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Editorial Team

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Cover Image, THST Vol 45, no. 1:
Preschooler holds spotted salamander (2022, Cooper Farm Field Station in Muncie, IN)
Photo by Erica Oliver

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Editorial Team

Contents

Published by the Hoosier Association of Science Teachers, Inc (https://hasti.org)

Butler, D (2022)
The Hoosier Science Teacher, *45*(1)
DOI 10.14434/thst.v45i1.34521

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The President's Paragraph: Notes from HASTI's President

David Butler

In each issue of The Hoosier Science Teacher, we invite the president to share some thoughts as an introduction. In this issue, HASTI's most recent President David Butler shares some philosphical opinions about the purpose of teaching our students about science as his term ends on June 1. Look in the December 2022 issue of THST for an introduction from HASTI's new president Staci Hootman.

2021-22 HASTI President David Butler

When was the last time you identified or clarified your values with regards to science education? We are so caught up in our day-to-day duties at school that sometimes we forget to examine our beliefs, goals, and understandings about the meaning of education. In this passage, I would like to share with you one of my philosophies regarding the teaching of science which has been strengthened by my interactions with HASTI members, work colleagues, and students. Teaching science is not just about presenting content but also about providing opportunities to find purpose for learning about the concept being discussed.

For instance, when teaching students about DNA during a lesson on genetics, an educator undoubtedly mentions structure and function. I expand the lesson further to also include student-centered activities. I enjoy opening the floor for discussion in order to get student input regarding why they feel that DNA may be important to learn about. Everything from criminal investigations to cloning can surface during this time of enlightenment. Nothing makes a topic more meaningful than engaging students in a lesson that provides a sense of reality such as a project or lab activity.

During one such investigation, my students have the opportunity to extract DNA from their own cells. One day, while my students were engaged in their DNA activity, I overheard a student remark, "It's so beautiful" while they watched their own DNA take form inside a test tube. Even though that comment warmed my heart, that simple remark most certainly helped to provide a purpose for isolating their own DNA, motivation for studying genetics, and an appreciation for the magnificence of nature. In my opinion, in order to make a subject have purpose and have real life meaning for students, one must first simplify complex concepts to ensure understanding.

One way to do this is to use what is familiar to students in order to bridge and explain the unfamiliar through word play (puns, analogies and/or metaphors). One can also use instructional techniques such as scaffolding to break up a concept into discrete parts and provide students with the help they need. In addition, it is beneficial to differentiate instruction in order to give some students the opportunity to choose an activity or project to complete; for example, an assignment based on their reading abilities or interests.

Ultimately, your goal is to move students toward a stronger understanding and appreciation of not only science, but likewise, to guide and encourage them to adopt my motto: "Never stop learning and wanting to know."

Authors

David Butler (dbutler@adamswells.com) is a Biology Teacher at Southern Wells Junior-Senior High School, near Montpelier, Indiana, USA.

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Call for Speaker Proposals: 2023 HASTI - ICTM Conference

HASTI Board of Directors

The 2023 HASTI - ICTM Conference will convene February 12-14, 2023, and you're invited!

The HASTI Board of Directors announces the Call for Speaker Proposals for this event.

Deadline for Speaker Proposals: Sept 30th, 2022

Conference Theme - Math and Science: Opening Doors to the Future

Conference Strands

STEM: Math in Science and Science in Math
Learning How To School Again
Teacher Education
For the Love and Joy of Math and Science
Access, Equity, Social Justice, and Empowerment

To find more details for submission guidelines,
Visit the Submission Page for the Conference

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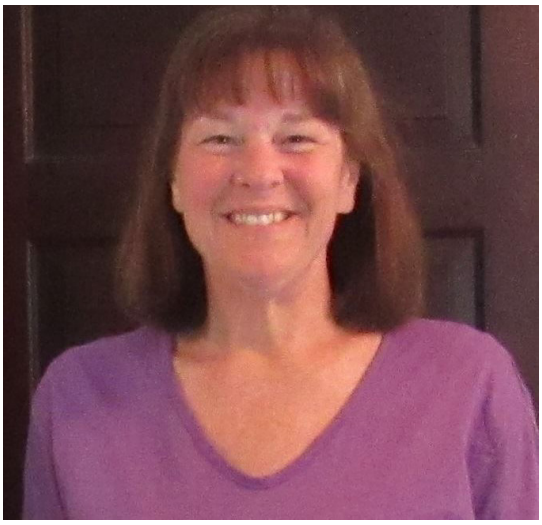
From the HASTI Historian

Shannon Hudson



HASTI members!

I am your HASTI historian. It is my goal to eventually update Edward Frazier's book, *HASTI: The First Thirty-Five Years* and create a collection and clearing house of HASTI items for future reference. I am in the process of gathering all materials that may be available from past conferences, workshops, printed copies of *The Hoosier Science Teacher* journals, buttons, pins, pens, or anything else related to HASTI.

If you have been a member of HASTI for a few years, I am guessing you have some great artifacts! If you might be cleaning and organizing, and come across any items you would like to donate, I would be more than happy to make arrangements to collect them, or pay for you to send them to me.

Free tee shirts from 2015 HASTI Conference

Contact Information

Shannon Hudson (shudson@cville.k12.in.us) is a science teacher at Crawfordsville Middle School in Crawfordsville, Indiana.

If you have questions about the historian's collection or have artifacts to share, contact Shannon at

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Visit the HASTI website to read more about the entire HASTI Board of Directors

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2022 Indiana Envirothon Back in Person!

Darci Zolman[1], & Teena Ligman[2]

Abstract

After two years of virtual contests, Indiana Envirothon students, coaches, and the Board were thrilled to be back in person in 2022. The Indiana State Envirothon contest was held on April 27th at Conner Prairie, with 15 teams from across Indiana earning a berth by placing as top teams in their respective regional competitions.

Keywords: Envirothon, Environmental education

Envirothon is a competitive learning event for high school-aged students. The contest judges the student's knowledge of environmental resources and their ability to apply that knowledge in creating a solution to a current issue. This year's environmental issue was "Waste to Resources" which asks participants to develop innovative ways to manage wastes by turning them into resources through restoration, repurposing, and recycling for the benefit of the natural environment and future generations.

The Indiana competition day was full of activity, as the high school teams participated in written and field tests on topics of soil and land use, aquatics, forestry, wildlife, and this year's current issue. The teams also toured the Woods on Wheels and Soil Health trailers and gave oral presentations on their local solution to the "Waste to Resources" issue scenario received in advance.

Figure 1. Salem High School team, 2022 Indiana State Envirothon First Place Overall
Zion Dunaway, Wyatt Rainbolt, Jenna Gilbert, Sarah Heightchew, and Jacob Rose

Full listing of authors and contacts can be found at the end of article.

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Awards were given for the top three teams on the written/field tests, oral presentations, and a combined overall score. Taking the top honors were:

Written Test:
First Place - Warsaw High School;
Second - Indiana Academy
Third - LaPorte High School
Orals:
First - Salem High School;
Second - Mitchell High School;
Third - Warsaw High School
Overall:
First - Salem High School;
Second - Warsaw High School
Third - Mitchell High School

Seth Purlee, the coach for the Salem High School team said, "[Envirothon] allows students to use the knowledge they have gained throughout their time in agriculture classes, science classes, science club, FFA, and numerous other activities they are involved in each year. It gives the students a practical application of the issues our community faces."

Harrison Phipps, Warsaw High School team member, said, "I would say that reading each source and taking thorough notes to review several times leading up to the competition was what helped me the most. And then as far as what I got out of it, I would say that having the special topic - it was interesting to learn more about waste management and specifically recycling because it's something I do on a daily basis, but I honestly didn't have much of an understanding of all that goes into the process. I also enjoyed the collaboration aspect of the competition because I feel like in a lot of ways high school can lack opportunities for frequent collaboration with peers on long-term projects."

Emily Gough, Warsaw High School team coach, loved that "the students really flourish on their own with minimal guidance from me. They really take charge of their own learning process, and it is a joy for me to see these hardworking students who are passionate about the environment.

Mitchell High School coach Robyn Embry agreed, adding, "I love Envirothon because it is such a good reinforcement of what I teach in my AP Environmental Science class. Students have a chance to hear personally from experts who work in the fields they've been learning about and then to demonstrate their learning at the state competition through an authentic project that connect to their community. That's the kind of learning that sticks with young people beyond high school."

Salem High School will represent Indiana at the week-long National Conservation Foundation – Envirothon in July at the Miami University in Ohio. There, they will compete with teams from the United States and Canada.

For more information, go to the Indiana Envirothon website at indianaenvirothon.org.

The NCF-Envirothon is a program of the National Conservation Foundation. The primary sponsor for the Indiana Envirothon is the Indiana Association of Soil and Water Conservation Districts.

Authors

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Summer Opportunity for High School Students

Elspeth Hayden

Abstract

Do you know a high school student who is interested in sustainability, the environment, or related college and career opportunities? Share this announcement about a summer program at Indiana University.

Keywords: Summer program, Sustainability, Virtual learning

Do you know a high school student who is interested in sustainability, the environment, or related college and career opportunities?

Indiana University's Integrated Program in the Environment is now accepting applications for a free, virtual learning experience this July!

Summer Experience in Sustainability and the Environment is an interactive online experience featuring live lectures, hands-on activities, and connections with IU faculty and like-minded students across the nation.

While participation is free, students will need an internet connection and a device capable of running Zoom and accessing the course page daily from 9:30am – 2:30pm on July 11-15, 2023.

Now accepting applications
on a rolling basis through June.

Questions? Reach out to IPE staff at
iuipe@indiana.edu.

Author

Elpesth Hayden (iuipe@indiana.edu) is the Associate Director for the Integrated Program in the Environment, Indiana University, Bloomington, Indiana, USA.

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Column: Elementary Explorations
Creating Citizen Scientists in Kindergarten

Kristen Poindexter

This is the first installation in a column Kristen will write for THST about teaching science in the elementary classroom.

Kristen Poindexter is a veteran Kindergarten teacher in Indianapolis, Indiana. She holds a B.S. and an M.Ed. from Ball State University, and is currently an Ed.D. student in Curriculum and Instruction with a focus on Science Educastion at Indiana University. Kristen is the recipient of the 2014 National Shell Science Teaching Award and the recipient of the Presidential Award for Excellence in Math and Science Teaching, and has served as HASTI's President, VP, Elementary Director, Director at Large and the 2022 Conference Chair. in 2014, she received the Presidential Award for Excellence in Math and Scienc Teaching. She is a frequent presenter at district, state, and national conferences and she serves as a science coach for her school district where she mentors other teachers. Look for her regular contributions to THST!

We learn lots of different things each year in my Kindergarten classroom, but our September Monarch Butterfly study is always a class favorite!

We begin our study by finding out as much as we can about Monarch Butterflies. I created a simple collection of books using my Epic! books account to allow my students to gather information on their own about Monarch Butterflies. Our favorite titles include "Monarch Butterfly" (2012) by Gail Gibbons, "Monarch Butterfly Migration"(Hirsch, 2022), and "The Incredible Migration of the Monarch Butterflies" (Furstinger, 2022). Each of these books provide enough information in just the photographs that my students can learn about Monarchs even if they cannot yet read the text.

As a class, we create a KWL chart and enter in all of our information that we learned about Monarchs while reading. We also make sure to write down everything the children are wondering about Monarchs, so that I can make sure to address those wonderings!

To help my students have some hands-on experience with migration, we use the website www.journeynorth.org to guide our understanding of the Monarch migration. They have a program each year where children can color and cut out their own life sized Monarch butterfly and then as a class you send all of them, plus a class picture, a letter, and a return envelope to the amazing folks at Journey North. They take all those paper Monarch butterflies and send them to schools in Mexico, close to where the actual Monarchs overwinter in the pine tree forests. In the spring, just as the real Monarchs are migrating back to the US, the paper Monarchs make their way back to our classroom, with the exception that we get paper Monarchs from all over the country to replicate the many paths that a Monarch may take.

Full listing of authors and contacts can be found at the end of this article.

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Figure 1: Life Cycle Bracelet

We create lots of items to put in our science notebooks that show the life cycle of the Monarch, but our favorite is the life cycle bracelet (Figure 1) and life cycle squishy bag (Figure 2). The bracelet is created using one clear bead (egg), one black bead with three yellow beads (head and body of the caterpillar), three green beads (chrysalis), and either one orange bead or a butterfly shaped bead (butterfly). We then sing the following song and move the beads on our bracelet to show the life cycle.

Monarch Butterfly Song
(to the tune of "Up on the Housetop")

First comes a butterfly and lays an egg,
Out comes a caterpillar with many legs,
Oh, see the caterpillar spin and spin,
A little chrysalis to sleep in,
Oh, Oh, Oh, wait and see…
Oh, Oh, Oh, wait and see,
Out of the chrysalis
My oh my!
Out comes a Monarch Butterfly!

We also create squishy bags (Figure 2) for another tactile experience. Using a sandwich sized baggie, fill it with a few squirts of clear hair gel. Add in a small bead (egg), a 1 inch length of pipe cleaner (caterpillar) a leaf shaped bead (chrysalis), and a butterfly shaped bead (butterfly). Students can squish the parts of the life cycle around and then work to put it back in order!

We study the Monarchs in September because in Indiana that is when many of them begin their long migration south to overwinter in Mexico. Most of the Monarchs arrive in Mexico just in time for the celebration of Dia de los Muertos, or the Day of the Dead. It is believed that the arrival of the Monarch butterflies represents the souls of those who have passed on coming to visit their loved ones during the Day of the Dead. We read the book "Day of the Dead" by Julie Murray (2022) using our Epic! books app to learn more about the custom of "Day of the Dead" and how cool it is that our Monarch butterflies are there being a part of the celebration!

It brings me so much joy as an educator to know that I am creating young citizen scientists in my classroom! I have students email and call years after they leave my classroom and tell me how they incorporated Monarch butterflies into a project they are working on because they learned about them in my classroom!

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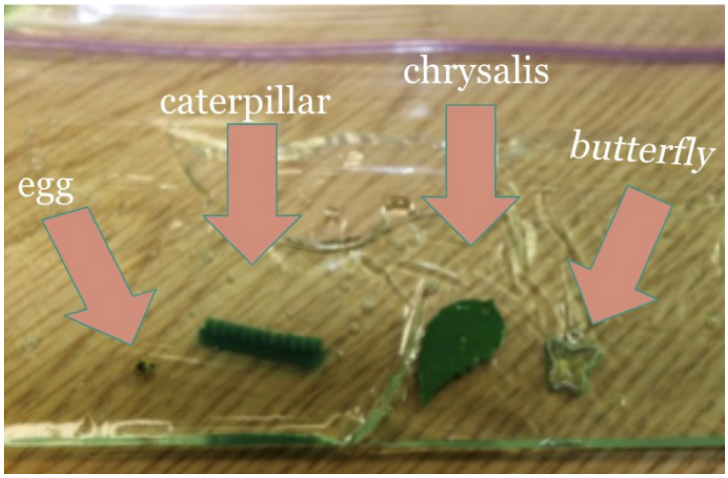

Figure 2: Life Cycle Squishy Bag

Author

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It's a Puzzle: Engaging Students in Plate Tectonics

George Nelson[1] and William Thornburgh[2]

Abstract

Plate tectonics is a topic where students are often not actively engaged and it can feel painfully slow as you are working through this unit. Through more opportunities for active engagement and a redesigned approach, make plate tectonics more engaging in your classroom and help your students build greater conceptual understanding.

Keywords: Plate tectonics, Unit planning, Conceptual understanding

It was almost a decade ago and I had been muddling through years of teaching a topic that I was interested in, but my students never really got excited about. I constantly asked myself, "Was it the way I was teaching?" "Was it just a boring topic?" "How can I teach plate tectonics differently and better?"

I needed help and thanks to seeking professional development (PD) opportunities - I got it! I attended PD where I learned more about A Framework for K-12 Science Education (NRC, 2012) and I learned Modeling Instruction™ (Hestenes, 2015) from the American Modeling Teachers Association (AMTA). Thanks to both, I was on my way to future success!

These professional development experiences helped me develop a plan to have my students 'act like' scientists, to 'do' science, and to engage more meaningfully in learning. I was able to restructure my class by using teaching strategies and by incorporating the three dimensions outlined in A Framework for K-12 Science Education. The results - my students were immediately more interested, they were gaining important foundational knowledge in plate tectonics, and they were more engaged in learning science.

If you struggle with this topic like I did and you are looking for new ways to teach your students, I have outlined a unit of activities and teaching strategies that are sure to captivate and transform your middle school classroom.

Unit Overview

1. Introduction "Why are there Fish Fossils High Up in The Himalayas?" (Khot, 2018)
2. Driving Question Board: Questions about the anchor activity
3. Core Samples worksheet
4. Plate Boundaries Data Analysis simulation (Concord Consortium)
5. Earth's Outer Layer reading annotation
6. Analyze Plate Boundaries simulation
7. Earth's Interior Research
8. **Convection Jar Activity**
9. Convection Jar simulation (ExploreLearning, n.d.)
10. Plate Tectonics simulation
11. Plate Boundaries reading annotation
12. Pangea simulation (ExploreLearning, n.d.)
13. Ancient Fossils reading annotation
14. Final Assessment

In this article I would like to focus on the connection with the Next Generation Science Standards [NGSS] (NGSS Lead States, 2013) (Table 1) and share my 5E learning cycle with the Convection Jar Activity in the Explore section. The intent of the convection activity is to introduce the driving force behind plate tectonics. What I have discovered over many years of

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Table 1.
Connecting Instruction and NGSS

MS-ESS2 Earth's Systems *https://www.nextgenscience.org/dci-arrangement/ms-ess2-earths-systems*	
Performance Expectation	**Connections to Classroom Activity**
MS-ESS2-2: Construct an explanation based on evidencefor how geoscience processes have changed Earth's surface at varying times and spatial scales.	Students observe the convection jar and gather data on the motion of liquid when heated. These data help students make connections between motion on and below the Earth's surface, how it has shaped the Earth, and how it occurs on various scales.
MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continentalshapes, and seafloor structures to provide evidence of the past plate motions.	Students complete readings, activities, and simulations to acquire data necessary for understanding the history of our planet.
Science and Engineering Practices	
Asking questions and defining problems	Students make predictions and ask questions before and during the convection current activity.
Developing and using models	They will make observations and use the data to develop a model.
Planning and carrying out investigations	Although they are given the investigation, students will carry it out and collect data.
Analyzing and interpreting data	Students will observe, record, analyze and interpret motion within the jar.
Constructing explanations and designing solutions	Upon recording data, students will collaborate and construct explanations for the observations they made.
Engaging in argument from evidence	Students will have an opportunity to engage in argument by using the evidence observed while conducting the activity.
Observing, evaluating, and communicating information	While collaborating in small groups and during the whole class whiteboard circle, students will communicate their findings and question others.
Disciplinary Core Ideas	
ESS1.C: The History of Planet Earth Tectonic processes continually generate new ocean sea floor at ridges and destroy old seafloor at trenches. *(HS.ESS1.C GBE),(secondary to MS-ESS2-3)*	Students observe and analyze two different simulations where they see seafloor spreading over the course of the unit. Additionally, students read articles about Iceland and Chile where they gather more information about seafloor spreading.
ESS2.A: Earth's Materials and Systems All Earth processes are result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from sun and Earth's hot interior. The energy that flows and matter that cycles produce physical and chemical changes in Earth's materials and living organisms. (*MS-ESS2-1*)	Students observe convection cycles in the Convection Jar Lab and then apply it to the Convection Cycle Simulation. Students research the Earth's interior and observe that the mantle flows in a convection cycle.
ESS2.B: Plate Tectonics and Large-Scale System Interactions - Maps of ancient land and water patterns based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart (MS-ESS2-3)	Students read an article about fossils and discover that fossils of the same organism are found on different continents. Students then apply the reading to a simulation on Pangea. They use the simulation to find multiple pieces of evidence that the continents fit together.
Crosscutting Concepts	
Patterns	Students observe the flow of liquid in the convection jar while thinking about what is going on at the microscopic level. They then apply that to the macroscopic level of what is driving tectonic plate movement.
Cause and Effect	Plate Movement is caused by the Earth's interior, which affects the surface of the Earth.
Systems and System Models	Students develop a model of convection cycles at the microscopic level and then apply it to the macroscopic level of what causes plates to move.
Energy and Matter	Students apply how energy drives the convection cycle and how it moves matter through the process.
Stability and Change	Convection cycles drive the motion of plates, which cause earthquake and volcanic activity. Gradually, the plate moves, which causes the fossils to move apart over millions of years.

using this activity was that students still often found it challenging to explain why tectonic plates moved and what caused them to do so after completing it. This was a major missing concept in students' understanding of Plate Tectonics. Developing explicit connections to the Next Generation Science Standards (NGSS Lead States, 2013), using the 5E Learning Cycle as a framework, and incorporating teaching strategies from the professional development course, helped me improve my teaching.

In the upcoming 5E cycle, I will share how using the techniques learned from the Modeling Instruction™ professional development shaped my instructional practices and report how these changes lead to positive results for my students in 1) making sense of convection cycles and 2) understanding key unit objectives.

I have seen students becoming engaged while observing the convection currents during the Convection Jar Activity. Furthermore, they were able to build conceptual understanding, which carried forward and was able to be applied to other units throughout the school year.

Engage (45 min.)

This is an important decision for teachers, as it is often the first introduction to new concepts and we need to hook our students. Although there are many options, I use the article, Why are there Fish Fossils High Up in the Himalayas? (Khot, 2018). It is a short article that introduces students to continental drift and it creates a mystery about the location of fossils.

I use this introduction as an anchor activity to the unit and I challenge my students to solve this mystery. I begin by having students make a prediction about this event, then I place them into small groups (3-4 students) to share ideas. During small group discussion, I find it valuable to visit each group to hear their predictions and ask probing questions. This acts as a formative assessment for me as I gather insight into students' preconceptions and/or misconceptions about continental drift, fossils, and other topics that may come up.

Finally, the class comes back together for a whole-group discussion about how marine fossils could possibly be located high up in the mountains. As they report to the entire class, I record their ideas on the large whiteboard at the front of the classroom so we can revisit prior thinking later in the unit. Upon completion of the engage phase, students move through a series of exploration, explanation, and elaboration phases where they create and revise models to explain scientific phenomena. Eventually, we get to the Convection Jar Activity.

Over the previous weeks, students have explored a number of topics through readings, worksheets, discussions, simulations, and research. They build understanding of concepts such as: the Earth's surface, analyzing core samples and observing various locations on our planet, earthquakes and volcanic activity, the movement of plates and what happens at plate boundaries; and the composition of the Earth's interior. As we review what we have been learning, there are unanswered questions that remain. That is how I engage them for the upcoming activity.

Explore (30 min)

In this activity, I create small groups of 3-4 students. Some of the grouping strategies I use most often include randomly mixed and pre-assigned, gender mixed, and based on academic levels. Find what works best for you and your students by visiting teachhub.com (Kiser, 2019) or edutopia.org (Johnson, 2014) for more ideas on grouping strategies.

Before beginning the activity, it is important to provide assistance for setting up the convection jar. There are many ways to set up convection jars and it is important that you follow school and district policy for safety. I use the set-up as shown in Figure 1, with a rectangular-sided glass jar that fits nicely into wooden supports that hold the glass jar above the flame of the candle. The flame of the candle should not touch the jar. The jar should be high enough that the jar doesn't warm too quickly. I use Carolina Convection Fluid™. However, it is possible to make your own fluid with ground mica or rheoscopic fluid. Watch a 'how to' video here. Be sure to have students wear goggles, pull back hair, as well as clear the lab desk and surrounding area if they will be working with a flame.

Figure 1. *Student groups making observations*

Remind students not to touch the glass jar and use safe lab techniques. The observation should be timed to keep the temperature within controlled limits. The teacher should remove the jars after observation with oven mitts to model adherence to safety. Refer to NSTA Heat Source Safety Guidelines. Ways to build non-flame convection jars can be found by searching on-line.

Once groups have the activity set up and ignite their heat source, allow time to make observations on what is happening inside of the convection jar (Figure 1). Within minutes of heating the jar students will begin to observe that the liquid starts to flow up and in a circular pattern. It is common for students to express surprise and to be perplexed by the movement of the liquid. As they continue to observe and record data, groups should begin to formulate ideas for why the liquid behaves in this manner.

I ask my students to record their data on a whiteboard by drawing what they observe inside the jar in 3 phases - before, during, and after (Figure 2). This allows them to draw the system, record time, and write/draw observations. The collection and analysis of data are then used to compare with students' original predictions and to produce new ideas. The use of whiteboards is common practice in Modeling Instruction™, as they allow for small groups of students to team up and collaborate; they are large enough for groups to share with the entire class; and they provide students a way to represent their thinking (or models).

The goal of this exploration is for students to come up with an explanation of the liquid's movement within the convection jar. I encourage them to use multiple representations (e.g. written, pictorial, graphical) in order to describe the movement and explain why it flows the way it does. Although their explanations may not be completely accurate, this process has them gaining skills in collaboration, observation, data collection and analysis, using evidence for argumentation, and critical thinking.

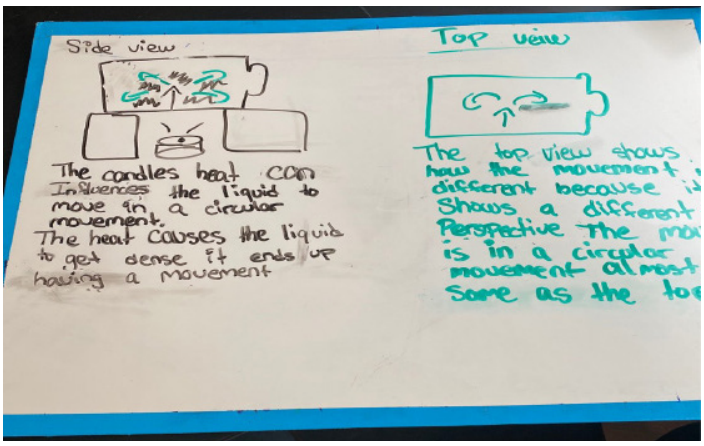

Figure 2. Group whiteboard

It is vital for the teacher to circulate through the room and listen to group discussions while focusing on what they are thinking, how they are depicting it on the whiteboard, if they are working off of each other's ideas, and if they are making any connections to previous content or activities.

Explain (40 min)

After students have collected their data and recorded observations and ideas on their whiteboards, the small groups return and we create a display of all group's whiteboards. This is called a whiteboard circle and it benefits students by allowing them to see and hear others' thinking. It is an opportunity for each group to share their findings with the class while the teacher facilitates the discussion. When using Modeling Instruction™, teachers need to create a student-centered experience, where students can construct and co-construct knowledge. It is vital to let students do the talking, compare whiteboards, ask questions, and explain their thinking.

During the whiteboard circle, I have a series of prompts that guide the discussion, but I also remain flexible to address students' questions and answers as they arise. Here are some prompts you may want to consider posing to your students to engage them in the activity and help them build a stronger conceptual understanding of convection currents:

- Do you notice similarities on any whiteboards?
- It looks like groups are representing motion in the jar - how did groups represent motion?
- Can you explain how or why this motion is happening?
- I see some boards mention that heat rises and that causes the motion. Can you elaborate on that?
- How could you explain the liquid's movement or heat rising by talking about these at the particle level?
- I notice that some groups included energy on their board. How is energy involved in this activity?

Elaborate (20-30 min)

After allowing ample time for rich, meaningful discourse where students are actively engaged, I ask students to make connections between the Convection Jar Activity and previous activities that we have completed. Although they may still need guidance, they are better able to explain things like volcanic activity and earthquakes than in previous years. In fact, I allow students to use the whiteboards or their iPads to represent their connections and knowledge if they choose to do so (Figure 3).

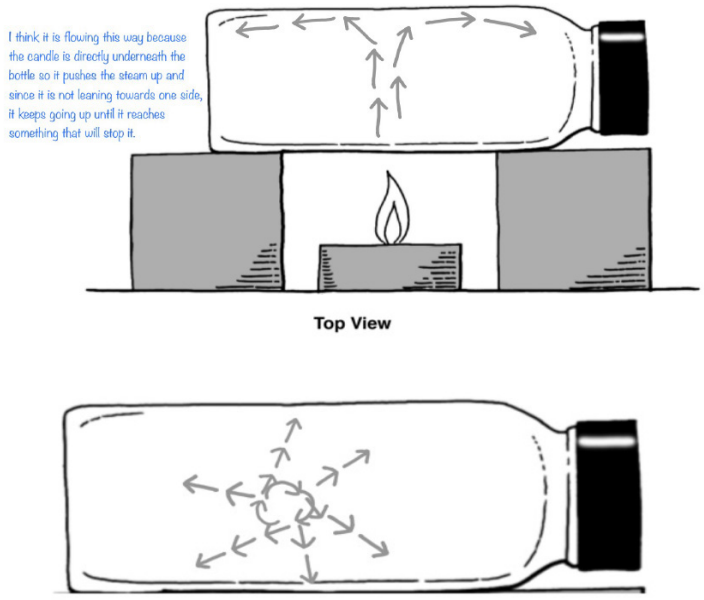

Figure 3. Sample Student Work (iPad) - arrows indicating movement with a written idea

Next, I ask students to use the activity to explain why tectonic plates move and how this activity ties into the unit's overarching question - "Why are fish fossils found so high in the Himalayas?". Through guidance and discussion, students eventually agree that the liquid in the jar flows in a circular motion (convection cycle) and some groups may notice that the liquid splits and forms two circular paths at the top of the jar. In order to solidify convection cycles, teachers could also show students a video. (Click for an example.)

Finally, to elaborate further on what students have observed and discussed, I have them complete a simulation to further their knowledge of convection cycles. Upon completion of a convection cycle Gizmo through-ExploreLearning (n.d.), groups reach a consensus on the flow pattern of the liquid in more detail, it helps students grasp convection cycles better, and they can link them to the tectonic model (Figure 4).

Evaluate

In total, this is a 6-week unit for my students, so the only evaluation I do at the completion of the Convection Jar Activity and simulation is formative in nature. Through visiting each group as they are making and recording observations - I evaluate their thinking. When we reconvene for our whole-class whiteboard circle, I evaluate each group's board, I listen to their questions and answers, and I am constantly evaluating the situation. Furthermore, when I move them from the activity into the simulation, I am able to work with them as needed and ask questions as I move throughout the room. All of these allow me to reflect on my teaching, evaluate student understanding, and make decisions on whether we move forward or spend more time learning a concept.

Within each formative assessment, teachers can evaluate individual students or small student groups depending on the structure of the classroom/activities they have created. Furthermore, if desired, this would be an acceptable place for teachers to do a short summative assessment to test students' knowledge of convection currents.

The use of questioning is an important feature of a Modeling Instruction™ classroom and an effective method to formatively assess students. They are free to express ideas, to ask questions, and work with their peers without 'fearing' a bad grade for being wrong. The questions should be designed to be higher on

4. Based on what you have seen in the jar, what effect do you think convection in the hot mantle might have on the earth's plates? What observations of the fluid inside the jar support your explanation?

I think that maybe it is what causes the plates to move. Like we learned yesterday, Earth's core is very very hot, so maybe the core heats up the mantle and pushes the liquid in it up towards the crust, and meanwhile the liquid near the crust gets cooler and sinks down, and this keeps repeating, and this is what causes plates to move and earthquakes and volcanoes to happen.

Figure 4. Sample student work

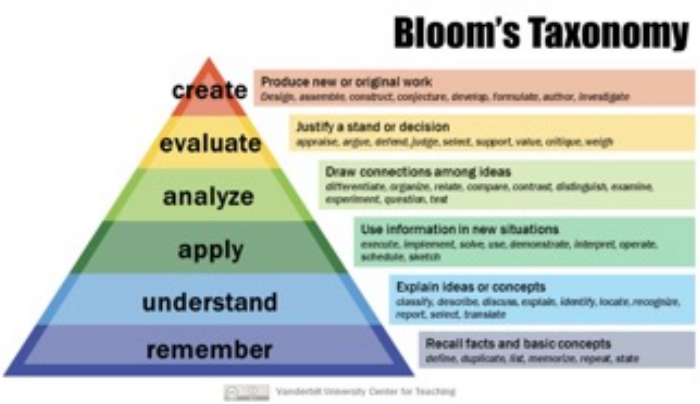

Figure 5. Bloom's Taxonomy (Armstrong, 2010)

the Bloom's Taxonomy scale (Figure 5) and improve students' critical thinking and problem-solving skills through Socratic questioning (figure 6).

At the conclusion of the unit, I evaluate students' models and I revisit the anchoring activity that was used on day one. In comparison to previous years, after I altered my instruction, the results have been nothing but positive. I have seen students forming more robust and elaborate explanations to the unit's objectives; the majority of students are able to bring concepts like convection currents into their reasoning; and they are able to explain what they have learned in much greater detail. I have included a writing prompt (figure 7) and rubric (figure 8) that I use, which is aligned with the NGSS framework.

There is a natural alignment between Modeling Instruction™ and the three dimensions of the NGSS (Figure 9). While attending the professional development, we (the teachers) participated in 'student mode' while deepening our content knowledge and having the teaching practices modeled by the workshop leader. This allowed us to experience the curriculum through the lens of students (known as student mode); to be immersed in a sequence of activities to build, test, and revise models just like scientists do; and to engage in equitable discourse just like their students will do.

Figure 6. Types of Socratic Questions (Paul & Elder, 2007)

Thanks to what I learned in these workshops, my classroom is truly student-centered and students are engaged in relevant learning experiences. The use of the Modeling Cycle (building, testing, and revising models) gives students opportunities to evolve their prior knowledge and develop greater conceptual understanding. Most importantly, my students work collaboratively through small group and whole class discussions, they collect and analyze data, they are able to construct explanations based on evidence, their communication has improved, and their critical thinking and problem-solving skills are better! Furthermore, my students have developed essential skills that will be useful in life (i.e. 21st Century Learning Skills, Fig. 10).

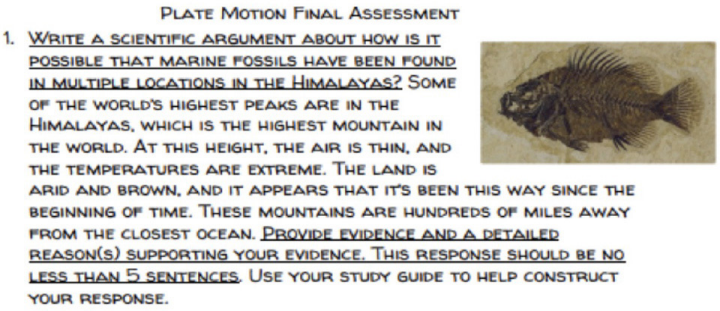

PLATE MOTION FINAL ASSESSMENT

1. WRITE A SCIENTIFIC ARGUMENT ABOUT HOW IS IT POSSIBLE THAT MARINE FOSSILS HAVE BEEN FOUND IN MULTIPLE LOCATIONS IN THE HIMALAYAS? SOME OF THE WORLD'S HIGHEST PEAKS ARE IN THE HIMALAYAS, WHICH IS THE HIGHEST MOUNTAIN IN THE WORLD. AT THIS HEIGHT, THE AIR IS THIN, AND THE TEMPERATURES ARE EXTREME. THE LAND IS ARID AND BROWN, AND IT APPEARS THAT IT'S BEEN THIS WAY SINCE THE BEGINNING OF TIME. THESE MOUNTAINS ARE HUNDREDS OF MILES AWAY FROM THE CLOSEST OCEAN. PROVIDE EVIDENCE AND A DETAILED REASON(S) SUPPORTING YOUR EVIDENCE. THIS RESPONSE SHOULD BE NO LESS THAN 5 SENTENCES. USE YOUR STUDY GUIDE TO HELP CONSTRUCT YOUR RESPONSE.

Figure 7. Student writing prompt

Claims, Evidence and Reasoning – Scientific Explanations Rubric Linked to SBAC Argumentative Writing

	4	3	2	1	0
Claim – a conclusion that answers the original question	• Scientifically accurate • Completely answers the question • Common inaccurate claim(s) are clearly addressed.	• Scientifically accurate • Nearly completely answers the question • Inaccurate claim(s) are only generally addressed, no specifics	• Partially scientifically accurate • Partially answers the question • Inaccurate claim(s) are not addressed	• Is not scientifically accurate overall • Does not adequately answer the question	No claim
Evidence – scientific data that supports the claim	• The data are scientifically appropriate to support the claim. • The data are thorough and convincing – enough details and evidence provided. • Proper units are used in data • Shows with evidence why alternate claims do not work	• The data are scientifically appropriate to support the claim • The data are basically sufficient and convincing, but tend to be more general and not as specific and in depth • Does not address why alternate claims do not work • Evidence may be repetitive	• The data relate to the claim, but are not entirely scientifically appropriate • The data are not sufficient, though generally support the claim	• There is some evidence provided, but it is not logically linked to the claim or scientifically appropriate	No evidence provided
Reasoning – a justification that links the claim and evidence	• Reasoning clearly links evidence to claim • Shows why the data count as evidence by using appropriate scientific principles • There are sufficient scientific principles to make links clear between claim and evidence	• Reasoning adequately links claim to evidence • Includes related scientific principles, but only passably clarifies why this data count as evidence • Reasoning tends to be more general and shows only partial depth of content understanding	• Reasoning does not adequately link claim to evidence, or clarify why data count as evidence • Includes related and non-related scientific principles, and shows little depth of content understanding	• Reasoning is clearly insufficient and relates only tangentially to question and claim at hand • Scientific understanding is very limited	Does not provide reasoning
Language and Vocabulary	• Response clearly and effectively expresses ideas using precise, scientifically appropriate descriptions and vocabulary	• Response adequately expresses ideas and scientifically appropriate descriptions and vocabulary, but they are more general than specific	• Response inconsistently and sometimes inappropriately expresses ideas or scientific descriptions and vocabulary	• Scientific language and vocabulary are not precise or appropriate	Not understandable
Focus and Organization	• Focus only on question at hand • Logical progression of ideas • Clearly stated and focused claim that is strongly maintained	• Focus mainly on question at hand, some loosely connected material present • Logical progression of ideas • Clearly stated and focused claim that is adequately maintained	• Focus not consistent on question at hand • Progression of ideas not entirely logical • Have a claim, but it's not entirely clear or maintained	• Focus not at all consistent • Progression of ideas not logical • Have an unclear claim that is not maintained	No clear focus or organization

Rubric adapted by Kevin J. B. Anderson from K. McNeill and J. Krajcik, NSTA, and SBAC Argumentative Writing Rubric for grades 6-11

Figure 8. Scoring rubric (McNeill & Krajcik, 2005)

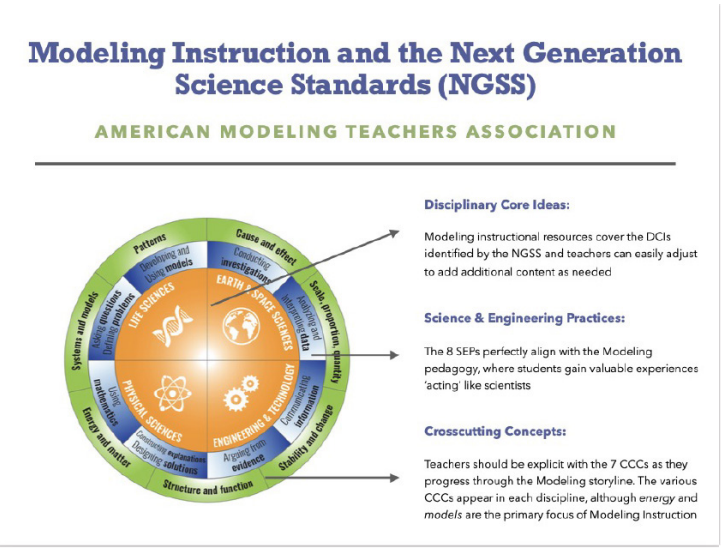

Figure 9. NGSS and Modeling Instruction™ (Thornburg, 2019)

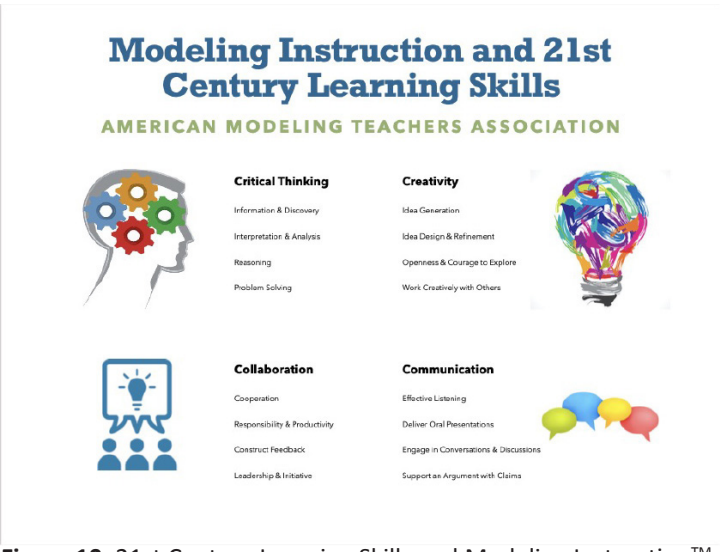

Figure 10. 21st Century Learning Skills and Modeling Instruction™ (Thornburg, 2019)

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William Thornburgh is employed by AMTA, which holds the MI trademark.

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Open Access

Ball State University Opens New Environmental Education Center

Erica Oliver[1], Carol Day[2], & Tom J. McConnell[3]

Abstract

Ball State University has opened its new Environmental Education Center and a newly expanded Conservatory at the Rinard Orchid Greenhouse. Teachers are invited to plan visits to the site for a variety of environmental education programs. Learn more about the facility and the activities the university hopes to host at the new facility.

Keywords: Environmental education, Rinard Orchid Greenhouse, Ball State University, Outdoor education

Figure 1. Rinard Orchid Greenhouse with new Environmental Ed Center (left)

Figure 2. *Maxillaria grandis* orchid

Ball State University has just completed work on a new Environmental Education Center adjacent to the newly expanded Conservatory at the Dr. Joe & Alice Rinard Orchid Greenhouse. The Ball State Field Station and Environmental Education Center (FSEEC) will begin hosting public events and classes at the facility in the summer of 2022.

The Rinard Orchid Greenhouse (ROGH) at Ball State University (Figure 1) is the largest collegiate orchid collection in North America. The collection is more than just orchids (Figure 2); it houses many species of tropical plants, as well as species native to the Midwest.

Full listing of authors & contacts can be found at the end of article.

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Figure 3. Preschooler walking in the tallgrass prairie.

The ROGH is also located on the south side of Christy Woods, which is an outdoor classroom for nature education. Located on the west edge of campus, Christy Woods also includes the Teaching and Research Greenhouse, forested areas, a tallgrass prairie (Figure 3), and soon a wetland to be constructed next to the new Environmental Education Center. This combination of habitats and spaces offers a variety of environmental education and research opportunities.

In 2021 construction began to expand the ROGH, which was built in 2014 to replace an aging facility from the early 1970s. Thanks to the generous support of benefactors, the university has doubled its conservatory space that contains examples of Central American flora as well as tropical frogs (Figure 4), Indiana-native aquatic turtles, and sculptures of various tropical wildlife. The adjacent Environmental Education Center includes a classroom designed to be a versatile space for many types of groups.

The expansion and new Environmental Education Center will allow us to greatly expand the programs and events that we offer. From the parking lot, visitors will walk through our Gateway Plaza, which will be an outdoor nature space accessible 24-7.

Upon entering the vestibule, visitors will have three directions to choose from. Going right will take visitors into the expanded Conservatory space (Figure 4),

Figure 4. View of the expanded Conservatory through the tree-of-life panel.

where they can observe a variety of tropical plants as they meander the path, as well as our red-eyed tree frogs, poison dart frogs (Figure 5), turtles, and sculptures. Going straight will lead visitors to the prairie, which will contain our newly built outdoor learning space. This space is inspired by the shape of an orchid, and will include permanent seating to allow educational programs to take place while surrounded by the prairie.

Turning left in the vestibule will lead visitors to our Nature Lab, a 1498-square-foot learning space. This room is intentionally designed to be a flexible learning space that brings nature indoors. A large over-head door can be opened to allow indoor-outdoor learning experiences as it connects to the outdoor learning space in the prairie. Large windows allow the prairie and forest to be easily observed. An observational beehive will be installed in the classroom, with a tunnel through the wall to allow the honeybees to exit the hive and pollinate our prairie.

Tanks will also be installed in the classroom to allow native frogs and a box turtle to live in the Nature Lab, so that visitors can observe some of our local wildlife year-round. Life-size bird silhouettes, skulls, furs, and other nature-inspired teaching tools will be displayed in the Nature Lab to provide additional learning opportunities for our visitors. Finally, the room is set up with a "wet lab" space, to allow us better resources to

Figure 5. Poison Dart Frog

Figure 6. Indiana Master Naturalists learn about songbirds.

do activities that can get messy, such as planting seeds, painting, and more.

From May 2021 through May 2022, the FSEEC welcomed nearly 15,000 visitors to our facilities. Visitors included BSU students, PreK-12th grade students, community members, and more (Figures 6 & 7). In our new ECC space, we look forward to continuing providing environmental educational opportunities for those audiences, and further expanding programs we offer to the community.

Each month, the ROGH offers a special "Second Saturday" program where visitors can come at their leisure and participate in scavenger hunts and other activities to learn more about a specific topic. Past topics have included pollinators, dinosaurs, Shakespeare, tropical edible plants, and more. We expect to expand the activities offered during these programs in our new space, and offer additional topics related to Indiana ecology.

Figure 7. Wildlife Warriors meet a native turtle.

Planning A Visit

Groups can contact our Environmental Education Program Coordinator, Erica Oliver, to learn more about scheduling field trips and programs with us. Her email is elforstater@bsu.edu. There is a field trip request form you can complete to help plan your visit to Christy Woods, the BSU greenhouses, and the Environmental Education Center. **Click here to download that form**.

Hours of Operation

The ROGH is open to visitors M-F from 10-4:30 pm, and Saturdays 10-3pm.

Christy Woods is open to visitors M-F from 7:30-4:30pm and Saturdays 10-3pm. Visitors do not need to schedule a time to visit our facilities unless they are a group such as school or community organizations.

Visitors can follow our social media accounts to stay up-to-date on events happening at our facilities.

ROGH social media

Facebook: Rinard Orchid Greenhouse – Ball State University

Instagram: bsurogh

Christy Woods social media

Facebook: Christy Woods and BSU Field Station Properties

Instagram: christywoods_bsu

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Yes, You CAN Write for THST!
Tips and Strategies to Make Submitting Articles Simpler

Tom J. McConnell

Have you thought about writing for *The Hoosier Science Teacher*, but the thought of writing for a publication makes you break out in a sweat? It turns out that what editors want may actually make the process easier than you think! This article has tips and strategies learned by an experienced teacher, author, reviewer, and editor.

Keywords: Professional writing, Submitting manuscripts

My first professional publication was an article in *The Hoosier Science Teacher* a couple of decades ago. I wrote that article during my doctoral program, and it was an eye-opener on the realities of an editor's pen. Had I written a manuscript when I was teaching high school biology, I might have been successful, but I am absolutely certain I would have made a lot of mistakes that might have prevented it from being accepted.

Since then, I have spent a lot of time writing, editing and reviewing articles and books for a variety of publications. I kept working at this part of my professional life is because I learned some lessons that make writing easier for me. The bonus is that these lessons also increase the chances my work will be accepted.

For the last six or seven years, I have taken on the role of an editor. My first work in that area involved books, and I learned how professional publishers do their jobs. Now, as part of HASTI's Publications Committee, one of my roles is to help convert manuscripts into the finished articles you see here in this journal.

One lesson I learned is that most teachers are a bit intimidated by the thought of writing an article for publication. I get that! Remember, I waited until late in my doctoral program to even try. So this manuscript is my attempt to help make that process a bit less intimidating. If you follow the tips I am sharing with you here, I can't guarantee that everything you write will get published, but it will help. The more important part, for me, is that I think it will make it easier for you!

Full listing of authors and contacts can be found at the end of this article.

Why You Should Write for THST

The Hoosier Science Teacher is an ideal first place to dip your toes in the pool of writing for publication. Your colleagues are genuinely interested in what you have to say, and there are people available to help you refine your article. What you write does not have to be long. The journal is open to a wide range of articles, from research about science and teaching to stories, opinions, book reviews, poetry and puzzles.

You can also reap some real benefits by writing for THST or other journals. Indiana's license renewal and teacher evaluation systems reward teachers for writing professional articles. The PGP points from one article can go a long way toward meeting your 6-year goals, and principals will value the publications in your annual review. Highlight the articles you write in your CV and evaluation portfolio!

So here are tips and hints. I hope you'll give these ideas some thought.. and then I hope you'll write a manuscript for THST.

Put Some Thought In It... But Not Too Much!

There are two ways to reduce the chances of a manuscript being accepted: 1) Not planning the article well, and 2) Overthinking the contents and layout of the article. OK, I admit it! That may not be the most helpful piece of advice. It makes more sense as you go on.

When I review articles for professional journals, I occasionally get a manuscript that does not address important information. In a research journal, not explaining methods or data analysis is the kiss of death for an

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article. For a teaching journal like THST, the most important task is to explain how your work is relevant for real teachers. Have you aligned a lesson to standards? Have you mentioned all the resources you need? What about safe science teaching and citations for your sources? These are all very important. Plan them out! Do what your middle school, high school and college writing teachers told you to do; Make an outline (Figure 1). It IS helpful, no matter how much you hated that assignment in school.

Article Outline – Food web lesson plan

1) Title Page
2) Abstract
3) Introduction
   a) *Featured concept*
   b) *Challenges to teaching this topic*
4) Activity Plan
   a) *Driving Question*
   b) *Objectives*
   c) *IDOE Standards*
   d) *Materials*
   e) *Procedures*
5) Assessment plan
6) Samples of student work
7) Impact on student learning
8) References

Figure 1. Sample outline

But reviewers are just as quick to reject articles that have too much detail. I once reviewed an article for a research journal that was 90 pages long! It had an extensive literature review, enormous tables of data and statistical analysis, and very specific and wordy commentary on every aspect of the study. The article never had a chance. Your article needs to carve out one specific idea to present, get to the point, and present the results that are relevant to the main message. And the rest can wait for another article. Be concise! It shortens the work for you, and makes reviewers and editors happy.

Make the Editors Happy!

I usually tell my students that when I grade their final papers, they want to make me feel happy, and that following the guidelines and the rubrics makes me happy. You can apply that same approach to the editors of a journal when you submit an article.

The best way to make the editors happy is to follow the guidelines published on the journal's website. If they say no more than 8000 words, don't submit something with 12,000 words. If they want the article uploaded as a Word file, don't send a PDF. If they say images must be in .jpg format, don't send .gif or .png files. It's really just like following the rubric for an assignment at school.

View THST's Author Guidlines here.

Don't Over-Format!

Overthinking an article can also mean over-formatting your work. I know you want your article to look sharp. Early in my writing career, I spent hours trying to make the text look the way I thought it should look on the page. It is natural that you want your work to look polished and professional, but the time you put into formatting will be undone by editors.

The turning point for me was working with editors at NSTA Press. I was working on a book, and over-formatting was my thing until I had a phone conversation with the editor who was managing the project. She told it to me bluntly. "Don't do ANYTHING with the format. Make it very plain!"

She explained that every bit of formatting I do beyond the returns at the end of a paragraph is likely to be deleted by the editors and pressmen, and they will reformat it the way they want it. It turns out I was wasting a lot of time and energy. When I started doing the editing I learned that over-formatting makes it extremely hard on the editors.

My suggestion: Format the title page with the information the journal needs, centered on the page. For EVERYTHING else, make it simple.

- Use the tools in the "Format>Paragraphs" menu to indent the first line of each paragraph. Then do NOT hit Tab to indent (see Figure 2)
- Do not add a return or extra space between paragraphs, except where you put a new header.
- If you need to make bulleted or numbered lists, use the tools within Word. Do not type the bullets or numbers or align text using space and tab keys. (Figure 3)
- It is good to boldface headers, but follow the journal's format like for aligment of the headers.
- Use italics for book titles, emphasis, and maybe excerpts of interviews, but not much else.
- NEVER EVER use the space bar and the return key to move text on the page.

Remember, this will feel weird to you at first, but trust me, it is easier! It also increases the chances you'll get published, because the editor who looks at your submission first is the one you want to make happy.

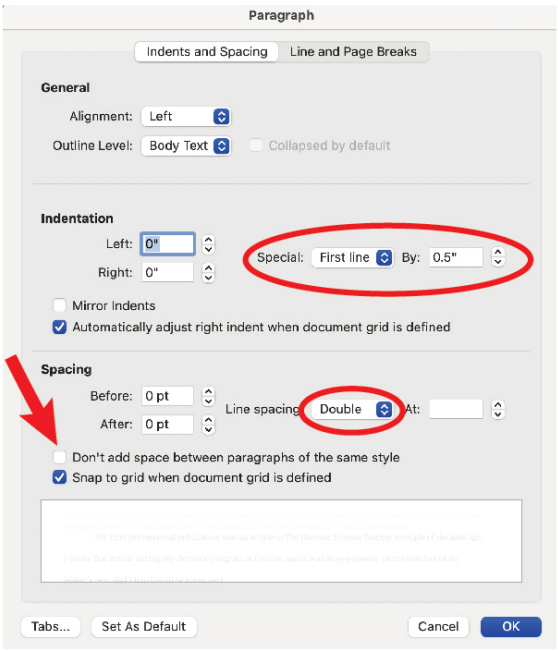

Figure 2. Use tools to set indentations and spacing

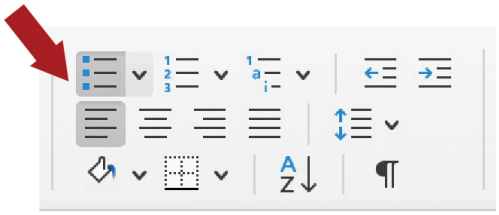

Figure 3. Tools for bullet and numbered lists.

Inserting Images Made Easy

One thing that make an editor's job harder is the way authors submit images with their articles. Most of simply copy and paste or insert an image into the text. But then we add "text wrap" features, or we put a frame around the photo. Many authors also don't think about the format or resolution of a photo.

The NSTA editors set me straight about this. "You can put a photo in the text if you want, but we are probably going to move it." In other words, don't spend a lot of time tinkering with the position of your image. If you want the image there, just insert the image, and let the editors take it from there.

You also need to reference the figure in the text. For instance, you can write "(See Figure X)" when you first write about that figure. On the page with the image, you also need include a caption. The caption should say "Figure X. Short description here." You write the description, but the emphasis is on "short." Each figure or table should have a caption, and should be mentioned in the text. If you look through articles that have been published in the journal, you'll see examples. It's ok to use those as a model for how to write your captions.

The image you paste into the text really needs to be high quality. Until recently, most cell phone images have been 72 dots per inch (dpi), and that resolution is so low that enlarging an image makes it very grainy or "pixely." The best images for an online journal should be 140 dpi or more. Use a large file. It is easier for editors to shrink the image than enlarging, and this makes high quality images easier. If you create an image on the computer, like a graph or a diagram, check your software's settings. It should allow you to start with high resolutions, often at 300 dpi. (See Figure 4).

In the production process, the editors will place the image in a layout that works for them, and they will place it in a spot that makes sense. Trust them to do it

Figure 4. Comparing high and low resolution images

Cite Your Sources

Here is another thing my students hear from me all too often. THST is a professional journal, and teachers are professionals. It is very important that when you refer to someone else's work, you cite the source.

You need to cite in the body of the text, even if you did not quote the source directly. It is simple to do. In parentheses, put the authors' last names and the year, or maybe names and page number, or maybe names, year and page number. (Check the format preferred by the journal – "make the editors happy!") For instance, you can just put "(McConnell, 2006)" or maybe "(Aurah & McConnell, 2014, 25)." If you use a direct quote, make sure you include the page number. That will cover almost any citation format.

Remember, anything you cite in the text must appear in a References list at the end, and vice versa. Some journals call it "References," and others call it

"Bibliography," or "References Cited," but you should expect to include this. (Check the format preferred by by the journal… again!)

THST guidelines ask you to use APA 6th edition. View Purdue's OWL website for examples.

Proofreading

One of the last steps will be proofreading your work. Do a thorough job, and better yet, ask a good writer to help proofread it for you! You will always miss typos in your own work that others will notice. It's human nature.

But keep in mind that reviewers and editors will also proofread your work. The more I write, the better I am at proofreading, and the less I worry about it. But I have also grown "author's callouses." You need to have thick skin when you view your first few responses from a journal with reviewers' comments. They WILL catch typos you missed, and they WILL suggest changes that you may not agree with. Most of the time, they are right.

So be aware that you will be the one on the receiving end of the proofreader's red pen, like being the student in your class after you correct their papers. It's all part of the process. Be prepared, and don't take it personally.

Don't Be Afraid To Try!

One last tip… Don't let the fear of the process stop you from writing. Take the leap and give it a try! I think this is especially true for a practitioner journal like *The Hoosier Science Teacher*. The editors, reviewers and readers are a lot like you, and we want to help you get your work ready for the public. The feedback we offer is meant to help you.

Even more importantly, the people who create and read THST want to read your article. We depend on each other find new ideas. That's why we go to HASTI Conferences and PD workshops. Your articles are just another way to share the good work you are doing.

It's also part of being a professional educator. If your school is like most, there is language in your evaluation policy that gives you Professional Growth Points for authoring an article, and it looks good on your evaluations.

Summary

The goal of this list of tips is to show how writing for THST can be easier than you may think. For the graduate student or college professor, writing can be a bit more elaborate that what I've described, but I would contend that many of the tips still apply.

To summarize my points, writing for a practitioner's journal is easy if you start by planning what you want to say, and be concise in your writing. Keep your formatting very simple, and take the easiest route to inserting figures and tables by letting the editors handle placement of the image. Then proofread well and be ready for constructive criticism.

But remember, HASTI is here to help, and we want to include your best lesson ideas, stories about science and teaching, reviews of resources, poetry or puzzles, and more! Without submissions from members and other readers, there is no THST. We invite you to write. We KNOW you can do it!

To submit a manuscript or cover photo for consideration by *The Hoosier Science Teacher*, we invite you to visit the Submissions Page (Figure 5)

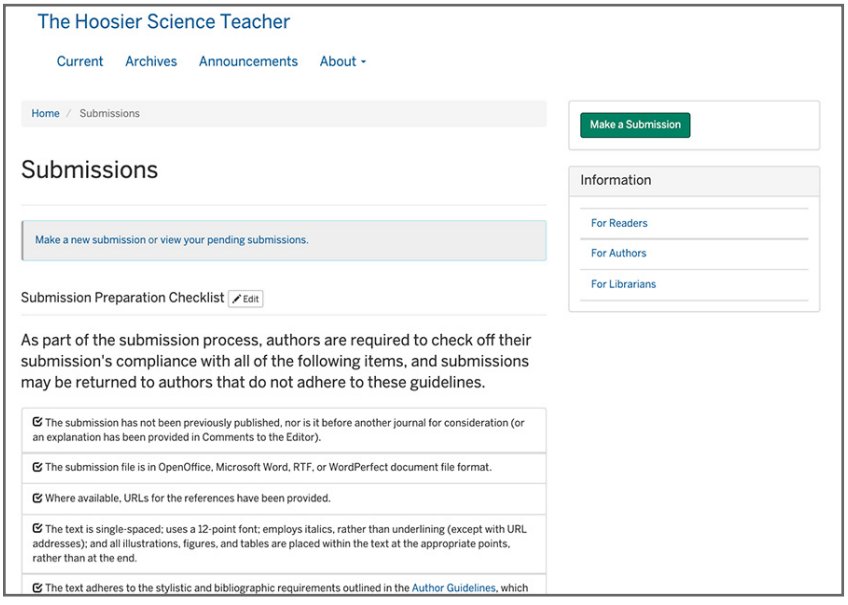

Figure 5. To submit an article to THST, visit the Submissions page

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HASTI Events Calendar

HASTI Board of Directors

The HASTI website has a calendar of upcoming events to help you see upcoming meetings, conference and professional developments.

HASTI Events Page

To submit an event you would like to add to that list, email info and URL to thst@hasti.org

American Association of Physics Teachers (AAPT) Summer Meeting
July 9-13, 2022, Grand Rapids, MI

July 15 Deadline for presentation proposals at the **Environmental Education Association of Indiana (EEAI) Conference** to be held Nov. 4-6, 2022, at Camp Mack, Milford, IN.

Engineering FYI! For Your Imagination
July 16, 2022, Purdue University

NSTA National Conference
July 21-23, McCormick Place, Chicago, IL

American Society for Engineering Education Conference
July 26-29, Minneapolis, MN

American Chemical Society Fall Meeting
August 21-25, Chicago, IL

HASTI Board Meetings
10:00 AM, Marriott East Indianapolis
August 6, 2022
November 5, 2022
February 12, 2023
May 6, 2023

Celebrate Science Indiana (CSI)
October 1, 2022 - Blue Ribbon Pavilion,
Indiana State Fairgrounds

Earth Science Week - October 9 - 15, 2022
More info, including an Earth Science Week Toolkit

School Science & Mathematics Assoc. Conference,
October 27 – 29, 2022, Missoula, MT

National Association of Biology Teachers (NABT) Professional Development Conference.
November 10 – 13, 2022
Registration for Early-bird by July 31, 2022

American Association of Physics Teachers Winter Meeting,
January 14 – 17, 2023,
Hilton Portland Downtown, Portland, OR

Indiana University Bloomington Biology Seminars
Open to educators.

- Microbiology series, Tuesdays, 4:00 PM
- Genome, Cell, & Developmental Biology series, Thursdays at 4:00 PM
- Evolution, Ecology, & Behavior series, Fridays, 4:00 PM
- Biotechnology series, Thursdays, 5:30 PM

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Open Access

Freebies! Free resources for teachers

HASTI Board of Directors

This feature of THST will provide information for teachers about free resources, PD activities, and materials.

Look for this feature in each issue!

NSTA's Daily-Do Page Daily Dos engage students in authentic science and engineering practices. The Dos are arranged by elementary, middle and high school class levels with an extra category just for families.

Mystery Science offers free lessons and daily e-mails to teachers. Hands-on lessons target K-5 standards. Free trials offered until June 30, 2023.

The Conservation Tales e-Learning Corner offers 16 FREE activities that are ideal for virtual learning days, but work great for the classroom, too. NGSS aligned with a focus on the science practices. Produced by an interdisciplinary team at Ball State University.

THST columnist Kristen Poindexter is an Ambassador for Epic! and Seesaw, two online resources for teachers. She shares these sources, and can help HASTI members set up their accounts.

Epic! Digital Library for Kids
Try it FREE for access to 10,000+ free books! Get unlimited access to 40,000 of the best books, audiobooks, videos, & more for kids 12 & under. A resource where teachers and students can access fiction & non-fiction texts up to 8th grade reading level. Teachers can sign up for a free account and create and share collections of virtual books with their students.

Seesaw is an online platform for PreK-5 students that allows students and teachers to create digital journals. Use it for digital science notebooks! Students can take pictures or video, draw diagrams, add labels & voiceovers, or drag/drop items to interactive work they share with teachers and family members.

The Civil Air Patrol (CAP) offers over 40 free and engaging programs and products for pre-K through 12 grades levels. Currently offering Aerospace STEM resources for remote education. Check out the Field Trips Around the World and virtually visit museums, zoos, farms and even planets!

The Minerals Education Coalition is a group of mining companies formed for the purpose of informing and educating about the importance of minerals and mining. K-12 resources such as a gold/gem pan, standards based lessons, an aggregate poster, and info about mine safety, reclamation stories, and careers in mining.

The **Frugal Reality** site is a personal finance and lifestyle blog by Chris, a self-professed frugality expert. Chris' blog lists 80+ free items for teachers by mail and online, such as school health hand sanitizer, ZooZingo Animal Cards, Colgate classroom kit (with toothpaste samples and toothbrushes), and even a way to get free SeaWorld tickets for K-12 classroom teachers.

The Environmental Protection Agency offers environmental resources for the classroom. Searches by grade level; topics such as air pollution, energy, or water; or predefined terms such as coloring book, posters, or science fair. Check out AIRNOW, a website that gives up-to-the-minute information about air pollution in your local community.

You can suggest other Freebies to include in the next issue of THST!
Email a description and URL to thst@hasti.org

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Open Access

The Hoosier Science Teacher
Open Call for Papers

The Hoosier Science Teacher is an open-access journal that shares a collection of information to help science educators of all grades and contexts in the state of Indiana. *THST* is published by the Hoosier Association of Science Teachers, Inc.

The editorial board of the *THST* invites authors to submit manuscripts in categories that include: "Editorials, Opinions, Announcements," "Lessons," "Stories, Poems, Nonfiction," "Articles, Research," and "Curriculum & Learning Environments." Authors need to consider the target audience when planning and writing the manuscripts they submit.

THST publishes at least one issue of the journal each year, and we offer an open call for manuscripts submitted by authors. There are no submission deadlines for our regular issues, and authors may submit manuscripts at any time. Special "themed" editions may be produced with guest editors. *THST* will post Calls for Papers on the journal's website to announce those issues.

Manuscripts may include photos, diagrams, tables, graphs and figures. Any identifiable photos of minors must be accompanied by a permission form signed by a legal guardian. Images may be in full color since the articles are published as online files. Authors can also include "supplemental files" to support readers if files include appendices.

Authors should consider the specifications listed in the **THST Guidelines page**. In addition to images, authors may include hyperlinks to supplemental materials such as lesson plans, assessments, large data files, and video or other media. In general, manuscripts should follow APA Styleguide, 6th Ed, and citing sources is required.

THST does not charge authors a publication fee. Authors retain ownership of the content of the article that will be published under a Creative Commons 4.0 BY-NC-ND license, with permission granted to THST for our uses.

Submitted manuscripts undergo a double-blind review process, and authors may be asked to revise text or images before final publication. Communications about submitted articles will be managed through **THST's Author Submissions** system.

Call for Reviewers

Authors and other individuals are invited to apply to be Reviewers. Reviewers may be asked to read and assess submitted manuscripts as part of the peer review process, and will be listed as members of GJTE's Editorial Review Panel. This panel is an important part of a rigorous publication process, and we invite a diverse group of reviewers from a variety of relevant areas of expertise. Click here to **Register as a Reviewer.**

Please direct any questions about submissions to the editors:
thst@hasti.org