



The Hoosier Science Teacher

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The Hoosier Science Teacher

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Cover Image, THST Vol 46, no. 1:

North American Water Lotus, Nelumbo lutea
(2010, Dogwood Lake, Glendale Fish & Wildlife Area, near Washington, IN)

Photo by Lisa C. Kern

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Volume 46, No. 1, August 2023

Editorial Team

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

The Phenomena of Teaching Science in 2023

Craig Williams



In each issue of The Hoosier Science Teacher, we invite the president to share some thoughts as an introduction. In this issue, HASTI's current President Craig Williams shares his thoughts about challenges and opportunities in 2023-24 for science teachers in Indiana.

Happy summer to all readers of The Hoosier Science Teacher! To those of you who are currently classroom teachers, I hope you are enjoying the chance to unwind a bit, follow a more relaxed schedule, and get a chance to reflect on the past school year. I usually find that with the day-to-day teaching pressures removed, I have a chance to think more expansively. I think about the reasons I am in this profession. After being in a classroom with me for nearly ten months, how are my students different than when they first walked through the door?

After being a teacher for so many years, we may get the feeling that we are in the answers business. Year after year, we train our students to know certain things, or how to perform certain tasks. The students can easily get the sense that school is all about learning the answers—or perhaps figuring out shortcuts to those answers. If it can be Googled, they may wonder why they need to learn it.

Imagine if ten years ago you were asked what the biggest challenges would be facing society in the year 2023. How many of us could have predicted the technological, medical, sociological, political, and environmental challenges that we see today? Clearly, we cannot foresee the exact issues that our students today will face in ten, twenty, or thirty years. However, we can teach them to be inquisitive and to learn how to answer un-Googleable questions.

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

One of the exciting things about our new state science standards is that they encourage us to turn the focus away from teaching students to get the right answers, and instead to teaching students how to ask meaningful questions. Asking questions is not just the first of the SEPS standards. It sets the tone for the scientific process of planning investigations, making inferences from data, and learning to deploy useful models. Here's a question we can all ask ourselves: do our students feel like the science classroom is a safe environment to ask questions, and one where asking questions is encouraged?

The challenge is, of course, how to accomplish that while ensuring that our students come away with the key content knowledge that is expected. Under the NGSS model, one of the primary ways we do that is through selecting phenomena that are exciting and engaging for the students in our communities. Picking a series of phenomena that will not only pique the students' curiosity but also help students learn the disciplinary core ideas is not an easy job! It may take several tries before finding the best phenomena to use and the best ways to implement the lessons.

Speaking of phenomena, there is a special one coming up in less than a year: the total solar eclipse of April 8th, 2024. It is not too early to start thinking about how you will use this once in a lifetime event to harness students' natural curiosity and incorporate eclipse or space-related topics into your lessons. I encourage you to think about this now, before the school year gets



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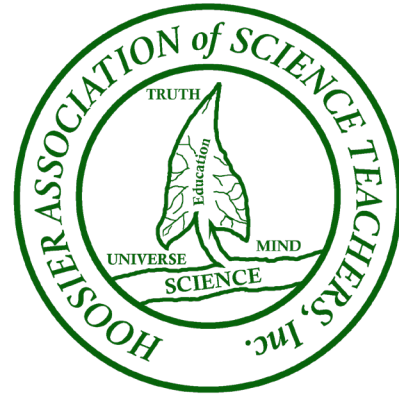
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underway. The website greatamericaneclipse.com is predicting that there could be up to half a million visitors to Indiana, in addition to the four million residents already in the path of totality. This will be a big event - potentially the biggest tourism event in Indiana's history!

As you think about ways to incorporate the eclipse into your lessons, try to resist thinking of eclipses as an already solved problem. True, the law of universal gravitation was worked out hundreds of years ago by Newton, and Google will tell you the exact minute that totality should begin and end for any location. But try to think about it through the eyes of your students. What do they already know about eclipses? What questions do they have? What would they like to learn about the sun, moon, and planets? How can you leverage this event to get them excited about learning those things?

Whether you devote a couple of lessons to the eclipse, or develop a full unit of study, this is one great way to practice implementing a phenomenon-based, three-dimensional lesson. It will give you confidence to do the same with other phenomena. Don't do it alone! I encourage you to consider attending both the fall HASTI mini-conference on October 14th and the main HASTI conference on February 18th-20th to learn more about NGSS style lessons, solar eclipses, and space-related lessons, and much, much more! You can also find information about NGSS and the upcoming total solar eclipse at the HASTI website. Simply click on the "NGSS" or "Events" links at the very top of the page. The NSTA website also has excellent resources on both topics.

I am looking forward to working with all of you in the coming school year. I am especially looking forward to our next gathering when we will share ideas, support each other, and learn from each other. Enjoy your summer, and don't forget to take time to reflect, to wonder, and to question.



**2024
HASTI/ICTM
State Conference**

**“Cultivating Curiosity and
Deepening Discovery”**

February 18-20, 2024

Submit a program/workshop proposal for the
2024 HASTI Annual Conference

at

hasti.org/2024-HASTI/ICTM-Conference

Author

Craig Williams (craig.williams@nwesc.k12.in.us) is the 2023-24 HASTI president. He teaches Physics at Northwestern H.S. in Kokomo, IN.



Reflections, Gratitude, and Encouragement

Stacy Hootman

Goodness...when you are busy, a year goes by fast! When I began my presidency of HASTI, I did not know all that we would accomplish together. From updating our bylaws, imagining and running our first ever mini conferences focused on the Next Generation Science Standards, leading a successful 2023 co-conference with the Indiana Council for Teachers of Mathematics (ICTM)... we have done some really great work for science education in Indiana. None of this work would have been possible without the support of a few groups of people:

To the HASTI Board of Directors - Thank you.

At any time, I could call on this team and there would ALWAYS be individuals who would step up to get the work done. I am convinced that we have one of the strongest and most dedicated Board of Directors in science education! It has been an honor to serve with you this past year. I hope you know how much you are appreciated!

To the members of HASTI-thank you.

Thank you for trusting the HASTI Board of Directors and engaging with us to improve science education in Indiana. We appreciate your membership and ask that you continue to share with others about the good work being done by HASTI. We also know that from this membership will rise the next Board of Directors! I want to encourage you that if you are considering becoming more involved in HASTI, please do. Any one of the board members would be happy to answer your questions and assist you in finding the right fit for you, and we look forward to your involvement and ideas! It is incredibly satisfying working with such a great group of dedicated individuals.

To those of you who attended our conference(s)-thank you.

This year we branched out and created mini-conferences, and we really didn't know how popular they would be! Many of you signed up to attend and shared wonderful feedback that we will use to continue to improve what we offer. Whether you attended a mini-conference or our annual conference, we appreciate you trusting us with providing strong professional development in science education that assists you to continue improving your craft.

As I transition from the HASTI presidency, I now become our 2024 conference chair. Recently our 2024 annual conference was announced, and we will again be partnering with ICTM so that teachers that attend the conference can receive professional development in both science and math education at one time.

Here are some highlights of the upcoming HASTI/ICTM Conference:
(More details available at <https://hasti.org>)

Theme:

“Cultivating Curiosity and Deepening Discovery”

Dates:

February 18-20, 2024

Location:

Indianapolis Marriott East

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



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Strands:

Leveraging Assessment

- Assessment as a way to show evidence of students' varied strengths and gifts.
- Making a product and demonstrating knowledge via means other than tests, such as presentations, posters, models, etc.
- Preference will be given to proposals that share rubric(s) or other grading criteria.

Developing Inclusive, Diverse, Equitable and Supportive Classrooms

- Best practices and inclusive strategies for reaching ALL learners in ways that are equitable and affirming.
- Social-Emotional Learning activities
- Preference will be given to proposals that describe how barriers to learning are removed for learners.

Inspiring Instruction

- Inventive ways of implementing Three Dimensional Teaching in science and Process Standards in mathematics
- Strategies that encourage curiosity and discovery in learners (phenomena, projects, problems, etc.)
- Preference will be given to proposals that include plans for complete lessons or units that teachers have actually run in their classrooms.

“To Boldly Go...”

- Encouraging students to think about space, exploration of our universe, and eclipses.
- How can we use earth/space-based phenomena to excite and engage students?
- Teaching earth/space-based learning within the NGSS framework

Science & STEM Literacy

- How literacy and science/STEM work together to cultivate science/STEM literate students.
- Presenters will share specific resources (books, websites, articles, blogs, etc.) that they have used in their classroom.
- Teaching students how to read/write and use primary sources.

We would appreciate your assistance in spreading the word about the 2024 conference. Proposals are being accepted now through August 31, and we hope you will take this opportunity to share your ideas with other educators in Indiana. And if you would like to be involved with the HASTI Conference Committee, please reach out to conferencechair@hasti.org. We would absolutely love to have you!

It has been a great year. A busy year. A year full of important work to be done for science educators in Indiana. HASTI is a wonderful organization, and it has been my joy to serve as president. I would encourage anyone considering serving with HASTI to get involved. You will be impressed with the dedication of those on the board, thrilled for the future of science education in Indiana, and professionally encouraged to continue this important work.

Author

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Indiana Department of Education Science Happenings

Eimear Towler

It has been an exciting and busy time at the Indiana Department of Education (IDOE). During the 2022-23 school year, as a result of House Enrolled Act 1251 (2022), IDOE was charged with streamlining the Indiana Academic Standards across content, including the designation of up to 33% of the standards as essential. Thank you to those who participated in the review process and public comment period. Proposed streamlined standards will be presented to the State Board of Education for approval at their June 7, 2023 meeting.

The 2022-23 school year was the implementation year for the 2022 Indiana Academic Standards for Science. However, these standards were streamlined by educator committees in 2023 to reflect essential standards. The streamlined standards will be assessed on ILEARN beginning with the Winter (February) 2024 administration of ILEARN Biology ECA. Grades 4 and 6 will be assessed in Spring 2024. The most recent standards implementation and assessment guidance can be found here. There are currently a number of resources related to 3-dimensional science instruction on the Indiana Learning Lab. Blueprints and item specification for these assessments will be released on the IDOE website around June 9, 2023. Other resources related to science assessment will be published in the Indiana Learning Lab at the end of June.

Pursuant to Indiana Code (IC) 20-20-5.5-2(h), IDOE is conducting a statewide survey to determine what curricular materials have been adopted for teaching science, technology, engineering, and mathematics in each state-accredited school. A designee from each public school corporation, public charter school, and state-accredited non-public school is required to complete the survey by 5 p.m. ET on Friday, June 16. A curriculum evaluation process and the results of this survey will be used to develop a vetted list of curricula for STEM disciplines.

IDOE released STEM Priorities in January 2022. The Indiana STEM Cadre has been a key implementation

strategy resulting from this effort. We have just completed the first year of the initiative and additional schools are joining in year two. Cadre schools are implementing an instructional coaching model to bring high-quality integrated STEM learning experiences to students using research-based best practices.

The year-long STEM certification application cycle recently came to a close. There are currently 105 schools that have earned STEM certification, including nineteen schools added to the list at the beginning of May. A new "Developing" designation has been included this year to highlight schools which have demonstrated significant progress in creating an engaging STEM culture and empowering students to create and innovate through integrated STEM learning experiences. For this school year, a separate process for secondary schools was also introduced, recognizing the differences in school structures and programming between elementary and middle/high schools.

We have just completed another round of solicitations for STEM Integration Grants, as well as the new Computer Science Catalyst Grants. STEM integration Grants are designed to improve elementary and secondary student achievement and participation in STEM learning experiences. The Computer Science Catalyst Grant aims to spark innovation in computer science education by accelerating pedagogical knowledge of educators, increasing the number of PK-12 students who have access to high-quality computer science learning experiences, and promoting the use of computer science in authentic problem solving. Stay tuned for more grant opportunities in the future. The best way to stay up-to-date with grant opportunities and other exciting science education opportunities, is to subscribe to [Dr. Jenner's weekly update](#).

Authors

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Purdue Northwest Hosts the 2023 Regional and State Science Olympiad Competitions

Vanessa S. Quinn

Abstract

Purdue University Northwest (PNW) welcomed 37 middle and high school Science Olympiad teams to its Hammond campus during the spring semester for STEM academic competitions on Feb. 11. The top six middle school and top seven high school teams at PNW's regional qualified for the State Science Olympiad.

Keywords: Science Olympiad, Competition



Purdue University Northwest (PNW) welcomed 37 middle and high school Science Olympiad teams to its Hammond campus during the spring semester for STEM academic competitions on Feb. 11. The top six middle school and top seven high school teams at PNW's regional qualified for the State Science Olympiad.

Four weeks later PNW hosted 47 qualifying teams from across Indiana for the Science Olympiad state finals on March 11. Caramel High School (Caramel, Indiana) and Thomas Jefferson Middle School (Valparaiso, IN) and Raymond Park Middle School (Indianapolis, IN) advanced to the National Science Olympiad finals in Wichita, KS. Raymond Park Middle School won the Spirit Award at the National Competition.

Middle and high school teams compete in 25 different STEM events including events that test students' knowledge in many STEM areas including forestry, astronomy, code breaking, and chemistry. Other events tested apparatuses the students have been building for several months including bridges and airplanes. Faculty, staff, and student volunteers from across PNW make it possible for this competition to come off without a hitch.

As a host for annual Science Olympiad events, PNW offers a chance for event participants to preview the environments where their STEM interests can take them, as well as the people they would learn from. It allows students to navigate a college campus, eat in the cafeteria, and compete in college classrooms and labs.

PNW is also very fortunate to have STEM undergraduate and graduate students who work alongside faculty and staff during the competitions. This allows the middle and high school students the opportunity to interact with college students who were, in some cases, in high school a few years ago.

PNW looks forward to host the Regional and State Science Olympiad in 2024.

Author

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HASTI Awards Nominations

HASTI Board of Directors

Do you know an outstanding science educator? You can nominate that person for one of the HASTI awards. A brief description of each award is listed below. To learn more about the award and nominate someone (self-nominations are accepted) go to the [HASTI Awards page](#).

Nominations are due by November 1, 2023!

For questions, please contact AwardsManager@hasti.org

Edward L Frazier Distinguished Service Award

This prestigious award is given to a HASTI active member who demonstrates distinguished service and leadership as seen through participation in committees for HASTI and serving on the HASTI Board of Directors. (Nominators must be active HASTI members.)

Clyde Motts Award for Outstanding High School Science Teaching

The Clyde Motts Award for Outstanding High School Science Teaching is awarded annually by the Hoosier Association of Science Teachers, Inc, to an outstanding high school teacher who exhibits a passion for innovative science teaching.

Cheryl Cowan Memorial Award for Outstanding Elementary Science Teaching

This award is presented to an Outstanding elementary science teacher who exhibits the passion for the innovative science teaching that exemplified Cheryl Cowan's teaching career.

Outstanding College Science Teaching Award

The Distinguished Award for Outstanding College Science Teaching is awarded annually by the Hoosier Association of Science Teachers, Inc. to an outstanding college science teacher who exhibits a passion for innovative science teaching.

Charlotte M. Boener Memorial Award for Outstanding Middle School Science Teaching

The Charlotte Boener Award for Outstanding Middle School Science Teaching is awarded annually by the Hoosier Association of Science Teachers, Inc. to an outstanding middle school teacher who exhibits a passion for innovative science teaching.

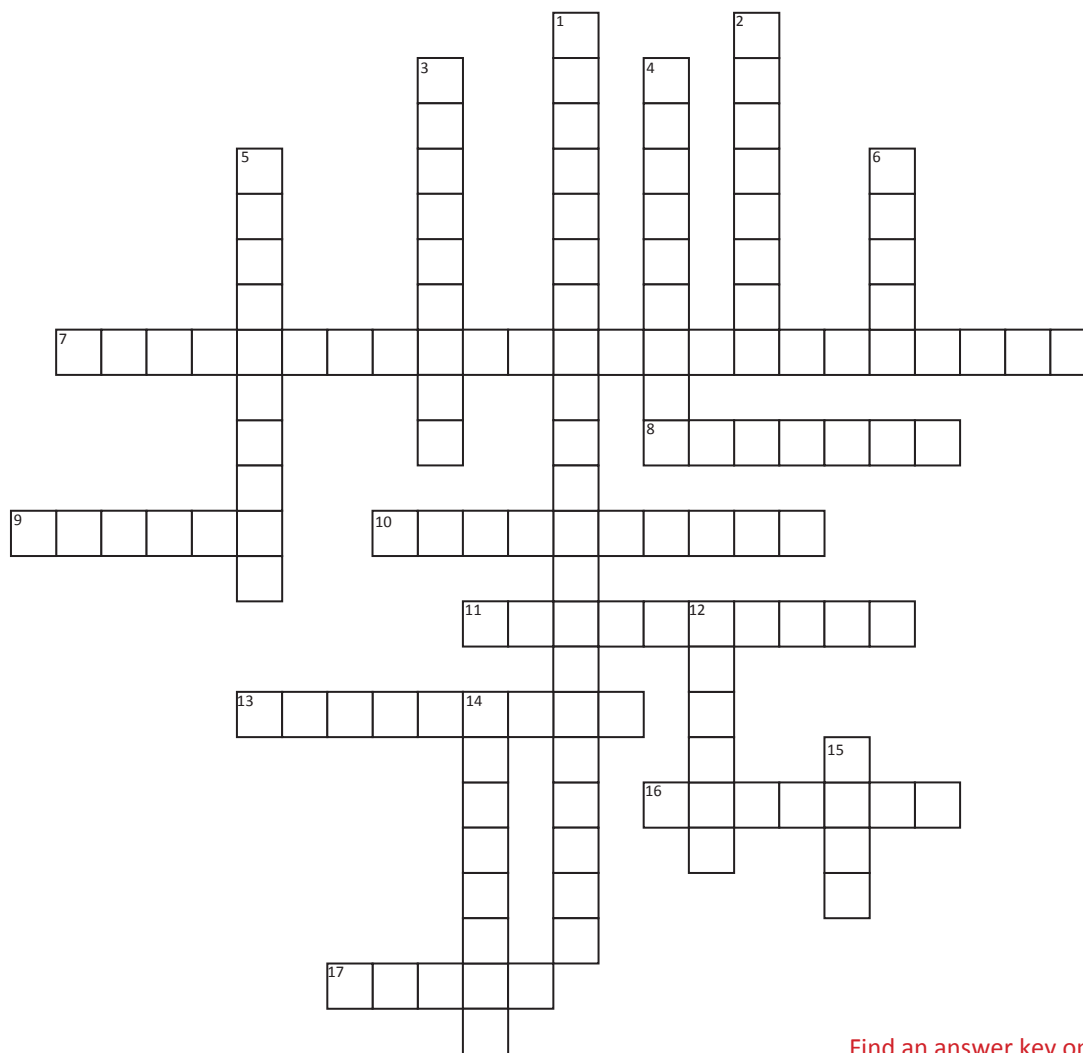
Gene Stratton-Porter Environmental Science Award

The Gene Stratton-Porter Environmental Science Award is given annually to an Indiana science teacher who exemplifies the spirit of the great Hoosier naturalist and author, Gene Stratton-Porter. The candidate exemplifies curiosity, independence, love of nature, and appreciation of the importance of science and the natural world.





Crossword Puzzle: What Do Science Teachers Do In the Summer?



Find an answer key on page 23!

Down:

1. A multi-step process to create or improve a course.
2. To arrange classroom materials for easy access & use.
3. Teachers sometimes catch up with this. It involves cleaning, maintenance, housework, etc.
4. Unpaid work that often contributes positively to a cause and community.
5. Gathering items such as fossils, plants, fungus.
6. Typically at night when consciousness of surroundings are suspended.
12. "... To boldly go..."
14. To systematically investigate.
15. To look at and comprehend text.

Across:

7. Learning events in which teachers develop and improve skills.
8. Replenish supplies.
9. Growing flowers and vegetables.
10. To watch multiple episodes of a TV show in rapid succession.
11. A trip made to study something firsthand.
13. Paid work completed when school is out.
16. To think deeply and carefully.
17. To train teams or players in sports, science, music, and other areas, often for competition.

Build your own custom worksheet at education.com/worksheet-generator

Column: Elementary Explorations

Becoming Citizen Scientists of the Earth: How young children can become good stewards of the earth

Kristen Poindexter

Abstract

Young children are able to embrace the role of a citizen scientist as they discover ways that they can care for and help the earth in a Kindergarten classroom.

Keywords: Environment; Elementary education

It is never too early to teach students how to be good stewards of the earth and citizen scientists! Caring for our planet and all the creatures that live on it is a theme that weaves throughout my classroom for the entire school year. At the beginning of the year, we explore ways we can help the earth inside our school building by examining why we have faucets that turn on when you wave your hand in front of them and why we have water bottle filling stations throughout the building. Students quickly see that by saving water and by using reusable water bottles, they are already helping to care for the earth. This gets them excited to learn about other ways they can help the earth and their school! When I ask my students if there is anyone who has other ideas about how we can help the earth, someone usually mentions recycling and reusing. Of course, paper is the one material that many of my students know that can be recycled, so we will spend several days learning about where paper comes from and how we can use the front and back of papers and recycle what we no longer want in our classroom recycling can. I also share this [collection of books I have curated](#) with my students to give them more opportunities to read and learn about recycling, pollution, and composting. (IN-K-ESS3-3).

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



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As we move into the Fall, we continue our learning about the earth by discussing the changes happening outside by both plants and animals to get ready for the arrival of winter. I share pictures of my garden with students both when it was flourishing in the Summer and how it looks in the Fall. I show students how I do not trim any of my native plants back as they will be used by animals throughout the Fall and Winter as a source of food and shelter. Once Spring arrives, I move all the old growth to my compost pile to make room for the new growth that will begin to sustain new life and a different wave of animals.

Early in the Spring, our science kit about plants and animals arrives and students are eager to plant seeds and watch them grow! Each student plants two kinds of seeds, lima beans, and alfalfa grass, so that they can compare and contrast them as they continue to grow and change. One of the fairy tales we read to tie in with the planting of our beans is Jack and the Beanstalk. I ask students to tell me what they know about seeds and collect that information on a KOWL chart (See Figure 1) so that I can determine in which direction we need to further investigate seeds.

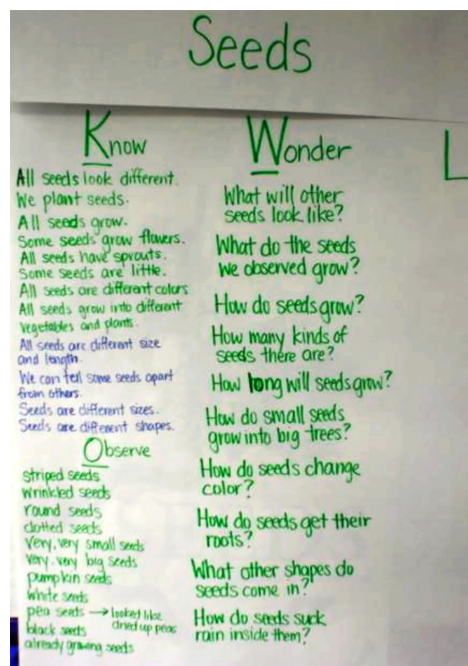


Figure 1. KOWL chart

Students plant seeds before sharing information on the KOWL chart to give those students who have not had any experience with seeds or planting an opportunity to develop some background knowledge. We also read several versions of Jack and the Beanstalk to compare and contrast the characters, plot, and setting. One of the misconceptions that usually presents itself during our study of seeds and plants is that seeds need dirt to grow. We plant seeds in plastic gloves (See Figure 2) using cotton balls as our soil to show students that this is not always the case.



Figure 2. Sprouting seeds in plastic gloves

We also experiment with growing plants in pea gravel, paper towels, the dark, and under grow bulbs so that students can determine the best growing conditions for plants. (IN-K-PS3-1, IN-K-LS1-1, IN-K-ESS2-2, IN-K-ESS3-1)

Once we have grown our plants, and inevitably, some start to die off, I share with my students' pictures of my compost area in my backyard. I ask them to tell me what they see in that area and what they think will happen to all of it. Why would Mrs. Poindexter collect all these things in one area of her backyard? During the discussion that follows, I listen to their ideas, and then I introduce composting to them and walk through the process of composting. I also let my students know that we can compost right in our own classroom and be citizen scientists! After showing my students our classroom compost bin, we discuss ways that composting can be helpful to our school and to our community. My students usually take a big interest in the compost bin, asking to add scraps from their lunches to it, or by



Figure 3. Observing compost bin

bringing in fruits and vegetables from home that have gone bad. They watch the redworms slowly break down everything they add and keep track of when items are added and how long it takes our decomposers to break items down. (See Figure 3.) Several students last year were very interested in the redworms themselves, so we took a few out to help us learn more about them. We determined if they preferred light or dark better and drew diagrams of our redworms. (See Figures 4 & 5.) Students also try their best to measure a redworm with math cubes so that we can track if they are growing throughout the school year.

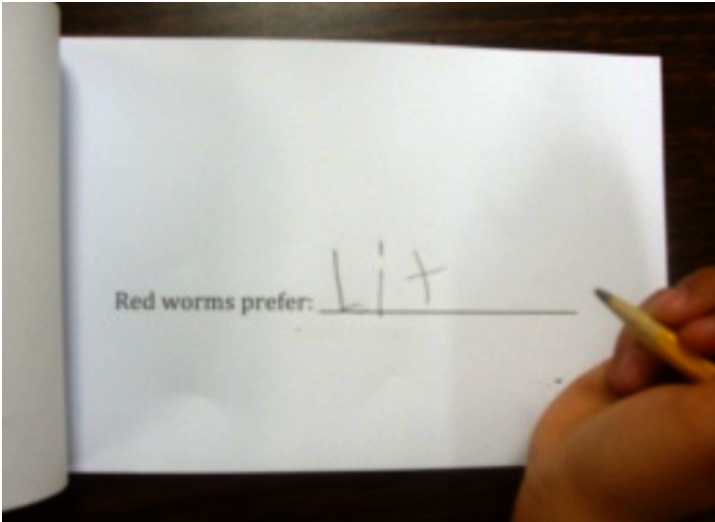


Figure 4. Students record inferences in their journal

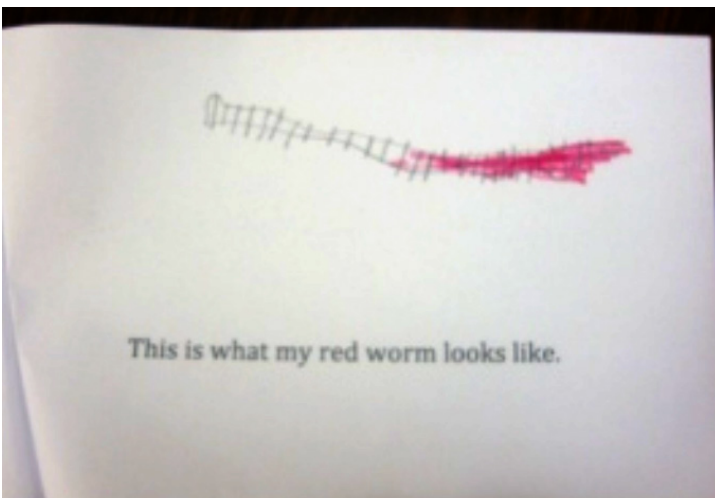


Figure 5. Observations include drawings of worms

Ecology is something that even young children can become interested and involved with if given ways that they can be good citizens of the earth. Sharing these ideas with my students throughout the school year not only gives them independence and a voice, but it helps to develop earth friendly habits that I hope they will share with their families and use as they become citizen scientists.

References

Epic! (2022). [Mrs. Poindexter's Recycling Collection.](#)

Indiana Department of Education. (2022). [Indiana Science and Computer Science Standards.](#) IDOE.

Author

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COVID-19, eLearning, the Digital Divide and Underprivileged Children

James E. Hollenbeck¹ and Becca-Marie Nesbitt²

Abstract

Within the last two years studies show that many of our youth are lagging in education due to the pandemic lockdown, the application of eLearning with the lack of preparation, and a shortage of adequate learning technology and updated technology (Povich, 2020). Schools moved away from paper homework and in-person learning, and to online homework unfamiliar to students. In some areas, the schools were able to provide technology that the students could take home, but this did not always come along with Wi-Fi, hotspots, or some type of internet to make it functional. In other areas, the school systems were not able to fund the distribution of technology to each student. The pressure students feel from not having access to the technology they need leads to academic decline. Students with lower socio-economic status and limited access to eLearning and technology were unable to complete their homework or receive an adequate education.

Keywords: eLearning, COVID pandemic, Educational technology, Underprivileged children

Introduction

Not having access to technology will influence student's post-secondary and vocational-technical learning. These students find themselves behind their peers, stressed by the new technological advances that they did not grow up with, or faced with the possibility of not being able to attend a university based on their level of competency. This paper, based on a review of the literature, is a study of how the effects of the Coronavirus lockdown exacerbated the situation of not having appropriate technology and examines the challenges that education endured during the COVID-19 pandemic. It also discusses how educators and public policymakers attempted to close the gap disparity between student access to technology and the effect of not having that technology disadvantaged vulnerable students.

The Digital Divide

The pandemic lockdown of 2020-2021 brought to light the digital divide within our school systems which has been a topic of discussion in the last decade. Before COVID-19, many schools had implemented eLearning

and online learning on a limited basis for their students such as one-to-one initiative for students to have their own computer. Data collected by the Pew Research Center between 2014 through 2021 shows just how much our youth, throughout the United States, have been affected by the lack of internet resources. Internet homework and resource use have been on the rise since around 2014. Many students had been left out and were struggling to keep up with what is necessary for them to have successful educational experiences (Haderlein et al., 2021). Gaps in technology and technological updates and systems that were inaccessible had caused some students to fall behind (Di Pietro, 2023). These gaps and issues will affect students for their whole lives and deserve to be addressed. In a PEW Research Center 2015 survey, which was when digital homework in middle and high schools was on the rise, 35% of lower-income households with school-age children did not have broadband internet connections at home (Lake & Makori, 2021; Vogel, 2021). The Pew Research Center reported that data analyzed from the 2018 National Assessment of Educational Progress (Havard et al., 2018) showed less than 6% of middle and high school-age students did not have internet at home for school

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purposes. In 2018, around 94% of middle and high school-age students were using the internet at home for school purposes, and in 2020, this number would include classroom meetings as well (Bushweller, 2020; Povich, 2020).

A 2018 Pew Center survey showed that students (ages 13-17) were affected by the lack of effective learning technology, 17% said they were often or sometimes unable to complete homework assignments because they do not have reliable access to a computer or internet connection. Teens in a household with an annual family income below \$30,000 were also more likely to say they lacked the appropriate technology and internet access than teens with a family income of at least \$75,000 a year (24% vs. 9%) (Havard et al., 2018; Vogels, 2019; Auxier & Anderson, 2020). During the COVID lockdowns, in many suburban school districts around 65% of students said that their homework was based online whereas 58% of students in urban schools stated that this was the case. In the same survey, 12% of the teens questioned stated that they sometimes used public Wi-Fi due to the lack of home internet resources. Of the 12%, the majority were from low-income families. (Auxier & Anderson, 2020; Di Pietro, 2023.)

The COVID pandemic forced schools across the nation to establish or improve their online platforms so that students could still learn during their time at home. Students in economically deficient areas were already experiencing many challenges to complete assignments, (Goldberg, 2021). Many teachers had little or no training with technology and a considerable number were reluctant to teach in this new paradigm of teaching methodology, (Johnson et al., 2016). Existing gaps in the technological updates and systems that were available for some students made the situation worse and caused some students to fall behind, (Auxier & Anderson, 2020). Unless this issue of appropriate implementation of technology and teacher training is continued as a priority, these gaps, and issues will continue to affect students in their education.

Responding to the New Paradigm in Teaching

In response to the school closings, one in every three school districts handed out mobile broadband or hotspots with their COVID response plan on a national level. (Lake, 2019). Some school districts could afford to loan out and provide students with laptops if they did not have access to them. Between April 2020 to March 2021 the number of computers rose from 88% to 94% (Hemphill et al., 2021). The governor of New Jersey

reached out to corporations and used state funding to help with the needed technological upgrades for students (Povich, 2020). In other areas in the United States where computers and laptops were limited or out of stock; teachers worked overtime to try and call each student in their class and individually help them complete assignments, drop off textbooks, or provide paper homework instead of having it online. This still left a remaining portion without access to broadband services, phones, or other technology necessary for the current education climate. Many of the communities where there is a greater need for families to have computers are not seeing it, as there is also a geographical divide determined by distance, topographical barriers in rural areas, and distances that prohibit access to these technologies by some school districts (Alsarayreh, 2023; Haderlein et.al., 2021; Polikoff et.al, 2021).

The Education Trust data researchers have found that in the last ten years (or since 2012), the percentage of students who attend college immediately after high school dropped by 50%, according to the US Census Bureau (Haycock, 2020). Much of the data collected showed this to be due to poverty and low-income-related issues, which included students not being ready for college. Although the number of students attending college right after the high school dropped, the Education Department has also concluded that by the end of 2020, 2/3 of jobs will require at least the completion of post-secondary education or training (Alsarayreh, 2023; Haderlein, et al., 2021; Ogundari, 2023).

Katie Haycock, the president, and CEO of the Education Trust, a national nonprofit educational advocacy organization advocates that we have the students who need the most and have the least access to educational facilities to gain more from the world; but we are providing them with even less than what they came with (Haycock, 2020). This is the issue at hand and the problem that many school districts in low-income areas are facing. Charles Best, who is the founder and CEO of DonorsChoose.org, takes this challenge and provides a solution. He advocates crowdfunds for teachers in low-income/high-need areas, and believes that states are not funding the schools fully and equally, and in many districts, it is due to inadequate budgets (Hess, 2020; Wolff & Carlson, 2021). Although many organizations are striving to help these students, it does not always reach the low-income areas that need it most (Chingos & Blagg; 2017; Cristia et.al., 2017). School districts have an obligation under Title VI of the Civil Rights Act of 1964 to provide students with equal



access to educational resources without regard to race, color, or national origin. These educational resources include, for example, access to safe school facilities, instructional materials and technology, and skilled educators (Goldberg, 2021).

Private enterprises assisting schools in closing the digital divide is new in K-12 education and has the potential to transform the fabric of community support for education. The inclusion of private initiatives could encourage increased connectivity, provide better digital literacy, and investment of resources to build better community/school relations. Parents and community members can be given opportunities to learn technical skills as well, either alongside students or as a separate component of innovation. The acquisition of such skills enhances the capability and potential of a community which can result in lasting gains (Vegas et al., 2019)

The Potential to Transform Learning and the Community

Elaine Povich (2020) cited John Rury, professor emeritus at the University of Kansas and author of *Urban education: Still separate and unequal* (Urban League of Greater Kansas City, 2019) on racial and socioeconomic disparities in Kansas City's educational achievement. He said the biggest concern of going to distance learning is "that the achievement gap is going to get worse. The gap is going to widen." Povich (2020) paraphrases, "...it's not just the issue of slow or no internet connections in some areas. That can be addressed by distributing hotspots or allowing students to connect in a school parking lot, he said. But children, especially younger ones, need parental or other supervision for distance learning to work." Although the previous information of this study makes the outcome for low-income students look grim, all is not lost.

There is still a lot that can be done to help our youth be able to learn and thrive in a conventional unthriving atmosphere (Goldberg, 2021).

To encourage teachers to use technology and implement the change necessary, teachers need to be provided with the tools and materials to help students gain their academic foothold so that they can be more successful in their future endeavors (Collis, 2020). In addition, students also need to be provided with faster and better technology to improve student learning and better test scores (Collis, 2020).

To improve education and encourage student interest in STEM education, each student must be provided with all the resources that are needed for them to

successfully learn. The Department of Education should create a policy that ensures better and equal opportunity for our students which will enhance learning everyone in school between the grades of kindergarten and twelfth. This change would be seen at the university level. The policies and rules for government-funded distribution need to be reviewed on a national level so that our students who need it most see the changes they so greatly deserve. The pandemic has identified the need for electronic learning equity for all students and how it can be implemented to provide learning opportunities for all students. Now is the opportune time to take the collected data and implement the changes needed to improve electronic learning to provide learning equity for all students so we can "fix" our education system.

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Writing in the Science Classroom: Dissecting in the Ideal Environment

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Kristen L. Snoddy

Remarks from the Author

In the more than two decades since this article was published, those who facilitate and evaluate student writing have found their task increasingly challenging. Helping students determine the credibility of online resources in addition to maintaining the integrity of student writing in the age of artificial intelligence are two key challenges. Despite these factors, I remain committed to my recommendations outlined in the article. Engaging students in the work of the classroom—both course content and the accompanying writing that confirms our students' understanding of that content—should be what drives our interactions with them.

Kimberly L. Snoddy, 2023

"But this is a *science* class! How well we *write* should not count in here!"

Such disdain and disbelief on the part of their students when science teachers critique the students' writing is common. However, as a teacher of writing, I believe that science teachers who hold high expectations for their students' writing contribute greatly to the goals of English teachers set for these students. Much of the impetus behind the Writing Across the Curriculum movement is founded in the belief that if students are to improve their writing, they must write both inside and outside the English classroom. However, a student who is less than willing to write outside the English classroom and an instructor who may feel uncomfortable grading that student's writing both contribute to a less than ideal situation. Thus, I have several recommendations which focus not only on improving student writing, but also on improving the relationship between the writing science student and the science teacher.

1. *Approach your students with the attitude that they can learn to write well.*

Having taught writing for several years, I truly believe that writing is a skill that can be learned just as shooting a jumpshot, casting a fly rod, focusing a microscope, or filtering a suspension can be. It is true that some students have more natural ability than others, but many aspects of good writing are concrete skills that can be developed: framing an essay varying sentence structure, describing an object using the senses, using active or passive voice, and And even more good news – if writing is a skill that can be learned, it is a skill that can be taught.

2. *Teach writing using the process approach.*

The process approach to writing includes the following: prewriting, drafting, revising, and editing/proof reading. The process approach should be encouraged at all levels, elementary through college. If you adopt the process approach to teaching writing, you will encourage and facilitate brainstorming or mapping or other idea starters before initial drafts, and you will allow ample time for feedback of these drafts either from you or the students' peers (based on guidelines that you have provided). Students should be given time for major revisions and careful proofreading before

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the assignment is submitted for a grade. Students need to create their work in conditions similar to those of professional writers. Those who write well know there are two criteria to producing a focused, thought provoking piece of writing – feedback and opportunity for revision.

An instructor who follows the process approach to writing is communicating to the student that good writing is rewriting. Prewriting and revising are by far the two stages of the writing process with which most students simply do not spend enough time. However, the instructor plays a key role in this, and by encouraging the process, you are saying to them, “You can learn to write, and I will show you how.”

3. *Do not feel compelled to pore over everything the students write.*

If writing is a skill that can be learned and thus taught, it is important to consider this question: What is the best way to improve a skill?

Practice. The student who is trying to focus the microscope or filter the suspension will get better to some degree simply by practicing, even without guidance. Consequently, if you do not mark everything the student writes, have faith that you are helping them become a better writer each time you assign something, whether it is a lab report, a response to a field trip, or a daily observation related to the subject matter. Instructors in various disciplines use daily or weekly journals for just that purpose – practice. Students simply need to write more.

4. *Encourage reading.*

Dr. Janice Lauer, one of the foremost contributors to the field of composition and rhetoric, in a class lecture at Purdue in 1996, asserted that “reading over time can improve one’s style (vocabulary and syntax).” By directly encouraging reading, you may very well be indirectly helping the science student to improve their writing. Supplement the traditional science reading, and do not discount related fiction. After a study of butterflies or moths, young Hoosier women in particular, may be interested in Gene Stratton-Porter’s *Girl of the Limberlost*. Nature studies can be accompanied by readings of Haiku, poetry that has nature as its theme.

5. *Reward the process.*

My ultimate goal is to convince my students that if they are willing to buy into the process, they can produce a piece of writing of which they can be proud. Some writing professionals will disagree with me philosophically here, but I do not believe that any grade restriction should be placed on revisions. In other words, if a student in my class receives a C- on a first graded draft, it could potentially receive an A by the end of the semester if the student develops enough skill and is willing to work and rework the draft. Admittedly, at some point the instructor will have to implement time frames for such revisions, and some students even when given several opportunities to rewrite will not develop the sophistication in their writing to earn an A. However, students will never hear me say, “You may rewrite, but for only one letter grade higher.” To do so is to penalize the process, not reward it. Holding that student’s so-so draft against them conveys the message that really good writers do not begin with so-so drafts, and I would certainly argue that!

6. *Share your own writing/rewriting.*

One of the great myths of writing is that there are two classifications of writers – those who can and those who cannot. What has perpetuated this myth for students is that they compare the finished products of published writers (which have gone through numerous revisions unseen by the reader). Thus, students are convinced that they belong in the category of those who cannot. Students need to see works in progress.

Of course, if you teach the writing process students will begin to see the early drafts of their peers, but it would also be helpful if you brought in your own writing: rough and final drafts of letters of recommendations, college course papers, reports, and other examples. Ideally, you should discuss what changes you made in your revisions and why you did so. Sharing your so-so drafts along with the polished versions will make good writing seem more attainable to your students.

7. *Talk about classroom readings as pieces of writing.*

Consider the following: What we read; someone once wrote.

That does not seem very profound, but one way to improve students' writing is to get them to think like writers when they read. In other words, as you discuss classroom readings with students, ask them to evaluate how well the ideas are communicated. How has the writer highlighted main ideas? Are there topic sentences? What methods of development are used? Narration? Example? Description? Illustration? Process? Comparison/Contrast? Have students, too, look for transitional techniques as well as introductory and concluding strategies.

The better able students are to identify these techniques and strategies in someone else's writing, the more conscious students will be of the quality of their writing.

With recent legislation mandating that a science component be added to the ISTEP in the new millennium, there is an increasing need for science teachers to not only have their students write but to do so in an environment that will encourage sophisticated, higher-level thinking. Adherence to writing as a process fosters such intellectual goals. Science teachers have always known that it is not enough to be able to think about data analysis, cause and effect, hypotheses and conclusions – the real test is whether or not the science student can communicate these concepts. What better way is there to help students share these ideas than through the writing process which encourages students to both reflect on and refine their thinking?

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Note: Issues of THST prior to 2016 did not use APA format. Editors chose to keep the original format for this reprint.

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Poetry in the Science Classroom

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Robyn L. Embry

Poetry can be a window to the inner self. Poetry allows people to speak freely about who they are and how they view the world. Poetry is seeing and hearing and feeling and knowing and understanding and sharing. Sometimes a short poem says more to the soul than does a novel. By writing poetry in the science classroom, students may bring a science concept into their inner selves and examine what they still need to find out. This process can be an important step in actually understanding a science concept.

Poetry offers students connections to their real lives. Classical, as well as contemporary, poetry should be included for reading enjoyment. Writing poetry should become something that students feel they can do. By reading and writing poems, students will learn to see poetry as a possibility, just as they themselves and endless possibilities.

Many people, especially children, are adept at creating visions of places seen only in imaginations - places made real by the very act of creation. So, what happens when you ask those same people to imagine places that are very real, to find the poetry in water and earth and stone? And what if students are asked not just to explore the simple beauty of a place, but also to reveal its environmental wisdom, and find their connection to that place through poetry? The result would be children who find their place in the natural world, children who know that water does not just come from tap, children who know their "ecological address" as well as the name of their street, their town, and their county, children who provide hope for the future.

Opposing Viewpoints

For those who appreciate the depth that poetry can add to the science curriculum, it is difficult to imagine that anyone finds poetry boring or unnecessary. Yet, for

many people, poetry is an impossible task that they would rather avoid. Others feel that poetry is inappropriate for a science classroom. They believe that combining science with language arts, particularly poetry, dilutes the science and takes time away from more serious endeavors. Carl Offner, in "Dumbing Down Mathematics and Science: Sizer's Essential Schools Proposal," makes the following points:

We have all heard of cute, "physics for poets" or "science for the right-brained" curricula. This idea feeds into the destructive cultural stereotype that science is difficult and has to be simplified in order to be understood. By way of contrast, a course entitled "poetry for physicists" would rightly be regarded as a joke.

The idea that "less is more" is misconceived when it comes to science education. The problem we have is not that our students are being taught too much, but that, really, they are being taught too little: that science and mathematics are not being taught as the central intellectual human achievements that they are. One cannot convey this by extracting a small part of chemistry, say, and "having the students learn it really well." Students must have a view of the subject as a whole; they must see the broad scope of the subject. This cannot happen without learning a lot of details in the process.

It is unrealistic to expect high school students to do original scientific work; they do not yet have the background, and it would be doing them a disservice to pretend they do. It is important to keep in mind that we are not turning out high school scientists: we are turning out people who have an appreciation for the way science is organized and who have an ability to read about it and learn more about it. We are turning out people who at some level understand the basic organizing principles of science.

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We do need scientifically literate citizens – people who can appreciate the relationship of science to public issues. But science per se is not public issues. Attempts to build science courses about matters of public policy (acid rain; destruction of rain forests; nuclear energy) fail because they do not really teach the core content of science.

Displacing the scientific curriculum by a discussion of social issues does not empower our young people. It actually disempowers them because it creates the pretense that they are dealing with scientific ideas without giving them any of the content that would enable them to understand what they are talking about.

Integrating Science and Language Arts

“I wish to propose the following educational technique which should prove equally effective for Harvard University and Shreveport High School,” Walker Percy wrote in his book, *The Message in the Bottle*. “I propose that English poetry students should find dogfishes on their desk and biology students should find Shakespeare sonnets on their dissection boards.”

Since 1970, Dudley Herchbach has done something very similar in the basic chemistry classes he teaches at Harvard. Twice a year he asks his students to write a poem meditating on some of the big ideas, such as thermodynamics or quantum mechanics, introduced during the term. In all likelihood, he says, writing a poem comes closer to real science than anything these students have done before in science classes. “These students have to get beyond the idea that the subject is something that belongs to the authorities, the establishment. Unless they can get beyond that and begin to play around with ideas, rather than just memorizing formulae, they will never make the transition to becoming a scientist who does interesting, original work.” Science, he adds, requires a playful attitude, a mind open to all kinds of possibilities. “That’s what poetry is all about – something vivid, unexpected, offering little delights and surprises along the way.”

Reading Poetry

Sometimes it is enough just to hear poetry read out loud. It is not always necessary to dissect it. A teacher may wish to talk with students about their connections to a poem, such as things students remembered as they listened, or their feelings generated by that poem. A teacher may choose to wait until the day after reading a poem to talk about it. For every poem a teacher reads to students, another connection waits in the wings.

The emotional intensity of poetry coupled with strong sound elements such as a rhythm, can lead children not only to identify with the image of the poem but also to return again and again to enjoy and reflect. The poetry of specific cultures can reveal their interaction with the environment, thereby providing an interdisciplinary element to the study.

Reading poems aloud during environmental study not only enhances children’s sensitivity to the world but also provides models for students as they explore and create their own meanings through writing. These models can help children find their own ways of expressing appreciation of the environmental images and increasing awareness for wise stewardship of Earth’s resources.

Writing Poetry

Poetry is an art form that is accessible to every student in some way. A poem is an organized way of expressing insight through language. Meter and rhyme combine as one kind of poetry. Song and free verse are other forms of poetry.

Gather students together and talk about the things that can be done to save Earth and its inhabitants. Ask someone to be a recorder and write the responses on chart paper. Work together to boil ideas down to central themes; then ask students to work in small groups and write a choral poem to be shared with the entire class, other classrooms, administrators, parents, ... Students may want to save the reading of their poems for Earth Day.

Another choice may be to talk with students and help them expand their thinking and their imaginations – what if one could see the wind as well as hear it, what if one could taste the rain, what if clouds could be touched, and why do different clouds not only make different weather but also make us feel differently, etc. Some of this thinking could lead to exciting writing choices for the students.

The International Rivers Network sponsors an annual poetry contest. The feedback from educators indicates that writing poetry can address the needs of students that are frequently overlooked and can reach students that may not be reached in other ways. Some of the quotes from educators about their experiences with the contest follow.



From an Illinois teacher at T. Marshall Middle School:

"I want you to know who these children are, not because I expect this information to influence your decision, but just so that you can share my pride in their accomplishment. All three are immigrant children and students in a big city public school system which is beset by all the usual problems of urban education. None of the three speak English at home. One of them, Luis, is also learning disabled."

From an Alabama teacher at Robertsdale Elementary School:

"Thank you for the opportunity to participate in this activity. To my knowledge, out students have never done anything like his before. This is a rural area, and I had no idea of the interest our students had for poetry."

From a Connecticut teacher at Hartford Institute of Living:

"I teach at a psychiatric hospital school and these poems are from my students. They composed these totally on their own and I am very proud of them."

From a California 6th grade teacher:

"The majority of my students come from ranching backgrounds where the word 'environmental' is considered a four-letter word at best! My students are growing up in a time when a portion of the 'outside' world considers their lifestyle to be harmful to the environment... [They] gladly accepted this assignment as an avenue to let their voices be heard. Thank you for allowing them that opportunity."

These quotes speak of the universal nature of poetry and the way that diverse individuals can take complex subject matter, relate it to previous experiences, and then communicate understanding of the subject. Is this not one of the main goals of education?

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Note: Issues of THST prior to 2016 did not use APA format. Editors chose to keep the original format for this reprint.

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Taxonomic Poetry: Those Marvelous Metazoans

Reprint from THST, Vol. 29, No. 4, Summer 2003

Susan E. Smith, Brockton, Massachusetts

Porifera are full of holes.
This group includes the sponges.
They're filter-feeders through and through
Some grow to be humongous!

Cnidaria are jellyfish,
Anemones and corals.
Their tentacles have stinging cells
On colonies or singles.

Planaria are flatworms,
Platyhelminthes, to be sure
As scavengers they crawl around
With muscle cells galore!

The roundworms are ubiquitous
Nematodes by name.
Some of them are parasites
And that's their claim to fame.

Mollusks are a sturdy group.
Most of them have shells,
Except the wily octopus
Who hides in caves quite well.

Segmented worms are Annelids,
More complex than the others,
With hydrostatic skeletons
And coeloms like their mothers

Arthropods have jointed legs
In every shape and size
And exoskeletons they molt
As a regular exercise.

Echinoderms are all marine,
Sea urchins and sea stars.
Their radial symmetry stands right out
On seaweed or sand bars.

Chordates usually have backbones,
But a few of them do not.
Sea squirts and the lancelet
Are examples of that sort.

Invertebrates are a splendid group
Filling niches far and wide
From ocean floor to mountain top
Over all the countryside.

Now we're on to vertebrates
With their backbones strong.
The Agnatha, the jawless fish,
Were first to come along.

Next we have Chondrichthyes
With sharks and skates and rays.
These fish are fast, so well-equipped,
And splendid in their ways.

Bony fish are Osteichthyes,
First with solid bone.
Swim bladders filled with gases light
So they can float alone.

Amphibians and Reptilians
Were the first to live on land.
Some reptiles, like the turtles,
Sought the ocean, not the sand.

Birds and mammals were the first
To counteract the weather
With built-in thermostats they found
The ocean was not better!

We tend to think we human beings
Are really just the best;
But we're the same, though not in name,
No different from the rest!

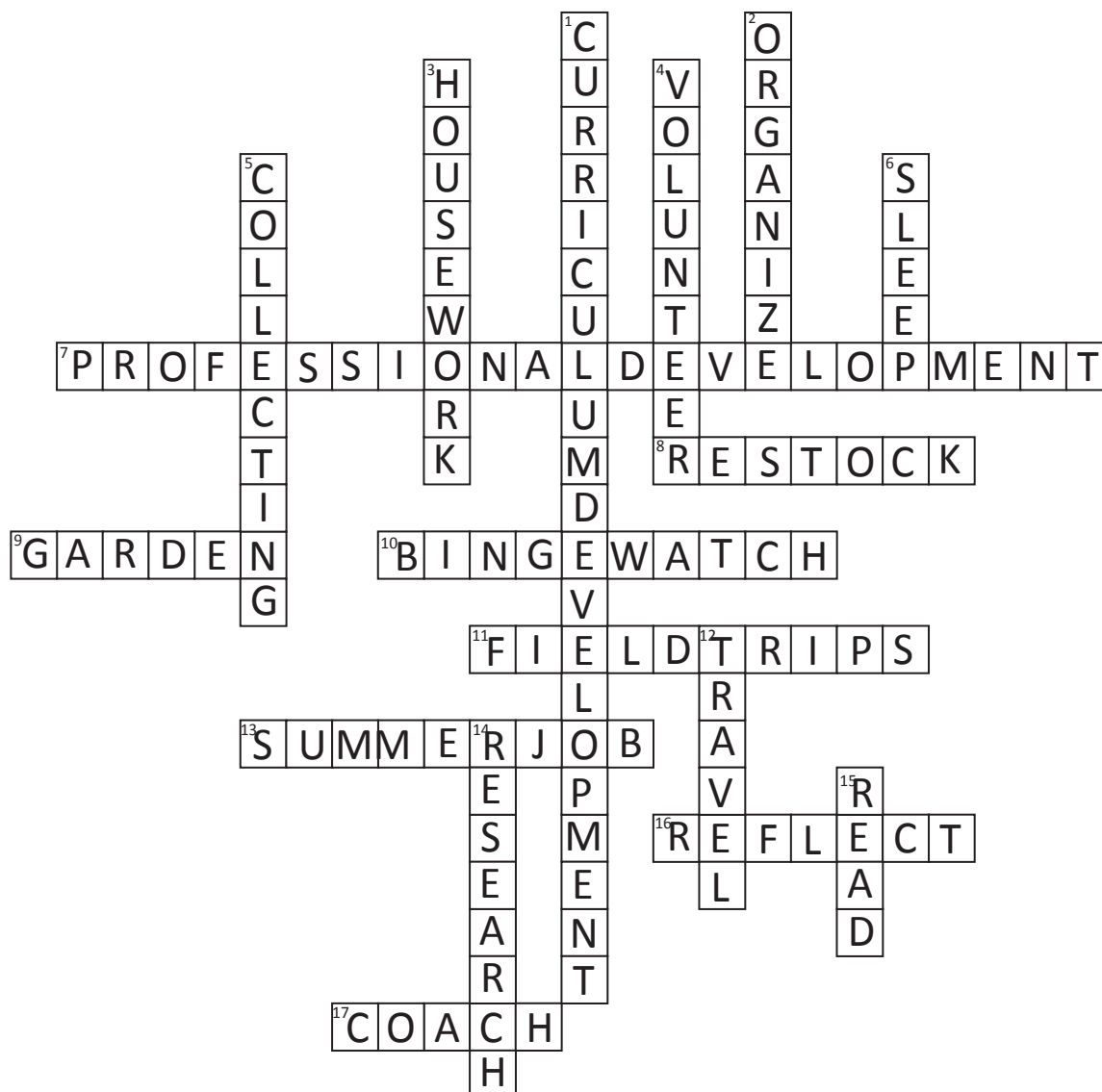




Crossword Puzzle: **ANSWER KEY**

What Do Science Teachers Do In the Summer?

This key contains the answers to the puzzle on page 8.





HASTI Calendar of Events

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

[Hoosier Riverwatch Training.](#)

Two workshops sponsored by the DNR Lake Michigan Coastal Program, IDEM, & Michigan City Parks and Recreation Department. Basic training will be held on Monday, August 7 from 9:00 AM to 4:00 PM (CDT) and advanced E. coli on Tuesday, August 8th from 9:00 AM to 1:00 PM at Krueger Memorial Hall in Michigan City. All classes are free. Email [Ashley Sharkey](mailto:Ashley.Sharkey@dnr.state.mi.us) or 219-299-4388 for info and registration.

[NIH Web Seminar. Genome: Unlocking Life's Code. High Altitude Living Storyline.](#)

August 15, 2023.

Deadline for [proposal submissions for the HASTI and ICTM Indiana State Conference](#)

August 31, 2023.

Click to submit a proposal.

[Ball State University Pollinator Party.](#)

September 9, 2023. 10:00 AM EDT

Buzz over to the BSU Nature Lab, Christy Woods, and the Rinard Orchid Greenhouse to learn all about our pollinators and their relationships with flowers. Contact information: Erica Oliver, 765-285-8103

[HASTI Mini-Conference, Allisonville Elementary School.](#) October 14, 2023.

This 1-day PD for teachers will include ways to include recently adopted Earth and Space Science standards and the April 2024 solar eclipse into their teaching. Submit proposals between July 18 and September 1, 2023.

[Celebrate Science Indiana.](#)

October 14, 2023.

Indiana State Fairgrounds.
9:30 AM to 5:00 PM.

October 25-28, 2023.

[NSTA National Conference](#) in Kansas City.

Early bird registration deadline:
September 29, 2023.

[Indiana University Science Fest.](#)

April 6, 2024.

For one year only Science Fest will move from fall to spring. Learn about the impact of solar eclipses on life, the science behind them, and how to safely enjoy a most unusual day.





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!

Astronomical Society of the Pacific (ASP).

K-12 Educators, are you interested in engaging learners in the April 2024 total solar eclipse? Get professional development, a kit of astronomy teaching materials, a stipend, and other resources designed to engage your students in the April '24 solar eclipse.

NASA. Be an Eclipse Ambassador!

Join over 400 approved applicants to receive virtual training, resources including glasses, partnerships and a supportive community of eclipse enthusiasts to get the word out to their community.

Purdue University Superheroes of Science Podcast.

Bringing you science from the experts to share STEM content and topics. New episodes released on Fridays.

Purdue University. Physics Inside Out Lessons.

Middle School physics lesson plans.

Indiana Geological and Water Survey at Indiana University.

Lesson Plans and Activities. Demonstrating Geological Time, Folded Mountains, and Exploring Ancient Environments are just a few offerings you can find on the outreach section of the Indiana Geological and Water Survey website. This site is easy to follow and kept up, making it easy for teachers to find resources for their classrooms.

Solve Climate by 2030.

The Integrated Program in the Environment hosted an esteemed panel of speakers for a virtual, climate teach-in titled "Climate Imaginaries: Environmental Communication, Narrative, and Justice." Panel 1 was a discussion about Climate Change Communication and Panel 2 Climate Storytelling and Narrative. Watch the recorded webinar at:

**You can suggest other Freebies to include
in the next issue of THST!**

Email a description and URL to thst@hasti.org





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.

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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:
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