National University

ITL 518

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Abstract

The purpose of this paper is to demonstrate how to teach NGSS science standards and develop a learning map connecting the 5 Es. Thinking through the methods of planning and teaching will be instrumental in developing future lesson plans for elementary classes. The scope of this paper covers classroom management, standards, projects, assessment, materials, ensuring student understanding, and accommodating ELL/Gifted students. The result of this paper has given me an intuitive understanding of how to teach, conduct, model, and demonstrate concepts within a lesson. In addition, assessing students informally, formatively, and formally has given me a step up in evaluating student understanding throughout the teaching process. I highly recommend incorporating the structure of the planning and teaching stages into future lessons; it's helpful and gives teachers a structured approach to implementing lesson plans for optimal learning.

Note: A more detailed explanation is explained after these initial tables.

STAGE 1: PLANNING

YOUR TARGET: Standard, Goals & Outcomes

Teacher:____Michael Suzuki_____Grade/Subject: 5th, Physical Science

TARGET: Unpack Your Standard

Part 1: My Standards, Goals and Outcomes

Academic Standards: : **STATE YOUR STANDARD**
5-PS1-1- Develop a model to describe that matter is made of particles too small to be seen.

Highlight the main idea/knowledge (what) *Underline the skills/verbs (how)*

Big Questions (Questions to frame student learning)	Knowledge (Concepts to be understood and applied)	Skills (what you will explicitly teach)
Are all particles the same size in matter?	Subatomic particle like electrons	*The Behavior of Matter
How big does a particle need to be to be seen to the human eye?	Microscopic particles like atoms and molecules Democritus and his theory of matter composed of particles too small to be seen.	*Why particles Move *The relationship between particles, matter and heat.
What is the difference between a particle and an atom?		*Sublimation, deposition, condensation, evaporation, melting, freezing

	Understand the particle model of Matter which states that: 1) All matter is made of particles 2) The particles of matter are always moving 3) The particles have space between them 4) Adding heat to matter makes the particles move faster	

Student Learning Goal: **STATE YOUR GOAL FOR THE STUDENTS TO SHARE**
The goal of this lesson is for students to be able to demonstrate an understanding of the particle arrangement for particles too small to be seen, in all three states of matter and describe how their arrangement affects their properties.
Student Social-emotional Goal (LEARNER):
Students will work on developing models cooperatively, increasing their social-emotional skillset.

Barriers to learning (LEARNER): (level of literacy;language proficiency levels; funds of knowledge; attention span)
Attention Span- Some students may not like building models in team environments. Language proficiency- Some students may not speak English fluently
Common Misconceptions (LEARNER & TARGET): (Subject-matter specific; Related to academic standard; Knowledge gaps; Student confusion; multiple meanings; cultural differences; misunderstand)
Students may have trouble understanding how stationary solids have particles that move when the object isn't moving. In addition, some students may have trouble understanding how the composition of matter stays the same when states of matter change.

Part 2: My Class

My Classroom Composite: (TEACHER & LEARNER) Whole group (Broad needs of students; observable patterns & trends; language and literacy subgroups; digital/technology fluency; emotional regulation)

23 students 13 boys and 10 girls. 3 students are extremely bright and get through school easily. Most students can speak English well. 6 have passed the CELD and 3 are ELL learners. 2 students are on IEP, one is at grade level but has a diagnosis of Autism (mild). Another student has ADHD and learning disabilities.

What vocabulary words demand attention & are related to our big idea?	Particle Electron Subatomic Microscopic Melting, condensation, sublimation, freezing, deposition, evaporation
Academic Language	Support Provide Analyze Identify
Sentence Frames: **Lessoneer**	**Emerging**: I read that particles……..

	Expanding: One way particles change states is _____. **Bridging:** After observing how particles change matter states, I've concluded that _____changes particle movement.

(TEACHER, LEARNER, TARGET, ASSESSMENT, INSTRUCTION, MANAGEMENT),

ENGAGEMENT (multiple means of engagement)	Students will become interested in the material by having individual choice and autonomy for the assignment. They will be able to choose how they want to creatively develop a model that represents particles that can't be seen. In addition, the material will be relatable to every day life. Students will be able to understand how familiar matter such as water changes into ice and water vapor. In addition, fostering collaboration and community within the project correlates to social-emotional goals. Lastly, teaching students how to self-assess

	and reflect on their learning will optimize their learning outcomes and engagement on the project.
EXPLORATION (multiple means of action)	Activities students will be doing: *Students will be working in partners and developing models that answer the Big Idea questions. *Students will be able to choose how they want to present the model. This can include YouTube, on the computer, poster, or a combination. *Students will also be researching the topic so that they can present the information on the model they will be constructing *Finally, students will be presenting their findings and final model to the class. They will have answered the Bid Idea questions that their model presents and discuss their research findings. Some Big Idea questions include: *How does the speed of particles within matter affect the state of matter? *Are particles moving within a solid object?

EXPLANATION (multiple means of expression)	In order to help students connect exploration to examination, I will describe how to do research and what I'm looking for specifically. I'll describe how the research findings should correlate to the final model. Some higher order thinking questions include: *Are the particles traveling slower or faster in a gas compared to a solid? *Is there a limit to how fast particles can travel in a state of matter? *At what speed do the particles in ice have to travel to become a liquid?
ELABORATION (Multiple means of expression)	Students will gain a more sophisticated understanding of the concept through research. In addition, I'll show a short video describing how states of matter change based on particle movement and temperature. In addition, I'd allow students to do experiments with ice cubes and calculate the time it takes for the cubes to become water. Many vocabulary terms will be introduced that connect to the student's observations including condensation, melting, and freezing. This knowledge will give students a comprehensive understanding of why everyday objects behave the way they do. Students will be able to answer questions such as:

	Why does water turn into a liquid? At what point will water turn into a liquid? How fast are the particles traveling when they turn into a liquid?
EVALUATION (Multiple Means of Representation modeling & practice)	Students will demonstrate that they have achieved the objective by constructing a model that represents the objective. The model will answer the Big Idea questions in a creative and diverse format that all students can understand. After the model is created, students will go on to explain their model and research findings to the class. They will answer questions about different states of matter and why matter behaves in particular ways.

STAGE 2: TEACHING

WHAT MATERIALS WILL YOU USE?

I will have materials ready for the students to model including poster board paper, glue. Computers, scissors, small balls, and miscellaneous items that could represent the particles in matter.

HOW WILL YOU ASSESS STUDENT LEARNING?

Student learning will be assessed formatively as they are constructing the project and doing research. In addition, I'll provide form handouts for students to answer. Their final reflection and presentation should demonstrate a mastery of the ideas presented.

Accommodations/Adaptations/Intervention (Teacher, Learner, Instruction, Management)

You have 3 ELL students and 2 students on an IEP, one of those students is academically on level but has a diagnosis of autism (mild). the other student has ADHD and learning disabilities.

Accommodations and grouping : For this lesson, I'll allow the IEP and ELL students to be in groups of three instead of paired up. The class has 3 very smart students that are doing well. I'll make sure that some of the grouping follow the pattern below:

Group 1:

(Smart Student)-(IEP)-(Regular Student)

Since there are only 3 smart students, the other grouping will follow the below pattern:

Group 2:

(regular student)-(ELL)-(Regular student)

A more detailed explanation is presented below covering topics in the Rubric

Target: Standards - Stage 1

Unpacking the Standard

Develop a model to describe that matter is made of particles too small to be seen.

(Standard unpacked below)

Standard	Verbs	Nouns
5-PS1-1 Develop a model to describe that matter is	Develop Describe	Model Matter Particles

made of particles too small to be seen		

Learner Outcomes & Goals - Stage 1

Expected Behaviors- Students will be expected to stay on task and collaborate with their pupils. Activities that are off task will result in DOJO points being lost.

Classroom Composite Description - Stage 1

(Covered above)

Accommodations, Adaptations, Interventions - Stage 1

In addition to groupings, here are additional accommodations:

ELL Students- ELL students will be allowed to focus on specific parts of the assignment so that they have more time and a thorough understanding of the topic. ELL students are still expected to understand how their part relates to the Big Ideas. The other group members will explain the rest of the project

Gifted students- Gifted students will be given the opportunity to present more challenging work. They can do research on the periodic table elements and present the temperatures at which these elements become a liquid and share pictures with the class.

Managing the Classroom Environment - Stage 1

Transitioning- The expectations during teaching are that the students are quiet, in their seats, focused, and raise their hand if they have something to say. During the transition to the project, students are allowed to collaborate and talk with other students. I'll let students know after teaching that it's collaboration time. During certain times of the day, there are different expectation regarding talking and other behaviors depending upon the activity. After the transition, DOJO will be used for students who are off task. At the same time, reward stickers will be given for students who are on task and completing the assignment.

Engagement (Multiple Means of Engagement) - Stage

(See above)

Exploration (Multiple Means of action) - Stage 1

Instructional Sequence , concepts, and skills

Teaching

(Questions and pre-vocabulary)

I'll start off by asking students about their experiences with liquid, gases, and solids. In addition, I'll ask questions that relate to the Big Idea. Why does matter change into different states? A pre-vocabulary lesson will ensue so that students will become familiar with unfamiliar terms.

(Temperature and it's impact on particles and state of matter)

At this time, I'll begin teaching on the above and give concrete examples of why this happens. A short video will be shown that demonstrates water and it's different forms when heated up and cooled down.

(Project time)

After teaching, I'll explicitly talk about how to do the project and model particles within solids that can't be seen. For example, the model will visibly show that water is composed of particles that can't be seen.

Explanation (Multiple Means of Expression)- Stage 1

The processes of all the states of matter should be expressly defined and visually demonstrated within the models. Some of the states include deposition and sublimation. Again, students will be modeling this and can use the computer, posters, etc. They are not limited to one form of expression.

Elaboration (Multiple Means of Expression) - Stage 1

(See Above)

Learning Map Sequence for Day 1 - Stage 2

Explaining, Modeling, Demonstrating, Checking for student understanding, sequence of activities

Things to be Explained

What is an atom?

An atom is the basic building block of nature. This is a particle 1 million times smaller than a speck of dust, meaning it is impossible to see it.

What are atoms made of ?

Nucleus (protons + neutrons) and Electrons

What is a molecule?

A molecule, on the other hand, is what results when two or more atoms bond together.

What is a particle?

any of the **basic** units of matter and energy (such as a molecule, atom, proton, electron, or photon)

What are the 5 states of matter?

Solid, liquid, gas, plasma, Bose-Einstein condensates

What are the 6 phases?

Melting, freezing, sublimation, vaporization, condensation, deposition

How does matter change states?

Matter changes states through temperature. Temperature causes the particles in matter to move faster or slower, changing the state of matter. The matter composition doesn't change.

Modeling and Demonstrating

After explaining this section, I'll model and demonstrate how an ice cube I had at the beginning of class changed to a liquid. This is a real life example of how a solid turns into a liquid. I will then ask the students questions:

Can honey turn into a solid? Can wood turn into a liquid? After some brief discussion, videos will be shown of the phases of matter.

Transition and Project

After the video, students will work collaboratively on the project, demonstrating how they can represent particles within a state of matter that can't be seen.

Materials and Technology - Stage 2

(see above)

Evaluation (multiple Means of Representation modeling and practice)- Stage 2

informal assessment- I will check for student understanding as I walk around the room and ask student's questions.

student self-assessment-Students will be working on a form during the project and assess whether they understand the material. There will be a check for understanding section on the form.

Formal assessment-There will be a quick formal assessment to go along with the project. The test will ask the students simple questions for understanding such as:

Name some particles contained within matter

What is an atom?

What is a nucleus?

Name the 6 phases and 5 states of matter

References

Guide to Teaching Children About the States of Matter. (2018, May 04). Retrieved from https://scienceexplorers.com/guide-teaching-children-states-of-matter/