

2014

Evaluation Report

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UMass Amherst STEM DIGITAL
Dr. Morton Sternheim, PI; NSF ITEST #1031115

STEM DIGITAL Year 4 Annual Evaluation Report (2013-2014)

INTRODUCTION

This evaluation report synthesizes the results of evaluation activities conducted by SageFox Consulting Group of the STEM DIGITAL project led by the UMass STEM Ed Institute for its no-cost extension year, covering the period September 2013 to August 2014. The goals of the program are to facilitate the participants' abilities to stimulate student interest in STEM careers while engaging them in ways to think critically about their environment. Participating teachers incorporated digital cameras and Analyzing Digital Images (ADI) software into lab activities focusing on environmental science. STEM DIGITAL materials focused on three strands related to (1) ozone and air quality, (2) arsenic and soil contamination, and (3) water quality.

This year's evaluation activities involved two surveys, one, the Post-Class Survey Report 2014, given in February, 2014, as a follow-up to the teachers' participation in the STEM DIGITAL online course in the fall of 2013, and the other, the Follow-up Survey Report 2014, given in May 2014 to teachers from all participating cohorts as a means of fining out the long-term impacts of participation in the program.

This report summarizes the key findings from these two reports. The full sets of data from the surveys are appended at the end.

EVALUATION METHODS

Post-Class Survey 2014 (N = 14/16, 88% response rate)

This online survey was conducted with participants in the online STEM DIGITAL course for teachers, held in the fall of 2013, the fourth cohort of teachers to go through the program. The purpose of the survey was to obtain the following information:

- Participant background and familiarity with course material
- Feedback on the experience of taking the course
- Use of the materials from the course in their classroom

Follow-Up Survey 2014 (N = 35/108, 32% response rate)

This online survey was conducted with participants in all four teacher cohorts (summer 2011, summer 2012, summer 2013, and fall 2013) after they had all had a chance to incorporate the STEM DIGITAL materials into their classrooms. It was designed to obtain the following information:

- How and where they used the STEM DIGITAL materials
- Feedback on the experience
- Expectations of using the lessons again
- Interest in disseminating their results

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July, 2014

Although there were 108 possible respondents across the four cohorts, only 35 responded to the survey. These were predominantly from Cohort 2 (13 respondents) and Cohort 3 (16 respondents); the other two cohorts had three respondents apiece and thus the responses are likely not representative of these experiences.

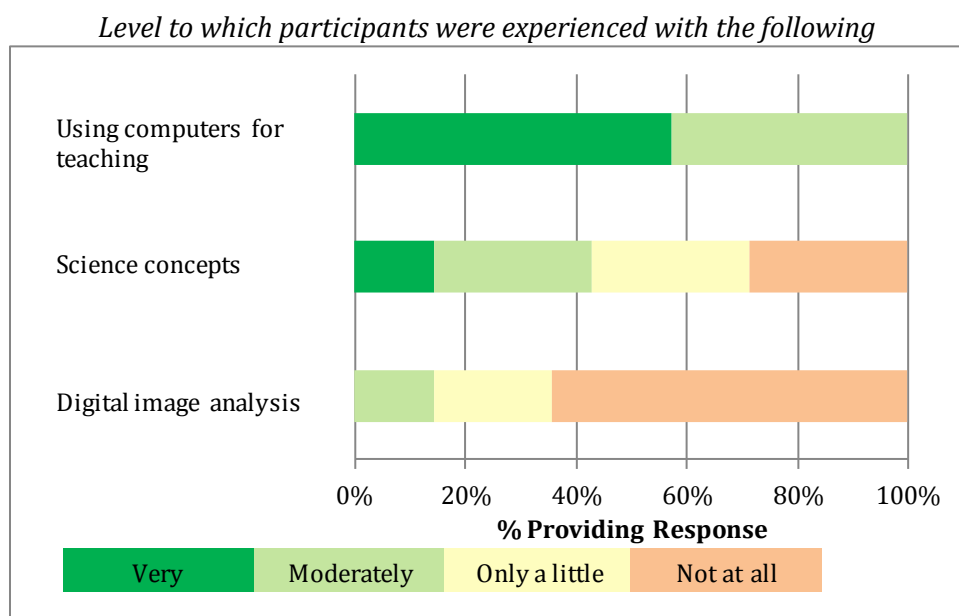
KEY FINDINGS AND RECOMMENDATIONS

Post-Class Survey 2014

Participants

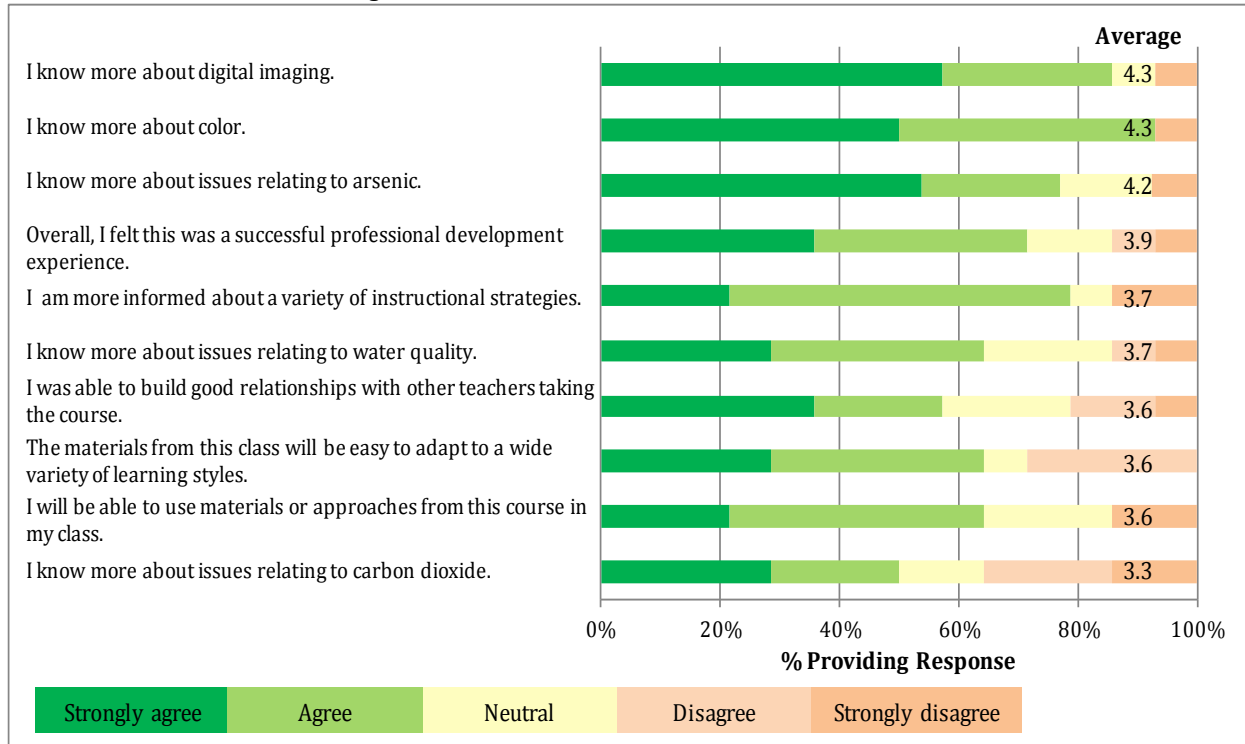
The survey respondents came from all areas of the K-12 spectrum but most were middle school teachers. All who were currently teaching (one was a paraprofessional) were teaching science courses of some sort, though these ranged across the different fields of science.

The extent to which the teachers knew the content of the course ahead of time varied, as shown on the figure below. Clearly, most were familiar with computers, which is probably to be expected from teachers willing to take an online course. Familiarity with science concepts varied and that with digital image analysis was generally low to nonexistent.



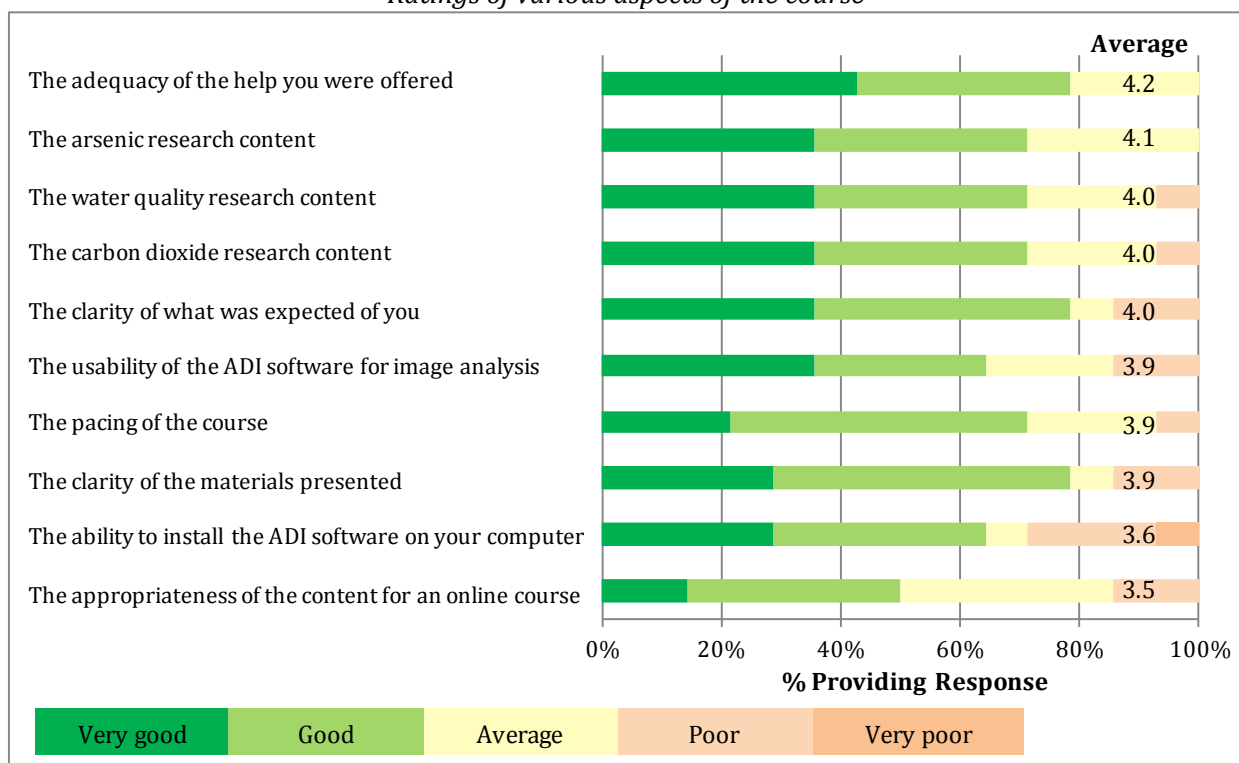
Feedback on the Course

Overall, the course was given high ratings by most but not all participants, resulting in lower ratings than we have sometimes seen in the past from the STEM Education Institute's professional development offerings. As the figure on the following page demonstrates, most participants thought they had learned a great deal about the various topics covered by the course (with the possible exception of carbon dioxide) and that the course experience itself was very positive, but there were a number of participants who had a negative experience, and at least one respondent disagreed with every statement. Moreover, four of the fourteen respondents did not agree that the experience was a successful one overall, which is a very high number for offerings from this group.

Agreement with statements about the course

The respondents were also asked to rate various aspects of the course, and again we saw two to three people giving nearly every aspect negative ratings (with the exception of the help offered and the arsenic material), though the majority of ratings were either average or positive. Areas of particular concern seemed to be installing ADI software, which is perhaps understandable given the resources available at some schools, and the appropriateness of the content for an online course, which is something that will need to be looked into.

It is worth noting that there did not seem to be any particular problems with the carbon dioxide content, so the relatively high levels of disagreement with the statement that they knew more about carbon dioxide were probably due to a higher pre-existing knowledge about this subject than the others.

Ratings of various aspects of the course

The respondents were also asked how easy or difficult it was to complete the course, and three of the fourteen found it difficult. Similarly, of the nine who said they had previously taken an online course or courses, two said this course was below average. Clearly there were a number of individuals who were dissatisfied with the course experience.

The comments point to a number of challenges that the respondents had with the experience, as follows:

- The experience of doing hands-on labs and collaborating with peers could not be replicated in the online course.
- Online conversations did not work as well as conversations held face-to-face, taking place over too long a time span.
- Some felt that the lessons were too content-heavy and sometimes overwhelming.
- There were inconsistencies in the expectations and structure of assignments within Moodle that some found frustrating.
- Several found the ADI software to be difficult and unrewarding to use.

On the other hand, the respondents also identified a number of positive aspects of the experience.

- The instructors provided helpful feedback and were very interactive.
- For some at least, the lessons were clear and easy to follow.
- The science kits sent at the beginning of the course were very helpful.

Overall, the reactions were as mixed as the graphs would suggest, as demonstrated by the following comments.

An exceptional course! Well-paced to allow comfort in use of the software on a basic level with practical applications in the classroom that I have been well prepared to share in professional development in my school and District.

The teachers/professors and weekly subjects were great, although I'm not a fan of the ADI software, due to far too much time was spent working around and with the system, with very little reward and productive results. In the end, I wouldn't suggest this class to future students because I found the ADI software not to be user friendly and a found it to be a waste of valuable time.

Use of the Materials

Six of the participants said that they had used the materials from the course in their classes and five other said they intended to do so, either this year or next, leaving only three who did not. As one teacher said, "the time requirements and logistics of teaching the software, and underlying physics make it unlikely that I'll ever use it in class."

Of the six, four modified the activities for their classrooms and four developed new activities, which are described in the comments. All those who answered the question felt that the activities had gone very well with their students.

Conclusions and Recommendations

Overall, most participants had a positive experience with the online course, but a substantial minority did not. This seems to stem from the limitations of an online course. Although there was general agreement that the course instructors were very responsive and helpful, there were some things that could not be accomplished online. Specifically, it was very difficult for the participants to really build the sense of community that occurs as part of a summer workshop, nor did the hands-on labs work as well when done individually. These problems seem like they are to be expected in any online course, and just point to the difficulties with using that form of instruction. On the other hand, the online course allows the program to reach more people from a wider geographic area at less expense, and given the positive responses from most participants this may be well worth the downsides of the online experience.

Another problem seems to have been the ADI software itself, which a few participants found difficult to use. Since most participants seemed to have no problems with the software, however, it is not clear what the actual issues were.

Moving forward, we believe that there are definite benefits to be gained by using online courses as a means of delivering professional development. First, an online course can reach a wider geographical range and larger number of teachers than a standard workshop, allowing the professional development to have a larger impact. Second, the expense seems to be less, allowing the course to be continued beyond the range of the grant where a workshop would be unsustainable. On the other hand, the online experience seems to be less personal than that of a workshop and to be less effective with a segment of participants. This was true for the STEM DIGITAL course even given the fact that all of the participants identified themselves as reasonably knowledgeable about using computers; for teachers with less comfort with computers the course would likely be even less successful without direct contact with the instructors. For these reasons, we would suggest that when online courses are a major part of a professional development program that there always be opportunities for some interested teachers to participate in person through standard workshops. Moreover, it might be beneficial to talk to teachers for whom the online course does and does not work so that if there is a particular type of teacher for whom this mode is effective they can be targeted for the course as opposed to those for whom it is unlikely to be effective.

Follow-up Survey 2014

Use of the STEM DIGITAL Materials

Of the 35 respondents, 24 (69%) had used the materials this year. Given that we cannot say anything meaningful about the two years with only three respondents apiece, this percentage was consistent for both the summer 2012 and summer 2013 cohorts. The most common reasons provided for not using the materials were not having sufficient time or resources, though small numbers also found they were not relevant to their current teaching responsibilities or had problems installing the ADI software.

The class subjects and uses of the STEM DIGITAL materials and ADI software varied considerably, ranging from applications in mathematics and technology to those in biology and environmental science. Water filtration and arsenic testing were topics addressed by more than one teacher, but most teachers used materials for their own, idiosyncratic purposes. The variety of uses is a testament to the creativity of the teachers and the widespread applicability of the STEM DIGITAL materials and ADI software. As befits a set of highly creative teachers, 16 of the 24 teachers who made use of the materials and/or software (67%) modified the activities introduced from the institute and 15 of the 24 (63%) devised new activities of their own. The time period taken up by lessons using the materials and software also varied considerably, but the median seems to have been around 2-4 class days for each.

About half of the teachers found that their students were more engaged in the lessons using STEM DIGITAL material than other lessons they gave, while the other half found that engagement was about the same.

Feedback on the Experience

Generally, the teachers identified the ease of use and power of the software and the applicability of the materials to their particular teaching goals as the greatest benefits. They also liked the fact that the students had the opportunity to participate in hands-on activities. Problems encountered mostly centered on loading up the ADI software and other technology issues.

In terms of additional help, the respondents said that they would like STEM ED to provide more lessons and updates, as well as help overcoming their own issues with monetary shortfalls. In general, however, they seemed very pleased with the support they had already received.

Expectations of Using the Lessons Again

Of the 22 who used the materials and answered the question, 21 (95%) said that they would use the materials again next year. This is an excellent proportion, especially for teachers from the 2013 cohorts who were using the materials for the first time this past year and thus had not already committed to using them over multiple years. The one teacher who was not planning on using it again next year cited a lack of appropriate equipment as the reason.

When looking at this result, it should be remembered that the teachers who responded to the survey were probably more likely to be positively inclined toward the materials—those who didn't like them (if there were any) would probably also be more likely to ignore the survey invitation. Also, those who weren't planning on using them again would probably also have been more likely to be among the group who weren't asked this question because they did not use the materials this year.

Interest in Dissemination

Nine of the respondents said that they would be interested in being funded to disseminate what they did in their classes. They are marked on the table showing the list of participants on the last page of this report.

Conclusions and Recommendations

The majority of teachers who responded to the survey seem to have been able to use the STEM DIGITAL materials and ADI software in a wide variety of contexts, and most have incorporated them into their class curricula to the extent that they plan to continue using them in the upcoming year. These are very encouraging findings and speak to the quality of the product delivered and its utility in different classroom situations. As might be expected, the main problems that the respondents cited were around using the technology, not the quality of what was delivered itself.

It is important to remember, however, that the low response rate to the survey may mean that there are other participants who did not respond who had negative responses to the materials. Without their feedback, it is impossible to know just how valuable these materials were. Still, hearing very little that was negative from those who did respond makes it unlikely that the non-respondents had a significantly worse experience.

Moving forward, there was a call for more lessons and updates to follow up what the teachers had already been given. If these responses are any indication, a “STEM DIGITAL 2” workshop that follows up on the institutes that have already been given and provides additional lessons and support would be well-received and might be an interesting idea for future funding.

SURVEY DATA**Post-Class Survey 2014**

What grade level(s) do you teach? (Choose all that apply)

Elementary school	2
Middle school	9
High school	4

What class(es) are you teaching related to the content you learned in this course?

Elements of Science
Comprehensive Science
None at the moment - paraprofessional
8th grade science
Science
General science
Physics
Biology
Neuroanatomy, AP Environmental Science, Chemistry
Physical Science and Life Science
NA
7th Grade Earth Science
I teach a general, introductory science class

How experienced were you with the digital image analysis content of the STEM DIGITAL course prior to taking it?

Very	-
Moderately	2
Only a little	3
Not at all	9

How experienced were you with the science content of the STEM DIGITAL course prior to taking it?

Very	2
Moderately	4
Only a little	4
Not at all	4

How experienced were you with using computers for teaching prior to taking the course?

Very	8
Moderately	6
Only a little	-
Not at all	-

To what extent do you agree with the following statements about the effects of taking the course?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Average
I know more about color.	7	6	-	-	1	4.3
I know more about digital imaging.	8	4	1	-	1	4.3
I know more about issues relating to carbon dioxide.	4	3	2	3	2	3.3
I know more about issues relating to arsenic.	7	3	2	-	1	4.2
I know more about issues relating to water quality.	4	5	3	1	1	3.7
I am more informed about a variety of instructional strategies.	3	8	1	-	2	3.7
I will be able to use materials or approach from this course in my class.	3	6	3	-	2	3.6
The materials from this class will be easy to adapt to a wide variety of learning styles.	4	5	1	4	-	3.6
I was able to build good relationships with other teachers taking the class.	5	3	3	2	1	3.6
Overall, I felt this was a successful professional development experience.	5	5	2	1	1	3.9

How would you rate the following aspects of the course?

	Very good	Good	Average	Poor	Very poor	Average
The clarity of what was expected of you	5	6	1	2	-	4.0
The clarity of the materials presented	4	7	1	2	-	3.9
The pacing of the course	3	7	3	1	-	3.9
The appropriateness of the content for an online course	2	5	5	2	-	3.5
The carbon dioxide research content	5	5	3	1	-	4.0
The arsenic research content	5	5	4	-	-	4.1
The water quality research content	5	5	3	1	-	4.0
The ability to install the ADI software on your computer	4	5	1	3	1	3.6
The usability of the ADI software for image analysis	5	4	3	2	-	3.9
The adequacy of the help you were offered	6	5	3	-	-	4.2

If you would like to explain any of your answers to the preceding question, please do so here.

An exceptional course! Well-paced to allow comfort in use of the software on a basic level with practical applications in the classroom that I have been well prepared to share in professional development in my school and District.

The arsenic session should have taken into account (it did so a little less effectively than other sessions) that some students did not have access to labs and lab equipment and would need directions tailored towards kitchen experimenting.

I feel that the hand on labs and collaborating with my colleagues was very important to the course - I do not think that could be replicated in an online course.

Much of the trouble with the course was related to Moodle / Blackboard chaos. The location to post assignments was variable by unit, the expectations and criteria varied by unit. There are some very interesting aspects to the use of digital cameras as analytic tools – e.g. estimating area from photos, and as a crude spectrometer, but overall the time requirements and logistics of teaching the software, and underlying physics make it unlikely that I'll ever use it in class. A quick RGB colorimeter test using lab-pro tools and software is much easier and faster than trying to adapt another device to emulate the real thing. It was an interesting experience.

The teachers/professors and weekly subjects were great, although I'm not a fan of the ADI software, due to far too much time was spent working around and with the system, with very little reward and productive results. In the end, I wouldn't suggest this class to future students because I found the ADI software not to be user friendly and a found it to be a waste of valuable time.

The lab activities were extremely time consuming.

How easy or difficult was it to complete the course?

Very easy	3
Easy	5
Neutral	3
Difficult	2
Very difficult	1

Have you ever taken an online course before?

Yes	9
No	4

If yes, how did this course compare to your other online course experience(s)?

Above average	5
About the same	5
Below average	2

What worked particularly well with the course?

Practical work with the software in curriculum driven lessons.

The instructors were very interactive, giving helpful feedback to our responses as we went along. The science kits sent at beginning of course were very helpful.

I didn't take this course online.

Lab experience

Great faculty. Excellent location for the course. Perfect mixture of instruction and hands-on experiences. Living on campus with other participants was beneficial to continued conversations about content. The lunches were excellent!

Very interactive!

I am fortunate to have a coworker who took the course with me so I had a real lab partner and collaborator as opposed to a virtual lab partner collaborator otherwise this course would have been much less valuable.

Lessons were clear and easy to follow.

Researching the coursework.

The instructors were very understanding and responsive. They responded promptly and took the time to clarify things that were unclear or help with content. I liked the feedback form used for the lesson plan at the end.

What did not work well?

Nothing! It was terrific and successful!

See above about arsenic session. Many sessions were too 'meaty', time-wise and content-wise. Many students seemed to be in over their heads (me included!) and this was expressed in posts-people not having time to complete assignments and calculations (math) being too difficult at times. This did not diminish my sense of accomplishment each time I wrapped my head around an assignment and was successful! The expectations for students might have been a tad high.

The breakfast choices were somewhat limited.

Nothing

the software would not load on my PC so I had to borrow a MAC. I do not find that I am able to make and develop meaningful or useful professional relationships with people in an online format. Online discussions are too cumbersome and evolve over too long a period of time to be valuable. It's learning in Sloooow motion. So far in my CAGS program I have found that waiting for others to catch up, keep up and contribute means I just work alone even if its a group assignment. I am particularly opposed to group grading in an online format as there is usually someone who isn't doing any work and without face to face and timely communication things just get put off til the last second and the person with the greatest grade anxiety does the work for the group...

Online communication

Instructions on how to clearly use and interpret the ADI software. Uploading pictures and measuring is simple, but analyzing the results, especially the graphing part, past that point was never clearly understood.

Using the program was often frustrating. It did not always function well 100% of the time. While I can navigate this easily, using it in my classroom would be challenging.

Have you used the materials from the class in your class(es)?

Yes	6
No	8

If yes, how, if at all, did you use the ADI software?

I set up stations in my classroom and taught basic use of the software to my classes. More than 23 students used the software as a measuring tool in the mandatory research project last quarter. It has also been used in heat exchange experiments in 7th grade classes, and force and motion class projects in our 6th grade.

I will be having the students look at hominid skulls and measure the angles and distances of different features so see how they have changed over time.

With an environmental unit we are starting - growing plants - measuring them and keeping track of their health

Photosynthesis, UV bead labs

Linear and angle measurements, quantifying color changes

Did you use or modify activities that were introduced in the course?

Yes	4
No	2

Did you develop new activities on your own?

Yes	4
No	2

How did using the materials in your class go?

Outstanding! The kids found it easy to learn, use, and manipulate to extract and analyze data in all 3 applications. We are currently developing lessons for our 18 STEM initiative schools to use it!

I have not done the lesson yet.

Great. Students created water filters and learned a lot about arsenic in the water

Went great, kids enjoyed it!

Excellent. Students love this technology.

If you did not use the materials, do you have plans to do so this or next year?

Yes	5
No	3

Follow-up Survey 2014*When did you participate in STEM DIGITAL?*

Summer 2011	3
Summer 2012	13
Summer 2013	16
Fall 2013 (online course)	3
No response	-

What grade level(s) do you teach?

	All (N = 35)	Sum 2011 (N = 3)	Sum 2012 (N = 13)	Sum 2013 (N = 16)	Fall 2013 (N = 3)
Elementary school	2	-	-	2	-
Middle school	15	1	6	5	3
High school	23	2	10	11	-
No longer teaching	-	-	-	-	-
No response	-	-	-	-	-

Did you use the STEM DIGITAL material in your class this year?

	All (N = 35)	Sum 2011 (N = 3)	Sum 2012 (N = 13)	Sum 2013 (N = 16)	Fall 2013 (N = 3)
Yes	24	3	9	11	1
No	11	-	4	5	2
No response	-	-	-	-	-

*What were your reasons for not using the materials**(Given only to those who did not use the materials, n = 11)*

	All (N = 11)	Sum 2011 (N = 0)	Sum 2012 (N = 4)	Sum 2013 (N = 5)	Fall 2013 (N = 2)
I was not interested	1	-	-	-	1
I did not have enough time	6	-	1	4	1
I did not have adequate resources (computers or technical support)	6	-	2	3	1
The materials were not relevant to my teaching responsibilities	3	-	2	-	1
I was unable to install the ADI software	3	-	-	2	1
I didn't have a good understanding of how to use the materials	1	-	1	-	-
Other	1	-	1	-	-
No response	-	-	-	-	-

Other: My teaching schedule was switched so I did not teach the courses where the ADI content was relevant.

Would you be interested in being funded to participate in a conference or workshop disseminating what you did in your class?

(Given only to those who did use the materials, $n = 24$)

	All (N = 24)	Sum 2011 (N = 3)	Sum 2012 (N = 9)	Sum 2013 (N = 11)	Fall 2013 (N = 1)
Yes	9	2	2	5	-
No	14	1	7	5	1
No response	1	-	-	1	-

In what subject(s) did you use the materials?

(Given only to those who did use the materials, $n = 24$)

	All (N = 24)	Sum 2011 (N = 3)	Sum 2012 (N = 9)	Sum 2013 (N = 11)	Fall 2013 (N = 1)
General Science	6	-	4	1	1
Biology	5	1	2	2	-
Chemistry	2	-	1	1	-
Environmental Science	7	1	3	3	-
Geology/Earth Science	2	-	-	2	-
Physics/Physical Science	3	-	1	2	-
Technology	2	-	1	1	-
Other	6	1	1	4	-
No response	-	-	-	-	-

Other: Oceanography, Science Fair Project, Pre-Engineering, Math, Marine Biology, Science Research

What lesson(s) did you teach using the STEM DIGITAL materials?
 (Given only to those who did use the materials, $n = 24$)

Lesson	Cohort
Eutrophication lab	Sum 2011
Aiptasia and ADI	Sum 2011
I used the ADI software to analyze eye color from digital images.	Sum 2011
Beer's Law and Dilution Analysis	Sum 2012
Plant life and development; changing	Sum 2012
Water quality testing	Sum 2012
Ozone, CO ₂ , Arsenic, NOMs	Sum 2012
Arsenic/rice, trees	Sum 2012
Displacement and velocity	Sum 2012
Cellular Respiration	Sum 2012
Used in a science fair project	Sum 2012
Hominid Evolution	Sum 2013
I used the arsenic testing lab as a demo in my chemistry unit; and the STEM digital ADI program in the physics unit	Sum 2013
Alternative Fuels/Renewable Energy	Sum 2013
Analyzing pH with ADI	Sum 2013
Environmental engineering project - designing water filters	Sum 2013
Water filtration lab with leaf litter	Sum 2013
Quadratic Regression Models	Sum 2013
Orbit Eccentricity and Stream Erosion and Deposition	Sum 2013
NGSS Force and Motion, Kinetic/Potential Energy	Sum 2013
Used the API software, other lessons.	Sum 2013
Trained students to use the program and they used it for various independent research projects.	Sum 2013
I used the software to look at the decomposition of debris in water.	Fall 2013

How, if at all, did you use the ADI software?

(Given only to those who did use the materials, $n = 24$)

Response	Cohort
To detect changes in pond water samples over time (3 weeks)	Sum 2011
Created an independent study with my one oceanography student who is taking my class for college credit is creating a lab concerning aiptasias.	Sum 2011
I have used it for a number of lessons; mostly using the color analysis section. I used it when teaching the electromagnetic spectrum also.	Sum 2011
We used the ADI program to explore Beer's Law and identify the concentration of an unknown copper(II) sulfate solution. Also used the program last year in organic chemistry to study organic material in water samples.	Sum 2012
Photosynthesis, environmental changes over time	Sum 2012
None	
Used in conjunction with Ozone and CO2 Labs. Also used to supplement a lab on Lichen Metal Uptake. Arsenic Testing was used to look at content in Bivalve shells.	Sum 2012
No, I was not able to use ADI.	Sum 2012
To analyze displacement to calculate velocity.	Sum 2012
Analyzing the color change of bromthymol blue solution before/after exercise.	Sum 2012
The software was used to analyze r-g-b values of photos taken at two different depths under water.	Sum 2012
I had the students measure the differences in the skulls among hominid ancestors.	Sum 2013
I introduced the students to the basic concepts of color (light) analysis and we used some cell phone pictures for analysis. Unfortunately, we have a district where the PCs are "deep frozen". This requires that each one be loaded each day with the program, which is impractical at best. So, I used it as a large projected demo. We explored the use of the ADI software and I shared the link info with them for home use/investigation.	Sum 2013
Used to evaluate the color of biodiesel vs. petroleum diesel in the generated torque of a running diesel engine.	Sum 2013
Used the ADI software to analyze the color intensity of pH strips of various acidic and basic compounds.	Sum 2013
I used it for a whole class demo on the mimeo overhead board for the environmental project as well as a project that we did to study the effects of hydrogen peroxide (in fertilizer) in seedlings.	Sum 2013
not this semester, as our IT dept was not able to load the software yet. I will utilize it in the future.	Sum 2013
We calculated the force of gravity by filming objects dropped from varying heights then used the movie-based software to analyze drop times and heights.	Sum 2013
To measure the distances in order to calculate the eccentricity of the orbits and to measure distance and area of stream deltas on a stream table.	Sum 2013
As an evaluative tool. First data collection on the successive heights of various bouncing balls. (Data used to establish a constant on energy loss) Second, data collection on engineered landing site. (Data used to establish if a statistical increase in retained energy occurred.)	Sum 2013
Analyzing flower color, tree cover images. Still need to work with it more. Working on a Picture Post project that will allow for analyzing more data.	Sum 2013
Trained students to use the program and they used it for various independent research projects.	Sum 2013
Measuring the color of the water.	Fall 2013

Did you modify activities that were introduced in the institute?

(Given only to those who did use the materials, $n = 24$)

	All (N = 24)	Sum 2011 (N = 3)	Sum 2012 (N = 9)	Sum 2013 (N = 11)	Fall 2013 (N = 1)
Yes	16	3	6	6	1
No	8	-	3	5	-
No response	-	-	-	-	-

Did you develop new activities on your own?

(Given only to those who did use the materials, $n = 24$)

	All (N = 24)	Sum 2011 (N = 3)	Sum 2012 (N = 9)	Sum 2013 (N = 11)	Fall 2013 (N = 1)
Yes	15	2	4	9	-
No	8	1	4	2	1
No response	1	-	1	-	-

During approximately how many class days did you make use of the ADI software?

(Given only to those who did use the materials, $n = 24$)

	All (N = 24)	Sum 2011 (N = 3)	Sum 2012 (N = 9)	Sum 2013 (N = 11)	Fall 2013 (N = 1)
None	5	-	4	1	-
1-2 days	7	1	2	3	1
3-5 days	7	2	1	4	-
6-10 days	4	-	2	2	-
More than 10 days	1	-	-	1	-
No response	-	-	-	-	-

During approximately how many class days did you make use of other STEM DIGITAL materials?

(Given only to those who did use the materials, $n = 24$)

	All (N = 24)	Sum 2011 (N = 3)	Sum 2012 (N = 9)	Sum 2013 (N = 11)	Fall 2013 (N = 1)
None	5	1	3	1	-
1-2 days	8	1	2	4	1
3-5 days	4	-	1	3	-
6-10 days	4	1	2	1	-
More than 10 days	3	-	1	2	-
No response	-	-	-	-	-

How engaged were the students in the lesson?

(Given only to those who did use the materials, $n = 24$)

	All (N = 24)	Sum 2011 (N = 3)	Sum 2012 (N = 9)	Sum 2013 (N = 11)	Fall 2013 (N = 1)
More engaged than other lessons	12	2	3	7	-
About the same as other lessons	11	1	5	4	1
Less engaged than other lessons	-	-	-	-	-
No response	1	-	1	-	-

Do you expect that you will use the materials again next year?

(Given only to those who did use the materials, $n = 24$)

	All (N = 24)	Sum 2011 (N = 3)	Sum 2012 (N = 9)	Sum 2013 (N = 11)	Fall 2013 (N = 1)
Yes	21	3	7	10	1
No	1	-	1	-	-
No response	2	-	1	1	-

If no, why not?

(Given only to those who said they would not use the materials next year, $n = 1$)

Response	Cohort
Lack of appropriate equipment.	Sum 2012

What, if anything, worked particularly well when using the materials in your class?

(Given only to those who did use the materials, $n = 24$)

Response	Cohort
Software detects changes which are difficult to detect with the eye.	Sum 2011
The ADI software is so intuitive that students needed little help once shown how maneuver through the tabs.	Sum 2011
New versions of the ADI program this year worked better than last year. no problems uploading pictures. We also ordered better sample containers for better pictures.	Sum 2012
Rotating centers so that all students were able to have an opportunity to manipulate and utilize materials.	Sum 2012
CO2 was used in study of Ocean Acidification with both freshmen and jr/sr classes. Modifications included using both natural and made saltwater to look at buffering effects. NOMs Lab allowed students to work with many applications, from calorimetry to dilutions.	Sum 2012
I was able to use the arsenic lab with my students.	Sum 2012
Data was relatively easy to collect and analyze once the students were able to work with ADI.	Sum 2012
The students who used the software for their project found the directions to be very clear.	Sum 2012
Resupply of the lab reagents will be an issue for me to repeat the use for next year's classes. Unfortunately, we will not be budgeted to restock what the STEM Digital supplied me with last year. I will continue to seek funding through small grant writing, which I am hopeful will work.	Sum 2013
The amazing color analysis on pictures to collect data.	Sum 2013
The software actually ran very well. We usually have problems with our older systems, but everything worked well.	Sum 2013
We used the digital camera to keep evidence of the growth of plants as well as to monitor the effectiveness of our water filters. We used the special containers to hold our filtered water to compare the success of our water filters.	Sum 2013
The students liked collecting tangible data and developing the gravitational constant.	Sum 2013
Allowed students to make measurements and calculations individually in a group setting, it added individual accountability and I noticed a deeper understanding when I gave assessments.	Sum 2013
Engineering applications to solve problems using technology and content were especially effective.	Sum 2013
Students liked the hands-on activities. Students often needed more background than the course allowed for detours. This would work best in classes like Environmental Science, where there is more room to alter curriculum.	Sum 2013
Software detects changes which are difficult to detect with the eye.	Sum 2013

What, if anything, didn't work well?

(Given only to those who did use the materials, $n = 24$)

Response	Cohort
Our own technology - 7 year old laptops	Sum 11
ADI would occasionally hang up, causing frustration for some students.	Sum 12
Trouble loading and using the ADI software.	Sum 12
It was a challenge to teach the students how to use ADI without taking too much time away from necessary biology curricula (MCAS pressure)	Sum 12
There were issues with keeping the camera a consistent distance from the subject as well as issues with the camera itself. Neither of these are the fault of the software.	Sum 12
It was hard to get the software onto all of the laptops. So we ended up just using my laptop and had the students take turns using the program.	Sum 13
Again, the PC situation within our school district offers technology safeguards, but is impractical to not be able to use programs like this one. As for the arsenic testing, it would have been much more meaningful to have lab teams working on the lab rather than as a demo.	Sum 13
Teaching students how the effects of glare reduced validity of data.	Sum 13
I had a hard time getting the ADI software on our school computers other than mine that is why I used my overhead mimeo to show the class - next year the IT person will work over the summer to make sure all computers have it installed. They were just overwhelmed with other software we had to have this year that they did not get around to loading it.	Sum 13
It's always hard to introduce new software.	Sum 13
The movie maker program did not work on our computers and I wanted to use that program to calculate stream velocity.	Sum 13
Nothing....it all went well!	Sum 13
I am still getting used to working with the software and how to incorporate it into the curriculum, so it's taking time.	Sum 13

What additional support, if any, could STEM Ed provide to help your use of the materials in your class?

Response	Cohort
None	Sum 2011
To be able to different temperature probes to more accurately determine what temperature would need to be reached for bleaching to occur. Also a pH probe in order to determine at what pH does the aiptasias bleach. I love working with them and creating a bigger lab for myself to use next year because of this awesome technology.	Sum 2011
Nothing	Sum 2011
STEM Digital 2	Sum 2012
Our computer availability is limited to one media center with computers that are reliable and fast. Unfortunately, sign-up for usage is competitive so that it is difficult to have the kids have enough practice on the program basics before usage for experiments.	Sum 2012
Out tech department + out IT infrastructure did not allow the software to run. I like it and would have used it but for my limited resources.	Sum 2012
I found I learned things that helped me as a teacher that you did not ask about on this survey. I also found STEM ED to be extremely supportive after I left the institute and with this particular project.	Sum 2012
Continued example lessons/software upgrades.	Sum 2012
More individual practice using the software. Maybe modifying the lesson to suit my curriculum right at the workshop.	Sum 2012
In all seriousness, funding is the only way to continue using the arsenic testing kits that you provided for us. Many of the articles can be inexpensively purchased, but some of the key components are costly when stocking for 125-150 students. Class period demos are the next best option.	Sum 2013
I could certainly use assistance in certain areas of science (physics and engineering) where the scientific method and data collection are not the norm for a research inquiry.	Sum 2013
I could use more cameras- students aren't able to hook up their personal devices and we didn't have enough cameras to take pictures.	Sum 2013
Convincing Belchertown that having one of the lowest per-pupil spending stats in the state is not a point of pride. We are in the process of completing a grant that will allow the Science department to have a cart with 6-8 computers ... otherwise, we have no access to computers adequate to running any Science software. I really thought we'd see some improvement this year, but it's getting worse! This is a fantastic program that I'd love to utilize. A few grants from now, we may.	Sum 2013
Any updates and additional lesson plans would be useful. The sharing of ideas is what made this institute so great!	Sum 2013
None.	Sum 2013
Nothing aside from sharing additional lesson plans!	Sum 2013
Not sure. Most of us are on FB together, but I haven't asked others about how they used the ADI and I should have! (It was a particularly hectic winter and I was more locked into curriculum than usual.)	Sum 2013
The materials require the support of the district. I don't have control over the programs that are downloaded onto school computers. There isn't anything that could be provided to help.	Fall 2013