Dear Science, Agriculture Education, Family and Consumer Sciences, and Extension and Outreach Educators:

It is with great pleasure that I invite you to attend one or more of the biotechnology or bioethics workshops offered in Ames this summer. Educators in public and private schools or those who work with youth in 4-H or other community programs can strengthen and update their STEM-based curriculums with modern content, techniques, and activities in biotechnology and bioethics, while earning professional development or Iowa State University graduate credits at the workshops.

The workshops, instructed by Clark Wolf and myself, will be held in the Biotechnology Outreach Education Center (BOEC) through the month of June on the Iowa State campus. Iowa teachers can receive stipends of $100 per day to help cover their costs of attending. ISU Extension and Outreach educators or personnel can receive travel reimbursements of up to $100 per day to help cover their expenses. Materials and stipends for the workshops are funded by Iowa State’s Office of Biotechnology and by the Iowa Biotechnology Association. Upon completion of any of the workshops, Iowa teachers and ISU Extension and Outreach educators are eligible to receive free supplies and equipment for specific lab protocols from the Office of Biotechnology.

Please share this invitation with your colleagues. I hope to see you in Ames this summer!

Sincerely,
Mike Zeller
Biotechnology Outreach Education Coordinator

Iowa State University Office of Biotechnology

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Don’t miss the Research Experiences for Teachers (RET) opportunities to work with Iowa State researchers. See p. 3.

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Biotechnology education workshops

Biotechnology Education Workshop I
Iowa State University, Ames
June 10-13, 2019

This workshop course is directed at science, agriculture, family and consumer sciences, and ISU Extension and Outreach educators who want to gain the basic knowledge and laboratory skills necessary to teach biotechnology in their classrooms.

Teachers will learn how to prepare and instruct the laboratories in DNA extraction and quantification from various sources, DNA transformation, DNA fingerprinting, antibiotic resistance, biofuels, and more. Educators will prepare and perform the lab protocols as the students would do in class.

Credits
• 2 professional development credits – cost to be announced
• 2 ISU graduate credits – cost to be announced

Stipend
• $400 stipend for Iowa teachers ($100 per day) funded by the Iowa Biotechnology Association

Travel
• Travel reimbursement available for ISU Extension and Outreach educators/personnel (up to $100 per day)

Registration deadline
May 28, 2019

Questions? Contact Mike Zeller, 515 294-5949, or mzeller@iastate.edu

Biotechnology Education Workshop II
Iowa State University, Ames
June 24-27, 2019

This advanced workshop is open to science, agriculture, family and consumer sciences, and ISU Extension and Outreach educators who have attended one of the previous biotechnology workshops.

Educators will learn how to prepare and instruct advanced biotechnology laboratories in their classrooms. Activities will include marker assisted selection, DNA isolation, recombinant DNA techniques, DNA amplification, restriction analysis of DNA, bioinformatics, sequencing, genomics, and more. Educators will prepare and perform the lab protocols as their students would do in class.

Credits
• 2 professional development credits – cost to be announced
• 2 ISU graduate credits – cost to be announced

Stipend
• $400 stipend for Iowa teachers ($100 per day) funded by the Iowa Biotechnology Association

Travel
• Travel reimbursement available for ISU Extension and Outreach educators/personnel (up to $100 per day)

Biethics workshop

Bioethics Workshop I
Iowa State University, Ames
June 17-20, 2019

This course is designed for educators who want to incorporate discussion of ethical issues into existing K-12 course work.

Participants will create case studies designed to integrate ethical content in the science curriculum, and which might also be used to address such issues for extension audiences.

The focus will be on ethical issues in science education, including especially agricultural biotechnology, but other bioethics topics will also be covered.

The workshop will also address pedagogical issues, including appropriate objectives for bioethics units, alternative approaches to bioethics pedagogy, and other issues that regularly arise in the science ethics classroom.
Iowa Biotech Opportunities

Workshop participants will work through activities and case studies that they can take back to their own classes.

Participants will work in groups to develop a participatory case study designed expressly for their own students and will leave with classroom-ready case study exercises for use in their own classes.

Credits
• 2 professional development credits – cost to be announced
• 2 ISU graduate credits – cost to be announced

Stipend
• $400 stipend for Iowa teachers ($100 per day)

Travel
• Travel reimbursement available for ISU Extension and Outreach educators/personnel (up to $100 per day)

Registration deadline
May 28, 2019

Questions? Contact Clark Wolf at 515 294-3068 or e-mail jwcwolf@iastate.edu.

There's no better way to learn a lab protocol than to do it yourself. Iowa educators who complete a workshop are eligible for free support materials and supplies for specific protocols.

Summer Research Experiences for Teachers

Iowa State University is offering middle and high school teachers the opportunity to participate in research experiences and develop on-going professional relationships with career scientists.

Participating teachers will be better prepared to share the latest developments in STEM fields with their students and to inspire them to learn more about science and engineering and their related career paths.

Major activities
Teachers will engage in cutting-edge research under the guidance of a faculty mentor and members of their labs for approximately 35 hours per week for six weeks.

Strong professional relationships with researchers from Iowa State will be developed through small group discussions about their research, leading to strategic partnerships that could bring new ideas into the classroom.

Teachers will have time to focus on their professional learning and will receive help in translating their summer learning into activities for use in their classrooms with master educators from the Des Moines school system.

Follow-up activities may include faculty and graduate student visits to teachers' high schools and opportunities for high school students to conduct small independent research projects.

Choose a research project
The Office of Biotechnology coordinates with faculty members from all across campus to offer a selection of research opportunities for teachers in engineering, technology, mathematics, life sciences, chemistry and many others. Teachers are encouraged to be specific about the type of research that fits their classroom best when filling out the application.

Learn more and apply
For more details, please visit the Office of Biotechnology's website at www.biotech.iastate.edu/RET or contact:

Dr. Jeanne Serb
Director
Office of Biotechnology
Ph. 515 294-7479
E-mail serb@iastate.edu

The deadline for applications is February 15, 2019.

Interested in working with Iowa State researchers this summer? Teachers can apply for a summer research experience. Contact Dr. Jeanne Serb for more information and apply before the deadline!
Iowa Biotech Expertise

Mike’s message . . .

The Winter 2019 edition of the Iowa Biotech Educator newsletter serves to officially announce the dates, location, and where to find specific information about our summer Biotechnology Education Workshops. All this information can be found on page 2.

The workshops offer you a chance to experience the most modern STEM techniques and concepts in life sciences. After completing a workshop(s), Iowa educators will be eligible for free equipment and supplies.

Please share this issue with your colleagues and/or direct them to our website (www.biotech.iastate.edu/for-k-14-educators/) so they, too, can benefit from the resources the Biotechnology Outreach Education Center (BOEC) can offer educators.

BOEC’s role in STEM

I want to remind you that the BOEC is here to help you enhance your STEM initiatives in life sciences with biotechnology resources. Just contact Lori Miller, lorimill@iastate.edu, or me anytime to order supplies or equipment, to schedule a visit to the BOEC, or to have your questions answered. I have arranged my schedule so that most days I am exclusively available from 7-8:30 a.m. weekdays, except when I travel. For immediate questions, my office phone is 515 294-5949 or email me at mzeller@iastate.edu.

Fall semester in the BOEC

This fall, I was kept busy teaching 65 pre-service teachers from agricultural education and family and consumer sciences programs here on campus. Along with teaching, I presented to 15 Iowa State sponsored and outside school groups, either here in the BOEC or at Iowa schools.

Typically, the demand for the BOEC outreach services is very high in the spring. Please order supplies and schedule visits as soon as your schedule allows for your spring classes.

For more information about event visits or field trips to the BOEC on Iowa State’s campus, please contact Lori or me to answer questions and/or schedule a date.

It was good seeing many of you at the Iowa Academy of Sciences Iowa Science Teaching Section conference at the Des Moines Area Community College (DMACC) FFA Center in Ankeny, Iowa. We were pleased to again display our new PCR equipment for loan and supplies for PCR activities that are available to schools. It’s always great to connect with the group of you who were able to attend the conference.

During the fall, I was developing and testing two protocol revisions. The first one is a marker assisted selection version using a cystic fibrosis scenario, and the second is a more efficient, research quality calcium chloride wash version for doing any of our transformations. Watch the website this semester for their addition to our protocol list.

PCR in your classroom

The BOEC is now making available thermal cyclers and high-speed mini-microcentrifuges to teachers to do PCR activity(ies) in their advance biology curriculums (see article on page 7). Depending on your individual equipment situations/needs, the BOEC can loan you the equipment and offer supplies, including alternative gel and PCR product staining methods to complete the TPA-25 Alu sequence activity. Additionally, each of the four thermal cyclers has been programmed with the most popular Bio-Rad and Carolina Biological protocols for purchased PCR activities. This flexibility allows you to use the Iowa State equipment to do these science supply companies’ PCR activities.

Planning for the spring semester

Remember, if you are planning a visit to the BOEC or need supplies, contact Lori or me as soon as you can to reserve dates and/or schedule deliveries. The spring schedule traditionally fills up fast, so please plan ahead. I hope you will let the BOEC and the Office of Biotechnology assist you in your life science STEM endeavors by bringing biotechnology into your classroom.

Have a great start to the spring semester.
**Iowa STEM Competitions**

Major award programs for which Iowa science educators or their students are eligible are featured below. For other award, competition, and grant opportunities for educators or students, visit the Office of Biotechnology's educational funding website at [www.biotech.iastate.edu/educational-awards-and-funding-sources](http://www.biotech.iastate.edu/educational-awards-and-funding-sources).

**State Science and Technology Fair March 28 – 29**

The State Science and Technology Fair of Iowa (SSTFI) will be held in Ames on Thursday and Friday, March 28-29. The fair is open to any student in grades 6-12 residing in or attending school (public, private, parochial or home school) in the state of Iowa.

The SSTFI is affiliated with the Intel International Science and Engineering Fair. All high school exhibitors at the fair are eligible for college scholarships. In addition, the top two individuals, the top team project, and their teachers will be awarded trips to the Intel International Science and Engineering Fair in Phoenix, Arizona, in May. All exhibitors in grades 6-12 are eligible for prizes and many other special awards.

As one of the fair sponsors, the Iowa Biotechnology Association (IowaBio) will be making five scholarship awards at the 2019 fair. The IowaBio scholarships will be awarded to the five students who exhibit the best use of biotechnology with their projects.

All Iowa high school students who exhibit top-level projects at the fair are eligible for the IowaBio scholarships, which are $2,000 if used at an Iowa school of higher education or $1,000 if used at an out-of-state institution of higher education.

The 2018 winners were Mason Burlage, Beckman Catholic High School, Dyersville; Cheryl Blackmer, Ballard High School, Huxley; Pearl Krieger Coble, Winfield-Mt. Union High School, Winfield; Aaron Wills, Central Lee High School, Donnellson; and Helen Hu, Ames High School, Ames.

In addition to the five IowaBio scholarships, the Association is working with the Biotechnology Institute, an educational foundation headquartered in Washington D.C., to award an Iowa BioGENEius Challenge Winner. The Iowa BioGENEius Challenge winner will compete at the International BioGENEius challenge in Philadelphia, Pennsylvania, next summer. The 2018 BioGENEius winner was Mason Burlage, Beckman Catholic High School, Dyersville.

For more information about the SSTFI, visit [www.extension.iastate.edu/sstfi](http://www.extension.iastate.edu/sstfi) or contact chairman of the board Jay Staker, e-mail jstaker@iastate.edu. Volunteers are being recruited to judge at this year’s event. For details, contact Vicki Speake, phone 515 294-5738.

**Ames Lab / Iowa State host science bowls**

**The Iowa Regional High School Science Bowl**

This year's Iowa Regional High School Science Bowl is scheduled for Saturday, January 26, 2019, on the Iowa State University campus in Ames. The event is hosted by the U.S. Department of Energy's Ames Laboratory and Iowa State University.

During the competition, teams of up to five students, including one alternate, answer questions from categories such as biology, chemistry, mathematics, physics, earth and space sciences, and energy.

The regional winning team is awarded an all-expenses-paid trip to compete in the Department of Energy's National Science Bowl® in Washington, D.C., from April 25-29, 2019. The 2018 champion of the Regional High School Science Bowl was Johnston High School.

**The Iowa Regional Middle School Science Bowl**

The science bowl for grades 6-8 will be Saturday, February 16, 2019, on the Iowa State University campus in Ames. This event also is hosted by the U.S. Department of Energy's Ames Laboratory and Iowa State University.

Participants will compete in a question-and-answer contest about life science, physical science, earth and space science, energy, mathematics, and general science. The winning academic team of the 2019 competition will receive an all-expenses-paid trip to the National Middle School Science Bowl® in Washington, D.C., to compete from April 25-29, 2019. Ames Middle School was the champion of the 2018 Middle School Science Bowl.

For more information

To learn more about the science bowls, go to [https://www.ameslab.gov/education/science-bowl](https://www.ameslab.gov/education/science-bowl) or contact Deb Samuelson at 515 294-9557, [debsam@ameslab.gov](mailto:debsam@ameslab.gov), or Steve Karsjen at 515 294-5643, [karsjen@ameslab.gov](mailto:karsjen@ameslab.gov).
Nominations from administrators, colleagues, or self-nominations are accepted continuously throughout the year by the Iowa Academy of Science (IAS) for its Excellence in Science Teaching Awards. These awards honor outstanding science teachers in Iowa’s K-12 schools. The submission deadline each year for completed application packets is January 31.

Iowa teachers of all grade levels in all science areas are eligible to be nominated in one of the eight nomination categories: elementary science, earth/space science/environmental science, general/multiple science, life science, middle school/junior high science, physical science, STEM (elementary, middle school, high school), and science supervisory. The awardees will be recognized at the IAS Annual Meeting to be held April 26-27 in Cedar Falls. For details, visit the website at www.scienceiniowa.org/awards or e-mail iascience@uni.edu.

I.O.W.A. STEM Teacher Award concludes 2019 competition

Nominations and applications for the 2019 I.O.W.A. STEM Teacher Award sponsored by Kemin Industries and the Iowa Governor’s STEM Advisory Council have closed.

The award, now in its fifth year, recognizes one teacher from each of the six STEM regions for their dedication and contributions to science, technology, engineering, and math (STEM) education for Iowa’s PreK-12 students. Each recipient receives a $1,500 award and an additional $1,500 to be used in their classroom.

The 2019 recipients will be recognized during events at their respective schools in January and at a statewide event in February. In honor of the fifth year of the award, all 30 of the past I.O.W.A. STEM Teacher Award recipients will also meet for a reception following the announcement of the 2019 winners. For a full list of final recipients of the 2019 I.O.W.A. STEM Teacher Award, visit https://stemaward.fluidreview.com for details at the end of January. Nominations for the 2020 I.O.W.A. STEM Teacher Award will open in the fall.

National STEM Competitions

Outstanding biology teacher award deadline on March 15

March 15 is the deadline for biology teachers of grades 7-12 to nominate a colleague or themselves for this year’s Outstanding Biology Teacher Award, sponsored by the National Association of Biology Teachers (NABT). Nominees are judged on their teaching ability and experience, cooperativeness in the school and community, and student-teacher relationships.

Please take the time to nominate a deserving colleague or yourself. Nomination instructions can be found in the Awards section of the NABT website at https://nabt.org/.

The deadline for Outstanding Biology Teacher Award nominations and most other 2019 NABT awards is March 15, 2019. For more information, contact Iowa's director for the award Doug Herman, Herman.Doug@iowacityschools.org, or Mike Zeller, mzeller@iastate.edu.

Presidential awards have March 1 and May 1 deadlines

March 1 is the deadline for online nominations of teachers of grades 7-12 for the Presidential Awards for Excellence in Mathematics and Science Teaching. Nominated teachers have until May 1 to submit their applications. Enacted by Congress in 1983, this award is the highest recognition that a U.S. mathematics or science teacher can receive. The awards are administered by the National Science Foundation.

The competition alternates each year between teachers of grades K-6 and grades 7-12. The award includes $10,000, a certificate signed by the President of the United States, a paid trip to Washington, D.C., and more. For details, e-mail info@paemst.org or visit www.paemst.org. Nominations should be done early enough to allow the nominated teachers time to thoroughly prepare their applications.
Free Biotech Resources

Want to do PCR? Borrow a thermal cycler, order free supplies from the BOEC!

Hundreds of Iowa students over the past few months have done PCR (polymerase chain reaction) lab protocols with equipment and supplies provided by the Biotechnology Outreach Education Center (BOEC) at Iowa State University. In addition to the equipment and supplies, the BOEC provides detailed instructions and advice along the way.

Thermal cyclers and more
With funding from the Office of Biotechnology and help from the Bio-Rad company, the BOEC has four thermal cyclers and shipping containers as part of the Biotechnology Public Education Program’s equipment loan program. The BOEC also can provide a 12-position mini-microcentrifuge to complete the special equipment needed to do PCR activities with classes.

Protocols
The TPA-25 Alu sequence protocol on the BOEC website (www.biotech.iastate.edu/laboratory-protocols) was written to use either 1) one size (P20) micropipettors found in the DNA fingerprinting kit in combination with various sizes of transfer pipets or 2) a combination of micropipettor sizes (P10, P20, P200 and P1000) that educators may already have available in their labs. When ordering a thermal cycler, a DNA fingerprinting kit, and a mini-microcentrifuge (if needed) from the BOEC, educators should be ready to provide information about the amount of equipment and supplies they require for their classes.

To make staining the PCR product after electrophoresis easier, a 50% mixture of Carolina Blu final stain diluted with distilled water and poured over the gel in a plastic bag or staining tray and left overnight produces dark bands with no destaining needed. The BOEC can also provide a stain for classrooms that have UV transilluminators available.

What the BOEC supplies
Equipment:
• Bio-Rad thermal cycler programmed for TPA-25 Alu sequence and the most popular Bio-Rad and Carolina Biological PCR kit protocols
• Mini-microcentrifuge (if needed) with 12 positions

Supplies/reagents for TPA-25 Alu protocol:
• PCR ready-to-go beads in 0.2 ml tube
• Chelex – add 9 ml of distilled water for final volume
• Alu forward and reverse primers
• Assorted disposable plasticware – transfer pipets, 1.5 ml tubes, 15 ml tubes, etc.
• Carolina Blu DNA staining supplies or migration dye with Gel Red DNA stain for use with a UV transilluminator

Also needed:
• DNA fingerprinting kit from the BOEC
• The TPA-25 Alu protocol is designed to use the P20 micropipettors, electrophoresis chambers, and power supply that are provided in the DNA fingerprinting kit.

Contact for information or to order
Lori Miller: lorimill@iastate.edu
Mike Zeller: mzeller@iastate.edu

The BOEC provides educators with free access to the reagents/supplies, thermal cyclers, and mini-centrifuges (left to right below) that they need to do PCR protocols.

Genetic Science Learning Center resource announced
https://teach.genetics.utah.edu

The Genetic Science Learning Center at the University of Utah has announced a new unit for teachers titled Evolution: DNA and the Unity of Life. This resource, based on work supported by the National Science Foundation, is an eight-week curriculum unit that explores genetics, DNA, and heredity.

The unit includes online multimedia presentations, interactive web-based exercises, and paper activities. The materials are presented on two parallel websites, https://learn.genetics.utah.edu for students and the public and https://teach.genetics.utah.edu for educators.

Five modules
The unit is organized into five modules that can be used individually or together in sequence. The goal of the modules is to increase students’ understanding of DNA as a blueprint for all living things, especially DNAs association with variations in traits that are involved in natural selection and the diversity of life.

The five modules are Shared Biochemistry, Common Ancestry, Heredity, Natural Selection, and Speciation. The unit’s activities align with the Next Generation Science Standards (NGSS).
About Iowa State’s Public Education Program in Biotechnology... 

Iowa State University’s Public Education Program in Biotechnology thanks donors for their generous support:
Sustaining donor: Iowa Biotechnology Association
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