Tech-Integrated Unit Plan

CI 5307 – Technology for Teaching and Learning Science

Purpose: To begin authentically planning for, implementing, and reflection on the integration of technology to support your teaching and student learning of a specific concept.

Overview: In this final project you will demonstrate your ability to integrate technology in your lesson plans in your third unit of your middle school placement. Your final lesson plans will be submitted to Barb Billington and to me for grading. The lesson planning template that you use will be the one used for Ms. Billington's course. You will integrate technology into your 2nd or 3rd unit for her class. There are no time requirements for use of technology within your lessons, rather you are required to design your lessons with technology integration that supports innovative practices, modification, and redefinition. The goal is for you to thoughtfully integrate technology beyond a direct substitution. Following your lessons you will complete a reflection.

Part 1: Plan for Integration of Technology

As you develop your lesson plan and think about integrating technology, answer the following questions:

1. What technology is available to you for your teaching? To your students for their learning?

Students have Chromebooks, and the classroom has a projector to use with a computer to project videos/slides/etc.

2. What technology are you planning on integrating?

Projector/Computer/Chromebooks.

3. Explain in detail how you plan on integrating technology. Include both how you as the teacher plan on using technology and how the students will use technology.

I will use the projector with slides and YouTube Videos and an online interactive - Gizmo (Crumple Zones) that students will interact with on their Chromebooks to do the interactive.

4. How does the technology support instruction and what process did you use to determine that (think frameworks and purposeful technology use)?

The projector for slides and videos will support demonstrations and visualizations. This would be Passive Replacement or Passive Amplify in PICRAT. The Chromebooks and the Gizmo (Crumple Zones) would be Interactive Amplify. The Students will be able to both follow directed worksheets as well as explore concepts independently.

5. What science practices will this support? Explain. (see below)

a. Asking questions
b. Developing and using models
c. Planning and carrying out investigations
d. Analyzing and interpreting data
e. Using mathematics, information and computer technology, and computational thinking

f. Constructing and critiquing explanations
g. Engaging in argument from evidence
h. Obtaining, evaluating, and communicating information
i. Applying and using scientific knowledge (i.e. engineering)

The Gizmo will support the following. 1. Asking questions - Students will start the gizmo without a worksheet and the directive that later in the week they will be designing vehicles to protect an egg in a frontal collision, this idea should prompt questions such as what are important characteristics to protect car passengers. 2.Using Models - students will be able to simulate different car designs and see how they result in protecting the driver in frontal collisions. 3. Carrying out investigations - students will complete a worksheet in the form of a simulated lab (investigation) 4.Applying and using scientific knowledge. - students will use the information gained from the gizmo to design their own egg vehicles.

6. How will using this technology affect student learning? In other words, how will using the technology in this unit support student learning and hopefully improve student outcomes?

Students will be able to learn more about the forces involved in collisions and newtons laws in the process. Newton's laws and unbalanced forces are the central focus of the unit. This interactive will reinforce other learning in the lesson as well as give students ideas for the final project of the lesson - the egg vehicle to protect and egg from frontal collision.

7. What potential challenges might you face in implementing this technology in the classroom? How might you navigate these challenges?

Classtime is short (only 40 minutes, it may not be enough time to get engaged fully) I'll prepare clear and concise directions on how to get into and start the gizmo.

8. What conditions (materials, student knowledge/skills, technology infrastructure, etc) need to be in place for you to use this technology with your students?

Students need to bring their chromebooks to class and the wifi needs to be working well that day as 20+ students all try and log in to the gizmo at once.

9. Include a link to your unit/lesson plan here using the Lesson Planning Template with Tech Integration

All Relevant Documents in Google Folder - https://drive.google.com/drive/folders/1GnTf9iVBelddyoOvjZyLZPNOTTV8ah8b?usp=sharing

Part 2: Reflect on Implementation

1. Reread your original responses to answers to the questions under part 1. **Make reflections on your plan using Google Doc commenting tools.**

2. What would you change and why in terms of the technology integration?

I would change the gizmo to two days worth of time rather than ¾ of one day.

3. What went well? What evidence do you have that your instruction or student learning was enhanced through the use of technology? Engagement?

Students were engaged - they reported enjoying the exercise. They also remembered key concepts later in the lesson when questioned about it.

4. What questions emerged as it relates to tech integration after you did this activity? (e.g. I wonder why? I wonder how?)

I wonder how to speed up the login process (how can I get students into the interactive quickly) Would a second day work?

Lesson Plan Template: Science Education 2017

1. Focus Question

How do I build a vehicle to protect an egg from a front collision?

2. Learner Objective(s)

I can explain Newton's First Law I can explain Newton's Second Law I can explain Newton's Third Law I can use Newton's laws to protect an egg from a front collision.

3. MN Standard(s)

8P.3.2.2.2 Design a solution to a problem involving the motion of two colliding objects using Newton's 3rd Law.* (P: 6, CC: 4, CI: PS2, ETS1) 8P.1.2.1.2 ~~Plan and conduct an investigation to~~ provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. (P: 3, CC: 7, CI: PS2)

4. NGSS Standard(s)

NA

5. Main Ideas (This should be written in age appropriate language and include connections to the students' real world.) Please put your vocabulary terms in **bold** text.

Newton's First Law - **(INERTIA)** objects resist changes in their motion or non-motion. If an object is stationary, it will remain stationary unless a force is applied to set it in motion. Likewise, if an object is already in motion, it will keep moving at a constant speed in a straight line unless an external force changes its speed or direction. Newton's Second Law - (**FORCE**) This law relates the force applied to an object, its mass, and the resulting acceleration. OR the force acting on an object is equal to the mass of the object multiplied by its acceleration. This means that a larger force is required to accelerate a more massive object, and a smaller force will cause an object with a tiny mass to accelerate.

Newton's Third Law - **(ACTION-REACTION)** This law states that when one object exerts a force on a second object, the second object exerts a force of equal magnitude in the opposite direction back on the first object. Essentially, forces always occur in pairs. If object A exerts a force on object B, then object B exerts an equal force in the opposite direction on object A. This law is often summarized as "action and reaction are equal and opposite."

These three laws help people understand the relationship between the motion of objects and the forces acting on those objects.

Crumple zones are portions of cars that absorb the forces from collisions and slow the deacceleration (thus lowering the force on the passenger)

6. Materials (List of materials needed for this lesson and numbers of each.)

CER Handout (10) one for each group
Newpaper
Wooden Ruler
Leather Glove

Gizmo Crumple Zone Handout (28) one for each student

Ramp for Testing - Provided by Cooperating Teacher.
Plastic Sheeting (Large garbage bag) for the eggs that don't survive
Dozen Eggs

10 Vehicle Kits (See list Below) One for each team
Base vehicle (Kevin will provide)
Four Large plastic Cups
Four small plastic cups
Eight bendy straws
Eight stiff straws
8 Pieces Plain Printer Paper
Clear tape
Masking tape
Egg Crash Test Handout

Egg CrashTest Data Sheet (28) one for each student

Egg Crash Test Reflection - One assigned to each student in Google Classroom - Not printed.

7. Safety/Special/Academic Language Considerations

Safety

Egg Crash Test - Safety Rules - On handout and reinforced in class
Special
None
Academic Language
Just vocabulary shown above as part of lesson.

8. Student Misconceptions you anticipate encountering.

Students often confuse the order of the laws (ie the 2nd law is about inertia)
Students often have trouble with Inertia - due to not remembering all the forces (friction / air resistance)
Students have trouble understanding the relationship of mass to acceleration or velocity
Student have trouble understanding newton's 3rd - the action/reaction is understood as a number of other phenomenon

9. Lesson Sequence: 5E (Remember to focus on what the students will be doing and address/elicit students' prior knowledge. The outline below need not all happen in one day.)

Day	Question(s) / Probe(s)	Teacher Does	Students Do	Technology Included	Notes
Day 1 Monday	What is C.E.R.	Teacher Explains C.E.R. Process		Slides	
		Teacher Hands Out CER Handout / Helps Students Form Groups	Students get in groups of three		
		Teacher Does Newspaper / Ruler Demo	Carefully watch to be prepared to do CER		See Demo Here - https://youtu.be/0pJlTzz5pDw?si=ke9id05c5MYSXAFN
		Teacher reminds students components of CER	Student Groups Begin CER	Slide with sentence starters	
	How did teacher break ruler without damaging newspaper?	Teacher Circulates from group to group - answering questions - reminding students of CER components (indicates sentence starters on screen)	Groups work on CER for 10 minutes	Slide with sentence starters	
		if students seem to be having problems - change slide to atmosphere diagram	Groups finish CER		
		Teacher Circulates from group to group - answering questions - reminding students that they should choose a person to share.	Groups finish CER / pick a speaker.		

		Teacher marks 10 minutes and facilitates each group sharing their CER.	Groups present their CER from their seats		
	Closure	Teacher explains to students that CER is the heart of science and we'll continue to do them in some form for the rest of the year and as long as they continue in science	Students released at end of class		
Tuesday Day 2	What happens if I throw a ball up in the back of a slowly moving pickup truck?	Teacher poses day's engaging question to students?	Students respond as they can		
		Teacher gets students to commit to possible answers	students make claims by raising their hands		
		Teacher plays video of engaging question	Students watch video to gather evidence for their claim	Teacher plays YouTube video on screen	
		Teacher explains that inertia in x direction can be completely seperate from inertia in y direction			
	What made this car special?	Teacher shows class car picture	Students make guesses	Teacher show picture of car on screen	
		Teacher explains the car is the first with crumple zones.			
		Teacher explains next steps - project with egg cars / short video / gizmo interactive.			
		teacher plays video of car design (crumple zones)	Students instructed to watch for design tips for future egg car designs	Teacher shows video of crumple zone designs	Video Link: https://www.youtube.com/watch?v=v9ML4GA47Rg&authuser=0
		Teacher switches slide to gizmo login instructions - instructs students what to do and says go	Students wait for go and then get chromebooks out and login into Gizmo	Crumple Zone Gizmo Interactive.	Crumple Zone Interactive
		Teacher Passes out Gizmo Worksheet	Students explore crumple zone		

			interactive		
		Teacher circulates and observes students exploring interactive	Students explore crumple zone interactive		
	Closure	Teacher explains rest of week - tomorrow continue Gizmo to help design / design egg cars in groups	Students released at end of class		
Wednesday	What is the best design to protect an egg from a frontal collision?	Teacher explains agenda for the day. - Get in groups / login to gizmo to explore the interactive for about 15 minutes / brainstorm with group for 10 minutes / Draw design on Handout before leaving	Students listen for important info about day and project.	Slide with agenda / slide with project grading	
		Teacher prompts students to get started	students login in Gizmo and work in groups evaluating possible design characteristics	Gizmo Interactive	
		Teacher assembles one egg kit on table at front of class / Teacher passes out egg kit handout			
		Teacher circulates and observes students exploring interactive / asking probing questions about their findings	Students explore for approximately 15 minutes		
		Teacher asks students to pause and explains kit and handout. Instructs students to begin brainstorming / designing			
		Teacher circulates and observes students designing / answers questions	Students work in groups to design egg vehicles on paper		
		Teacher circulates and encourages students to start drawing their designs so they're	Students work in groups to design egg vehicles on paper		

		ready to build the next day.			
		Teacher circulates and observes students designing / answers questions			
	Closure	Teacher			
Thursday	How do we build the design we put on paper?	Teacher sets up the ramp for testing and assembles the kits for students to use to build with	Students retreive the kit for their group and await instructions	slide of kit details	
		Teacher explains how ramp works (the angles to be used in testing)	Students begin to build their egg vehicles		
		Teacher circulates and observes building / answers questions			
		Teacher checks in with each group on readiness for testing day	Some student groups test with analog egg (plastic easter egg)		
	Closure	Teacher explains agenda for tommorrow - students will get 5 minutes to make final adjustments / then 5 minutes to install egg / vehicles will be tested in order 1-10 on shallow ramp then 1-10 on medium ramp then 1-10 on steep ramp. if egg breaks that team won't test anymore.			
		Teacher directs students to clean up and how to store car for tomorrows class	Students clean up and are released after class.		
Friday Day 5	Which characteristics of cars survive better	Teacher goes through agenda			
		Teacher lets students get ready to test / distributes data sheet	Students get vehicles ready		
		Teacher distributes eggs	Students "install" eggs in vehicles		

		Teacher explains data sheet and gets groups in order for testing	Students (one from each team) line up and test one car at a time / Other students record relevant results on data sheet	egg crash datasheet projected on screen - teacher fills in with white board marker as test proceeds	
		Teacher adjusts ramp as needed until testing is complete	students test vehicles until final ramp angle or failure		
		Teacher guides students for proper disposal of eggs (Compost) and cars - specified location and instructs them to clean up all other components			
	Closure	Teacher reminds students of final assignment on google classroom to finish over weekend	Students clean up and are released after class.		

10. Assessment(s) (This must be included above in the 5E or 7E model. However, here you will provide evidence how each assessment will assess student learning for each learning objective.)

    - Group CER (newspaper/ruler demo) - formative assessment - students will practice CER's throughout the year.
    - Group Egg Project - formative assessment - how well are students understanding Newton's laws
    - Individual Reflection Handout - Summative assessment of student understanding of Newton's laws

11. Teaching Materials (Attach copies of visuals/PowerPoint/student handouts/quizzes/ keys etc…)

    In Shared Google Folder
    CER Handout
    Gizmo Crumple Zone Handout
    Egg Crash Test Handout
    Egg CrashTest Data Sheet
    Egg Crash Test Reflection

    Video of Demo to be done live in class
    https://youtu.be/0pJlTzz5pDw?si=ke9id05c5MYSXAFN

    Inertia Video
    https://www.youtube.com/watch?v=j1URC2G2qnc&authuser=0

Car Crash Video
https://www.youtube.com/watch?v=v9ML4GA47Rg&authuser=0

link for Gizmo
https://apps.explorelearning.com/account/el/login/student?gizmos=1&authuser=0

Interactive for advanced students
https://ophysics.com/f1.html