CONCEPT-BASED LESSON PLANNING PROCESS

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Water, Water Everywhere

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Classroom Context: This lesson was delivered as part of the 6th grade curriculum on the water cycle, how water is processed and used in a community. I used this lesson with my 7th grade students (approximately 27 stundents per class) during our integrated chemistry unit which covers the concepts of types of mixtures, solutions, solutes, and water filtration. The students in my classes came from a wide range of socioeconomic backgrounds in the north eastern part of Colorado Springs. The participants had access to computers, lab materials and a reflection sheet necessary for the lesson. The prior lessons included information on separating mixtures based on their physical and chemical properties, vocabulary integration and a mini lab in which students were given several items and asked to identify and execute a filtration process of a mixture of rice, sand, sugar and small paperclip pieces. The following unit was then used as a unit assessment in which students where guided in an inquiry process in order to discover the best way to filter and clean the given sample of water in order to make it drinkable for a "local community".

Shift in Instructional Design	***Lesson Elements and Design***	***Metacognitive Reflection***
The Unit Generalization and Focusing Lens asks students to …	**Lesson Focus:** (*Connection to Generalization and/or Focusing Lens in the District Sample Curriculum Project)* **Human activities (including increased atmospheric pollution) can determine the quality and availability of water locally and worldwide.**	*How does this specific lesson advance the big idea or generalization of the unit?* **Human water filtering allows more available water.** *What connections might be made between other content areas?* **Geography** **Persuasive/Argumentation** **Research** **Ratios/Quantity/ppm**
This lesson objective / learning target is critical to student understanding because…	**Objectives / Learning Targets:** **Students will be able to identify the source of their usable water and the contaminants that affect the water as well as how to clean the water.**	*In what ways does the learning target support the generalization?* **By understanding how water is cleaned, students will be able to make connections and**

		investigate the water conditions in their communities and in other communities.
Instructional strategies	**Instructional Strategy Menu** • **Student-generated questions** • **Teacher-provided inquiry questions** • **Think- aloud** • **Hands-on experiential learning** • **Written explanation (Claim, evidence, reasoning)** • **Research** • **Collaborative groups**	*Which instructional strategies will foster learning the lesson's skills, processes, or content?* **The hands-on/experiential model will be the most effective in developing process skills. Researching real-life methods will build content understanding for students who need further clarification on contaminants and current filtering methods.**
In the first 3-7 minutes of the lesson,	***Opening (hook / anticipatory set / lesson launch)*** **Instructional Strategy: Students will be shown three samples of water (river, pool, and toilet) using the following to frame the lesson: "This is your only access to drinking water due to natural disaster. What will you do now?" Students will be asked to develop questions they would need to know about the water sources to determine which would be better to drink. Students will write down their thinking on their own then discuss with 2-3 other students.** **Why is this strategy impactful:** **Students will be investigating the concerns of water purity that affect communities as they ask their authentic questions. Asking questions allows students of varying background knowledge and to engage equitably.** **Pool link** **River link** **Toilet link** **How does this strategy support meeting the "just-right challenge," or "building relationships," or "creating relevancy," or "fostering disciplinary literacy"?** • **Students will build relationships by working together to build a bank of questions about different water sources (pictures).** • **This lesson is challenging to students because it motivates them to think about ways to filter water samples (which they will be designing a lab around) and asking questions about the quality of their**	*In what ways does the chosen strategy work toward a larger purpose at the beginning of the lesson (e.g., engaging students, increasing curiosity, stimulating student-generated questions, etc.)?* **This strategy is giving the students a way to look at multiple sources of water that they should be familiar with, and prompting them to think about creating safe drinking water if no other source are available.** *In what ways does the chosen strategy (ies) work toward a larger purpose (e.g. increasing collaboration; interacting with complex texts; situating students in real-life, relevant experiences;*

	drinking water.	*increasing student agency; stimulating student discourse; etc.)?* ***The lesson strategies are intended to foster collaboration, curiosity, and interest in the community and community issues.*** *In what ways does the chosen strategy cement the learning?* ***By witnessing and experiencing the filtration process, students will be able to collect and analyze data regarding water purity.*** *What evidence will show that the strategies impacted student learning? Were the strategies effective through the learning process?* **Students will test their filter, reflect on their results, and then redesign their filter. The redesign and subsequent explanation for why they made their changes will show that they have a better understanding of the filtering process, and what contaminants in the water needs to be removed.**
The Learning Experience will	***Learning Experience / Lesson*** **Instructional Strategy: Students will be building a model to filter water.** **Developing a water filtration process that leads to safe levels of contaminants in the water.** **Why is this strategy impactful:** (*In what ways does this strategy move the learner toward meeting the learning target? How would this strategy ensure all students, with differentiated needs, can feel successful?)* **This strategy is important as it engages the students in the lesson and hightens their engagement levels.** **How does this strategy support meeting the "just-right challenge," or "building relationships," or "creating relevancy," or "fostering disciplinary literacy"?** • **Students will build relationships by working together to design a lab and test their predictions.** • **This lesson is challenging to students because it motivates them to find ways to clean a water sample that they will be drinking.** • **This lesson will create an applicable experience as students will be asked to rank their methods of cleaning the water and how confident they would be in drinking the water.**	
The closing activity reinforces the learning.	***Closure*** **Instructional Strategy chosen: application of learned concepts** **Why is this strategy impactful:** **Students will be asked to explain how they would market their filtration design to their community.** **How does this strategy support meeting the "just-right challenge," or "building relationships," or "creating relevancy," or "fostering disciplinary literacy"?**	

Technological resources that will support student learning and move students toward the learning target.	***Technological Resource and application:*** https://www.natureworkseverywhere.org/asset/resources/HowNaturalAreasFilterWater_v4_8_31_2015.pdf **How: In what ways does this chosen resource support meeting the "just-right challenge," or "building relationships," or "creating relevancy," or "fostering disciplinary literacy"?** • **Students will work in research groups (building relationships) to research and apply their learning to their investigation.** • **This fosters disciplinary literacy by having students read, understand and examine sources of information that they will apply to their understandoing of different ways to filter water sources.**	*How will my students and I strategically use technology resources to enhance the learning experience (and support "meeting the just-right challenge," "building relationships," "creating relevancy," and/or "fostering disciplinary literacy")?* ***Technology will allow for more engagement and questioning through reliable resources in order to validate various ideas and methodologies students have come up with.***
Formative assessment will be a quick Check for Understanding in which students will demonstrate they are or are not on track.	***Formative Assessment*** **Formative Assessment tool/method Filter redesign and explanation will be assessed for reasoning and depth of understanding.** **Learning indicators of success:** *(What evidence will show that the learner is moving toward mastery of the learning target?)* **The students will describe how to clean water (with their filter and explanation) and in the extension portion, they will research and describe the local water source.**	*What "indicators of success" will show that the students are gaining mastery?* **Initial design assessment: Students will look at logical reasoning skills by being able to explain the order of their model filtering system.** **Design process: Students will be able to test "before" and "after" water samples based on previous knowledge.** **CER- Rubric:** **Students will use that evidence from the rubric in feedback loop to increase and re-evaluate their learning.**

Reflection: (What are the *strengths in the lesson plan? What changes would I make in the lesson plan for next time*?)

Overall I thought that this was a great lesson. It did surprise me that I had planned on doing this in one-fifty minute class with maybe a ten minute follow up the following day and in reality it ended up taking two and a half- 50 minute class periods. The students enjoyed the process but ended up feeling unsure of how to create their filtration system. After letting them try to work through it I pulled the class together for a quick "mini lesson" on what their filtration system should look like and why I limited them to a maximum of four filters per test. I also had to do some demonstrations on how to properly test for PH and read the range. After the first day of experimenting I had the kids find on the internet what the "acceptable" PH range is for drinking water. They returned with many descrepancies so we argeed to test the water from the hallway fountain and use that as our PH number. We also had some issues with the groups that choose to use the charcoal as their filtering material as it discolored the water to a slight black color. This made it so that almost no one (myself included) wanted to "drink" their sample.

On the third day (after their lab work and written lab papers were completed) I had them get back in their groups and discuss the following questions (that were projected on the screen):

* What did you learn from doing this activity?
* What are some things that you did really well in this activity?
* Were the strategies, skills and procedure effective for this assignment?
* Did you do an effective job of communicating your learning to others?
* Why do you believe that we are studying water purity?

As a whole class we then had a discussion about "failure" and how that leads us to be tenatious and do even more experiments. It was agreeded that if we were "desperate" for water our filtration methods would have been adequate to clean the water and it would be "worth the risk" to drink (the alternate would be to die from thirst!). We then discussed the recent actual event where the town of Fountain, Colorado had contaminated drinking water and how the city worked endlessly to clean the water. In the end they were not able to eliminate the contaminents and ended up re-routing the water source so that the residents were getting "cleaner" water without the fire retardant chemical.

I made some notes in my lesson planner that next year I need to have a model of the filtration system and do some pre-teaching about PH and its relivance to the activity. Also, pushing a bit harder to make this no more than a two day activity by having students do the research at home and even testing their home water for PH prior to doing the experiment. Also it may be easier to use "lab contaminated water" (vinegar, dirt, rocks, lemon juice..) instead of samples from an actual pond at the park!

Connection to Performance Goal: (*What did I do in this lesson that gives evidence or may be used as an artifact for my professional growth plan?)*

- The secondary teacher has knowledge of literacy and mathematics and is an expert in his or her content endorsement area. (Standard 1)
- Teachers establish a safe, inclusive and respectful learning environment for a diverse population of students.(Standard II)
- Teachers plan and deliver effective instruction and create an environment that facilitates learning for their students. (Standard III)
- Teachers reflect on their practice. (Standard IV)

Student Feedback: (*What did students say about the lesson? Did they find it engaging, interesting, appropriately challenging? Did their feedback confirm my own perception of the lesson?)*

The students enjoyed the hands on activities but did express some frustration with not understanding what the filtration system should look like and what the signifigance of the PH testing. In the end they said "we felt like real scientists, soing a lot of trial and error to get to the product".

Time Suggested	Lesson can be completed in two to three class period. Extensions may include multiple days to do research and/or a share out (demonstration) days.
Materials Needed	Images of several water sources, large poster papers for groups to brainstorm questions, sample of a water source (preferably dirty sample), materials for students to use in their filtration lab (sand, gravel, cotton balls, 2 liter plastic bottles, PH paper, microscopes…..)
Co-teaching Opportunity	Group discussion for question building, provide students with links on filtration, more guided support for setting up the lab.
Cross-Content Connections	Math: parts per million, rations, quantities Writing: Writing for a specific purpose, expository writing Geography: geographical location of where water comes from (mountains, wells, oceans…), natural disaster locations (i.e. Florida: hurricanes, Colorado: fires, California: oil drilling in ocean that may contaminate a community's water source….)