SCUDEM IV 2019

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Overview

We offer an invitation for nationwide (and more) SCUDEM IV 2019 at local schools around the country (and beyond!) with Challenge Saturday, 9 November 2019, for schools within a two hour drive of the local sites. We shall be posting site locations as their numbers grow. If you are interested in having a three member student team register and engage or hosting SCUDEM at your school then please do so now. SCUDEM IV 2019 registration opens 1 September 2019 and runs through 25 October 2019.

The high school and undergraduate student team (3 students per team) challenge takes place over a week-long period that begins on Friday, 1 November 2019, at each team's individual home campus and culminates on Saturday, 9 November 2019, at a regional host site. Beginning on Friday, 1 November 2019, three member student teams can access three modeling scenarios involving differential equations, posted at our SIMIODE website. They select one on which to work. These teams will work at their home institution, developing approaches and solutions to their chosen modeling scenario. The scenarios are designed so that every team may experience success in modeling, building their skills and confidence in differential equations. Each team will prepare a draft Executive Summary and 10 minute Presentation to bring to the regional host site on Challenge Saturday, 9 November 2019. There, student teams will work on a small modification of the modeling scenario they have selected (for example, effects of new assumptions, variables or changes in parameters) for inclusion in their final Presentation, NOT their Executive Summary, though. They are NOT to redo their model, rather they are to discuss how this new modification might be incorporated in their model and what outcomes they might expect in view of this new modification.

In the morning faculty will participate in faculty development experience to help them incorporate more modeling in their coursework. SIMIODE has complete, off-the-shelf, ready-to-go, faculty development materials available and will work with local campus coordinators to tailor the workshop as needed. Student teams will address the expansion to their problem for inclusion in their Presentation, adding any additional details needed. The first portion of the faculty development program will involve students as well as all engage in a real-time modeling activity and discuss their different perspectives.

Teams will submit their anonymous Executive Summary (paper copy) at registration/check-in without addressing the additional issues for morning judging by faculty. Then at noon local site time student teams will submit their fully identified electronic Executive Summary and Presentation files to challenge monitors for posting at the end of SCUDEM IV 2019. Their Presentation will be used in afternoon sessions and must address the additional issue for judging efforts.

During the afternoon session, each team, in one of several tracks of four teams, will give a 10

minute Presentation, scored by an audience of coaches, faculty, and participating students. The challenge culminates with an awards ceremony rounding out the day by 4:30 PM to allow time to travel home.

There is a $100 registration fee for each coach-team pair which includes both faculty development workshop and team participation. Additional teams from the same school, with each team having its own coach, preferably, may also register for $100 for each additional coach-team pair. All teams must have a faculty coach. Registration fees are paid through SIMIODE's PayPal portal using a credit card which will be open from 1 September 2019 - 1 November 2019. Additional faculty, who are not coaching a team, may join workshop and judging activities at no cost. Membership in SIMIODE is FREE.

Helpful Comments from Previous SCUDEM Events Problem Author

We have posted Commentary and Overview on the Problems for SCUDEM I 2017 problems from the problem author, Dr. Kelly Black, of the Department of Mathematics, University of Georgia, Athens GA USA. This is a very worthwhile read, highlighting good practices in modeling and communicating results. Further we have posted Commentary and Overview on the Problems for SCUDEM II 2018 from Dr. Kelly, who authored the problems for SCUDEM II 2018. Commentary and overview for SCUDEM III 2018 will be posted soon.

Assumptions/Rules

An Executive Summary is typically a Summary of the results which is forwarded to an Executive for a decision. It might well be named Essential Summary, for it should have the essentials of the activity described, with attention to terms, definitions, assumptions, details, results or conclusions, and reflection, but NOT be laden with computations or reference material. Specific details with respect to format, content, and style will be issued to all student competitors after registration closes on 25 October 2019.

1. This challenge is for three member teams of students at the high school or undergraduate level.
2. Registration begins 1 September 2019 and closes 25 October 2019. Team member and coach names are due 25 October 2019.
3. Challenge begins one minute after Midnight EDT Friday, 1 November 2019, with posting of three problems for selection by teams, and closes with submission of Presentations on Challenge Saturday, 9 November 2019, at noon local site time.
4. Teams register weeks (1 September 2019 - 25 October 2019) before the challenge with team members registering for SIMIODE and SCUDEM and filling out a pre-event survey. Also coaches register at SIMIODE and SCUDEM and fill out pre-event survey.
5. At one minute after Midnight EDT Friday, 1 November 2019, teams can access and select the one problem on which they wish to work. Problems will be from 3 different areas: physics/engineering, biology/chemistry, and social sciences/humanities.
6. During the period, Friday, 1 November 2019, through Challenge Saturday, 9 November 2019, teams work on their problem at their home institution, producing a two page

Executive Summary and a 10 minute Presentation to bring (electronically/physically) to local site.

7. ***NO animate assistance to the team is permitted on the problem effort.***
8. On Challenge Saturday morning the following break outs will occur from 9 AM to 10:30 AM at local site
    - Faculty meet for judging Executive Summaries and initial faculty development activities on using modeling in teaching.
    - Student teams go to separate rooms to address an additional issue posed for each problem and incorporate the results of their efforts in their Presentation. Students DO NOT redo their model.
    - Students join faculty in active Modeling Scenario and overview of SIMIODE resources.
    - Students join faculty for first portion of faculty development workshop in which all participate in a real modeling activity and share each others' perspective on the process.

At morning check-in teams submit (10) paper copies of their anonymous Executive Summary at registration without addressing the additional issue offered. Then, at noon local site time, student teams submit their identified electronic files for their Executive Summary and their Presentation, the latter ONLY addressing the additional issue to monitors for judging efforts. All files will be published in SIMIODE for review and consideration by future coach student participants.

Role of the Coach

The role of the Coach for each team is to prepare the team members for participation in SCUDEM IV 2019, and NOT to assist in any way with modeling efforts during the period of the challenge 1 - 9 November 2019. Indeed, both coaches and team members will be asked to sign an Integrity Statement at Registration on the morning of Challenge Saturday, 9 November 2019, which reads, “I, the undersigned, hereby state that during the challenge period, 1 - 9 November 2019, I have not received any animate assistance with regard to the SCUDEM problems as a student competitor. Neither have I given any assistance to any member of a team as a coach.”

Specifically, before 1 November 2019, but not during the challenge 1 - 9 November 2019, a coach can organize the team; meet with team members to discuss technical materials; go over past SCUDEM modeling problems and student submissions; go over with team members the comments from the problem poser from past SCUDEM events on what good modeling should be; help students develop good presentation skills and concise writing and communication efforts; and go over the requirements for SCUDEM IV 2019. The coach should make sure students understand what is expected of them in terms of deliverables: (1) a two page Executive Summary and (2) a 10 minute Presentation, both to be delivered on Challenge Saturday, 9 November 2019.

One thing the coach should do before the challenge begins is to stress the need for the team to settle on one of the three problems offered (and not carry forth with several problems’

analyses) in the first day or so and move on to success with their model building on that one selected problem. Further, coaches should stress that there is no one right answer, but rather SCUDEM is about demonstrating the modeling process as applied to the problem of their choice. Formulating and communicating their efforts is of utmost importance.

Coaches need to emphasize that ALL team members must participate in all aspects of SCUDEM, modeling, writing, and presentation.

Certainly, coaches may interact with their team members during the challenge period, but under NO CIRCUMSTANCES should there be technical discussions about their modeling efforts on their problem of choice. This is THEIR chance to develop and grow. Coaches should let students bloom.

The role of the Coach for a SCUDEM team of three students is to coach.

The Coach is NOT to engage in any challenge problem activity for the challenge itself, e.g., students are to work on their model and then prepare Executive Summaries and Presentations WITHOUT ANY assistance from a coach. From when the problems are initially posted until the end of Challenge Saturday the coach is to let the students grow and learn on their own.

Here are some things for coaches to consider.

1. Help form a team, perhaps through coach's class, Math Club, word of mouth, posting a flyer, etc.
2. In building a team, try for diversity of skills, e.g., not all programmers, not all "dreamers" – a blend.
3. Find a nearby local site which and register as Coach with team registrations to follow before 25 October 2019.
4. Plan transportation to and from a local site on Challenge Saturday, 9 November 2019. Make sure you assure them of meal arrangement – teams pay for lunch at local site. Also discuss meals in transit. Be sure they have needed money for an all-day outing.
5. Make travel arrangements, i.e. meeting and return drop place; allotted time, mode, and travel route; driver or other transportation; meals in transit; parking (local site host coordinator will provide this information).
6. Meet with team to go over exactly what SCUDEM IV 2019 is all about, e.g., timeline, requirements, expectations.
7. Go over past SCUDEM problems and student submissions. Discuss how to attack the model first in practice sessions and then examine other students' submissions. Talk about how to select which problem to do.
8. The three SCUDEM problems are in these domains (i) physical sciences or engineering, (ii) life sciences or chemistry, and (iii) social sciences. So make sure students know that there could be interesting modeling and learning experiences in SCUDEM outside their main area of study.
9. Stress general modeling strategies; go over a complete modeling cycle from assumptions to model building to solutions and interpretations to parameter estimations or data fitting to revisiting reality to communicating final results in Executive Summary

and Presentation; point out differential equations solution methods; make sure student accounts and access to computation tools are in order; visit with them informally during the week to see if they are making progress – ask about their pace, their attention to school work and personal life(!) as well as time on task for SCUDEM; and perhaps offer them some nutritional snacks

10. Read the instructive essays by the problem poser for past SCUDEM events in response to student submissions. These documents emphasizes what the problem poser had in mind and also how students addressed issues as well as technical aspects of materials submitted.
11. Share some of your readings concerning modeling principles and good approaches.
12. Meet with students occasionally during the challenge period to be sure they are aware of the rules and expectations.
13. Email students from time to time to give moral support, send them some funny math stuff for chuckles.
14. Ascertain if they are getting rest and maintaining a rich student life.

DO NOT engage in discussions about the model itself or students' strategies during Challenge Week.

Challenge Saturday 8:30 AM – 4:30 PM (Local time)

Judging, Fellowship, Awards

8:30 AM	Teams arrive at local site. Debriefing, confirmation/registration, tour of facilities. Ten copies of paper version of two page Executive Summary submitted,
9:00 AM	• Faculty meet to judge Executive Summaries and for Faculty Development I to engage in modeling activities in differential equations and other courses. • Student teams go to separate rooms to address an additional issue posed for each problem and incorporate the results of this efforts in their Presentation. • Presentation submitted electronically by noon. All break for lunch. All pay for their own lunch in institution dining area or other local offering.
10:30 AM	During Faculty Development I faculty and students combine for real modeling activity after which they share their perspectives.
1:00 PM	Faculty and students return to designated rooms. Faculty engage in Faculty Development

	II in which faculty share modeling experiences and discussions on modeling in differential equations coursework, while students compete in fun Math Bowl for individual awards.
2:00 PM	Teams make Presentations— tracks of 4 Presentations each —10 minutes each, 5 minutes for questions, and 5 minute break between Presentations for scoring by faculty judges. (Total 2 hours.) Teams must indicate how they incorporated the additional issues posed in the morning.
4:15 PM	(15 minute) Award presentations for Outstanding, Meritorious, and Successful team modeling and first, second, and third place for individual MathBowl competition with departure at 4:30 PM.

Objectives:

1. Offer students modeling opportunities in one area of mathematics, differential equations, to practice modeling skills and permit focus on modeling approach and mathematics.
2. Foster the value and applicability of differential equations.
3. Develop visual and verbal communication skills through written Executive Summary and oral Presentation.
4. Bring faculty coaches together for Faculty Development to experience modeling activities and share ideas and activities from their own teaching in modeling with differential equations and other courses.
5. Get students to think about value in teaching with modeling and invite exceptional student efforts to submit a full write-up for peer-reviewed Modeling Scenario publication in SIMIODE.

SCUDEM Offerings:

- Create a supportive and competitive environment for modeling at host sites (for schools within a 2 hour drive) that builds camaraderie for students through team work.
- Give students feedback on their work through seeing other group presentations, receiving feedback from on-site judges, and receiving final awards.
- Offer faculty development activities for modeling in teaching.
- Recognize creative skills and communication of students.
- Have an enjoyable experience for faculty and students.
- Period of time is given to invited teams with exceptional results to write-up their materials as publication-quality Modeling Scenarios, ready for SIMIODE referees.

Benefits for school, students, and faculty

School:

For each school there is the fact that a team has represented the school on the fields of friendly strife, received an award certificate for work on a model in response to a real-world situation, and the possibility of publishing their results. Most importantly, there is individual and school recognition as well as participation and dialogue with peers.

Students:

For students there is the camaraderie of the three person team and the opportunity to meet with other students from other schools who are passionate about applying mathematics and share the same SCUDEM experience. For students of mathematics to be honored as a team effort is very motivating and students who compete in the COMAP MCM/ICM say, unequivocally that the time spent was the best undergraduate mathematics experience they have had. While on a different scale, SCUDEM generates a comparable response. There is an award certificate for their work on a model in response to a real-world situation and the possibility of on-line publication as a Modeling Scenario in SIMIODE.

Faculty:

Faculty make contacts with others who are interested in modeling in their coursework, contacts which can function and last as they are made at the regional level. Faculty can come away from discussions held at the challenge site refreshed with new ideas from other faculty, proud of what their students can accomplish, and in touch with new found professional friendships.