HAMTE Crossroads

The Official Newsletter of the Hoosier Association of Mathematics Teacher Educators

Message from the President

Happy November! It is starting to feel like we might be getting close to whatever the new normal will be. This semester has been a busy one for HAMTE. We just held elections and our free preservice teacher conference that we are co-hosting with KAMTE is this Friday, November 11.

I am happy to announce that we have three newly elected officers: President-Elect--Andrew Hoffman, Secretary--Michael Steele, and Graduate Student Outreach a Coordinator--Patti Walsh. Congratulations on your win! A big thank you to everyone who was willing to run for a position this year. Your willingness to serve HAMTE is deeply appreciated. I encourage all of you to consider running for a Board position in the future.

New people on the board also means that we are saying goodbye to board members: Patrick Eggleton and Hanan Alyami. Thank you both for your service to HAMTE and for your assistance and advice to me personally.

Of course, the elections could not have happened without our Nominations and Elections committee members. A huge thank you to Rachael Kenney and Jonathan Watkins for their hard work to make this election happen in a timely fashion. Their work is not quite done yet – they will also be soliciting and reviewing nominations for this year's Terry L. Wood Mathematics Indiana Teacher Educator Award. If you have a nomination, please contact either myself, Rachael, or Jonathan. I encourage all of you to read Betsy Berry's tribute to our inaugural award winner, Sheryl Stump, which can also be found on page 2 of this newsletter.

I also want to remind everyone that this coming **Friday, November 11 is the date for the K-12 pre-service teacher conference** that we are hosting in collaboration with KAMTE, the Kentucky affiliate of AMTE. You can register for the conference at https://docs.google.com/forms/d/e/1FAIpQLSeHI5dq8Mofbqr8nTIVbQfka8KdXiaSG7We9Yz_O_jeZwK9gw/viewform?usp=sf_link. We have an exciting schedule planned with nationally recognized speakers, breakout sessions for elementary and secondary talks, and much more. The conference is free to attend. There are activities planned for both pre-service teachers and any math education faculty that would like to attend. In particular, there will be a networking activity over the lunch hour just for faculty, and we would also love if you could drop in on the poster presentations. Working with KAMTE on this conference has been a rewarding and educational activity. I sincerely hope that we can continue with this collaboration in the future.

In addition to the pre-service teacher conference, we will be having our annual meeting during the spring ICTM/HASTI annual conference. I wish you a wonderful end to the semester and I hope to see all of you soon in person!

Inside This Issue:

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Sheryl Stump Received the 2022 Terry L. Wood Mathematics Teacher Educator Award

On March 18, 2022, at the HAMTE Annual Business Meeting held in conjunction with the Regional NCTM Conference in Indianapolis, I had the honor of presenting the first Terry L. Wood Mathematics Teacher Educator Award to Sheryl Stump. Before I share why Sheryl is so deserving of this award, I want to describe the background of the creation of the award and who Terry Wood was and a little about her legacy in mathematics teacher education.

In May 2021, I had the opportunity to be a part of the Terry Wood Memorial (virtual) event. It was held over two days and included presentations and testimonials from individuals from three continents and was the impetus for the creation of this award. I first met Terry as a PhD student at Purdue in 2001. During my time there, I knew her as instructor, mentor and friend. I even lived in her house for a time as did many other graduate students, colleagues and visiting professors. However, it was my participation in this memorial event that revealed Terry to me in a whole new light.

Terry was a professor at Purdue, West Lafayette for 25 years. During that time, she collaborated with Paul Cobb and Erna Yackel in what was known as the Purdue Problem-Solving Project. This and other collaborations and projects with international scholars in Germany, United Kingdom, Australia, New Zealand, and Honduras led to an extensive body of work that shaped and furthered the field of mathematics education. In addition to her academic relationships and publications Terry was also an amazing human being. The stories shared at the memorial gave me, and all who participated, the opportunity to see how Terry's relationships with teachers, graduate students, colleagues, family and resulted in their growth and development in both their professional and personal lives.

Since the memorial, I have had the privilege to serve as an editor with Jill Newton (Purdue), Travis Miller (University of Indianapolis) and Megan Staples, (University of Connecticut) for a special issue of *Theory into Practice* to celebrate Terry's contributions. In conversation with Jill during this work together, I mentioned how it might be nice to honor Terry through a HAMTE award given in her name. Jill composed a memo to the Board and in August 2021 they voted to create the Terry L. Wood Mathematics Teacher Educator Award and to present it to an Indiana mathematics teacher educator who fulfills at least two of the following criteria:

1. who has made significant contributions to the preparation and/or professional development of mathematics teachers in Indiana.
2. whose research has significantly impacted the teaching of mathematics and/or preparation of mathematics teachers.

   who has served the mathematics education community through leadership in state, national, and/or international organizations.

Sheryl Stump was named the first

recipient of this award and I was honored to be asked to make the presentation to her at the annual meeting. She couldn't attend in person, but we were able to have her attend by Zoom and to surprise her with the award.

I first met Sheryl in the fall of 2006 when we were representing our universities on the ISTEM (Purdue) middle school mathematics professional development project. This began a close friendship and a rich, productive, professional relationship. Since that time, we've worked on statewide projects, attended and presented at state and national conferences, planned and implemented workshops and in the process drunk a bit of wine together.

Sheryl has been at Ball State for 26 years and will retire in May. She is a full professor and has served as Interim Associate Dean of the Teachers College and as Associate Dean of the College of Sciences and Humanities as well as Chair of the Department of Mathematical Sciences. Many of us know that Sheryl was also our third president of HAMTE from 2015-2017. In addition to these important roles, she has a long list of publications and presentations. She has been co-PI on a variety of grants and lead several *Mathematics Science Partnership (MSP)* professional development projects with Muncie and Warsaw schools. Her CV is impressive and illustrates her extensive contributions and achievements in our field of mathematics education.

If I were going to pull out one area, however, of her work to focus on, it would be extraordinary commitment to the importance of elementary mathematics specialists and coaches in the state of Indiana. She has been the catalyst, champion, cheerleader and architect of this initiative as the leader of the HAMTE EMS Working Group for many years. Her inspiration and dedication resulted in multiple day-long conferences for teacher leaders and the 6-day year-long Indiana Mathematics Leadership Academy now in its 5th year. Her conversations, presentations and testimony before colleagues, administrators and legislators lead to the passage of *House Bill 1399 Elementary School Content Area Licenses.* She continued this leadership as a member of the standards writing team for the Indiana Department of Education for this license. She has also organized and facilitated a collaboration of colleagues from multiple Indiana universities to explore the possibility of partnerships in programs to prepare teacher leaders for the license.

Speaking personally, I do not know a more committed, conscientious or more deserving person for this award. It is a joy to know her and to have had the opportunity to work so closely with her.

The Author

Dr. Betsy Berry is Associate Professor of Mathematics Education at Purdue University Fort Wayne. She teaches college geometry, the history of mathematics and methods of teaching for secondary education majors and mathematics foundational content courses for elementary education majors.

AMTE Travel Award

The HAMTE Board is accepting applications for a Graduate Student Travel Grant award to attend AMTE. The board will award $250 to a graduate student. Please consider applying if you meet these criteria:

- You are a HAMTE member and a graduate student making steady progress toward your degree;
- You have a presentation accepted for the conference;
- You do not have other funding sources available, or these funding sources do not cover all expenses.

The travel grant winner will be asked to share their experiences at AMTE via future editions of the *HAMTE Crossroads*.

If interested, please send your CV and a brief statement (300 words or less) explaining why you should receive the award to Jodi Frost (jodi.frost@indstate.edu) by **Friday, January 6th, 2023 at 5pm**.

Developing Better Instructors Using the *Principles to Actions* Professional Learning Toolkit

Abigail Pyle and Dr. Patrick Eggleton

Abstract

This research report documents how a group of mathematics teachers collaborated to use the *Principles to Actions* (NCTM, 2014) (*PtA*) professional learning toolkit in their classes, the tools they used to measure development in future teachers, and the findings of the study. According to other studies, the use of 'effective mathematics teaching practices' as defined by *Principles to Actions* brought about changes in the beliefs of elementary school teachers in pre-service mathematics toward best practices for teaching mathematics. There is hope that the benefits of seeing those instructional practices used by elementary classroom teachers through the PtA Toolkit videos help develop new commitments toward effective mathematics teaching practices in future educators.

Keywords: mathematics, teaching practices, effective, principles to actions, NCTM, commitment

Learning to Use Effective Mathematics Teaching Practices

Many years ago, there was an article titled *Unlearning to Teach Mathematics* (Ball, 1988) that emphasized how the experiences and beliefs future teachers bring into their preparation courses highly impact the commitments they make toward their future teaching. Although there have been many advances in knowing what constitutes an effectively taught mathematics class, many preparing teachers have limited to no experience with those techniques and envision their future classroom continuing the *status quo* – typically a teacher-centered focus of instruction. Are the efforts of mathematics education courses helping these future teachers to unlearn how to teach mathematics?

In the training of teachers for the classroom, there has been an ongoing question of how to help future teachers move from the teacher-centered focus of instruction to a more student-centered focus of instruction. The National Council of Teachers of Mathematics (NCTM) published a series of resources called the *Principles to Actions (PtA) Professional Learning Toolkit* (PtA Toolkit Link) that provides classroom videos that allow the opportunity to view "student-centered" lessons that promote recommended teaching practices for mathematics. In Spring 2020, a collaboration of mathematics teacher educators committed to sharing at least five of these videos in their mathematics courses for future elementary teachers. Their goal was to answer the question: *Does exposure to video examples of student-centered mathematics instruction in elementary classrooms contribute to students' commitment to this type of instruction?* Future teachers completed a pre/post survey to measure their commitment to using student-centered type instruction in their future mathematics classes. This article shares the results of these efforts, communicating what commitments future elementary teachers made towards effective mathematics teaching practices and what factors brought *...continued on Page 5*

about those commitments.

Connections to Prior Research

Hart et. al. (2019) provide a review of research related to experiences of prospective elementary teachers in mathematics content courses that are influential in developing productive dispositions for teaching mathematics. Their review generally shows that experiencing alternative approaches to instruction (e.g., problem-based learning, working in groups, exploring various approaches and considering children's thinking) helps to shift, to varying degrees, the beliefs of prospective elementary teachers away from teacher-centered instruction toward more student-centered instruction. They suggest that more research is needed on "specific experiences that prompt the change of EPT [elementary prospective teacher] change" (p. 11). Even when beliefs about effective pedagogy are shifted, prospective elementary teachers often revert to teacher-centered instruction when they enter schools where this is the predominant mathematics pedagogy. "Letting go of traditional perspectives on mathematics and its teaching and learning engrained over many years as students in mathematics classrooms is an arduous process and fraught with resistance" (Hart et al., 2019, p. 11). Swars et al. (2007) noted that new teachers are often hesitant to implement reform beliefs within a culture of a traditional school setting. They did observe some maintenance of more student-centered pedagogies when prospective elementary teachers worked with cooperating teachers who used those methods *...continued on Page 6*

Upcoming Events

- **KAMTE-HAMTE Pre-Service Teacher Conference:** November 11, 2022**,** Virtual
  - For more information visit: https://kcm.nku.edu/KAMTE/2022fall_preservice_teachers_conference.php
- **PME-NA 43 – 2022 Conference:** November 17-20, 2022, Nashville, Tennessee
  - For more information visit: https://www.pmena.org/pmena44/
- **NCTM Regional Conference**: November 30 – December 2, 2022, Baltimore Maryland
  - For more information visit: https://www.nctm.org/speak/
- **Indiana STEM Education Conference:** January 12, 2023, West Lafayette, Indiana
  - For more information visit: https://www.education.purdue.edu/catalyst/catalyst-programs/indiana-stem-ed-conference/
- **AMTE 2023**: February 2-4, 2023, New Orleans, Louisiana
  - For more information visit: https://amte.net/content/2023-annual-amte-conference
- **ICTM/HASTE Conference**: February 12-14, 2023, Indianapolis, Indiana
  - For more information visit: https://indianactm.org/2023ictmhasti
- **MES 12**: July 28 – August 2, 2023, São Paulo, Brazil
  - For more information visit: https://www.mescommunity.info/

in their field placements. The focus of this project provided a specific type of experience to encourage reformed beliefs in effective mathematics pedagogy (using the *Principles to Action* Toolkit videos and resources) which also exposed students vicariously to classrooms where the methods were being used effectively. The hope is that these experiences could lead to commitments to effective pedagogy that will overcome the resistance experienced when entering the workforce in traditional school settings.

One of the challenges in documenting the changes in students' views on effective mathematics pedagogy is an objective tool to measure that change. A study by Pourdavood and Liu (2017) on the beliefs of preservice mathematics teachers noted the importance of collecting quantitative and qualitative data for research related to the development of instructional strategies in teachers. They emphasize that "qualitative data could provide valuable information on different factors that influence the change process that occurs in PSTs [pre-service teachers]" (p. 10) providing details that numbers simply cannot show. "Mixed methods research benefits from the strengths of both quantitative and qualitative research and therefore provide a better perspective for understanding, analyzing, and interpreting the complexity of teacher change and mathematics education reform in general" (Pourdavood, 2017, p. 25). In keeping with these recommendations, this study utilized both quantitative data from Likert-type questions in a pre/post survey and also open-ended questions, which were analyzed using a coding scheme. One of the open-ended questions asked prospective elementary mathematics teachers to describe the teaching strategies they would use in teaching equivalent fractions. The coding of this description benefited from a type of continuum suggested by Bull (2019) that provided a variety of teaching strategies with teacher-centered methods at one end and learner-led classrooms at the other extreme.

Method

Students taking a mathematics course for elementary education in Spring 2020 took nearly identical pre- and post- course surveys with questions adapted from Swan (2006) and the Wisconsin Center for Education Research (2021), providing a snapshot of their plans for teaching mathematics. The survey consisted of 3 parts:(1) an open ended question where the student described the instructional strategies he/she would use in teaching a lesson on equivalent fractions, (2) a series of questions describing various instructional techniques allowing students to answer on a scale of anticipated use in their mathematics classroom (Almost Never, Sometimes, Half of the time, Most of the time, Almost always), and (3) an additional list of instructional activities where students indicated the amount of time used in that activity over the course of a school year (None, Little – less than 10% of instruction time for the school year, Some – 10-25% of the instruction time for the school year, Moderate – 26-50% of the instruction time for the school year, and Considerable – more 50% of the instruction time for the school year). An additional open-ended question was added to the post-survey as follows: *Please describe how your views about teaching math in the elementary classroom have changed over the last semester and what has brought about that change*. (Copies of the survey instruments are available from the author. A link to a copy of the post-survey is available here: Post-Survey). Although the surveys were elicited from students at two different universities, only students from *...continued on Page 8*

Girls Excelling in Math and Science (GEMS)

Imagine walking into a room full of laughter, joy, hugs, energy, snacks, and fun activities! This semester, Girls Excelling in Math and Science (GEMS) successfully launched their first Indy GEMS Club at Lew Wallace School in Indianapolis, IN. Laura Reasoner Jones, founder of GEMS, created activities facilitated by Yi Zhu, Grace Gochnauer, Maria Eloisa (Lisa) Nuguid, and Elizabeth Suazo-Flores. The first activity was Hidden Legos where girls pair up and one builds a Lego structure without their partner seeing it and then explaining to their partner how to build the structure to see if they produced the same outcome. The second activity, Cup Stacking, involved the girls in groups building a pyramid shape by stacking upside down cups without using their hands; the materials available to them were string and rubber bands, and the girls utilized their creativity to stack cups. These activities are meant to encourage collaboration, teamwork, bonding, and a sense of community among the girls. Furthermore, such skill-building is an example of how professionals work in Science, Technology, Engineering, and Math (STEM) fields. We will continue encouraging girls to create and maintain a STEM identity. Our intention is for the GEMS girls to walk away with a sense of confidence as doers of STEM disciplines and therefore see themselves as belonging.

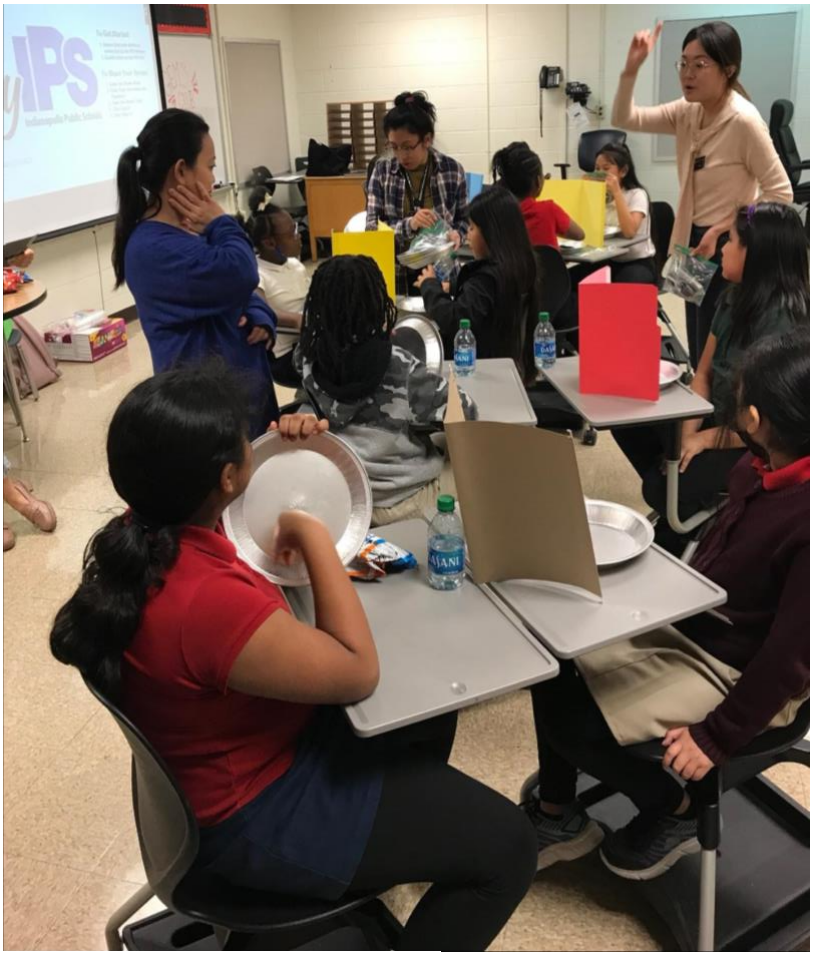

Photo Courtesy of Lisa Nuguid

Would you like to partner with us to organize GEMS clubs in your institution? Email us at janewton@purdue.edu.

The Authors

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one of the universities complied, with 23 completing the pre-survey and 27 completing the post-survey. The pre- and post-surveys could be linked by a code created by the student. Only 15 of the surveys were paired using this code. (It was noted that the students who completed the survey were typically in their third year of study, while those from the university who did not complete the survey were in their first year.)

The instructors who participated in the study agreed to supplement the curriculum of their mathematics for elementary teachers' classes in Spring 2020 with at least 5 of the classroom videos available through the *Principles to Actions* Professional Learning Toolkit. The classes connected to those who completed the survey consisted primarily of topics from geometry and measurement. Before being required to leave campus due to the pandemic, students worked in groups with a variety of upper elementary grade activities modeled as they reviewed the mathematics concepts. When *PtA* recordings were used, the students first worked through the activity associated with the *PtA* video. They then watched the video in class and answered the reflection questions afterward. After leaving the campus due to the pandemic, the course was provided asynchronously. Students still completed upper elementary activities associated with the concepts (e.g., Geogebra constructions, Math Playground activities, and activities provided in their coursepack). The *PtA* videos were watched individually and students still submitted written reflections on the classroom episodes.

Results: Quantitative Data

The surveys completed by the students allowed for a view of their perception of their future mathematics classroom. Students rated instructional techniques and activities according to the anticipated regularity in their classrooms. The scales were quantified in order to compare pre- and post-results. After considering the initial outcomes, the researchers realized that it would be beneficial to compare the changes observed from the student surveys to see if the students moved closer to the goals for effective mathematics teaching. Consequently,, members of the Association of Mathematics Teacher Educators in Indiana (HAMTE) were asked to complete the survey in order to define goal results for effective mathematics teaching practices. The results were then used for comparison with the results of the student surveys.

After running 2 sample t-tests and paired t-tests on the data, several categories indicated significant change in the pre-service teachers (PSTs) and also approached the effective mathematics teaching practice goals. Table 1 shares these categories. Note that approaching goals for effective mathematics teaching practice may mean more or less time for a particular teaching strategy, depending on the type of strategy.

The three strategies that demonstrated the most significant change toward the suggested effective mathematics teaching practices were (12) the teacher is surprised by ideas that the students develop during the lesson (increased expectation), (39) the students explain their reasoning or thinking in solving a problem by using several sentences orally or in writing (increased expectation), and (14) the textbook or worksheets guide the instruction (decreased expectation). According to Swan's (2006) research, question 12 (teacher surprise) represents student-centered behavior, question 14 (textbook guided) represents teacher-centered behavior, and question 39 (explain thinking) is a constructivist teaching method, often found in student-centered classrooms. All three of these strategies were *...continued on Page 9*

Table 1

Instructional Strategies that Showed Significant Change

- The teacher is surprised by ideas that the students develop during a lesson. (12)
- Students explain their reasoning or thinking in solving a problem by using several sentences orally or in writing. (39)
- Students maintain and reflect on a mathematics portfolio of their own. (35) **
- The textbook or worksheets guide the instruction. (14) *
- Students invent their own methods. (17) *
- Topics are taught separately. (22) *
- The teacher jumps between topics. (25) *
- Students watch the teacher demonstrate how to do a procedure or solve a problem. (26) *
- Students complete computational exercises or procedures from a textbook or a worksheet. (28) *
- Students work in pairs or small groups on mathematics exercises, problems, investigations, or tasks. (32) *
- Students solve non-routine mathematical problems (e.g., problems that require new or non-formulaic thinking). (38) *
- Students make estimates, predictions, or hypotheses. (41) *

The survey item number is in parentheses.
* - indicates statistical significance only in the 2 sample t-test
** - indicates statistical significance only in the paired t-test

modeled both in the *PtA* classroom videos and in the class taken by the preservice teachers. As has been seen in other studies where effective mathematics teaching strategies are modeled in the classroom, these students communicated a significant change towards student-centered instructional approaches that are emphasized by *Principles to Actions* (2014).

Results: Qualitative Data

Reading through the description of a lesson on equivalent fractions provided by the preservice teachers in both the pre- and post-surveys, themes were noted that led to a coding scheme.

The coding scheme (see Table 2) represented a kind of continuum from teacher-centered transmission-based teaching to constructivist-based student-centered teaching (as long as we can define a "continuum" in education where there are so many influencing factors and variables). "'Teacher-centered practice' is conceptualized as the teacher transmitting knowledge to students, while 'student-centered practice' is conceptualized as taking students' individual processes for knowledge-building into account through instruction designed to be flexible to student needs" (Carney, 2015).

Table 2

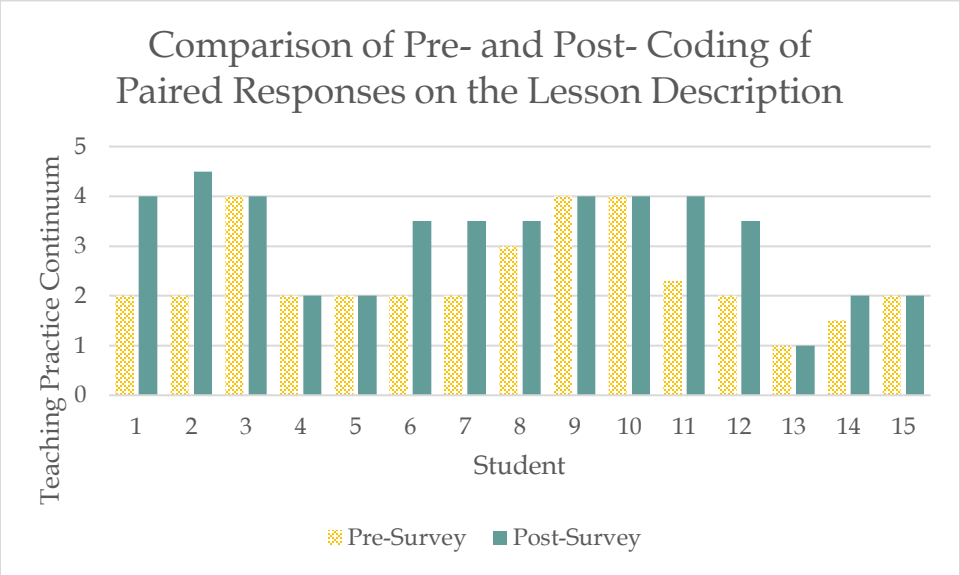
Codes for Lesson Descriptions

(1) Use traditional methods (worksheet - drill)
(2) Show using visual representations (pie charts)
(3) Discussion - Student Discourse
(4) Engage students in creating visual representations (more teacher directed)
(5) Exploration (student-focused)

For the lesson description, all the paired responses indicated movement toward student-centered classrooms with constructivist views or no change in classroom focus (see Figure 1). For the pre-survey, paired responses the average was 2.45. The post-survey*...continued on Page 10*

Figure 1

Comparison of Pre- and Post- Coding of Paired Responses on Lesson Description



paired response average was 3.33, indicating some increase up the scale. This demonstrates a general movement/trend from more teacher-centered, transmission-based teaching to more student-centered, constructivist-based teaching. The overall pre-survey average was 2.3 and the post-survey average was 3.0, so here, also, there appears to be some increase up the scale in general.

In the post-survey, an additional open response item asked the preservice elementary teachers to provide a description of any change in their views of teaching mathematics and to also indicate what may have brought about that change. As in the lesson descriptions, themes were noted in the responses that led to a coding scheme. The categories in Table 3 informed the analysis of the responses.

The frequency of each of the categories is shown in Figure 2. Clearly, category 2, *Exploration and Productive Struggle*, was described by the preservice teachers the most frequently as a description of how their views of teaching mathematics had changed. The *PtA* materials and the in-class instruction both emphasized these teaching practices. One responder said that she had been most affected by "all the hands-on activities we did in in class to help us understand the concepts better" (Response 7). Another student said: "[the instructor] modeled how to promote exploration and discovery through the tasks he gave us as he challenged us to figure things out for ourselves by not just giving us the answer or formula" (Response 11). This theory is most clearly seen in this response from the teacher in the pre-service period:

> I have really started considering the idea of guiding students to explore on their own through asking questions. I usually would have thought it was helpful to give them some information to guide them, but I can do the same process with questions instead and although it may take longer, it is more likely to stay in their minds when they approach...*continued on Page 11*

Table 3

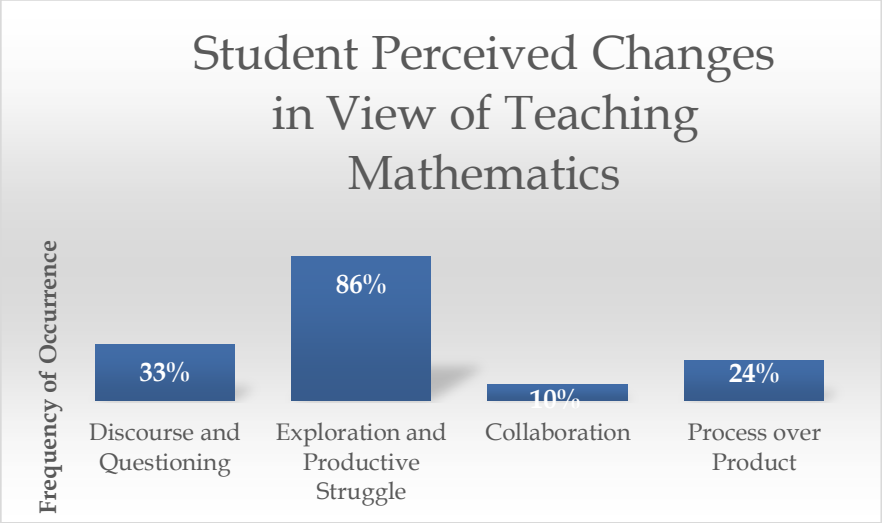
Codes for Changed Views about Teaching Math in an Elementary Classroom

(1) **An emphasis on discourse - questioning**
(2) **Exploration**
Problem Solving
Allow mistakes - productive struggle
Student-Centered Emphasis
Create conclusions
(3) **Collaboration** - Working with others
(4) **Emphasize process rather than product**
Why vs. How
Reasoning

> the same types of problems in the future. This change occurred in my thinking because of a lot of the activities we engaged in during the course, as we were asked to explore things as we were guided only with questions. It was frustrating at some points, but the success of solving a difficult problem was much more rewarding. (Response 16)

Figure 2

Student Perceived Changes in Their View toward Teaching Mathematics



The productive struggle and problem-solving that this pre-service teacher talks about were clearly modeled quite well in the course and made a positive impression on her. Therefore, since exploration, productive struggle, and hands-on learning were so well incorporated into daily classes throughout the semester, this category frequently appeared in the responses of the PSTs. Many of them were especially impressed by the idea of allowing students to struggle with problems until they arrive at their own conclusions/formulas/answers because the pre-service teachers themselves experienced deeper learning when their instructor had them do this. They also observed this modeled in classrooms with young children in the *PtA* videos, making the teaching practice relevant to their future teaching.

Category 1, *Discourse and Questioning*, was also a common description of change in the instructional focus, occurring in one of every three responses. Here is one response:

> There is a need for students to have productive struggle and conversation/discourse when learning math. I think what brought about this change was all the hands-on activities we did in class to help us understand the concepts better, as well as the reflections that were done in class … where we watched a video, had the script, and were able to discuss it. Just like in learning math concepts, learning how to teach math we need ... the discourse on how to teach math. (Response 7)

This student learned the benefit of math discourse through actual practice in class, as well as through the videos and reflections written. Another student said, "math should be more exploration, hands-on, collaborative, and facilitated with lots of thought-provoking questions. After being in [my practicum experience], working in my math group in class, and also watching and writing the math reflections, I now see the importance of these things!" (Response 12). Again, the student emphasizes the in-class experiences and the *PtA* videos with reflections as fundamental for developing new commitments toward teaching mathematics.

Category 4, *Emphasizing Product over Process, Why vs. How*, was usually related to an emphasis on "deeper learning" gained by students when this was the instructional focus. For example, Response 9 said, "I have learned *...continued on Page 12*

that it is important for students to see why concepts and formulas make sense. Even better, the students should be given the opportunity to create a formula for a concept, and by them creating the formula, they will have a deeper understanding for the concept." Another example, Response 15, said: "my views have changed in the sense that I want to make my math students understand why things work instead of just how they work. I want to help them understand the why because that will help them understand the concepts." Thus, we see here that these pre-service teachers moved towards the Effective Mathematics Teaching Practice of using and connecting mathematical representations, for in this practice, "effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving" (NCTM, 2014, p. 24).

Conclusion

As has been observed in other studies, providing coursework that emphasizes effective mathematics teaching practices helps preservice elementary teachers develop commitments toward those teaching strategies. The students in this study benefited from instruction guided by the effective teaching practices presented in *Principles to Actions* (NCTM, 2014). The instructor modeled those techniques and the *PtA* classroom videos allowed students to see the same teaching practices used with elementary-aged children. In the quantitative data, preservice elementary teachers showed a significant change in measures of instructional techniques that are indicated as effective mathematics teaching practices according to mathematics teacher educators. Teaching strategies indicating the most significant growth emphasized students developing their own conclusions or strategies that provoke teacher surprise and students explaining their reasoning and thinking. These strategies are similar to the effective teaching practices shared in *Principles to Actions* (NCTM, 2014) that emphasize students engaged in problem solving and reasoning, students making connections, students engaging in discourse, and the teacher posing purposeful questions. The instructional strategy of using textbooks or worksheets to guide instruction showed a significant decrease in importance among pre-service teachers, as students learned the value of working in groups and with hands-on activities.

The students communicated their growth in a similar manner through descriptions of a lesson to teach equivalent fractions where pre-survey descriptions tended to be more teacher-centered and post-survey descriptions communicated a more student-centered focus. Pre-service teacher self-assessment of their growth, as shared in the post-survey, also indicated a commitment to student-centered instructional practices. Not surprisingly, the themes that became apparent in the responses paralleled several of the effective teaching practices noted in the *PtA* materials such as *productive struggle*, *questioning*, and *discourse*. Even with half of the online course instruction during forced stay-at-home requirements from the pandemic, the preservice teachers described their changes in instructional commitments as coming from both their experiences within the course and the experiences related to the *PtA* videos and reflections.

The results of this study are similar to many noted by Hart et al. (2019). They noted that a number of different pedagogical approaches applied to mathematics content classes for teachers (e.g., problem-based learning, working in groups, etc.) encourage a shift in beliefs from more teacher-centered to more

...continued on Page 13

student-centered approaches to teaching. The preservice teachers in this study experienced instruction guided by the *Principles to Actions* (2014) "Effective Mathematics Teaching Practices" both in classroom experiences and in videos of those practices used in elementary classrooms.

One of the concerns with the change in beliefs is the maintained commitment to those teaching practices when elementary pre-service teachers have their own classroom. "Changes seen in EPTs [elementary preservice teachers] during courses may not carry over to the practicing teacher" (Hart et al., 2019, p. 11). Swars (2007) found a maintenance of new pedagogical commitments in student teaching due in part to alignment of teaching strategies used in the university content classroom with successful modeling of those teaching practices by cooperating teachers in field placements. For many programs, finding cooperating teachers in field placements who mirror the effective mathematics teaching strategies used in university courses is not a possibility. One benefit provided by the *PtA* videos is that students are able to see and reflect on the use of the "Effective Mathematics Teaching Practices" by teachers in *real* elementary classrooms. Although this study does not have data to document a maintenance of commitment to change as preservice teachers enter their own classrooms, there is hope that exposure to classrooms modeling effective teaching strategies, as shared in the *PtA* videos, will provi

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The Authors

Abigail Pyle teaches Geometry and Bible at Valley Christian School in Spokane, WA. She is a 2022 graduate of Taylor Un Abby was awarded sc both NCTM and ICTM for her potential as a future mathematics educator. She was also a co-recipient of the award for Outstanding Graduate in Mathematics Education given by Taylor's mathematics department.

Dr. Patrick Eggleton, Professor of Mathematics at Taylor University, earned his Ph.D. from the University of Georgia. He has taught mathematics at all levels from elementary through university, including 10 years at a school for missionary children in Papua New Guinea. Patrick has numerous publications related to mathematics instruction. He has served as president for both ICTM and HAMTE.

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- **Join a Working Group/ Advocacy Group** or suggest a new topic to connect and collaborate with others across the state in order to address crucial issues in the field of mathematics education!
  - IMERS
  - Teacher Recruitment & Retention (Jean Lee, jslee@uindy.edu)
  - Elementary Mathematics Specialists (Sheryl Stump, sstump@bsu.edu)

- ***Submit an article and/or teaching methods or ideas to the newsletter***, *HAMTE Crossroads.* You can also ***write a special article for*** *the new newsletter section called "Thinking Equity in Mathematics Education."* Email your submission or questions to Amanda Huffman Hayes, Newsletter Editor, at huffma33@purdue.edu. We publish Fall and Spring editions.

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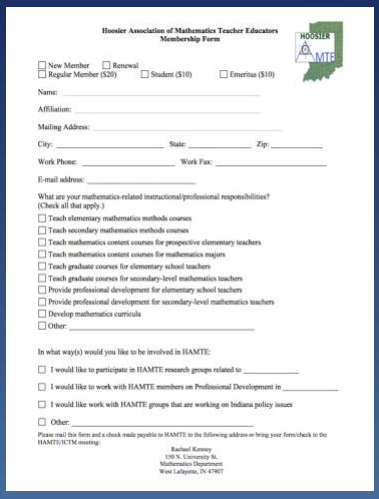

Hoosier Association of Mathematics Teacher Educators
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Please mail this form and a check made payable to HAMTE to the following address or bring your form/check to the HAMTE/ICTM meeting:

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What's the Word on Campus?

Ball State University

Publications

Sapkota, B. & Huffman, A. (2022). Preservice teachers' mathematical knowledge for teaching: Focus on lesson plan and reflections. In A. Lischka, J. Strayer, J. Lovett, R. Jones, & E. Dyer (Eds.), *Proceedings of the 44th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 701-710.

Presentations

Bima Sapkota and Amanda Huffman are presenting at the 2022 PME-NA Conference.
Preservice teachers' mathematical knowledge for teaching: Focus on lesson plan and reflections
Saturday, November 19, 2022

Indiana State University

Publications

Journal Articles Ko, Y. Y., & Rose, M. (2022). Considering proofs: Pre-service secondary mathematics teachers' criteria for self-constructed and student-generated arguments. Journal of Mathematical Behavior, 64, https://doi.org/10.1016/j.jmathb.2022.100999

Holden, L., Ko, Y. Y., Maxwell, D., Goodwin, C., Lee, C. H., Runge, J., & Beeman, E. (2022). Exploring geometry with origami one-cut-heart. Mathematics Teacher: Learning and Teaching Pre-K–12, 115(9), 650-658.

Presentations

Ko, Y. Y., Johnson, A., & Rose, M. (2022, November). Does student-centered instruction matter? Investigating undergraduate students' perceptions on proof. Session presented at the International Conference of Education, Research and Innovation 2022. Seville, Spain. (Virtually)

Indiana University Southeast

Publications

Suh, E., Hoffman, L., & Zollman, A. (2022). STEM SMART: Five essential life skills students need for their future (pp. 526-530). In Morska, J. and Rogerson, A. (Eds.).

Photo courtesy of Alan Zollman.

Proceedings of the 16th International Conference of the Mathematics Education for the Future Project. King's College, Cambridge, UK: WTM Verlan fur wissenschaftliche Texte und Medien. https://doi.org/10.37626/GA9783959872188.0.099

Suh, E., Hoffman, L., Zollman, A., & Estevez Posadas, B. (2022). Measuring students' STEM Smart Skills: studying teachers' beliefs (pp. 35-43). In Bateiha, S., & Cobbs, G., (Eds.). Proceedings of the 48th Annual Meeting of the Research Council on Mathematics Learning. Grapevine, TX: RCML. https://rcml.memberclicks.net/assets/Proceedings/RCML%202022%20Proceedings.pdf

Presentations

Suh, E., Hoffman, L., & Zollman, A. (2022, August). STEM Smart: Five Ways to Support Students with the Mindset They Need for Their Future. Presented at the 16th Conference of The Mathematics Education for the Future Project. Cambridge University, UK.

Purdue University

Publications

Bofferding, L., Haiduc, A.M, Aqazade, M., Chen, L., & Kocabas, S. (in press). Using incorrect worked examples to investigate the consistency of first and third graders' measurement conceptions. *International Journal of Science and Mathematics Education.*

Huffman, A., Dietiker, L., & Richman, A. (in press). How the teacher and students impact the unfolding of mathematical ideas across a lesson. In A. Lischka, J. Strayer, J. Lovett, R. Jones, & E. Dyer (Eds.), *Proceedings of the 44th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education,* 119-127.

Lolkus, M., & Newton, J. (2022). Knowing the World Through Mathematics: Development of an undergraduate mathematics course for international social justice. In M. Suleiman, & T. Huber (Ed.), Beyond provincialism: Promoting global competencies in teacher and educator preparation. In Tonya Huber (Series Ed.), International Education Inquiries: People, Places, and Perspectives of Education 2030 (pp. 105-154). Information Age.

Newton, J., with Yackel, E. (2022). Justification in secondary math classrooms: Co-constructing context and process. In K. Bieda, A. Conner, K. Kosko, & M. Staples (Eds.), Conceptions and consequences of argumentation, justification, and proof (pp. 159-175). Springer.

Purdue's Mathematics Education summer graduation celebration.
Photo courtesy of Jill Newton

Zhou, L., Sapkota, B., Mbewe, R., Newton, J., & Phillion, J. (2022). Global social justice in education: Developing a virtual intercultural community of practice. In M. Suleiman, & T. Huber (Ed.), Beyond provincialism: Promoting global competencies in teacher and educator preparation. In Tonya Huber (Series Ed.), International Education Inquiries: People, Places, and Perspectives of Education 2030 (pp. 63-101). Information Age.

Betsy Berry, Travis K. Miller, Jill Newton, and Megan Staples are the editors of a new book:
Theory into Practice Special Issue (lots of HAMTE/Indiana Contributors) The Collective Endeavor of Learning: Reflecting on the Contributions of Terry L. Wood
https://www.tandfonline.com/action/showAxaArticles?journalCode=htip20

The House with the Blue Door: Personal and Professional Synergies for Theory and Practice in Mathematics Education
Travis K. Miller, University of Indianapolis, United States

Revealing Theory and Enhancing Practice: The Purdue Problem Centered Math Project
Sandra (Betsy) Berry, Purdue University-Fort Wayne, United States
Janell Uerkwitz, Tippecanoe School Corporation, United States
Graceann Merkel, West Lafayette School Corporation, United States

Collaborative Approaches to Enhancing Theoretical Perspectives and Pedagogical Insights
Gaye Williams, University of Melbourne, Australia

Inspiring New Teachers: Standing on Shoulders of Giants and a Look to the Future
Audrey King, Purdue University, United States
Michelle Chamberlin, University of Wyoming, United States

A Social Constructivist Introduction to Research on Teaching: Ivory Tower Transformed into Exhilarating Climb
Lindsay Keazer, Sacred Heart University, United States

Self-efficacy and Situated Learning Theories Beyond the Classroom
Carla Gerberry, Xavier University, United States

Negotiation, Argumentation and Participation: Three Basic Concepts Referring to Everyday Procedures in Teaching and Learning Situations in Mathematics Classes
Götz Krummheuer, Frankfort University, Germany

Supporting Teachers to Enhance Learning Opportunities for Maori and Pasifka students in New Zealand
Roberta (Bobbie) Hunter, Massie University, New Zealand

A Golden Braid: Weaving Terry Wood's Unique Threads of Humanity in Theory and Practice
Barbara Jaworski, University of Oxford, United Kingdom

Presentations

Betsy Berry, Travis K. Miller, Jill Newton, Megan Staples are presenting at the 2023 AMTE Conference.
The Collective Endeavor of Learning: Reflecting on the Contributions of Terry L. Wood
Thursday, February 2: 4:30 pm-5:45 pm, Astor Crowne Plaza, St. Charles B

Ana-Maria Haiduc is presenting at the RCML (Research Council of Mathematics Learning) Conference in March 2023 - Teachers' Beliefs as a Tool to Extend the Cognitive Equity Concept

Amanda Huffman and Leslie Dietiker are presenting at 2022 PME-NA Conference.
How the teacher and students impact the unfolding of mathematical ideas across a lesson
Saturday, November 19, 2022

Amanda Huffman Hayes is presenting at the 2023 Indiana STEM Conference.
The Story within Lessons: Highlighting Moments of Student Inquiry
January 12, 2023 at Purdue University

Congratulations to all 2022 graduates, including Purdue University's Dr. Bima Sapkota, Dr. Lili Zhou, and Dr. Michael Lolkus pictured above with Dr. Jill Newton. *Photo courtesy of Jill Newton.*

News

Purdue's Math Ed Seminar Group compiled a list of upcoming conferences to consider attending or presenting at. See the list here: https://docs.google.com/spreadsheets/d/1lvWGmvQdZeUnM1LHEBBpjP-gQr9u3w2ilya8veo_rCc/edit?usp=sharing

Purdue University – Fort Wayne

Publications

Alyami, H. (2022). A radian angle measure and light reflection activity. *Mathematics Teacher: Learning and Teaching Pre-K–12. 115*(6), 422–431. https://doi.org/10.5951/MTLT.2021.0217

Alyami, H. (2022). Defining radian: Provoked concept definitions of radian angle measure. *Research in Mathematics Education*. https://doi.org/10.1080/14794802.2022.2041470

Presentations

Hanan Alyami is presenting at PME-NA and AMTE about preservice mathematics teachers' conceptions about angle measure in a science context.

Taylor University

Presentations

Patrick Eggleton will be presenting "A Quick-Prep, Mathematically-Rich Lesson from Fold and Tear Tangrams" at the HAMTE/KAMTE Preservice Teacher Virtual Conference on November 11 at 10:30am.

News

The Taylor University mathematics education program renewed its NCTM national recognition in February 2022. In September, the education program was awarded the 2022 Frank Murray Leadership Recognition for Continuous Improvement from CAEP.

University of Indianapolis

News

Get the Facts Out (GFO) and the Mathematics Teacher Education Partnership (MTEP) are co-hosting the second annual pre-conference to the 2023 AMTE Annual Conference, Transforming Secondary Mathematics Teacher Preparation: Focus on Recruitment and Equity. The pre-conference is February 1, 2023, 9:00 a.m.-5:30 p.m. CST. Virtual participation will also be possible. The purpose of this one-day pre-conference is to support mathematics teacher educators committed to improving secondary mathematics teacher preparation by exploring two interconnected areas: (1) effective strategies for recruiting STEM teacher candidates, with a focus on secondary mathematics teachers but applicable to candidates at all levels K-12, utilizing the resources of and led by members of the AMTE Get the Facts Out (GFO) Task Force (see https://amte.net/content/get-facts-out); and (2) transforming secondary mathematics teacher preparation programs with a focus on equity and social justice, incorporating the expertise of the Mathematics Teacher Education Partnership (MTEP) (see www.mtep.info).

The program will kick off with two plenary sessions focusing on each area organized by the AMTE GFO task force and MTEP, followed by break-out sessions in the afternoon providing opportunities to dig more deeply into aspects of program transformation and recruitment. Details on the schedule will follow. The pre-conference offers a valuable opportunity to gain important insights into how you might improve your secondary mathematics teacher preparation program, particularly its recruitment strategies, as well as to network with others who have a similar focus. Please register for the pre-conference at this link (https://docs.google.com/forms/d/e/1FAIpQLSc_VxClc7nxNn44wTlwI6Bpy-kroWnBS3hjpbJ_vD74AbEflA/viewform) at your earliest convenience, as space is limited. A limited amount of funding will be available to support attendance at this pre-conference. Questions should be directed to Jean Lee at jslee@uindy.edu

University of Southern Indiana

Publications

Amador, J., Park Rogers, M., Hudson, R., Phillips, A., Carter, I., Galindo, E., & Akerson, V. (2022). Novice teachers' pedagogical content knowledge for planning and implementing mathematics and science lessons. Teaching and Teacher Education, 115. doi.org/10.1016/j.tate.2022.103736

News

Dr. Rick Hudson is part of a team that was recently awarded an IUSE grant from the National Science Foundation entitled "Enhancing Data Science & Statistics Teacher Education through E-Modules II [ESTEEM II]-Transforming and Building Community." The $2.5 million grant is a collaborative research grant with partners at North Carolina State University, Eastern Michigan University, and the Concord Consortium. The grant will build on the team's prior work to develop materials for use in preparing secondary teachers to teach statistics. The new grant seeks to transform the preservice preparation of secondary teachers in statistics and data science on a broader scale. The grant will include opportunities for mathematics teacher educators to engage in professional learning and research regarding problems of practice in data science and statistics education. https://ced.ncsu.edu/news/2022/10/06/hollylynne-lee-and-gemma-mojica-aim-to-transform-teacher-preparation-for-data-science-and-statistics-education-through-2-5-million-grant/

ICTM CALL FOR MANUSCRIPTS!

The Indiana Mathematics Teacher is the official journal of the Indiana Council of Teachers of Mathematics (ICTM) and **received the 2021 Publication Award for outstanding journal**. It is published twice a year and is distributed by mail to all current members.

The journal provides ideas and information for mathematics teachers at all levels of the curriculum (PreK-16). The editors invite submissions from new and experienced authors and accept articles on a range of topics including innovative classroom activities and lessons, practical applications of pedagogical research and theory, thoughtful reflections on challenges faced in the mathematics classroom, strategies and stories of mathematics coaching and teacher leadership, and any other topics that support the professional learning of ICTM members. **We especially encourage collaborations between PreK-12 teachers and higher education faculty**. Indiana residents whose feature articles appear in the Indiana Mathematics Teacher will be granted free membership to ICTM for one year.

Deadlines for Winter/Spring issue:
- •Feature articles should be submitted by January 1
- •Departmental manuscripts should be submitted by February 1

Deadlines for Summer/Fall issue:
- •Feature articles should be submitted by July 1
- •Departmental manuscripts should be submitted by August 1

Visit the ICTM (http://ictm.onefireplace.org/page-819122) and/or contact editors **Mark Creager**(macreager@usi.edu) and **Andrew Gatza** (amgatza@bsu.edu) for more information.

A NOTE ABOUT PERSPECTIVES SHARED:
*The perspectives presented in articles within issues of **HAMTE Crossroads** represent the views of individual authors and do not necessarily represent the views and positions of the HAMTE organization.*

Our dear newsletter editor, Amanda Huffman, got married a couple of weeks ago. We are happy for her and want the HAMTE community to celebrate her. Amanda, the Purdue Math Ed community is excited for you and wishes you the best in this new stage of your life!