Entry 1:

Designing Science Instruction

Entry 2:

Probing Student Understanding

Entry 3:

Inquiry through Investigation

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Entry 1: Designing Science Instruction

a. Knowledge of Students (KOS)

- Information for this is a collection of data that may be obtained from the following sources:
  - QPA or NCA building profile, building secretary, district office, district public information, other educational professionals, IEPs, parents
  - Surveys of non-confidential issues: pre/post surveys, learning styles, interest, personalities, color theories, etc.
  - Internet search on your city for community data
- Although each of the following sections below affect what you teach and how you teach your specific students, select only the areas that are specific to your setting and necessary to demonstrate student impact for the lesson explained in the portfolio entry. Remember: some of this information may also be included in your contextual information.
  - Gender and age
  - Physical/psychological age (e.g., 14 but thinks as an 8-year-old)
  - Community (e.g., urban/rural/suburban, employment opportunities, geographical location, cultural life experiences)
  - Academic ranges (e.g., strengths/weaknesses, honors/AP, reading level/ writing level/math level)
  - Science level (e.g., comfort level with inquiry method, interest level, inquisitive group of students, state assessments, other standardized test results)
  - Student interests (e.g., sports, fine arts, Discovery Channel, technology)
  - Special needs—any that apply
  - Family (e.g., economics, free/reduced lunch, parent education, family structure)
  - Ethnicity/cultural issues

b. Goals/Connections (G/C)

- Identify your scientific concept (big idea), the process skills (observations, data collecting), and learning goals (aligned w/ standards). Explain how they are connected to one another.
- Provide rationale for why they are relevant for this group of students, based on their needs, and how your instruction will assist the students in meeting the goals you have set. Be sure to include how the concepts and skills are central to science.

- Determine a pretest/diagnostic tool. Use data/information from the tool to provide rationale for your goals.
- Use the data/information to develop goals for EACH lesson in the unit. Identify specific connections to student needs.

c. Instructional Sequence (ISEQ)

- Explain the instructional sequence. Provide evidence of why it was logical and of its effectiveness. Indicate how student progress/performance dictated a change in your original plan.
- Provide examples of how student strengths and weaknesses and/or interests directed your instruction.
  - Explain how strengths and weaknesses were determined.
  - Explain what the students were asked to do and what they actually did.
  - Cite in your commentary and on student work where you used differentiated instruction to assist student learning.
- Give a specific explanation of how the goals were met. Address each goal, concept, and skill.
  - Explain how each lesson helped meet the goals you set (overall and individual).
- Explain how each lesson was built on the previous lesson. Show how they were connected or interrelated in helping the students reach the goals you set.
  - Justify your instructional sequence. Explain how it was based on student needs and your instructional goals.
- Explain how each activity promoted students' scientific reasoning.
- Explain how the instructional sequence/activities moved the students from a broad/vague understanding to a deeper understanding of the concept. (E.g., students go from saying "Convection currents cause plates to move," to explaining how convection currents work and move the plates to their current locations.)
- Explain how this lesson establishes connections to other contexts of science. (E.g., convection currents can also be found in the ocean and atmosphere.)

d. Assessment (ASMT)

Remember: the word "evidence" refers to materials sent with the portfolio to verify the commentary. The word "tools" refers to equipment, technology, materials, approaches, and strategies used to demonstrate performance.

- Be sure the assessments are relevant and they measure what needs to be measured.

- Identify which parts of the assessments measured a specific goal.
- Indicate diagnostic, formative, and summative assessments used. Explain how the data collected helped modify your instructional method.
- Explain how you individualized assessments to meet student needs. Provide rationale for making modifications or not making modifications.
- Show assessment variety (e.g., performance-based, paper pencil, constructed response, compare/contrast, physical product, portfolio entry, formal/informal, observations).
- Identify how the assessment demonstrated student growth and tied to the goals. Identify specific references to growth as cited in the evidence.
- Explain how the assessments showed a need for further instruction or advanced instruction.
- Explain how the assessments were relevant to students and provided immediate feedback.

e. Technology (T)

- Provide rationale for why specific technology resources are appropriate and relevant. Take in to consideration your learning goals, knowledge of students, and availability.
- Examples may include some of the following: computer spreadsheet, Internet, SmartBoards, clickers, K'Nex, virtual tours, videos, United Streaming, digital thermometers, etc.
- Explain how technology assisted your instruction. Tell what you used and how it helped you improve your instruction.
- Explain how the students used technology in their activities. Explain how technology was used by the students and how it increased their learning or advanced their understanding.

f. Instructional Resources (IR)

- Identify resources you used to assist instruction or student learning. Provide a rationale for the use of the resources and cite proof of how they increased student learning.
- Examples of resources may include: texts, trade books, videos, Internet, websites, teachers, paras, parents, members of the community, CDRom, curriculum resources, guest speakers, tours, newspapers, magazine articles, games (computer or other), TV programs, museums, Web Quests, SciLinks, photographs/illustrations.
- Activities that may become resources include: Thinking Maps, graphic organizers, role playing, debates, demonstrations, cookbook experiments, model building, hands-on activities.

- Instructional resources should be rational, current, relevant, affordable, available, safe, reliable, and hold students' interests.
- Consider your knowledge of students, learning objectives, and the big idea.
- Classify where this fits in the learning cycle: exploration/concept development/application.

g. Analysis (ANA)

- Truly provide an ANALYSIS of student work. Do not merely describe what the assessor is seeing, but explain what he/she is seeing.; give it meaning. (Don't say they scored 8 out of 10 questions correctly. Tell why they missed those two and what learning took place that enabled them to get those 8 correct. What does 8 of 10 mean to you?—not 80% mastery, but what concepts and skills are demostrated in those correct responses? After the assessor reads your commentary they should be able to look at the evidence and know it means what you said it meant.)
- Did the student meet the goals for the activity/assignment/project? If so, cite proof from the student's work. If not, cite places in the student's work that provide proof the student is still struggling. Explain how the response leads your future instructional decisions.
- Identify modifications made during the sequence. Cite evidence from the student work that guided any changes for the class or the individual student. Provide rationale for modifications.

h. Feedback (FB)

- Explain your rationale for any feedback you provide the students. This includes verbal and/or written feedback on the activities submitted.
- If there are areas where no feedback was provided, a rationale for that should be provided as well. (Perhaps you want the student to make the connection on their own after you have used another strategy.)
- Explain how your feedback, or lack there of, enhanced student learning. Tell how your feedback helped "make it click" or opened the door for new ideas to take root.
- Identify positive outcomes, unanticipated outcomes, and where appropriate, outcomes that reveal the need for further work.

i. Content Knowledge (CK)

- Explain how your knowledge of the science content helped you teach this unit and students reach the goals you have set.
- Explain how your knowledge of learning pedagogy helped you plan this instructional sequence so it best enables students to attain the goals you have set. (E.g., based on your understanding of how students learn and this science content, is it best for students to have a basic or a more in-depth understanding of density before introducing convection currents? Or can convection currents be understood without prior density experiences?)

- Provide a rationale for how your learning and teaching experiences have helped you develop learning sequences promote student learning. Explain the "method to your madness."

j. Reflection (R)

- Identify and provide evidence from the student work/growth that indicates the next step(s) in this instructional sequence. Should you reteach? do an extension activity based on student interests/needs? fill in gaps or provide clarification of concepts? or modify the learning pace (slow down or accelerate instruction)?
- Identify possible alternative approaches that could impact student learning of this particular group of students. Provide rationale or justification for alternative strategies. Some could include compare/contrast, peer editing, graphic organizers, cooperative learning, differentiated instruction, hands-on, incorporating technology.
- Reflect on your teaching practices. Identify strengths and weaknesses that did/did not impact student learning throughout the instructional sequence. Point out specific parts that were successful/impacting and **explain** why. Point out specific parts that were not as successful/impacting as hoped or anticipated and **explain** why. Factors may include the activity itself, the questions, the sequence of activities/instruction, the resources, etc.
- Identify adaptations/modifications made along the way or possible ones that could be made. State why they were/would be appropriate.
- Cite specific student feedback used that influence instruction.
- Explain how you can move this lesson from a good lesson to a GREAT lesson.
- Identify what you learned (good and/or bad) from this lesson that can be transferred to future lessons.
- Identify defining moments in this instructional sequence that raised your own personal definition of quality instruction.

*Focus on students with different abilities. Don't use two special education students or two with the same struggles. Consider using students with different challenges for you as a teacher. Perhaps consider a gifted student that you struggle to provide with a learning challenge.

*Be sure to clearly articulate the goals and connections for the students for all the entries.

*Put a strong focus on the analysis and reflection for all the entries.

Entry 2: Probing Student Understanding

a. Knowledge of Students (KOS)

- Refer to suggestions provided in Entry 1.

b. Goals/Connections (G/C)

- Refer to suggestions provided in Entry 1.
- Explain your goals for this video segment. What information are you hoping to learn about your students' knowledge/understanding? Remember, you want to gain an understanding of what your kids know or think they know about the new concept.
- Explain why this probing technique/activity works best for this group of students and their needs.
- Explain how this activity fits into your instructional sequence. It should be part of the natural flow of this instructional sequence.

c. Student Understanding (ST/UD)

- Cite specific examples and quotes from the video demonstrating specific questioning and probing techniques to gain an understanding of student knowledge and ideas. (This might be a discrepant activity, asking for more detail, having the student relate the idea to past/real-life experiences, restating their idea, etc. You might ask for group consensus then have those who do or do not agree explain why.)
- Cite examples from the video segment that demonstrate how you were able to gain a better understanding about student ideas/beliefs in a non-verbal way. (This could be using illustrations, diagrams, student drawings. Show how you can reach all the students, not just the ones who will speak out. Let the assessor know that you want to know about all your students, not just the active learners.)
- Cite dialogues and situations from the video; explain what you are learning from the students. Be specific. Don't just quote the student, but tell the assessor what the content and details from the statement actually tell you about the student's idea/understanding. Identify correct information as well as misconceptions.
- Explain how what you are learning about student understanding helps guide the discussion. (Sometimes the students may take control of the discussion and provide you with little opportunity for input. Perhaps they are debating an idea. If it is relevant to your learning goals or a good/healthy discussion is taking place let them continue in the lead. Only when they get way off track or disrespectful you should step in and guide the discussion back. Provide a rationale for why you let the students be in control of the discussion. Remember this is mainly about student discourse, not a teacher lead discussion. You are a guide, not a dictator.)

- Explain and provide a rationale for how you are going to use the information you have gained about student understanding to develop your instructional sequence. Tell the assessor where this discussion/activity dictates your next step.(Perhaps you will provide opportunities to correct misconceptions or you will build on a concept students have a strong interest or understanding.)

d. Learning Environment (LE)

- Explain how you strive to make this learning environment conducive to all student learning/participation.
- Consider "fair", "equitable", and "accessible" as one category, not three separate entities. To be fair students will get what they need. Access means students will have equal opportunities in learning experiences. Equity means you have leveled the playing field, everyone has a fair shot. (Things that make your environment fair, equitable, and accessible may be allowing students to draw their ideas; share in their group, but not require them to speak to the whole class; modified instructions; etc.)
- Give examples of how your environment is safe for all the students and how you provide opportunities for all students to participate in some way, either active or passive.
- Identify positives for student participation.

e. Engagement (ENG)

- Look at teacher-to-student discourse, student-to-teacher discourse, and student-to-student discourse. Cite how the students are engaged in the discourse. Select a segment of the lesson that is predominately student-to-student.
- Identify verbal and non-verbal signs of interest. (A student laying his/her head on the desk does not look interested, but a student whose eyes widen and nods his/her head is showing some kind interest/agreement. They may not speak but they are listening.)
- If students are not actively engaged in the discourse then don't use this video.
- It is possible for students to be meaningfully engaged in discourse that is not always relevant to your goals. Cite how and why the discourse shown on the video is relevant to your featured concept/goals, or related/connected to your concepts/goals.

f. Analysis (ANA)

- Truly analyze the video. Don't just quote what is said by you and/or the students. Give meaning and understanding to those quotes. When the assessor reads the commentary then watches the video he/she will know that you truly understood what your students were thinking and they will see the discourse on the video as an insightful tool you used to guide your instruction.
- Just providing a quote is a "so what?" A quote with an analysis of the meaning behind it answers the "so what?" question.

- Don't describe the video; explain it.
- Pay attention to the content and details in the conversation. Don't assume because the student wasn't loud or passionate it was not relevant or noticed.
- Identify modifications made during the video. Cite evidence from the video that guided any changes. Provide rationale for modifications.
- If your goals for the video were met, explain how, and if not explain why. Provide specific evidence for either.

g. Content Knowledge (CK)

- Refer to suggestions provided in Entry 1.
- Explain how your knowledge of the science content helped you introduce this concept so you would have a clear understanding of student ideas/beliefs.
- Explain how your knowledge of learning pedagogy helped you plan this probing activity so it best enables you to have a clear understanding of what the students know. Based on your understanding/experience, what should your students know compared to what they did know at the beginning?
- Provide a rationale for how your learning and teaching experiences have helped you develop this activity in such a way that allows you to gauge your students level of understanding. Explain the "method to your madness."

h. Reflection (REF)

- Refer to suggestions provided in Entry 1.

Entry 3: Inquiry through Investigation

a. Knowledge of Students (KOS)

- Refer to suggestions provided in Entry 1.

b. Goals/Connections (G/C)

- Refer to suggestions provided in Entry 1.
- Explain your goals for what is seen during this video segment. Identify what the students should be seen doing or saying. Remember, you should be demonstrating **how you support** the students in scientific inquiry discourse as they interpret data they have collected from an investigation. They should be the ones trying to make sense of the data, not you. You are simply a guide that gently leads them, and answers questions they may have regarding their struggles to understand the data.
- The goals should be student goals (your goals for what the students need to do, not goals for how you guide them).
- Explain why this investigation/activity works best for this group of students and their needs.
- Explain how this activity fits into your instructional sequence. It should be part of the natural flow of this instructional sequence.

c. Instruction (INS)

- Explain what the students were asked to do for the investigation and for the data analysis. This should go beyond merely collecting data, graphing it, and saying the temperature increases at a steady rate.
- Cite instances in the video where your specific questioning and probing techniques helped the students analyze/interpret/make sense of the data. (If they say the temperature increased at a steady rate, then you need to explain how you guided the students to actually explain why they think it went up. They don't need to be correct, but they need to be using scientific reasoning. You can address the misconceptions when appropriate.)
- Your instructions and guidance should foster scientific reasoning. Cite when and where your students gave explanations, not descriptions.

d. Use of Data (UD)

- Cite examples from the video of how you guide your students to use scientific reasoning to analyze and interpret the data. Since this does not come naturally for most students, you need to demonstrate how you teach them to analyze and interpret. (An example would be analyzing data yourself. Having the students listen to you make sense of data gives them an example to follow.)
- This investigation should not be a stand alone. It needs to fit into your instructional sequence, giving it value and relevance. Explain how the data

analysis and interpretation in this investigation was used to deepen the students' understanding of the concept. Explain how this investigation assisted the students in reaching the goals for the unit. Explain what your students have a greater understanding of now than they had before the investigation.

e. Learning Environment (LE)

- Refer to suggestions provided in Entry 1.
- Some students may not be mentally mature enough yet to analyze/interpret data at a higher level. Explain how you accommodate them so they feel their ideas hold value rather than "out of their league." Some students may already think at higher levels therefore making analysis easier. Explain how you challenge them to go one step further with their ideas. Be sure to give rationale for both sides.

f. Engagement (ENG)

- Refer to suggestions provided in Entry 2.
- Cite how the students are engage in the discourse of interpreting and analyzing the data. Select a segment of the lesson that is predominately student-to-student.
- By changing a variable students will be able to gather different data relating to the same concept. (E.g., the rate sand, water, and soil absorb and release heat. There are three variables, two groups per variable, and as a result you have discourse on why they absorb and release at different rates. This can open debates and deeper analysis by the students.)
- Consider the quality of the student-to-student, teacher-to-student, and student-to-teacher discourse. Are they simply arguing or agreeing with each other without providing reasons? Are you giving answers they could/should come up with themselves with a little thought or probing? A much stronger video will be one where you can cite examples seen in the segment where they are challenging each other, supporting each other, all in a safe and respectful way. Cite examples where you are challenging them and supporting them.

g. Analysis (ANA)

- Refer to suggestions provided in Entry 2.
- Don't describe the video; explain it. Explain what this video segment tells you about your students' ability to analyze and interpret data. Cite proof found in the featured segment.

h. Content Knowledge (CK)

- Explain how your knowledge of the science content helped you choose this investigation and helped to guide the students in analyzing and interpreting data.

- Explain how your knowledge of learning pedagogy helped you plan this investigation so it would better enable your students to analyze and interpret data to gain a deeper understanding of the concept. Explain why this investigation was appropriate for this group of students and their needs.
- Provide a rationale for how your learning and teaching experiences have helped you develop this investigation in such a way that allows you to guide and teach your students to interpret and analyze data. Explain the "method to your madness."

i. Reflection (R)

- Refer to suggestions provided in Entry 1.