

## **SIAM Activity Group Applied Mathematics Education Charter Renewal Application**

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Applied Mathematics Education. The SIAM Activity Group (or SIAG/ED) to which this renewal applies was originally formed under the aegis of SIAM in July, 2014 by the SIAM Council and in July, 2014 by the SIAM Board of Trustees with its initial operating period beginning 7/31/14 and ending 12/31/16. Its charter has been renewed by the Council and Board two times.

SIAG Statistics:

- This SIAG has 611 members, including 471 student members and 140 are non-students as of December 31, 2017
- There are 46 female and 88 male members who are non-students
- There are 117 domestic and 23 foreign members of this who are non-students

According to its Rules of Procedure, the objective(s) of the SIAG are:

- It is the purpose of the SIAM Activity Group on Applied Mathematics Education to advance the development and practice of educational programs, courses and resources in applied mathematics interpreted as broadly as possible. This will include but not be limited to organizing conferences, maintaining a curated web-based repository of resources in modeling, computational and applied mathematics and mathematical sciences including the applications domains. The potential constituencies of the SIAG will include college faculty in fields represented by SIAM's membership: faculty with an interest in applied and computational mathematics; this includes members with primary interest in applications domains; mathematics teacher educators, especially for in-service professional development (since SIAM's involvement in pre-service teacher education is not extensive); and graduate students in applied mathematical areas with ambitions for careers in academia with a strong education component. Within the framework of SIAM, the SIAG will conduct activities that implement its purposes.

The SIAG on Applied Mathematics Education will organize activities in Educational Innovation, Practice, Improvement and Faculty development. The SIAG is expected to:

1. Organize minisymposia at the SIAM Annual Meeting in years where there is no SIAG conference.
2. At least once every five years either organize a track of at least six minisymposia at the SIAM Annual Meeting or have an activity group meeting held jointly with the annual meeting. The VP for Programs and the VP at Large will coordinate the scheduling with the SIAG chair.
3. Organize a biennial SIAM Conference on development and practice of educational programs, courses and resources in applied mathematics. The SIAG will consider dovetailing specialized

workshops and conferences with the SIAM Annual meeting or other SIAG conferences. The chair of the conference organizing committee shall be either the program director or the chairperson of the SIAG or their designee.

The organizing committee must be approved by the VP for Programs at least 16 months before the conference.

4. With the approval of the SIAM Program Committee, the SIAG may organize special sessions at SIAM meetings, and conduct special one- or two-day meetings immediately before or after a regular SIAM meeting. Other SIAG meetings may be organized only with the approval of the SIAM president and vice president for programs.

5. SIAG meetings, workshops, and conferences may be organized only with the approval of the SIAM president and the SIAM vice president for programs.

To which have been added (list prizes, publications, conferences not included in the ROP):

6. The SIAG has complemented SIAM's activities and supported its proposed functions. The answers to the questions below indicate how this was accomplished and what the officers propose as the future directions for the SIAG.

List all current officers of the activity group (including advisory board, if relevant).

Chair: Ben Galluzzo

Vice Chair: Rosalie Belanger-Rioux

Program Director: Eric Kostelich

Secretary: Kathleen Kavanagh

*1. How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last two years?*

The field of applied mathematics education continues to be at the heart of training a workforce with 21st Century Skills and the ability to solve complex, open-ended problems across disciplines (and *between* disciplines). A push to graduate more STEM majors continues to be prevalent in the news. There is a growth of data analytics programs at the undergraduate and graduate levels bringing along a need to prepare faculty for teaching and advising those majors. At the K-12 level, the Common Core Curriculum continues to challenge teachers to meet the new standards. The SIAG/ED plays a key role in bringing awareness to these issues and offering support and solutions to the current challenges in applied math education.

*2. How is the activity group doing? Is it remaining vibrant? Is the size of the SIAG stable or increasing? How is the SIAG keeping up with the changes in the field? How are the broader interests of SIAM reflected in the activities of the SIAG?*

The size of our activity group has nearly doubled since the last charter renewal, with continued strong growth among students. Our activity group seeks to keep pace with the changes in the field by encouraging broad participation in our bi-annual conference (ED18).

Members of the activity groups also participate in many other efforts to foster ED related themes, often in leading roles (see previous answer). Our activity group specifically aims to introduce new opportunities for the teaching and learning of applied mathematics. For example, this year marks the launch of the Math Modeling Hub--an online community to foster and support math modeling across grade levels and promote solving open-ended real-world problems. One SIAG Committee member serves on the Math Modeling Hub Steering Committee. Another important contribution from a SIAG member and former SIAG/ED Vice Chair, Jeff Humpherys, is the completion of the SIAM text book series "Foundations in Applied Mathematics" which is an effort to improve curriculum so students are better prepared to meet the needs of the industrial workplace. Also, a new collaboration between SIAM and Mathworks has led to the continued success of the M3 Challenge, with two SIAG Committee members serving on the problem development committee and judging at all levels.

*3. Please list conferences/workshops the activity group has sponsored or co-sponsored over the past two years, and give a brief (one sentence or phrase) indication of the success or problems with each.*

ED16, September 2016, Philadelphia, PA. There were five plenary talks, 20 mini-symposia, three contributed paper sessions, one multi-session minitutorials, and the poster session, with more than 160 attendees. The meeting was held jointly with the inaugural meeting of the SIAG on Mathematics for Planet Earth. This was a successful inaugural conference. Moreover, the minitutorial, which focused on math modeling was taped and produced as an instructional video that has been numerous times.

ED18, July 2018, Portland, OR. This will be the second conference of the SIAG and will be held in conjunction with AN18. There are six scheduled plenary talks (one of which is a joint talk with AN18), 22 minisymposia, and three contributed paper sessions.

--Below is a partial list of other activities. SIAG/ED affiliation was sometimes informal.--

- JMM, January 2017, Atlanta, GA. A session on the GAIMME Report (Guidelines for Assessment and Instruction in Math Modeling Education) was organized and presented by SIAG members.
- AMTE 2017, February 2017, Orlando, FL. A minisymposia on the GAIMME Report was organized and presented by SIAG members. The session was well attended and a number of attendees sent emails to the presenters in the weeks following the meeting.
- AN17, July 2017, Pittsburgh, PA. A panel session on the GAIMME Report was organized by SIAG members. Additionally, a session on "Adapting Our Departments to Learn About and Support Diversity in Mathematics" was organized by a SIAG member, with talks on NSF program funding for underrepresented students, supporting students with hearing loss, and how to begin having conversations about inclusion in our departments. The session was well attended and prompted discussion on the topic. This session, as well as a similarly themed session at ED16 were catalysts for making Inclusion and Diversity a major theme of ED18. There will be three sessions and an invited speaker addressing these topics.

- NCTM, April 2018, Washington, D.C. A session on how high school teachers can use math modeling contests to engage students in modeling activities in their mathematics classes.
- Math Modeling Workshop for Teachers, July 2018, Portland, OR. The workshop registration has already filled to capacity (70 teachers).
- MPE18, October Two-part minisymposia on Mathematics for Planet Earth Education as well as a mini-tutorial on Mathematics for Planet Earth Research Experiences for undergraduates.

*4. Please indicate the number of minisymposia directly organized by the activity group at the next planned SIAM annual meeting. When will the SIAG organize a track at an annual meeting or meet jointly with the SIAM Annual Meeting?*

See details above--in 2018, SIAG/ED will meet jointly with the SIAM Annual Meeting.

*\*Because of the number of Activity Groups, the current guidelines are that an Activity Group should organize a track about every seven (7) Annual Meetings or meet jointly with the Annual Meeting within a seven (7) meeting period.\**

*5. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and web sites. Have each of these been active and successful?*

Two SIAG Officers (Galluzzo and Kavanagh) co-authored the guidebook *Math Modeling: Computing and Communicating* in collaboration with Rachel Levy (exiting Vice President for Education) and Karen Bliss of Virginia Military Institute. Over 6,000 published copies of an earlier guidebook *Math Modeling: Computing and Communicating* have been distributed and it has (as of December 2017) garnered more than 16,000 unique on-line views on the SIAM M3 Challenge site; we expect similar results for this publication. Development and publication of the guidebook was supported by Mathworks.

Galluzzo and Kavanagh co-authored the 2018 M3 Challenge Problem focusing on food waste and food security and served as triage, contention, and final judges. They are serve on the SIAM M3 Challenge Problem Development committee to vet problems and work with authors and ultimately provide in-depth modeling experiences for high school students. The SIAG is also solicited to submit problems. Nearly 5,000 students participate in the M3 Challenge annually.

The April Issue of SIAM News featured an article about the above work titled *Quantifying, Reducing, and Repurposing Food Waste*.

As noted above, the Math Modeling Hub will launch at ED18. Members of the SIAG have worked to develop and build this website that will serve as an interactive repository and community "home base" for educators interested in math modeling.

*6. What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.*

Because of the broad scope of SIAG/ED initiatives, both across disciplines as well as education levels, we plan to create an Advisory Board. The focus of the Advisory Board will be to provide feedback, support, and advice on initiatives such as soliciting articles for SIAM News, suggesting speakers for conferences, and broadening our reach to promote SIAG/ED activities. The advisory board will consist of experts in applied math education across the K12, undergraduate (community colleges and teaching colleges), and graduate levels to help build a stronger continuum in our efforts; additionally former SIAG/ED board members will be considered for this role for purposes of institutional memory.

The Math Modeling Hub (MMHub) has great potential to foster dissemination of SIAG/ED activities and strengthen interaction between SIAG members. SIAG members currently serve as MMHub Steering Committee; we anticipate identifying a permanent role in the Steering Committee for a SIAG member.

We also hope to identify a different conference registration fee to ensure that SIAG/ED meetings are accessible to our broad, and in some cases, non-traditional membership; including but not limited to students, K12 teachers, and math teacher educators.

In general, we hope the next leadership team will work to strengthen communication with members in terms of newsletters, announcements, and perhaps the incorporation of social media.

Another initiative should be to work with SIAM student chapters to connect with Teaching Assistants to encourage participation in the SIAG and their activities. Sponsoring events at Student Chapter Days could be another way to do this.

Finally, we would like to institute a program similar to the [Workshop Celebrating Diversity](#), which would give financial support to underrepresented speakers addressing applied math education issues at SIAM meetings (not solely at ED meetings).

*7. How can SIAM help the activity group achieve its goals?*

The SIAG would benefit from solicitations to members for articles/blog entries for SIAM News with assistance from those editors. Connecting with student chapters can be facilitated by SIAM.

We mentioned initially that this SIAG has a large proportion of student members. We need help in ensuring these student members remain active SIAM and SIAG/ED members after graduation, particularly if they become instructors at non-research universities and colleges. SIAM can help by sharing career information and incentives with students so they can continue their involvement. We also believe that SIAM can provide assistance by making ED-related conferences affordable and accessible for all our members. We would also welcome other SIAM advice on taking advantage of opportunities to engage junior mathematical scientists, pre-service teachers, and teachers.

It would also be valuable to connect with the leadership of other SIAGs to get a better understanding of how they operate, compare experiences, identify common problems, and identify and address areas of common interest. For example, our SIAG has members also connected with other SIAGs; we plan to borrow some of their ideas and we know that there are many other great ideas that we would love to incorporate into our group. We also hope that SIAM will help us to improve communication through social media with members of our SIAG and beyond.

We would also like an easier process of soliciting and associating sessions at SIAM meetings that are organized by other SIAGs. For instance, sessions are often organized at meetings with ED themes, and by ED members. However, the SIAG leadership does not know about these sessions and therefore cannot include them in their decision making and their reports. Also, it would be helpful to have common and easy to find guidelines for sponsoring minisymposia at conferences of other SIAGs.

*8. How can the activity group help SIAM in its general role of promoting applied mathematics education?*

SIAG/ED is an opportunity for SIAM to facilitate connecting mathematicians across educational levels (K12 teachers through faculty/industrial partners) to promote applied math education and tools for solving real world problems, workforce preparation, and continued professional development and mentorship.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a 2 year operating period beginning January 1, 2019.

A handwritten signature in black ink, appearing to read "Ben Galluzzo". The signature is fluid and cursive, with a large initial "B" and "G".

Ben Galluzzo, SIAG/ED Chair

May 31, 2018