.
How do I react and how do I fly in a foggy condition.
What do I do if I'm in a thunderstorm.
And so now I'm in rain conditions.
Or the instructor could also throw in snow.
Or the instructor could throw in the robot doesn't return to home position and it shuts everything down.
How do you figure out.
Now, I talked earlier as far as this being a teaching and learning tool.
We have innovative instruction on one side and assessment on the other.
Here is something to think about.
We could also look at how this user works through this simulation.
And while they were working through the simulation we could have them maybe do a drop-down box, select the proper tool to fix the problem, whatever that may be, whatever we're simulating.
And we can see that John solved this problem in three tries.
And Tom solved it in 27 tries.
Unfortunately he fixed everything that wasn't broken before he got to what was broken, but we can make some inferences about knowledge and experience and we can go back and provide targeted instruction to that
user and help them become better at what they do and build out the process. Also a simulation like this, for example, maybe a plant is getting ready to launch a new device, whether it's a punch press or some other type of equipment. In the meantime if we could develop simulators around that equipment, have individuals using it at the time they're ready for launch and ready to begin, we could then see that they're ready to go with it and then we phase it into putting it into a hands-on application of that model. So these models are just examples of what simulations are and they can become very more detailed and I'm just giving you a glimpse of what a simulation is and what an emergence model is for that purpose. So to that end I want to look at applications once again. And look at Emergence Learning solutions first and primarily I see the emergence models that we talked about earlier as being presentation tools, classroom instructional tools. They would be really good for industry training. They would be key for student engagement and captivation so they can see the parts and the manipulation of those parts. And key to that is the accuracy of the model, the development of the content and the regulation of the content. Now, a couple slides I want to look through here. I did get off my sequence a little bit there. Simulation development, which we just talked about, has the learner exposed to real operation of high value machines in controlled, safe environment. And that one is really key. If you're operating a piece of equipment that's very dangerous and if you made a mistake or he or she made a mistake in operating this piece of equipment, they didn't damage a million dollar machine. And they didn't get killed or kill someone else. So you can put them in a simulator first just as aircraft pilots do to where they can gain with all scenarios and try to figure out their best responses to that and you can do that in this controlled environment. That will hopefully shorten the learning cycle, the time it takes to go from that beginning employee to a higher producing employee. We have the capabilities, as I illustrated, to instructor fault insertion or put in time barriers so that five minutes into the simulation something occurs and you always mix it up and make it different. Data collection on student responses, we talked about that. Reduced training time and cost, and prehiring skills assessment training tools are also a key part of this. The impact and goals of this now are key. What we hope to accomplish from the process are shortened learning cycles, better trained work force, skill level evaluation for targeted
instruction, a reduction of training costs, hopefully maximized exposure to new technologies across colleges or classrooms. If we can't buy multiples of a piece of hard equipment, we can at least put a simulation in place to give some exposure to it until the time that they can get to the real equipment to actually use it. And then enhanced critical thinking skills are all part of the process as we go forward.

Typical applications, where do I see these fit? That's a key thing to talk about, I think. Emergence Learning I see as a classroom tool primarily, but I see business and industry applications for specific work force training and parts and nomenclature and so forth. But I see applications in the medical field, in areas of manufacturing, electronics, the nanotechnologies or small component training, as I mentioned earlier, and other applications that we probably haven't thought of yet. There's a lot of opportunity and range for this, and as I mentioned, the bottom line is that we make good decisions about content, we validate that content and engage with our partners in business and industry to get us there.

Some applications for visualization I've addressed, high-risk, high-dollar machines, but complex operational environments. Do we want to spend a lot of money building a simulation for a simple piece of equipment, or a low-cost piece of equipment, so we make some good decisions there, but it also has applications for health care, manufacturing, others. I could envision at some point in time using shutter glasses and haptics gloves and doing a virtual body where you simulate a surgery and do it on a virtual cadaver rather than a real cadaver or some other types of applications of that nature. I can see it being a workplace assessment tool for both prehire or with the incumbent work force to increase their skills and upgrade, and again, other applications that we may or may have not considered.

Development, where we are in this stage of the process and what it takes to develop models is key. And there are several things here in partnership.

Other partnership with 3D Pipeline Simulation and the College Collaborative Network is key to getting us access to the capacity to develop simulations themselves, to develop the content we need, but ultimately the software, the hyper pipe engine that's behind the Emergence Learning and then some of the other technologies that are there, and then on top of that the other side of partnership, there's really three sides to it, is with business and industry partners such as Toyota who can give us guidance on what they're looking for and what their needs are and we could do some needs analysis and develop simulations to meet their needs. And then lastly there is a partnership with collegial institutions and colleges and schools across the country who are interested in becoming
involved at first adopters of this technology and work with us in the
development process.
Industry needs analysis is a key part of it.
Requirements documentation in any simulation development is very
important.
Probably to my end anyway right now is one of the more difficult
parts, and that is where you look at something you want to simulate
and you make the decisions, what are all the data points that we need
to cover to make this simulation accurate and make it as real world as
possible.
That's a real challenge, but it is doable.
And then once you develop the requirements definitions you look at
development of the simulation itself, and then simulation deployment
and training is the next part.
I didn't really talk about too much through the presentation about
professional development and the integration with faculty and where we
go with this, and that's one of the key components that also has to
happen in the development.
Once we figure out where we're going to apply emergence, where we're
going to build simulations and what classroom applications it has,
there has to be a key group of professional development to meet that.
So as I'm getting ready to wrap up I'd like to turn it over to
Dr. Keith Bird, our chancellor of Kentucky Community and Technical
College System, to give his viewpoints on how we see visualization
coming together and our next steps in this initiative.
BIRD: This a totally new paradigm in teaching and learning.
It's a real breakthrough.
I think back in my experience back in the late '60s, early '70s when
we saw something called a VCR and videotapes, and it was going to
sweep the country and then for a while it didn't quite take off and
then all of a sudden you have video store rental on every corner and
we saw its impact in the classroom.
But this I think goes far, far, far beyond that.
I think what we have here, tied in with eLearning, and of course
there'll be some major opportunities for this simulation visualization
to take place in a distance learning or in a blended mode, but what we
have here is something that really brings resources and brings a
pedagogy to teaching and learning that I just have not seen the equal
of, and it's quite overpowering when you are able to fully engage a
learner.
And they can disassemble, reassemble.
They can see big, small objects.
You can have a 2.5 million dollar jet engine in the room and all
students see it from the same perspective, or you can be down at the
level of an electron microscope taking things apart, and so to me it's
something that engages a student in all their senses. Every student
sees something from the same perspective. And so from a standpoint of
using multiple learning styles, that we know we have to with the kind
of diverse classrooms, we see it as a very powerful tool and also one which allows us to introduce or bring things into the classroom that before were just not things that we could do very easily, both physically as well as expense wise.

Also we see by working with other institutions -- and we're looking to do this with our sister institutions nationally -- is an opportunity to develop curriculum on a collaborative basis nationwide, in fact, potentially worldwide, with other training institutions and comparable institutions in other countries.

The response for business and industry has just been instantaneous. They have seen the immediate application of this. And in fact we've had to wait and not respond as quickly as we would want because we need, number one, some of the technology to catch up to what we want, as well as the development time, because we're going to have to do the professional development to develop a new generation of faculty who feel comfortable with that, and yet I think in terms of our system, I look at what we've done with eLearning, over 30 percent of our faculty now have their own course management accounts for eLearning, and I think that's just tremendous.

And we have in our application, have for a number of years, that people who wish to be a faculty member at our institution, it says on the application you need to know that they need to be prepared for adapting distance or blended learning into their classroom. And I see the same thing ultimately with this type of technology, that it will be just something that will become part and parcel of how we do business for the future.

We've been very encouraged by the response both from business and industry and from our faculty, who have seen this work. You have to see it to understand its potential.

>>JUSTICE: So right at the beginning of an exciting initiative, where we're looking at a variety of applications within education, as a teaching and learning tool, to enhance instruction and to benefit our students, all those that we serve, and also to enhance and support our partnerships with business and industry from several areas.

I guess primarily the benefits that we see from the visualization initiative itself is that we have a new tool to help with student engagement and captivation in the learning process; that we have common visual perspectives for all learners, that wherever you are in the classroom, you have the same perspective as other users.

And I think that can be very key to us.

Real time assessment data, where we get feedback, we can make inferences that learning is occurring or is not occurring and we can adjust instruction accordingly, is a very powerful tool that we maybe haven't had access to in the past.

We see enhanced opportunities for training, retraining of local work force, innovative technical currency of faculty, doing professional development that will come along with this.

Joint applied research projects with business and industry.
We see ability to attract significant private sector support for being able to integrate technologies that meets the needs of our partners and through other applications. And really improved competitive position for funding and research grants or potentials for publishing revenue for faculty, for the system, for other partners across the board. And then ultimately enhanced opportunities for graduates in the region through use of visualization. It's a very exciting process that's evolved quite a bit over the last two years. I expect we'll see some exciting changes in the coming years or months ahead as we move forward. We do feel that our challenge is to make sure that we make good decisions with what projects we choose to do and how we integrate those projects into the overall mission and vision of the system, and that we best meet the needs of our employers and their students and we go through the process. That's always going to be the key thing and the driving force behind it. So with that I'll be open to questions now. We'll turn this back over to Becky Parker.

>> PARKER: We would like to use the next few minutes to answer questions that have been submitted during this broadcast. Jamie, lots of questions have come in and I think you've excited the viewers out there. What kind of technology does a classroom have to have to be able to use this technology on a daily basis?

>> JUSTICE: That's a very good question. And that's the exciting thing about this technology is that we're able to use standard off-the-shelf equipment. There's nothing special. Typically if you're wanting to do a stereo type of arrangement, which is bring it in the room type, you would need two computers with the video G force cards, two LCD projectors, about 1600 lumen or so range, polarizing filters and polarized glasses, and the only thing that's really special about the whole process I think is there is a silver reflective screen that you use on the wall, which can be used for other presentations. It just has to be more reflective. And Emergence Learning software, which is under development and moving forward.

>> PARKER: This viewer said it would be nice to have 3-D laser technology for projection in the center of the classroom. Is that technology available?

>> JUSTICE: That technology is probably available, but at a very high dollar, I would think, and I don't know that much about it other than CAVE technologies and some other holographic types of technologies.
And to clarify a point, we heard this described as a hologram at times, and we're really not doing holograms. We're doing stereographic presentation. And stereo goes back to the 1800s. It's been around for a long time. So we're just fusing some new technology with some old technology to enhance instruction.

>> PARKER: As you know, work force development in career and technical education have quite a few content areas. You touched briefly on manufacturing and medical. Are there other applications that you looked at or that you can potentially see application for?

>> JUSTICE: Well, there's a whole lot to look at yet. We did do a deliberate focus originally on health care and manufacturing because that was the first groups we saw, those were the ones that just happened to be there. I really see a lot of application. I can see this being used in a general education classroom, maybe a history classroom. You're talking about bringing a galleon out in the room, spin it around, turn off the parts and you say this is what it would be like to be underneath a paddle all day. I don't know. There's -- that may or may not be a good example. But there are lots of applications that are out there, and I can see it fitting at all locations. The bottom line is that we want to get beyond the wow factor. It's very exciting to bring something out in the room. But after you bring it out in the room and someone sees it, then what. Is it really going to enhance instruction. So we have to make good decisions about the content that we develop. And to do that we have to engage the business and industry partners and faculty and they have to look at it and say this is something I really teach and in this is something that could enhance that instruction, and business and industry, where applicable, says the same thing, so really I could see it happening across all levels of education, general education, technical education, work force development and so on.

>> PARKER: This viewer would like to know besides building the models with software how you have an experience with taking actual models from other sources and being able to use them with this software.

>> JUSTICE: Yes. As a matter of fact, I have. There are a large number of sites on the Internet where you can grab models that are being created in the 3D Max format and other formats that currently the export process goes through the 3D Max software. But I have pulled models off the Internet, I've used them and they've
worked very well.
What you do find when you pull those models off or how detailed are 
they developed, are they developed enough to be good instructional 
models or are they at least just something you pull out of the room, 
so you make those decisions, but content isn't challenged. 
We'll be honest about it. 
I think we have high definition television here and now how are we 
going to develop content and apply that. 
I don't think it's an insurmountable challenge. 
We're looking at methods to build capacity that will support this 
network across the country and across our system, KCTCS. 
>> PARKER: You talk a lot about instructor driven, setting the 
parameters or adding the implications to those models and those 
simulations. 
How much can be student driven? 
>> JUSTICE: You know, actually that could be quite -- it could be 
developed around a student self-paced model of application where they 
could actually sit down with the emergence software, go through a 
predetermined -- we could actually build a predetermined show, if you 
will, or presentation that the student can go through and manipulate 
the GUIs and follow their own content that goes with it. 
We're working on and looking at potentials for distance education and 
applications and there are some new technologies that are coming out 
soon that will make that more available. 
>> PARKER: This viewer would like to know if this technology is 
being used in the secondary system in Kentucky. 
Apparently they have -- they must be connected with middle school and 
secondary students and think that this could be a great connect. 
>> JUSTICE: At present, no. 
But we have had multiple discussions with our secondary partners and I 
do see opportunity for that to occur. 
And I know that there is interest within the secondary programs, and I 
think that will come as we get more refined in our development process 
with the software. 
>> PARKER: Are the graphics you showed today proprietary? 
>> JUSTICE: Some of those are, yes. 
Some of the models that I'm using come from a company called Amtrol in 
Jeffersonville, Indiana, who develop industrial training models in 
fluid power and so forth. 
Some of them are pulled off the Internet. 
Some of them are the property of 3-D Pipeline Simulation Corporation 
or the College Collaborative Network. 
>> PARKER: and that brings us to a question that a viewer had with 
regard to partnerships. 
How do you deal with the proprietary nature in that partnership such 
as with Toyota? 
Who will have the right to the simulations you develop? 
>> JUSTICE: Well, you, of course, clearly identify that on the front
end before you start a project.
If you get into developing a custom simulation that could go anywhere from 100,000 to $500,000 or more, depending on fidelity and complexity, you certainly want to make sure you have some ownership of it before you finish, or if not, you at least have made some revenue up front to cover your time for doing it. So we are doing agreements where appropriate to do that and to make sure we have releases of the content and with anything in education it's always important to look at your sources and document appropriately.

>> PARKER: We talked a little bit earlier about how you saw what I might say foundational components to this that then can be taken into local areas and be manipulated with more specific things that would be to either that content area or that community. So that might be another way with the proprietary issue that you build that in so that it may have specific implications for the business and industry partner, but the foundation of it can be utilized in other areas.

>> JUSTICE: Exactly. Those are the types of discussion we've had with Toyota and I think Dennis actually mentioned it in the presentation, that some of the things that we develop, KCTCS can then take off and use and we'll take out what we're not to use and put in what we can.

>> PARKER: One of the things that was interesting when we had a chance to sit down and really talk with Dennis was how he saw this as a win/win for all and just because Toyota might be at the beginning stages in developing this that it can have far-reaching effects that can ultimately serve the entire region and the entire world, and he sees that as part of Toyota's mission, and so he was all for that.

>> JUSTICE: Certainly. One of the key things that will come from that partnership with Toyota will be some projects that we could do and that will help us go to the next level and develop our capacity to be more effective.

>> PARKER: There's been some discussion apparently among the viewers about cost, and I know we didn't want to spend a lot of time in this presentation talking about cost, but I think if you could give a range or give some information there would be helpful.

>> JUSTICE: It's really conceivable that you could set up a stereo classroom for under $15,000. You'll have software costs and packages and some of that's coming together right now. We can get specific quotes through College Collaborative Network or 3-D Pipeline directly. We've explored turnkey set-ups from a company that they can give you the screen, the filters and everything, and we can also point you to resources for individual components and parts. The real challenge to it is figuring out how it all comes together. In many cases the colleges or the schools probably have LCD projectors
around. It doesn't matter as long as they're matched for the application. They may have computers around that are powerful enough to do this. Again, they're off the shelf, typical keyboard computers with 512 megabyte memory and really the higher memory video card that you have and currently in the video cards are ones we're the working versions with our technology, the higher memory on those, 128 or higher, gives you the real capability to manipulate the model, so depending on how much equipment that you already have, screen costs go anywhere from $500 -- I have a giant one back at KCTCS that's 14 feet by 14 feet, about $2600. It depends on what you're wanting to set up. But that's a range you could get into, and then software costs. 

>> PARKER: This viewer would like to know if there is a location in which the 3-D images can be shared. Or that they can go to to look at the actual 3-D images. 

>> JUSTICE: Possibly in the near future on the emergencelearning.com web site you'll be able to find some more models, and I'll take that back as something we could do, give out some examples. We haven't done that, I don't think, as yet. I may be mistaken. My partners will let me know. But we can look at that. 

>> PARKER: And then before we move into some specific questions with Kentucky, this viewer would like to know what is your suggestion for how you begin to develop a partnership? Obviously your partnership with Toyota has been a long standing one that's evolved over time and many years of working together, but this viewer would like to know where do you begin? Do you start with a need? Do you build the relationship and then look for the need? What's your suggestion? 

>> JUSTICE: Well, typically I would approach it from trying to identify a need and see if I can help sell a solution rather than talk about problems, so if I can -- if I pick up through meetings -- actually some of our development was interesting in our contacts that evolved and I think Dr. Bird talked about us holding back to some degree. We had a business-to-business conference about two years ago and I did this presentation at the conference and a lot of employers came to me immediately after and were really interested in scoring this with us. So there's interest and there's need and the challenge is how do you present the information the first time so that business can say this is what we have and then you try to find out through a needs analysis with your working group and that could be through your economic developers or through plant managers or others that are key in the process, whatever it may be.
And try to just get some general dialogue going with them to figure out what are some challenges that you have for your work force. You'll find and I'm finding that it's common that they all need foundational competencies and they need people with basic skill sets and those kind of things, along with technical skills, and if you can enhance the two together with a package you're going to be off for a good start for a solution.

>> PARKER: One thing I think Dennis pointed out over and over again is how workers need to be flexible and that the most valued workers in their plant are the ones that have multiple skill sets, that they don't have to transfer people and they can do more than one particular job.

>> JUSTICE: You think about it, too, we heard discussions about how many times over a lifetime people change careers, not just jobs, so the bigger repertoire of skills that you can build and have in your own tool kit, the better off you'll be, so that's another reason to enhance these.

>> PARKER: Very much so. What funding sources are being used to research, plan, implement this initiative at the federal, state, and local level?

>> JUSTICE: There's a variety of fund sources that are applying and in some cases we're using probably some state funds. We're maybe using some Perkins dollars in R and D capacity. We're tying it to some grants. We are tying it with some donations that we've had from companies like Toyota and others and then Kentucky has our work force investment network system which are Kentucky Wins that supports business and industry training for new and expanding industry. And so we've used some of those funds as well. So there's a variety of sources. There are several grants that are floating around that are reserved that are really targeting the uses of technology, such as simulation, or you'll hear them talk about video games or computer games. So there's lots of areas we can access. Our partners, the Clements Group or the College Collaborative Network, also can provide guidance on fund-raising and so forth.

>> PARKER: Are there plans for a creating a content library that could be used by all?

>> JUSTICE: Yes. That's really kind of the vision of our partnering. This started with the concept of a College Collaborative Network. Primarily the focus being that that's the way to leverage the power of college faculty that are really strong in certain areas or certain regions so we could bring together content. Maybe someone out in the western part of country has a really strong health care program and we have a need in Kentucky or vice versa where we can exchange with them. And I see that as this College Collaborative Network evolves and the
Emergence Learning process is grouping that we're putting together that we will have a collection where you can go to and buy specific content, or that you can post content and resell. We see a revenue stream as part of the potential for this as well for colleges and partners, so there's lots of opportunity for that to occur in the future.

>> PARKER: What kind of a plan does the KCTCS system have for providing professional development?
That's always the key with any new initiative is how do you get people on board with using it and utilizing it in classrooms?

>> JUSTICE: That's exactly true. And that's one of the challenges that we have.
I think we'll really focus more on that in the near future.
Right now our focus has been primarily on developing it and thinking what do we need to bring together, what kind of things do we have to do and just figuring out how to use it ourselves and build the model.
We have a couple of colleges, we actually have one college, Gateway has started a Title III grant they have and they're getting into emergence in a big way and they're going to R and D applications in all classrooms to some degree and we'll do a lot of training with them so that may set the foundation for it.

>> PARKER: Right.
What's Kentucky doing to encourage other states to partner with them in implementing Emergence Learning solutions and how would other states or institutions become involved?

>> JUSTICE: Okay.
Well, my travel schedule is a good indicator of that one.
We've been doing a lot of national presentations at different conferences and sharing information.
Our partners have a website. That's emergencelearning.com website where you can go and get information.
There's the College Collaborative Network. Collegecollaborative.net I think is the website address, the resource materials we have.
And just word-of-mouth and just general presentation of this.
The door is open to have other first adopters who want to enter this process with us, to become engaged, and you can feel free to contact me or go to the emergencelearning.com website for information.
It has links back to KCTCS and others where you can look at partnering.

There are some other things that we're looking at doing, too.

>> PARKER: So you talked about where technology was two years ago, how far it's come in the last 18 months to two years. Where do you see it two years from now?

>> JUSTICE: Well, that's always a good question to ask.
I think part of the driving force behind some of this was a classroom 2025 paper, I think it was intro'd by Bill Gates, but talked about the talking refrigerator, where you could call your refrigerator and it could tell you what you needed.
Well, those things are here now. That was supposed to be 2020, so I do see in the very near future -- in fact, I know this is going to happen -- is that there will be laptops and monitors that will be a glassless solution so you want need all the technology so you can flip open your laptop, put it in 3-D mode and the object appears in front of you. New releases and refinements of software, additional partners in developing the software, more content. And beyond that more interaction with the model itself. I'm only learning on the front end of my learning curve of things like haptics gloves and interactive virtual learning and some of those kinds of things to where you may do this virtual surgery I talked about as you pick up the scalpel and cut into a virtual cadaver, you can feel the resistance of the scalpel and feel the whole process happen, so that's something I see for the future that's more interactive and more integration of real physics so that our simulations become more and more realistic with every development that we do.

>> PARKER: We've talked about where institutions can collaborate and how to get involved. If you're an individual person you want to learn more, what's your recommendation?

>> JUSTICE: Okay. Well, we actually have a game plan in mind for that, to bring together a group of partners and doctors, and we have a workshop scheduled that's being sponsored by KCTCS, College Collaborative Network, and 3-D Pipeline Simulation. That workshop is April 26 through 28 in Versailles, Kentucky, at KCTCS system office. And what we hope to come out of that workshop is that we will share with you the vision in more detail, give you experience with using the software and playing simulations, but then beyond that we'll talk specifically to business planning, how to make that contact with business and industry, how to approach them, how to sell the process, and then ultimately we hope when you come away you come away as a partner and we can look at ways to enhance our network and our sharing of content and our product and put those revenue streams together. If you're interested in the workshop, the emergencelearning.com web site has a link to it and the KCTCS web page has a link to it also, kctcs.edu, that can give you a link to that workshop.

>> PARKER: Jamie, Thank you for sharing your insights with us regarding this new technology. I think you've generated a lot of excitement and there is value to be added to teaching and learning through the 3-D visualization and simulation examples that you've shared today. Our viewers have gained a better understanding of the goals, impact, and benefits in using this type of instructional strategy. We invite you to visit our web site at www.ncccte.org to check the
upcoming webcast for dates, times and topics. And we also invite you to use that feature in your own professional development activities. We wish you a great day.