

## ***SCRIPT***

### ***Authentic Assessment to Improve Student Learning and Performance: What it is and How it is Applied to STEM Curriculum***

#### **Mike Gentry**

**Authentic Assessment to Improve Student Learning and Performance:** What it is and How it is Applied to Science, Technology, Engineering, and Math – STEM Curriculum. Good day and welcome to the University of North Texas Podcast series, Authentic Assessment to Improve Student Learning and Performance. Today is June 18 and we will be discussing “Authentic Assessment – What it is and how it is applied to STEM Curriculum”. The discussion is moderated by Kathy Belcher, UNT - STEM Project Specialist with Ralph Szydlik, the Department Head of Educational Technology at Flower Mound High School. Ralph teaches Drafting and Computer Aided Drafting.

#### **KATHY**

Hi Ralph. Thank you for participating in this discussion. Your knowledge and years of experience as a technology and engineering graphics educator will give richness to our discussion on applying authentic assessment to improve

student learning and performance with science, technology, engineering and math curriculum.

### **KATHY**

Let's begin by talking about assessment in general. At UNT, we define assessment as being, "Any method used to better understand the current knowledge a student possesses."

Current knowledge implies that what a student knows is always changing, and that we can make judgments of student achievement through comparisons over time.

### **KATHY**

We believe the fundamental role of assessment is to provide authentic and meaningful feedback for improving student learning. It is not an end in itself, but rather a process that facilitates appropriate instructional decision making by providing information on two fundamental questions:

- 1) How are we doing? And,
- 2) How can we do it better?

### **KATHY**

How is this fundamental role applied to STEM curriculum?

### **RALPH**

Well, in my world, design is everything – prototypes, designs, meaningful feedback. How can we best improve it? How can we beat the other guy's time? We try to find tasks that make things flow smoother, stay straighter, go higher, are able to

lift, stretch, move, in a certain amount of time – something better than another person’s.

**KATHY**

Let’s talk a minute about assessing students’ knowledge, skills, and attitudes in STEM. Are written tests suitable for STEM?

**RALPH**

Written tests are generally very suitable if it means, “My car will go faster than yours. My robot will lift things faster, smoother, and more efficiently than the next person.”

**KATHY**

What about assessment of skills for students in STEM?

**RALPH**

Assessment of skills is very important because you have to have skills. You have to develop something that’s a little quicker, a little faster. And what are those tools? What material can make things run smoother, lighter, or faster? And, we need to draw these things up in models, and make them into actual products.

**KATHY**

Is it necessary to assess attitudes for STEM?

## **RALPH**

Attitudes are really important. Everybody wants to be the driver. Most people want to be the designer and only a few are chosen in that area. You have to be good. You're going to have to draw it like it's made. Then, when you talk about it to the driver or you talk about it to the person who is doing the actual lifting or moving, they have to collaborate and share ideas. They have to talk over the objectives, and they have to encourage one another and support ideas to make things run smoother.

## **KATHY**

Can you talk about authentic assessment in general as it is applied to the curriculum we just talked about?

## **RALPH**

To assess authentically, you have to have some kind of observation. You have to stimulate one another's thinking along the same path. To actually sit down and put together your thoughts, for example in a rubric, is what you need. You have to develop the science project that is simply better than the other's. To do that, you have to collaborate.

## **KATHY**

How is authentic assessment appropriate for Science, Technology, Engineering and Math in your world?

## **RALPH**

Performance, real world tasks, that's what we talk about. Solving complex problems and meaningful real world applications - that's more or less, "Can my plane fly? Can it really go up? Can it circle for 2 ½ minutes?" Now we are talking about real performance and how we get into the higher level learning, or stay in the contest.

## **KATHY**

We found that authentic assessment directs curriculum and presents a "backward" or "reverse planning" model of instruction. Is this the case?

## **RALPH**

Creating assessment, instructional content – let's talk a little bit about architecture. You have a lot of instructional content. Always, there are standards, meeting standards, testing standards, making sure that you're not "red-tagged", and that your standards meet approval so that you keep on building your house. Excellence has a lot of different meanings. Where is your house? What freeze zone is it in? What part of the United States do you live in? And now, you start worrying about what kind of a climate is there? And, how does your excellence now stand up? Is your performance going to suit the weather, or going to suit the frost line? Is it going to suit the standards of the city, or the city residence clause? Sometimes the city code means everything there should be a

certain style. Excellence is staying inside of that performance code.

### **KATHY**

We find that authentic assessment impacts how students think. Have you seen this to be true?

### **RALPH**

That's always the challenge. Open-ended, complex problems - what is the task and what is the objective of the task? And, a lot of times that makes them really pick, choose, and respond in a timely, orderly fashion to simply complete their challenge, or to complete their task for that day. They have to complete it, and under the thinking of complex problems or simply getting the object done.

### **KATHY**

It is documented, in educational writings, that authentic assessment impacts student learning and performance. Do you find this to be true with your students?

### **RALPH**

Yes, because examining both processes, and the outcomes of learning means when you build certain things, like a robot for example, it has certain tasks. Process is - how easily can that be built? How fluid is travel from one point to the next? Is it moving fast enough? Is it transferrable? How well do you know the rules? How active are you in the task? For example,

now you have to design your robot, build your robot as far as efficiency and speed is concerned. A lot of times, when you get into the realistic problem, you first have a dry run, or the first round. In that first round, you find out, “Oh, we’re way ahead, so all we have to do is stay on a level keel, and sequentially, pick up our points.” Or, you’re way behind. Now we have to problem-solve. Now we might have to take it apart. Now we have to get on our feet and do actual problem solving activities. We have to make it run faster. We have to demonstrate the skills and the ability for this robot to run efficiently.

### **KATHY**

A key component seems to be the impact on students due to providing assignments with real world application. Can you talk about that a minute?

### **RALPH**

Authenticity of assignments and collaborating - when the race car driver is talking to the designer. Something’s not smooth. Something’s not running well. If you ever went to a speed track, it seems to me that the smoother car is always ahead. It hums up to the front. Everything is done precisely. Every benchmark is met. And, that car is winning the race. And there is where success can be found.

## **KATHY**

It must impact teachers as well. How does it affect the instructional roles of teachers?

## **RALPH**

The heart of the matter is performance. How are your students performing? Are they actually doing something in class? Are they sitting there watching the other student do something for them? Are they actually bringing up a thought? If they are bringing up a thought, you have to find a way to get them actively involved and demonstrate what they know. It might be a small part. For example, whatever little part it is, you find it and then you ask them to demonstrate that.

## **KATHY**

Let's talk a minute about several methods we can use in implementing authentic assessment. While we don't have time to cover all of them, let's talk about demonstrations, student portfolios, group projects, and observation checklists. Tell me a little bit about demonstrations as an assessment method relative to STEM curriculum.

## **RALPH**

Demonstrations, that's the objective of the contest. A good way of proving what they've done is actually putting them to the test. Put them to a contest. Then, go to a regional contest, or a state contest. It's almost unlimited. It depends on how well their skills came out. How cooperative were they working

with one another? How well did the design of the object, robot, plane, or car, perform? How many people were on that work team? Who solved the problem? Whose skill led them to the front? And, when you find that, you keep on adding to it. A contest demonstration is how you are setting with people in the whole state. In the classroom, your time has to beat the time of the guy next to you. Once you have that time set, or put on the board, it's up to the rest of the class to chase it. Who can get under point 5? If you can get under point 5, you can go to regional. Or, you can get into another contest that will take you a little bit further. Now, maybe their practice scores are a little higher. Can you actually solve the problem and make your car a little faster or your robot a little smoother? Or, somebody might simply acknowledge the rules and they would win points on the rules and the reading of the rules and how it produced in the final outcome. It makes that student feel good. It makes that student think – “I have worth. All I have learned finally comes into play.”

### **KATHY**

What about portfolio assessment? Do you use portfolio assessment with your students?

### **RALPH**

I really love portfolios. It brings out every student in your room. Some kid might be just a simple great drawer. He can sketch, and he can draw. Everybody liked the picture. If anything, he can put it on his T-shirt. But, it gives that person a

little bit of worth. He has to tell about it and demonstrate it. In that portfolio, there's a lot of different attitudes, a lot of different tasks, a lot of different standards, and tables of contents. Can that person actually put into content what is expected of him?

### **KATHY**

Do you recommend group projects?

### **RALPH**

I like group projects when it comes to designs. Let everyone participate in the design. Let everyone try to find a way to design a project that will meet the task. I don't want a kid just to hold a clipboard. I want them actually taking some kind of interest, some kind of function, some kind of a project to the table. I want them either to look at the wheels and make sure they're fast as they can be, smooth as they can be. Then, I want another person to make sure that the weight takes them through the finish line. Sometimes the weight and the wheels have something directly to do with the outcome. So, one person's working on the wheels, one person's working on the weight and one person is working on the design. I want them always to be involved. I want them always to bring up some type of information. I need a tabulator. I need somebody who charts them and makes sure that they're on task. They're actually competing and going forward. When the means start

diminishing, we have to go back to the refining of the design of it.

### **KATHY**

What about the use of observation checklists. Do you use those?

### **RALPH**

Observation checklists are very important, especially in aerospace. Aerospace needs so much tabulation. Every little ounce has to be accounted for. If it's leaning a little bit too far to the right or to the left, you chart that. If it makes the plane fly a little longer, you did something right. If it makes the plane nose down, you have to bring the weight back. Every tabulation has a function. And, that equals and makes that plane stay up a little longer or do what it's supposed to do.

### **KATHY**

You have named many examples of student activities, or performance tasks that are appropriate for being assessed authentically. Do you have more?

### **RALPH**

Models, there are all types of models. Models are really what you want your students to do. A model is the overall outcome. Draw it, model it, and make sure it does what it's supposed to do. Make sure it fits in the guidelines, in the criteria - the reason why it initiates the standards you're looking for. Make

sure that standard really takes the place in the overall outcome.

### **KATHY**

Let's spend a few minutes on the process for authentic assessment.

### **KATHY**

We find that authentic assessment includes identifying standards to be met that have meaningful, real world application. The learning objectives are developed as specific, measurable components with target performance skills to match. The performance criteria is clear, concise, and openly communicated to the students. And, the activities require higher order cognitive skills. What would the next steps of the process be?

### **RALPH**

Assessing observations and assisting them in establishing what they want to do. What was the most difficult project for you? What did you have a hard time with? How can you make it easier? What should you do next about your problem? What would you do different? What did you learn from the project? What was the outcome of that object, project that made it go to the extremes, or make it more acceptable? What was the specific thing that you monitored and checked? And, what strategy did you use to perform that ability or to perform that task? The importance of the rubric is how they get along and

also how they observe. What kind of checklist did you use? Did you test the wood? Did the grain go the right way? Or did you put the grain in with no idea how you applied it? You have to check some of these. You have to assess some of these. And, a rubric would be a good place to start to have the performance of your project assessed.

### **KATHY**

We have talked a little about the portfolio as an effective assessment tool for STEM. Can you talk a little about its use for self-assessment?

### **RALPH**

After you know what it is you are doing, what's the purpose if you can't monitor it? You have to tell me, what did you do? How efficient is it? Is it something you like to do? What did you want to do? Is it something you really think you might want to get into a little later? Is it making you develop the thing that is faster, bigger, stronger, last longer? What good was it to you?

### **KATHY**

What do you normally have your students include in their student portfolio?

### **RALPH**

Self-reflection, evidence, and ideas - something they actually did that they liked to do. Certain people like doing different

things. Girls might like the fashion world a little bit, so they put in all types of clothes, jewelry, whatever it is that opened their eyes to look at that portfolio. What's going to make me want to open the cover? What kind of letter are you going to give me to read when I open the cover? Are you going to have tables for me to go to? Are you going to have content that is going to make me stay in there? Are you going to have content that makes other students look, or observe what you did? Then, how are you going to evaluate it, or better yet, how are you going to make them interested in what you did?

## **KATHY**

We are coming to the end of our time together and I would like to thank you for sharing your insights on improving student learning and performance through authentic assessment in Science, Technology, Engineering and Math. In conclusion, I think we have found many ways in which authentic assessment improves student learning and performance in STEM. Let's recap:

- It provides meaningful performance tasks with real-world application;
- It requires higher order cognitive skills;
- It emphasizes both process and product;
- It provides clear, concise, and openly communicated performance criteria and scoring rubric that guides students toward desired performance;
- It ensures consistent and fair grading procedures;

- It uses a variety of methods to evaluate performance by self, peers, and teacher; and
- It allows for revision.

## **KATHY**

I would like to take this opportunity to thank our listening audience for joining us for this podcast discussion. For references for this podcast, please download the reference file at the end of this podcast.

### **References:**

- Health Science Technology Education 2006 Assessment Tools. CD-ROM. 2006.
- Dietel, R., Herman, J., & Knuth, R. (1991). What does reserch say about assessment?

