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Information Assurance Model-Eliciting Activities for Diverse Learners

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Abstract

There is the need in colleges and universities across the country to attract students to the field of Computer Information Assurance and Security and support those students through a program of study that will culminate in their graduation and subsequent employment in the field. Simultaneously, there is a need to attract students, especially populations of underrepresented students, into the areas of science, technology, engineering, and mathematics (STEM). This paper addresses both of those needs by exploring open-ended problem solving with the use of model-eliciting activities (MEAs) and applying the same to problems that deal with information assurance and security. The specific example explored in this paper deals with middle school students forming teams to develop problem solutions and procedures for questions of collection, storage, and retrieval of various kinds of data, using acceptable confidentiality, integrity, and availability guidelines and screenings.

1. Introduction

Model eliciting activities are an instructional strategy that are grounded in constructivist learning theory and are aligned with discovery learning approaches. Therefore, before discussing what model eliciting activities are and what types of learning outcomes are targeted with model eliciting activities, we first provide a very brief overview of constructivism and discovery learning.

At the heart of constructivist beliefs about teaching and learning is the notion that learners must actively construct or build knowledge and skills. While this may not appear to be significant, when compared to cognitive approaches, it is. Cognitivist approaches assume that the mind is an empty vessel and information or knowledge is an object that is fed into the empty vessel. Cognitive approaches tend to focus on instructional approaches that transmit information in effective and efficient ways. The focus tends to be on the nature of the information and the information transmission. In contrast, constructivist approaches assume that information exists within these built constructs rather than in the external environment. Constructivism assumes that individuals bring experiences with them to each learning task and these experiences must be accounted for when constructing new knowledge. Advocates of constructivism agree that it is these experiences along with the individual's processing of stimuli from the environment and the resulting cognitive structures that produce adaptive behavior, rather than the stimuli themselves (Harnard, 1982). There are a variety of learning approaches that stem from the research in constructivism including project based learning, problem based learning, and discovery learning to name a few.

Discovery learning has been defined by Jerome Bruner as “all forms of obtaining knowledge for oneself by the use of one’s own mind” (1961, p.22; as cited in Driscoll, 2000, p. 229). Discovery learning does not suggest a random event, but rather learners devising strategies for finding irregularities and relationships within the environment (Driscoll, 2000). Occurring through the construction of new knowledge gathered from the discovery environment and building on an existing knowledge base, a discovery learning environment allows, even requires, learners to perform in an authentic situation, whether performing an experiment, performing hands-on exploration, solving a problem, creating a project, or developing a product. There are several key elements of discovery learning that are considered essential for any discovery learning experience. They are: 1) guided practice in the discovery/inquiry process, 2) sufficient prior knowledge, 3) reflection and contrasts, and 4) contrasts that lead to cognitive conflicts (Driscoll, 2000). In discovery learning the teacher does not typically present information to the learners; rather the role of the instructor is to provide cognitive tools, support, and collaboration opportunities that support and progress the discovery learning experience. Discovery learning can be applied through a number of different approaches; one of those approaches is Model Eliciting Activities.

What are model eliciting activities (MEAs)? Model eliciting activities are grounded in constructivism and more specifically discovery learning, but these instructional activities have several specific attributes. MEAs are open ended scenarios that require students to evoke a mathematical model to explain a phenomenon or solve a real world problem. MEAs require that learners first engage in problem identification and then progress to problem-solving. MEAs require that learners work to "construct" or develop a solution to a problem. When MEAs are used, learners are often actively engaged in solving or troubleshooting the problem at hand. MEAs engage students in problem solving in science, mathematics, engineering, and technology. MEAs go beyond simply engaging students in STEM problem solving by requiring students to construct a meaningful mental model of an important STEM construct. By this we mean that an important goal of MEAs is that learners discover or construct a powerful conceptual tool, such as proportional reasoning, Boolean logic, force. MEAs require students to go beyond simply developing the mental model; an effective MEA will require that students also test, revise and refine the mental model(s) over a series of activities. In other words, an MEA is not a single instructional task; rather it is a series of coordinated, intended activities that engage students in model development, testing, revision and refinement; these are sometimes referred to as model development sequences (Lesh, Cramer, Doerr, Post, & Zawojewski, 2003).

As instructional tools, MEAs have been shown to encourage diversity of student participants and to engage students in critical thinking, both of which are important goals in STEM education and more specifically in information assurance. All too often, students in underrepresented areas of this country, particularly in large urban school districts, encounter learning environments that fail to equip them with the types of instruction and the types of content material that allow for or foster discovery learning. These same students are often plagued with inadequate resources in their classrooms (Report of Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development, 2000). Consequently, by the middle school years many of them shy away from studying mathematics and science. Brand and Glasson also suggest that teachers find it increasingly difficult to understand and formulate instruction to address the many different cultures and subcultures represented in today's classrooms. (Brand & Glasson, 2004). MEAs have been found to be very useful in stimulating the participation of students of all backgrounds in problem solving and discovery learning because they allow those students to draw on their past experiences while at the same time receive guidance from their teachers in acquiring new knowledge in the context of the MEA problem-solving process.

The two primary ways that MEAs encourage critical thinking are through collaborative learning and the model development cycle. When MEAs are used, students work in groups or teams and are required to reveal their individual and group thinking as they sort through the problem and a reasoned conceptual solution. This activity contributes to engagement in critical thinking about one's own thinking as well as about the problem at hand. As students develop a conceptual system that will address the problem at hand, they are required to produce a product that is reflective of their thinking. This provides another opportunity for students to reflect on their own thinking as their thoughts become tangible objects that they, and not just the teacher, can critique. Once groups have developed a model, MEAs often require students to test the robustness or stability of their model by applying the model to a novel situation. Frequently this activity results in the identification of the incompleteness or insufficiency of the model, again this type of feedback contributes to the development of students' reflective and critical thinking.

What better content material to use for providing novel situations for MEAs than the many and varied facets of computer information assurance and security (abbreviated IA) – material that is at once topical, informative, and real-world oriented. IA is a relatively new area of exploration within STEM. However, it contains an abundance of problem-solving scenarios that can be used to suggest novel situations, in the context of which MEA mathematical models can be created and tested. These scenarios may include things such as the protection of networks and databases from intrusion and corruption, the creation and use of encryption keys and protocols, the calculation of risk determination factors in safeguarding a myriad of information assets in an organization, various computer ethics scenarios, and the like.

Section 2. Use of Information Assurance MEAs with Diverse Learners.

Model-eliciting activities are ideal for teaching diverse learners. Students included in that category are often from underrepresented groups, such as females, Native Americans, African Americans, Hispanics, Asians, rural students, and second-language students (students for whom English is their second language). The MEA outlined in this paper targeted inner-city middle schoolers, largely African-American, but it could have been applied just as easily to mainstream students as well as students in any of the other underrepresented groups.

The beneficial effects that can be expected from (1) combining open-ended information assurance problems for content and MEA methodology for discovery learning experiences, and (2) making this combination available in classrooms with diverse student populations, particularly in underrepresented locations, is palpably exciting. It has the potential of mitigating the problem of chronic lack of resources in such schools because the major resources needed for MEAs are a proposed scenario and the students' thinking ability. It also has the potential of increasing the performance and confidence of individual students as they build successful demonstrations of problem-solving skills.

Very basically, model-eliciting activities consist of the following six components: (1) model construction, (2) a reality component, (3) self assessment, (4) model documentation, (5) establishment of construct share-ability and re-usability, and (6) establishment of the model as an effective prototype.

The model-construction phase of an MEA ensures that there will be the construction of an explicit description, explanation, or procedure for a mathematically significant situation. Students must provide the mathematical model of the conceptual system that they develop when solving the MEA, and they must explain what the elements are, what relationships exist among elements, and what the operations are that describe how the elements interact. They must also make sure that the elements of the model, and their units of measure, are appropriate within the MEA.

The reality phase of an MEA requires that the activity be posed in a realistic STEM context – in this case, information assurance context – and be designed so that the students can interpret the activity meaningfully from their different levels of mathematical ability and general knowledge. Teachers must make sure that the context of the MEA is described in a real world story – one that will provide the students with the knowledge that they will need to bring to the problem as well as the background information that they will need. Teachers must ensure the open-endedness of the statement of the problem, so that there is not just one right answer.

The self-assessment phase is essential for discovery learning. The designer of the MEA must ensure that the students receive criteria that they can use to identify, test and revise their current ways of thinking as they move toward a solution to the problem. This may involve revisions to the students' models or procedures.

In the model documentation phase, students are required to create some form of documentation that will reveal explicitly how they are thinking about the problem situation and also that will record the procedural steps and mathematical model that they propose to reach the solution.

The construct share-ability and re-usability phase requires students to produce solutions that are shareable with others and modifiable for other STEM (or information assurance) situations. Their solutions must be shown to be generalizable.

Finally, the effective prototype phase ensures that the solution generated provides a useful prototype, a metaphor, for interpreting other situations – in this case, other situations within and outside of information assurance. Students should be able to give other examples of structurally or conceptually similar problems that would require a similar solution. If students from limited backgrounds find this phase particularly difficult, this would be a good place for the teacher to offer encouragement and suggestions.

Among the expected learning outcomes for diverse learners are the following:

1. Gets students used to scientific thinking.
2. Gets them used to thinking across disciplines.
3. Gets them away from teaching by rote.
4. Exposes them to real-world problems.
5. Exposes them to open-ended problem solving.
6. Gets them ***involved*** in problem solving and in creating a ***process***.
7. Engages their imaginations.
8. Engages their innate curiosity.
9. Engages their ability to brainstorm, analyze, be creative.
10. Fills a gap, mentioned in literature, between 'have' and 'have not' schools with respect to the abundance of resources and lack of resources.
11. Students use brain power more than tools and instruments, etc.
12. Students can feel that what they are doing is useful in a real sense.
13. Encourages students to do self-assessment and determine what they know, when they know it, etc
14. Requires that the students interpret an activity meaningfully from their different levels of mathematical ability and general knowledge.
15. Requires that students be able to come up with an explicit description, explanation, or procedure for a situation that has mathematical significance.

Expected outcomes #1 and #2 above are based on the fact that MEAs require students to observe carefully, formulate a problem statement accurately, devise a solution, try it, analyze results, and possibly revise the solution and try again. This always involves some aspect of mathematics coupled with the other STEM disciplines of the real-world scenarios on which the MEAs are based.

Outcomes #4 and #5 refer to the fact that MEAs are designed so that there can be more than one 'right' answer. Each team of students comes up with its own procedure for solving the problem at hand, using its own devised mathematical model.

Outcome #9 refers primarily to the team activities required in every MEA. Each team member must contribute his own ideas in each phase and must be respectful of the group dynamic in arriving at the conclusion(s) of each phase – those conclusions becoming the input to the next phase.

Outcome #12 refers to the fact that students gain a sense of what it is like to be presented with a problem in the real world – perhaps as a consultant for an organization of some kind – and devise solutions that actually work and that can be implemented to perform a real function in business or science or education or the like. This can become a huge insight for a student who may never have pictured himself/herself in such a role in society.

Section 3. A Sample Information Assurance and Security MEA for Diverse Learners

Target Audience: Middle schoolers in a large urban school district consisting of a diverse population, including a large number of African-American students.

Students working on this MEA should have basic knowledge of mathematical principles (use of signs, order of operations, ability to organize data cardinally – ordinary counting – and ordinally – arranging things in order) and limited knowledge of algebra (Algebra I skills, familiarity with the use of variables). They will use the logic of *if/then* and *yes/no* considerations that typical middle schoolers are able to use, even if they have not experienced the same as a description of 'Boolean logic' in the past.

Boolean refers to an algebraic system used in symbolic logic and in logic circuits and program instructions in computer science. An example of the use of Boolean logic would be "*If* the security rating of this piece of data is high, *then* only authorized personnel can have access to it." Or "*If* the answer to question #1 is *Yes*, *then* we want to follow procedure A; but *if* the answer is *No*, *then* we want to follow procedure B."

MEA Implementation Strategy:

I. Pre-Reading Activity – Students will be given a reading introducing them to data privacy and integrity and the need to assure and protect that privacy and integrity. The student will be required to answer several questions based on the reading about securing data and maintaining privacy.

II. Individual Activity – Each student will be asked to read the memo from the school principal, asking for help in assessing school files on students and organizing the data so that only authorized viewers will be able to access certain student data. Students will have to think in terms of the consequences of the wrong person seeing certain sensitive data about a particular student.

III. Team Activity – Students will group into teams of three or four and will re-read the memo and discuss issues of sensitivity of data and how to organize data so that only appropriate individuals can access it. They will need to define 'sensitivity'. They will need to come up with a scheme for classifying each individual at the school in terms of level of access based on the level of sensitivity that he/she is allowed to see. They will be required to set up a table of some sort that employs the Boolean logic of a 'yes' or 'no' answer as to whether each individual has access to each type of data.

MEA Statement

The main issues in the Information Assurance and Security MEA for middle schoolers in urban schools are to examine different kinds of data that are acquired and maintained in the main office of the school pertaining to each student, and determine whether each kind of data is sensitive or not. If data is deemed to be sensitive, is it highly sensitive or just moderately sensitive? Students may have to come up with definitions of sensitivity on their own upon examining the kinds of data available.

Beyond sensitivity verification, students encountering this MEA will have to establish some kind of method for determining who should have access to what kind of data so as not to infringe upon other students' rights to privacy and also so as not to infringe on state and federal laws of protection for certain types of data.

Each team of students will be given a different set of data files, not all of which will contain the same types of data. In that way, different teams may establish definitions of sensitivity and access tables that will be based on different data than the other groups'.

Model Eliciting Activity (MEA)
Information Safeguarding and Security Design

<u>MEA Story</u>

Please read the story contained in the following memorandum and follow the instructions for individual and team activities.

M E M O R A N D U M

TO: Information Assurance and Security Team
FROM: John Doe, Principal
Adam Clayton Powell Middle School
RE: Safeguarding School Data Handled by Students

In preparation for an upcoming Information Security Awareness Campaign at our school, we are asking your security team to design a model for the handling of school data by students. We anticipate that there will be several aspects of the preparation that will require the assistance of students and that will also require those students to retrieve and use data maintained in the Principal's office.

We need for your team to provide safeguards for the sensitive data that should be viewed only by people authorized to do so. You will need to establish what is meant by "secure" in this setting. You will also need to come up with a rating system for classifying data as either 'highly sensitive', 'sensitive', or 'non-sensitive'. You will need to establish what those categories mean. (How will those categories be defined?) Finally, we need for you to develop a mathematical model for determining the accessibility to the data by each person in the school. (Who should be granted access to what?)

The Principal's office maintains data on each student's health records, his current and previous addresses, date of birth, parental information, siblings, student locker combinations, student lunch pin numbers, a history of the student's grades from this school and from other schools attended, his country of birth and immigration status if applicable, a record of awards won by the student while in attendance, a record of absences and tardies, a record of the student's participation in extra-curricular activities after school, a record of the student's participation in community service projects and any comments by the community sponsor, a record of any disciplinary action taken against the student by the school, and teacher comments and recommendations regarding each student. You may create new files to house this data in different combinations from their present ones if you feel that doing so will enhance data handling for security purposes.

We hope that you will be able to help us organize this data in such a way as to allow the student volunteers access to only 'non-sensitive' data. Our office will cooperate in re-locating data that you deem should be stored differently from its current storage arrangements, if necessary.

Thank you very much. Your report will be welcomed.

Individual Activity:

Each student should read the article on Information Assurance and Security that has been handed out and then answer the following questions:

1. Do you know what an information system is?
2. Describe a database that you are familiar with
3. Do you know of any ways that databases are kept secure?
4. Do you know of any reasons why databases need to be kept secure?
5. Can you name a kind of data that would be considered 'sensitive data'?
6. To whom would it be sensitive?

Team Activity:

Students should group themselves in teams of three or four and brainstorm on the following tasks:

1. What lists of data or databases have been referred to in this problem? (See principal's memo.)
2. What data items would you include in these databases?
3. What data items would you consider 'sensitive'?
4. Be sure to define what you mean by 'sensitive'?
5. Devise a plan for deciding who in the school should be able to see what databases.
6. Create a model for assuring that only the intended individuals have access to each database.

Section 4. Discussion of Structural Elements in This Particular MEA

This section suggests how each of the six basic components of this MEA can be used to provide discovery of learning for each student while arriving at the solution to a problem about information security.

Principle 1. Model-Construction

This principle ensures that the activity requires the construction of an explicit description, explanation, or procedure for a mathematically significant situation

It gives a description of the mathematical model the students will be developing when solving this MEA:

- What are the elements?
- What are the relationships among elements?
- What are the operations that describe how the elements interact?

Students need to develop a model for determining the sensitivity of each type of student data maintained at the school. They also need to develop a grid, table, or index that determines the accessibility of each individual at the school to each level of data sensitivity. Finally they need to develop a procedure that will match the two and determine accessibility of an individual at any given time to any given type of data, along with means of safeguarding that breaches will not occur. The teacher will be available to help any group that gets stuck at any point.

This principle helps diverse learners to read critically, to clearly define a problem, and articulate that problem along with its component parts. It also enables them to question critically what information they *have* and what they still *need* to obtain.

Principle 2. Reality

This principle requires the activity to be posed in a realistic STEM context and be designed so that the students can interpret the activity meaningfully from their different levels of mathematical ability and general knowledge.

Diverse learners will bring to the table their own knowledge of descriptions found in the MEA story memo. These learners may come from different backgrounds and may have very different middle school experiences or data handling experiences; but this should add to the richness of the team discussions. These learners will also have an opportunity to demonstrate their mastery of grade-appropriate mathematics skills and build on them with increased understanding of how these skills can be used in a reality situation.

The students will also be required to use basic reasoning in thinking about accessibilities of data and will need to know or determine the types of data that must be kept confidential by law.

The fact that different teams of students can come up with different tables and different access procedures speaks to the open-endedness of the problem and allows diverse learners to experience the freedom of being creative.

Principle 3. Self-Assessment

This principle ensures that the activity contains criteria the students can identify and use to test and revise their current ways of thinking.

The test cases in this problem consist of two student data sets, each containing different kinds of data, and each containing data of differing sensitivity.

This phase more than any other provides diverse student learners with the opportunity to examine their own thinking, and to examine it in relation to the thinking of the group. First they must be able to identify those parts of the MEA story and/or individual and team activities that represent criteria that can be used to test and, if necessary, revise their solution. Then they must think of *how* they are going to accomplish this. In the case of the school data sets, it will involve tests of the appropriate access being given to each category of persons at the middle school with respect to each data set on the basis of that data set's sensitivity category.

Principle 4. Model-Documentation

This principle ensures that the students are required to create some form of documentation that will reveal explicitly how they are thinking about the problem situation.

Students will be required to keep documentation on their brainstorming sessions, the plans that they come up with, the models that they create, the data that they collect. any interviews that they conduct with key personnel, and all parts of the finished product.

Diverse student learners will be able to practice and improve organization skills and writing skills in this phase of the MEA. They will also create a document that can be referred to in the future as proof of their successes in problem solving.

Principle 5. Construct Share-Ability and Re-Usability

This principle requires students to produce solutions that are shareable with others and modifiable for other related situations.

The students will need to construct their tables and procedures in a way that can be used for all student data sets, not just the ones that they have been given. They will also need to make sure that their models are general enough that they can be used in other settings besides school student data sets.

Principle 6. Effective Prototype

This principle ensures that the solution generated must provide a useful prototype, a metaphor, for interpreting other situations.

Examples of other settings in which the models created in this exercise can be used are situations like insurance offices and customer service offices where there is a mixture of sensitive and non-sensitive data that is collected from the same source at the same time and is initially available on the same data set.

The discovery part of this MEA will let students see the fact that all data about them (the students) may not be kept securely at all times. This part of the MEA may also remove the misconception on the part of some students that they cannot find solutions to 'word problems', especially open-ended word problems. Also, the fact that the students will have to work out a procedure for classifying data according to sensitivity and then address the need to screen users for accessibility to the right kind of data that they want to access will address the possible preconception that security issues somehow take care of themselves; or that there is someone in the school administration or in the computer room that somehow takes care of security, and no one else needs to be concerned about it.

The discovery process will allow students to consider and answer the question "What does mathematical modeling have to do with securing data?" and "What does Boolean logic have to do with securing data?" They will also discover the fact that not all databases are kept on computers. Sometimes individuals will have the responsibility of securing the data that they keep on paper in their filing cabinets.

In working out this MEA, students may reach an impasse when they try to figure out the mathematical model(s) associated with the problem. They will need to engage their thoughts until they come up with a clear picture of what the client (in this case, the Principal) wants and how it can be provided. Then how can that relationship be expressed in symbols? If the group is not able to move forward at this juncture, the teacher can offer assistance.

The model or deep issue or principle being considered in this MEA is figuring out how to organize and store data in such a way as to keep individuals' privacy from being violated and at the same time provide the data that is needed for given tasks, reports, etc. The MEA provides the students with a story explaining the background of the situation at hand, some charts or tables of data on certain subjects about students that will give them a starting point for their work, and some pertinent questions for them to contemplate about their tasks.

Students will find opportunities in the MEA implementation to define their goals during the individual activity, and then refine them during the group activities. They can also define goals as they try to decide on data sensitivity and access methods. Students can assess their progress and test whether theirs is a workable solution in the self-assessment phase and in the sharability phase of the MEA. In the self-assessment phase, they may need to go back and revise their procedure or their model to make it more workable towards a meaningful solution.

For further discussion on the structure of MEA's, see Dark and Manigault (2006).

Section 5. Other Expected Outcomes from the Use of Information Assurance MEAs.

Our goals have been to attract students, especially underrepresented students, to IA and other STEM areas, using MEAs as an instructional tool. As laid out in the Introduction, our foundational instructional strategy has been constructivist learning theory that is closely aligned with discovery learning approaches. One of those approaches is the MEA. The subject matter of our illustrated MEA has been the IA topic of securing databases utilizing Boolean logic in a mathematical model. And our target audience has been inner city middle schoolers. To the extent that this configuration of instruction is effective, those goals can be reached.

However, we would be remiss if we did not point out that there are positive learning outcomes to be expected for the general student population as well, when using such a configuration of instruction. Section 2 gave a list of expected learning outcomes for diverse learners. Here is a list of expected outcomes for all learners, regardless of background or circumstances, along with a few outcomes related to IA and STEM.

General student outcomes directly related to the six principles of the MEA:

1. Ability to work successfully on an individual basis as well as on a team.
2. Ability to read a description of a scenario in which a need is expressed, and understand all of the parts of it.
3. Ability to identify a problem and articulate it.
4. Demonstration of open-mindedness when seeking answers.
5. Demonstration of grade-appropriate mastery of mathematics skills.
6. Ability to discriminate when acquiring evidence or data for the MEA and to choose only credible sources.
7. Ability to ask relevant questions about a situation or a set of data, etc.
8. Ability to incorporate and work with test cases that are associated with a problem and that are supplied to the student along with the problem.
9. Ability to come up with test cases that are associated with a problem (test cases made up by the student(s) himself).
10. Ability to work with data sets associated with a problem and that are supplied to the student along with the problem.
11. Ability to create data sets of their own that are associated with the problem.
12. Ability to use feedback from instructor(s) to modify one's work.
13. Ability to test one's own model (critique or self-assess one's own and/or teammates' results) and make appropriate changes to the model.
14. Improvements in writing ability, in the context of being able to describe results of brainstorming sessions, describe models being put together, write a formal report that includes mathematical modeling.
15. Demonstration of objectivity in analyzing data and drawing conclusions.

Outcomes related to Information Assurance and STEM:

1. Students become aware of information assurance as an area of study.
2. They become aware of professions within information assurance and security.
3. They become aware of issues associated with the securing of data in information systems.
4. Hopefully they are inspired to consider information assurance or some other STEM-related area as a field of study for themselves.

Section 6. Summary

The instructional strategy of model eliciting activities has great potential for exciting the STEM/information assurance classrooms and classrooms of diverse learners with a form of discovery learning. It engages students of all backgrounds in individual and group activities that explore areas of Computer Information Assurance with investigative skills appropriate for their grade levels, and it affords the opportunity to come up with problem solutions on their own for the most part, with limited reliance on the teacher. Teachers are given the stimulating challenge of designing MEAs that reflect real world situations in STEM areas and that lend themselves to the formulation of a mathematical model. Students learn to identify a problem, determine what sorts of information they have and/or need to solve that problem, and they get to do this by first working on their own and then brainstorming with classmates. MEAs are designed to encourage self assessment of the accuracy of the mathematical model generated to bring about a solution to the problem; and they are constructed so as to allow the model to be usable in other contexts. Teachers of students in underrepresented areas in particular will find MEAs a useful tool to introduce their students to open-ended problem solving, and indirectly to introduce them to the successful study of STEM subjects. MEAs create a win-win problem solving environment in the classroom.

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