Exemplary Instruction Commentary: Technology Engineering Education

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1. Which lesson or lessons are shown in the video clips? Identify the lesson(s) by lesson plan number.

2. Promoting a Positive Learning Environment: In response to the prompt, refer to scenes in the video clips where you provided a positive learning environment. * How did you demonstrate mutual respect for, rapport with, and responsiveness to students with varied needs and backgrounds, and challenge students to engage in learning?

Throughout the learning segment, I built a rapport with students I showed mutual respect for students by being open and allowing them to share their thoughts and ask questions. I built a rapport by being welcoming and establishing an inclusive environment where all the learners felt comfortable. I was responsive to all students because I paid attention to the variety of learning needs in the class and planned learning tasks that would benefit everyone. I challenged students with how and why questions, real world examples, and encouraged them to be problem solvers.

Evidence of an atmosphere of mutual respect occurs in Clip 1 at 00.00. I begin the lesson by asking a question. The learners show respect by being quiet as I begin the lesson and taking turns to answer the question. I show respect for the learners by listening to their responses as if we are having a conversation, instead of my lecturing them. The students show respect for each other by listening and taking turns when answering the question.

Evidence of building a rapport with learners during the whole class instruction occurs in Clip 1 at 04.07 and 04.24 when I use the students first names to prompt them to answer the question. This shows that I am building a relationship with them as individuals by addressing them by the name they prefer to be called. This helps them understand that although I am instructing the whole class, I believe they know the correct answer and want them to learn as individuals.

Evidence of building a rapport occurs in Clip 2 from 00.34 to 00.40. I ask the learner that I am working with a question, then I wait for him to think about the answer. This opens a channel for healthy communication. First, I ask him the question, it shows that we are working together and we are having a conversation, instead of me telling him what to do. Next I look at him, instead of just looking at the screen, this shows that I see him as a person and individual. Then I wait for his answer, I allow him to think and let him know that his thoughts are important to me, even if he doesn’t know or gives an answer that is incorrect.

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I show responsiveness to learners needs in Clip 2 from 00.00 to 01.28. This student has an IEP that requires periodic checking for understanding, reviewing content and skills, learning in a smaller group setting if possible. I meet the needs that are listed on his IEP and his direct learning needs as I am working with him one on one. I am meeting his need of working in a smaller group setting by working with him individually. I am meeting his need for reviewing content by reviewing an example from the lesson. At 00.34, I ask him a question to check his understanding of the content, to meet his need of checking for understanding. From 00.34 to 00.40 and from 01.11 to 01.16 I give him wait time to think. By doing this I am responding to his immediate needs concerning the assignment we are working on.

At the beginning of Clip 1 from 00.00 to 00.31 I engage students in learning. I start the lesson with a set induction, I ask the learners “how many total parts are in a car?”. This challenges them to become engaged because it is probably not something that they have thought about before so they are curious to know the correct answer. It is also relevant to their lives because they probably ride in a car almost daily. This engages them by connecting content to their everyday lives. I also allow them to guess, so it engages them by giving them a chance to participate in the lesson right away.
I challenge learners to engage in learning in Clip 1 from 05.55 to 09.07 by showing an example of a technical drawing. Prior to this, we talked about technical drawings and what information was shown on them. So, by showing them an example of a technical drawing, they can then see what we were talking about.

b. Address safety in the lessons or videos.

Students worked on computers for this entire learning segment so there was no need to discuss shop or machine safety. However, I did teach the learners about the importance of electronic file safety. I discussed the importance of saving files with appropriate names in a place that they will be able to access later. I also discussed the potential of computer programs and computers becoming non-responsive or “crashing”. I used an example from when I worked for two hours on a paper and did not save only to have my computer crash and lose all my work. I encouraged learners to save often when working so that they would not experience a similar situation. I made it clear that during this learning segment they only needed to use the internet when using Google Classroom to access the course assignments and resources. However, if they wanted to use the internet as a resource to reference class related information, I would allow it if they were safe. For example, if they wanted to find more examples of technical drawings or find an instructional video for an operation in Autodesk Inventor. I discussed the importance of internet safety and finding legitimate sources for information. I encouraged them to share any good resources with their classmates as well as myself. I also emphasized that they were not to use the classroom computers for games, social media, school work for other classes, or anything else not related to the learning segment.

3. Engaging Students in Learning: Refer to examples from the video clips in your responses to the prompts.

a. Describe your strategies to elicit student expression of their understanding of the learning target(s) and why they are important.

My instruction engaged learners in developing conceptual understanding during Clip 1 from 03.00-03.56. During this time, I am prompting the learners to answer, “what is the purpose for creating a technical drawing?”. This engages them by making them think about why we are talking about technical drawings. At 03.27, one learner says that the purpose is to communicate. Next from 03.29 to 03.37 I compare technical drawings to other forms of communication. This gives the learners a more general idea of why technical drawings are created. Then from 03.40 to 03.54 I apply this concept of communication to a technology related example by saying that it is the way the design team communicates with the manufacturing team. This helps the students understand more specifically where their knowledge of technical drawings could be applied.

My instruction engaged learners in developing technical skills in Clip 2 from 01.28 to 02.38. I helped this learner apply the concepts of dimensioning to his drawing. From 00.00 to 01.28, I am reviewing an example from the lesson with him. At 01.28 he opens his drawing again and I ask him where to place a dimension that locates the height of an arc on the part. By asking him, I am engaging him to think about the concept we just reviewed. Then he correctly places the dimension to the center mark of the arc. At 02.15, I ask him to look at the center mark for a hole and decide if the hole also needs a location dimension. Now I am making him apply the same concept but think about the concepts of dimensioning and decide if that dimension is needed. He correctly answers “no”.

My instruction engaged students in developing problem solving strategies in Clip 2 starting at 03.05. I am assisting a learner add a chamfer annotation to a drawing. From 03.08 to 03.21 I explain to him that the Chamfer note tool will not work on this part because it is round and the Chamfer note tool only works on straight edges. This helps him understand that when using Inventor, sometimes alternative methods must be used. From 03.21 to 03.45, I explain the alternate way of adding the annotation in Inventor is to add a leader line and type the annotation in himself. At .03.45 I ask him what the annotation will look like. He does not know so I tell him that we need the angle, then at 04.19 I suggest he check the original part drawing to see what else he needs. At 04.40 I suggest he type the word “CHAMFER” to make the annotation clearer. By walking through each step of this process I am probing him to think about what problem he is trying to solve. He also understands that there are many sides to the problem and it can be solved with several solutions.
b. Describe how your instruction linked students’ prior academic learning and personal, cultural, and community assets with new learning.

I planned my instruction to link students prior academic learning and personal, cultural, and community assets. I would often ask learners to think back to a concept or skill that we learned before either in another unit or earlier during this learning segment. I would also use examples from their everyday lives so that they could relate more easily to them. I also often mentioned where the concepts and skills would be useful for them in the future whether it be school or work.

I’m linking learners prior academic learning to new learning in Clip 1 from 00.00 to 02.29 when I am talking about the design process. I start by using the example of a car and all the parts that make up a car. Then I ask the learners to help me recall the steps of the design process, the process that every part on a car goes through. When we get to the point of production I ask the learners what is needed, this happens at 02.08. At 02.27 a learner says “technical drawing”. This is where I segue from their prior learning about the design process to the new learning, technical drawings.

I am linking learner’s personal assets to new learning in Clip 1 from 03.29 to 03.37 when discussing the purpose of technical drawings. I compare technical drawings to other forms of written communication such as: a research paper, email, or text message. Students commonly use these types of communication, so now they can understand that a technical drawing serves the same purpose.

I linked cultural assets to the new learning by giving an example that made sense to the student. Since I built a rapport with the students and got to know them, I knew this one learner was a hockey player. When he asked me a question about technical drawings during lesson 3, I used the example of a hockey coach drawing a diagram on a whiteboard for the team to see. This helped him understand that engineers, just like hockey teams, use graphics or diagrams to communicate with each other.

I am linking learner’s cultural and community assets to new learning in Clip 1 from 03.40 to 03.54. The community consists of many industrial companies and most of the learner’s parents are somehow affiliated with these industries which makes it a part of their culture. Also, many of the learners have expressed interest in pursuing careers in a technical or STEM related field. So, when talking about technical drawings as communication, I use the example of a design team: engineers, designers, or architects communicating with the producers, manufacturers, or builders.

4. Deepening Student Learning during Instruction: Refer to examples from the video clips in your explanations.

a. Explain how you elicited and built on student responses to promote conceptual understanding.

Throughout the learning segment, I built on student responses to help them understand better and make them think deeper. I used real world examples to better develop conceptual understanding. For example, a learner said that a technical drawing helps a machinist make the part. I said that it can also be used to evaluate the part before its made or inspect the part after its made. I used why questions when learners were working to develop technical skills. For example, a learner asked me if they did something correctly, I would ask them why they though it was correct or why they thought it was incorrect. I used how questions to help develop problem solving skills. For example, a learner asked if something was incorrect, I said that it was and asked them how we could fix it.

I elicit student responses related to conceptual understanding in Clip 1 from 09.13 to 09.40. When we are looking at an example of a technical drawing with two views. I ask them if every drawing will look the same, they all answer no. So I ask them why. This makes them think deeper about what a technical drawing does and what information is being shown.

I elicit student responses related to technical skills in Clip 2 starting at 00.36. I ask the learner how an arc should be dimensioned; he responds with “a radius”. So, I ask him how we locate an arc on a part. This makes him think deeper about what dimensions need to be added to a part that has an arc on it.
I elicit student responses related to the engineering design process in Clip 2 from 02.22 to 02.38. I worked with the learner to find the length dimensions and the height dimensions on his drawing. I challenge him to think deeper by asking him to find the depth dimensions on his own. Dimensioning in the order of length, height, then depth is a strategy I taught during lesson 2 to help them systematically determine if they have all the necessary dimensions on a drawing of a part.

b. Explain how you and the students used representations to support students’ understanding and use of mathematical concepts and procedures.

Throughout the learning segment, the learners created CAD models and technical drawings. When creating these work artifacts, they used engineering design and problem solving processes. They had to use engineering thinking when modeling parts using Inventor to figure out the most effective and efficient ways to model the parts. For example, they had to decide which command would work best when creating a hole. Some of them sketched a circle and extrude cut it out while others sketched a point and used the hole command. When creating the technical drawings, they had to use engineering thinking to determine where and how to show dimensions on a part. For example, if the height of an object could be dimensioned on both the front and right side views, they had to determine which would be more clear to the machinist making the part. If they made mistakes when modeling or drawing they had to use a problem solving process to fix those mistakes. For example, if they modeled a pin but they put in a radius instead of a diameter. They would have to problem solve to figure out the best way to fix that part.

In Clip 1, I use examples of technical drawings to support my learner’s understanding of the engineering design process. In Clip 1 from 05.58 to 09.59, we look at examples of technical drawings, that are similar to the assignments they will be given during this learning segment, after discussing where the creation of a technical drawing would be in the design process and the reason for creating a technical drawing.

In Clip 2, I am guiding the students to create their own technical drawings of parts they modeled in Autodesk Inventor. Throughout the clip I help two different learners with the dimensioning stage of creating their drawings by guiding them as they figure out what dimensions are needed on these parts and how they should display these dimensions. From 00.00 to 02.38, I am helping a learner figure out which dimensions are needed on an arc feature of the part. From 02.42 to 04.58, I am helping another learner annotate a chamfer on the part.

5. Analyzing Teaching: Refer to examples from the video clips in your responses to the prompts.

a. What changes would you make to your instruction better support student learning of the central focus?

One learning need that I would address for the whole class is participation during the lecturing part of my instruction. Due to this being such a large class it is difficult to make sure every learner is participating. This can be seen throughout Clip 1 but specifically from 04.00 to 05.55. The change I would propose here is instead of asking the whole class what information exists on a technical drawing, I would have the learners pair up with someone sitting next to them to list as many things as they could think of in a minute or two. Then I would ask each pair to share one or two things that they thought of with the class. This would ensure that every learner has the opportunity to think about the questions for a longer period of time and share their answer with a peer. The outcome would be that more learners are actively engaged by thinking and then sharing their thoughts with a peer and then with the whole class.

One learning need that I would address for an individual learner is to make a better connection between skills and conceptual understanding for my learner that has an IEP. I can be seen working with this student in Clip 2 from 00.00 to 02.35. One support that is stated on his IEP is reviewing content and skills. I do this in the video from 00.10 to 01.31, when helping him dimension an arc by referencing an example used during the lesson. My proposed change would be in addition to reviewing the example from the lesson, I would review the conceptual understanding of the purpose of technical drawings as well. This way he can make the connection between the technical skills and the conceptual understanding. The outcome would be that he understands the bigger picture and reason we are doing what we are doing.
b. Why do you think these changes would improve student learning? Support your explanation with evidence of student learning and principles from theory and/or research.

One change I would propose, would be to for the whole class to share with partners before sharing with everyone else, commonly known as a “think, pair, share”. According to Elham Kazemi of the University of Washington and Magdalene Lampert of the University of Michigan, partner sharing gives learners the opportunity to process what was told to the whole group and gives them the opportunity to think about an answer. During my learning segment, it would help more learners be engaged and participate because they would all have the opportunity to think about the question and listen to what one of their peers thinks. Instead of asking the whole class what information exists on a technical drawing, I would have the learners pair up with someone sitting next to them and list as many things as they could think of, in a minute or two. Then they would share one or two things they said with the whole class. It would help improve student learning because all the learners would be able to process the question and think about an answer, they would hear the answer that their partner came up with, and they would have a chance to participate and share with the whole class. This would be more engaging than calling on only a few learners to answer the question because it involves all learners, allows them three chances to think or discuss the question, and gives them an equal opportunity to participate. (Kazemi & Lampert 2009).

One change I would make with my learner with an IEP would be to connect skills with conceptual understanding when reviewing content with him individually. Joseph Akpan and Lawerence Beard, Universal Journal of Educational Research, believe that learners with special needs respond best to constructivist teaching strategies because they are student centered. They say that this philosophy works best when it is driven by learner thinking in a hands on, minds on environment. My proposed change would be in addition to reviewing the example from the lesson, I would review the conceptual understanding of the purpose of technical drawings as well. This way he can make the connection between the technical skills and the conceptual understanding, a hands on minds on connection. This will increase his learning because he will be actively thinking about how concepts apply to skills because he is experiencing it himself as he is doing it (Akpan and Beard 2016).
