Table of Contents

I. Purpose and Background 3

II. Design 3
   Logic Model 3
   Methods and Measures 4

III. Findings 5
   E. Educator Formative Results 6
      To what extent are educators already using SciGirls strategies? 6
      What are the components of effective professional development? 7
   F. Educator Summative Results 19
      What is the effect of the PD on educators’ understanding, confidence, mental models, and intent to use the SciGirls strategies? 19
      To what extent and under what conditions do educators’ implement what they learned? 20
      How do the educators think their changes affected their female students? 25
   G. Role Model Results 25
      What are the components of effective PD for SciGirls role models? 27
      What is the effect of professional development on the role models’ understanding, confidence, and intent to use the SciGirls strategies with CTE students? 30
      To what extent and under what conditions do role models implement what they learned about how to support CTE girls in STEM? 31

IV. Conclusions and Options for the Future 32

References 34

Appendix
   A. Baseline/needs assessment survey 36
   B. Pre/post project analysis for presence of SciGirls Seven 37
   C. Observation of professional development 38
   D. Post module and end of PD survey 38
   E. Observation of teachers using strategies 46
   F. Interviews with educators 46
   G. End of year/post project reflection survey 46
   H. Year later follow up survey 47
   I. Role model post PD survey 48
   J. Role model post visit survey 49
   K. Role model post visit educator survey 49
   L. Comparison group surveys 51
I. Purpose and Background

This external evaluation is designed to examine the training and implementation of gender equitable teaching strategies in the classroom.

II. Design

The evaluation will use a mixed methods approach (Frechtling, 2010) to collect both quantitative and qualitative data through observations, surveys, and interviews. Results will be provided quickly in keeping with a collaborative responsive design model (Davis and Scalise, 2014; Rodriguez-Campos and Rincones-Gomez, 2013, Clarke et al, 2006) that informs the project design and implementation.

The formative evaluation will help to improve the content and delivery of the course in gender equitable teaching strategies for increasing the number of girls who choose STEM career and technical education pathways. The summative evaluation will measure the expected/intended outcomes of the professional development for technical education instructors and counselors, and the training for female STEM role models to determine the extent to which each teacher used the strategies, resources, and role models, and how the role models used the strategies they learned in the training. The evaluation study questions are:
Formative Study Questions
- To what extent do CTE faculty already use SciGirls strategies?
- What are components of effective PD for CTE faculty?
- What are the components of effective PD for role models for CTE students?
- What are the conditions that support CTE faculty inviting role models into classrooms?

Summative Study Questions
- What is the effect of professional development on the CTE faculty understanding, confidence, and intent to use the SciGirls strategies?
- To what extent and under what conditions do CTE faculty implement what they learned about how to support girls in STEM?
- What is the effect of professional development on the role models understanding, confidence, and intent to use the SciGirls strategies with CTE students?
- To what extent and under what conditions do role models implement what they learned about how to support CTE girls in STEM?

Methods and Measures
The evaluator will observe the professional development and collect data on faculty participation, the nature of the PD, and interview participants about their intent to use (what and how) what they have learned. After the professional development, faculty will be surveyed about their perceived effects of the professional development on their knowledge, attitudes, skills, interests, and behavior (NSF Impact Categories, Friedman, 2008). During the year, faculty will be encouraged to log and share their activities, impressions, questions, and resources via video, audio, or text in D2L. These, along with interviews with the faculty, will be used to characterize the nature of the effects of participation in the project on the participants’ mental models and use of gender equitable teaching strategies. When they invite role models into the school, they will complete a short evaluation on the nature and effect of the visit.

During the implementation, participants will be observed at least once and interviewed about their implementation of the SciGirls strategies, and its effects on their students’ interest, attitudes and perceived sense of self-efficacy in computing and engineering studies and careers.

Role models will complete a post visit survey to provide data on their training, their visit experience, how they applied what they learned from their training, what else they would like to know as a result of their visit, and if they intend to visit another class.

Quantitative data from the surveys will be analyzed using basic statistics, analysis of covariance, and pre/post gains. Qualitative data will be analyzed for themes and patterns using discourse analysis (Johnstone, 2002) to identify changes, such as in participants’ mental models (Gentner and Stevens, 1983, Carley and Palmquist, 1992).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline/needs assessment</td>
<td>Identify their technology access, experience, and use, their current</td>
</tr>
<tr>
<td>survey</td>
<td>teaching practice, and their ideas about encouraging girls in STEM</td>
</tr>
<tr>
<td>Pre/post lesson analysis for</td>
<td>Characterize changes in mental models and practices for</td>
</tr>
</tbody>
</table>
### III. Findings

The findings are presented for the educators (teachers and counselors) in the participating schools, and then for the role models by evaluation questions.

**SciGirls schools and educators (intervention group)**

**St. Paul Preparatory School**
- School Counselor, College Prep Teacher, Student Advisor
- Aerospace Engineering, Pre-Calculus, Algebra 2, Aviation
- AP Calculus, AP Computer Science, Statistics, Intro to Computer Programming
- Physical Science, Physics, Robotics

**Apple Valley High School**
- AVID Teacher, Language Arts
- Earth Science

**Patrick Henry High School**
- Intro to Engineering

**Comparison schools and educators**

**Lakeville South High School**
- STEM teacher
- STEM teacher

**City Academy**
- Math teacher
- Social Studies
- Science teacher

**Woodbury High School**
- Technology Education/PLTW
- Technology Education/PLTW

### III.A. Educator Formative Study Questions
To what extent are educators already using SciGirls strategies?

Educators report that students find out about STEM and CTE classes through advisement of teachers during scheduling, from teachers and counselors, because they can go for special STEM diploma. Students who do decide to take STEM classes do so because they are required, the students are interested, the classes were recommended by teachers or counselors. None of the school currently have any special recruitment for girls. The enrollment of girls in CTE classes in the three schools is low (9%-25%).

When asked why girls would want to take STEM CTE classes, educators gave several reasons: 1) STEM is where the best future careers are, and is integral to our daily life, 2) STEM teaches a lot of things girls might not be familiar with (especially if they come from a culture of submissive women), 3) Girls like the challenge of STEM courses.

Once girls are enrolled, teachers report they pay more attention to them, involved them in discussions, and try to find things that interest or are relevant to them. Three teachers said they don’t treat girls any differently, but try to involve all their students. After school help and advisor support is available to help keep girls in technology and engineering classes. Peer support is not offered.

When asked specifically about their prior use of SciGirls strategies, educators report using collaborative groups (average 8 on a 10-point scale), and hands-on open-ended investigations (8/10), and to a lesser extent encouraging students to do projects in their own ways (6.9/10), providing specific positive feedback (6.9/10), making projects meaningful (6.4/10), encouraging students to think critically (5.1/10) and using role models (4/10).

When asked how they think they could recruit and retain girls in STEM and CTE, they noted strategies such as: 1) have projects that interest them, 2) build personal relationships with students to understand their interests and aptitudes to be able to encourage them, 3) start in pre-K to encourage girls in math and science, and 4) offer clubs and recruit girls for them so they become interested (such as Herobotics), and 5) show them examples of what other girls have done. When asked about barriers to girls’ participation, teachers said most of their Asian students are interested in business, boys often don’t take girls’ opinions seriously, that girls are aware that they are under-represented in society in these fields (some see that as a deterrent, others as a challenge to be overcome) and that girls are often driven out of math and science classes and career paths. All the educators thought girls were capable of pursuing STEM CTE careers, but that the culture makes it more difficult for them than boys.

What are the components of effective professional development for SciGirls educators?
The objectives of the professional development are to:
1. Develop teachers’ understanding, confidence, and intent to use the SciGirls teaching strategies
2. Enhance the effectiveness of counselors in recruiting and retaining girls in STEM CTE classes, activities, and career paths

The ITEST Grant research hypothesis is that girls will develop more positive STEM identities and interests when their educators employ research-based, gender-equitable and culturally responsive teaching practices enhanced with female STEM role models. The professional development was designed by a team of professors and specialists in gender equitable teaching strategies. It consisted of six modules and was offered as a six-week course with weekly three-hour face-to-face meetings (50%), and online interactions and homework assignments in D2L (50%). Participants could receive continuing education units. The face-to-face portion was Mondays from 3-8 pm at Twin Cities Public Television on November 9, 16, 23, 30, December 7, 14. The module objectives and assignments are shown in the tables below.

1: Role Models Objectives

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Assignments</th>
</tr>
</thead>
</table>
| 1. Explain the importance of role models in engaging and maintaining girls’ interest in technology and engineering-related fields and use live and video-based role models in classrooms, through mentoring opportunities and/or in advisory settings.  
  2. Use digital videos featuring women role models for instruction, assessment and self-reflection. | 1. Watch and reflect SHE++ and explore additional online resources for accessing female role models  
  [https://vimeo.com/6387745](https://vimeo.com/6387745)  
  2. Discussion Board: Women as Role Models in CTE and STEM; Explore Digital Resources for Role Models  
  3. Check the strategies and reflect on daily use of strategies on a check sheet. |

2: Student-Focused Instruction

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Assignments</th>
</tr>
</thead>
</table>
| 1. Create a plan to maximize student-centered learning, and increase the time that they spend facilitating (versus directing) new learning.  
  2. Practice specific strategies designed to engage all students and create an environment where students are responsible for their own learning and share observed results and outcomes online with colleagues. | 1. Jigsaw: read selected resource, reflect on Discussion Board.  
  2. Discussion Board:  
    • Student Centered Instruction: Use a Google Form to gather data on the extent to which your instruction is Student-Centered and plan for improvements  
    • Plan, Try, Reflect on Student-Centered Instructional Strategies: Using one of the models shared in the face to face instructional session, give one new strategy a try and share on the discussion board.  
    • Preparation for Growth Mindset: Choose a source to listen to, watch, or read before next week. |

3: Thoughtful, Respectful Communication and Promoting a Growth Mindset
<table>
<thead>
<tr>
<th>Objectives</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Provide feedback in ways that encourage persistence and provide students with further opportunities to improve on their learning outcomes. 2. Implement at least one new strategy that fosters effective student communication, and analyze learning results accomplished (or problems encountered) with colleagues.</td>
<td>1. Post a lesson plan that you’ve redesigned to increase student creativity. 2. Discussion Board -- <strong>Choose two</strong> of these four options for this week’s discussion.  • Growth Mindset, reflect on varied applications of growth mindset in your setting;  • Thoughtful Respectful Conversation; Consider strength areas  • Facilitating Productive Conversation, encouraging peer to peer conversations;  • Use Digital Tools to Increase Depth or Frequency of Feedback</td>
</tr>
</tbody>
</table>

**4: Promoting Student Creativity**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Design a new lesson or develop advisory strategies that inspire students’ creativity and motivation 2. Share examples of classroom projects and advisory strategies that focus on creativity and personal motivation and share student feedback with colleagues online.</td>
<td>1. Apply new strategies for creativity in your setting. 2. Discussion Board:  • Foster Creativity in Others--Share a new lesson or advisory strategy you create to inspire your students’ creativity and motivation. Give an example of other ways you use creativity to motivate students.  • Dare to be Playful -- Use an animation of digital storytelling tool for your own communication needs this week. Share your experience learning/using the tool. 3. Think ahead: Public Service Announcements: How can we inspire critical thinking?</td>
</tr>
</tbody>
</table>

**5: Critical Thinking**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Discuss, compare and employ models to increase students’ critical thinking capacities to make a positive difference in their achievement levels. 2. Share student feedback about a lesson that develops critical thinking and reasoning skills with colleagues online. 3.Use evidence to support the importance of gender equity in science trade and technology fields within a digital video they create as a PSA.</td>
<td>1. Preview TED talk for next class: The Danger of the Single Story 2. Employ one or two strategies this week that can increase student intellectual engagement, and therefore increase critical thinking, and provide feedback for your students. 3. Share student feedback about a lesson that develops critical thinking and reasoning skills with colleagues online. 4. Choose how you want to respond on the discussion forum (or VoiceThread). 5. PSA due by next week.</td>
</tr>
</tbody>
</table>

**6: Cultural Awareness and Relevant Learning Experiences**
<table>
<thead>
<tr>
<th>Objectives</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Implement at least one new strategy for successfully engaging diverse</td>
<td>1. Looking forward, how will you continue moving your own learning and that of your community to enhanced practices for inspiring young women to consider post-secondary options in traditional male STEM and CTE fields?</td>
</tr>
<tr>
<td>students, with the goal of making the information and overall learning/advisory experience more personally relevant for all students.</td>
<td>2. Assuming the role of an anthropologist, deconstruct the cultural norms of a student with a non-dominant cultural life.</td>
</tr>
<tr>
<td>2. Gather input from female students on the extent to which the girls can see a connection between the content they are learning, or CTE/STEM post-secondary opportunities they are considering and their own life interests.</td>
<td>3. Using flipgrid or your own means, gather data from students about the extent to which they see CTE/STEM in their post-secondary futures based on their current future life interests.</td>
</tr>
</tbody>
</table>

Seven out of the eight educators would recommend the course to another educator as very helpful, the right amount of time, providing lots of ideas, and worth the time and effort. The educator who would not recommend it said that the information is valuable but it is too stressful to take it during the year.

**Educators reported they liked** the topics (9.5), the length (9.3/10), the size of the class (9.1), and the consecutive sessions/one per week (8.9). They did not like as well (6.5) the hybrid format with face-to-face and online assignments, preferring the face-to-face discussions. It also came out in the interviews that two of the three schools did not post to D2L, that D2L was cumbersome to use, that Mondays were not a good day if you want people to try strategies during the week since planning for the week has been done, and that expecting teachers to try specific things in a week’s time was unrealistic.

They suggested overall improvements:
- Offer the course as a weeklong professional development in the summer
- Introduce a strategy, then have time for participants to think about and discuss how they will use it during the year
- Include examples of lessons before, then using the SciGirls Seven for common types of lessons like lecture/notetaking, lab work, build projects, homework, etc.
- Make the outcome of the course a plan for using the SciGirls Seven in the next school year
- Use a simpler tool for online assignments and materials. D2L is for college students to use all four of their years.
- Use an online tool that has each person able to easily post what they intend to do throughout the year, and update it with what they actually do.
- Offer monthly seminars during the year with interesting speakers and reporting out from the people in the course on what they are doing.
- Have separate assignments and reading for counselors with lots of models and ideas for encouraging girls school wide to pursue STEM and CTE.
- If the course has to be offered during the year, offer it earlier in the year or after winter break with the expectation that strategies will be used the following year and schedule the face-to-face portion on Thursday nights.
If you expect people to use the online portion, make it required, interesting and worthwhile so everyone participates.

Don’t expect teachers to implement a strategy in a week’s time. The strategies are broad, so planning to use them in a lot of different ways during the year is more realistic.

Educators were asked to comment on Modules 3-6 individually. Some questions on the final survey also apply to Module 1. Note that the surveys for modules 1 and 2 were not completed by the participants (an oversight in implementation) but they are available for use in the next PD.

Module 1: Role Models
When asked how they would use role models, educators listed several approaches: 1) a girl/mother breakfast with role models and challenges, 2) career days, 3) videos, 4) being more explicit in talking about role models, 5) shadowing opportunities.

They plan to locate female role models through; FabFems, district office listserv, personal relationships, appeals on social media, SciGirls trained role models, list from class, SciMathMN Frameworks, business contacts through the corporate sponsorships our school has developed.

They will prepare students before using the role model by
1. I will ask them which role model they want to visit.
2. Discuss the person’s job and related roles, have students develop questions to ask.
3. Have them do research about companies and current field
4. Introduce the idea of bringing a guest into class, review respectful behavior, introduce the guest/role model
5. Give them background information, provide some sort of hook to interest them, and make sure the role model isn't boring
6. Have a discussion about their thoughts and beliefs about the role being modeled.

Module 2: Student-Focused Instruction - No data

Module 3: Thoughtful, Respectful Communication and Promoting a Growth Mindset

Most of the educators think that it is important for girls to have a respectful classroom where they feel heard and able to take risks (7/8 educators). When asked how often they used each of the following strategies from Module 3 and how likely they are to use them in the future, the educators reported an increase in every area on a scale of 1-10 including keeping an inclusive environment (6.9 before, 8.9 after), Keeping discussion positive and constructive (7.7, 9.5), encouraging participants (7.7, 9.8), allowing participants to introduce themselves (5.0, 8.1, being clear up front about expectations (6.3, 8.9), using inclusive language (6.0, 8.6), asking for clarification (7.1, 9.1), treating participants with respect (8.4, 9.4), developing an awareness for barriers to learning (6.0, 8.6), providing sufficient time and space for participants to gather their thoughts (6.5, 9.0), and provide opportunities for pair-share (5.8, 8.8).
Keep an inclusive environment & 6.9 & 8.9 
Keep discussion positive and constructive & 7.6 & 9.5 
Encouraging participants & 7.6 & 9.8 
Allow participants to introduce themselves – you can even set up an icebreaker to have pairs of students introduce each other & 5.0 & 8.1 
Be clear up front about expectations and intentions amongst participants and the facilitator & 6.3 & 8.9 
Use inclusive language & 6.0 & 8.6 
Ask for clarification if unclear about a participant’s intent or question & 7.1 & 9.1 
Treat participants with respect and consideration & 8.4 & 9.4 
Develop an awareness for barriers for learning & 6.0 & 8.6 
Provide sufficient time and space for participants to gather their thoughts and contribute to discussions & 6.5 & 9.0 
Provide opportunities for participants to pair-share & 5.8 & 8.8 

![Current Versus Future Use of Inclusive Strategies](chart.png)

Educators plan to use a variety of strategies to move students more toward a growth mindset.

- **Respond to answers and comments with questions that push and encourage growth** - have the growth mindset flow chart available for reference when working through student issues and concerns
- **Discuss growth mindset; encourage process over result**
• Be explicit in talking about mindfulness and/or growth mindsets. Share the personal accountability and reflection poster by Jackie Gerstein with students.
• I’d like to include more sharing of products. I want students to see a variety of work and be able to rate themselves.
• Explicitly address what is a growth mindset, what it looks like, use stories or examples to illustrate, emphasize how much they’ve learned already
• Get them to consider other perspectives. Perhaps people do not see things the same way they do.
• I will try to give better feedback
• Talk about the hurdles while working through the problem

They reported insights into how to give students feedback and help them learn how to use it as a result of Module 3.
• It is important HOW the feedback is given. in an encouraging, kind, RESPECTFUL tone vs. discouraging, demeaning tone. it is also important on the consistency of the tone use-unconditional positive regard :) 
• Emphasize process/steps to completion/’not yet”
• Using the personal accountability and reflection poster with students.
• I’m very direct with my students and sometimes I forget that different students perceive this in different ways. I need to be mindful of student reaction so I can vary the level of directness I use with different students.
• I need to remember things like social status and peer influence when assigning groups.
• Stay on the positive. Be mindful of the words I use.
• I have learned to be mindful to give explicit feedback more frequently and in multiple ways.

The educators plan to try new practices as a result of what they learned. More aware of INCLUSIVE language when in the classroom (2)
• Be more mindful regarding group roles (2)
• Thinking about tasks within groups as I form the groups.
• More explicit instruction with group work.
• Watch more carefully how my groups are working together.
• Use inclusive language. I too use 'guys' a lot!
• I will try to create a digital communication format.

Questions going forward were:
• What are research-backed methods for encouraging growth mindset? I like the concept, but there wasn’t much tangible in the resource I viewed (the TED talk).
• How will I fit this into my lessons?
• What about respectful conversation outside group work?

Comments or suggestions?
• Part one was hard to answer as a counselor so I put in 5 for all. These are not necessarily accurate for me.
• More explicit strategies to use (as opposed to theory).
• I love the Google form as an exit slip, but I wish I had a record of my responses. Once I hit submit, I feel like they are lost and I don’t always remember what I wrote.
• I am a counselor, so disregard the data regarding class.

Module 4: Promoting Student Creativity
Educators see the girls in their classrooms as curious (7.0 on 1-10 scale), think creativity is a positive thing (6.4), and somewhat able to build on each other’s ideas (5.3), ask divergent questions (4.7), reflect intensely (4.4), and less able to embrace the messiness of creativity (4.2).

Five out of the seven educators believe it is “very important” for girls to be creative in the classroom for a variety of reasons:
• I’ve noticed that many of my girls enjoy the creative aspect, so it is a way for them to feel validated. This leads to increased motivation.
• So much learning happens when students need to be creative to apply concepts to reality.
• Girls are very creative and they need to take risks to be able to express this in the classroom for the benefit all present.
• I think girls sometimes just want to follow a process to get the answer. However, by being creative, they must take risks and by taking risks they might fail, but it gives them the opportunity to pick themselves up and try again.

For those who did not see it as important, they commented:
• Creativity does not integrate naturally with all lessons--sometimes they really do just need to learn the vocabulary/the formula. I use creative prompts and projects where I can, but some topics do not lend themselves to it (in the context of the material we must cover in a year).
• It is difficult to be creative while filling out college essays!

When asked how this module affected their use of key strategies for promoting creativity, the educators reported they already use all the strategies, but will use them more often in the future on a scale of 1-10, including having students ask the questions (6.0, 8.1), having students answer the questions (5.7, 8.3), fostering intellectual curiosity (5.4, 8.0), encouraging students to embrace messiness (6.4, 8.4), building a community of learners (7.0, 9.0), providing an atmosphere to encourage creative effort (6.3, 8.6), allowing time for students to ask questions (7.0, 9.1), teaching creative skills explicitly (4.6, 7.9), exposing students to creative work (4.5, 7.7), praising students for creative ideas and questions (7.0, 8.9), and permitting failure and helping students to learn from it (6.9, 8.7).

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Before</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have students ask the questions</td>
<td>6.0</td>
<td>8.1</td>
</tr>
<tr>
<td>Have students answer questions instead of you answering them</td>
<td>5.7</td>
<td>8.3</td>
</tr>
<tr>
<td>Foster intellectual curiosity</td>
<td>5.4</td>
<td>8.0</td>
</tr>
<tr>
<td>Encourage (and giving time) for students to embrace messiness</td>
<td>6.4</td>
<td>8.4</td>
</tr>
<tr>
<td>Build a community of learners</td>
<td>7.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Provide an atmosphere in which creative effort is valued</td>
<td>6.3</td>
<td>8.6</td>
</tr>
<tr>
<td>Allow time for students to ask questions</td>
<td>7.0</td>
<td>9.1</td>
</tr>
<tr>
<td>Teach creative skills explicitly</td>
<td>4.6</td>
<td>7.9</td>
</tr>
</tbody>
</table>
Expose students to creative work  4.6  7.7
Praise students for creative ideas and questions  7.0  8.9
Permit failure and help students learn from it  6.9  8.7

They reported they will try some new practices as a result of Module 4.

- **Working to build a community of learners in the classroom** - hoping they feel safe in their classes
- **Teach creativity as a skill that can be developed.**
- **Put together a question box and encourage students to add questions to it.**
- **Have students ask more of the questions and allow them to fail in their answers.**
- **More conscientiously working in creative activities/divergent question opportunities.**
- **Looking for a video game for the students to play that relates to college admissions.**

Educators reported insights into about how to give students feedback and help them learn how to use it.

- **Creativity = expression. It is a product which means that students are the producers.**
- **As a counselor, most of my job is asking questions and encouraging students to think creatively and independently to explore and try new ideas.**
- **That creativity is a skill.**
• Create a safe space for creativity and brainstorming; no verbal or non-verbal response to other students' ideas. Be explicit in the idea that there is no WRONG way to get the answer.
• It reminded me that I need to provide creative strategies for problem-solving, such as drawing a picture, guess and check, substituting and trying numbers to find the truth in a mathematical statement, etc.
• Ways to get students more involved in answering questions.

Questions going forward were:
• How do I be more creative in teaching math concepts?
• Exemplars of creative approaches to mathematics education? That is, consistent creative approaches, not occasional projects.
• Constant question about how to apply these strategies outside a classroom setting.

Comments or suggestions?
• This one was more realistic to counselor in the creativity/asking questions... but still hard to apply many concepts as we are not in the classroom on a daily basis. One thing I strive to do is create a safe zone in my office, but always working to create a safe school environment, especially in classrooms.

Module 5: Critical Thinking
Educators feel the girls in their classes are good at critical thinking for the question at issue (7.7), the information that is relevant to the question (7.7), the key concept they need to understand (6.7) and the purpose of instruction (6.7). They are less intellectually engaged in making inferences (5.7), assumptions they are making (5.3), making their thinking clear (5.1), the implications of their thinking (5.0), and their points of view (4.9).

All the educators believe it is important for girls to do critical thinking for the following reasons:
• Without critical thinking, they're not learning, they're just memorizing—they won't be able to apply what they've learned to novel problems.
• Having girls process through their thinking, using metacognition individually and VABB-ing as an adult, pushes their development.
• Critical thinking is very important for all students.
• This is a confidence builder. When girls get positive feedback on their critical thinking skills, they should be more likely to engage in intellectually rigorous activities.
• I feel critical thinking is important to girls. It's part of the why that they want instead of merely memorizing data. I think girls tend to focus on the whole and critical thinking is part of that.
• They need to be able to critically think about a problem, because in college, it will not be just rote memory. This will be even more critical post-college.
• I think it is important for all students, but girls may need more encouragement because they are not traditionally taught to 'figure out a way to fix it'.

When asked how this module affected their use of key strategies for promoting critical thinking, the educators reported they already use most of the strategies but will use them more often in the future on a scale of 1-10, including case studies (2.3, 5.4), providing rigorous feedback (4.3, 6.6),
expecting high intellectual engagement (5.7, 7.7) using discrepant events to provoke thinking (3.3, 6.1), structuring student group work so they push each other’s thinking (4.4, 6.4), providing an atmosphere in which critical thinking is valued (6.4, 8.6), allowing time for struggling with issues & doing critical thinking (6.1, 8.4), teaching critical thinking skills explicitly (4.1, 7.3), exposing students to intellectually rigorous work (5.1, 6.6), praising students for critical thinking and questioning (6.1, 8.7), encouraging students to constantly improve their thinking (5.9, 8.3), and using problem-based learning (5.7, 7.7).

<table>
<thead>
<tr>
<th>Effect on Educators' Use of Key Strategies for Critical Thinking</th>
<th>Before</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have students analyze case studies</td>
<td>2.3</td>
<td>5.4</td>
</tr>
<tr>
<td>Provide rigorous feedback on critical thinking</td>
<td>4.3</td>
<td>6.6</td>
</tr>
<tr>
<td>Expect high intellectual engagement</td>
<td>5.7</td>
<td>7.7</td>
</tr>
<tr>
<td>Use discrepant events to provoke thinking</td>
<td>3.3</td>
<td>6.1</td>
</tr>
<tr>
<td>Structure student group work so they push each other’s thinking</td>
<td>4.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Provide an atmosphere in which critical thinking is valued</td>
<td>6.4</td>
<td>8.6</td>
</tr>
<tr>
<td>Allow time for struggling with issues &amp; doing critical thinking</td>
<td>6.1</td>
<td>8.4</td>
</tr>
<tr>
<td>Teach critical thinking skills explicitly</td>
<td>4.1</td>
<td>7.3</td>
</tr>
<tr>
<td>Expose students to intellectually rigorous work</td>
<td>5.1</td>
<td>6.6</td>
</tr>
<tr>
<td>Praise students for critical thinking and questioning</td>
<td>6.1</td>
<td>8.7</td>
</tr>
<tr>
<td>Encourage students to constantly improve their thinking</td>
<td>5.9</td>
<td>8.3</td>
</tr>
<tr>
<td>Use problem-based learning</td>
<td>5.7</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Educators reported insights into about how to encourage your students to do critical thinking.

- As a counselor, I am always encouraging my students to think critically about the question at hand, whether it is planning ahead, or processing through a situation that
has arisen, using the different parts of today's lesson- working with students to teach them critical thinking is invaluable.

- Like much of the content in this class, I need to be explicit with students about critical thinking.
- Because I am still fairly new to the profession, I'm still very self-aware. Developing critical thinking in students requires letting that go.
- I was reminded of the importance of meta-cognition in learning and learned about all the different types of thinking students should be doing.
- It was good going through the eight steps for an engaged student and discussing ways to implement those in class.

They reported they will try some new practices as a result of Module 5.

- More explicit instruction of critical thinking skills.
- Continue working on point of view
- Use a discrepant event such as a video to get students thinking; introducing historical case studies; VABB more as feedback.
- Spend more time concentrating on why students are thinking the way they are and getting students to recognize it.

Questions going forward were:

- Examples specific to math/com science instruction.

Comments or suggestions

- As a counselor some of this did not apply directly to my work, I looked at this from working with individual students.

Module 6: Cultural Awareness and Relevant Learning Experiences

When asked how this module affected their use of key strategies for making learning relevant and cultural appropriate, the educators reported they already use most of the strategies (not listening skills as much), but will use them more often in the future on a scale of 1-10, including, consciously planning for diverse students to be included (5.8, 8.0), actively teaching methods that engage diverse students with each other (5.8, 7.8), planning ways to make the content accessible (6.9, 8.4), giving students time to relate to the content from their cultural perspectives (4.8, 7.0), accommodating different learning styles (6.1, 8.0), providing an atmosphere in which creative value each other’s perspectives (5.6, 7.5), and teach listening skills explicitly (4.3, 6.9)

<table>
<thead>
<tr>
<th></th>
<th>Now</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consciously planning for diverse students to be included</td>
<td>5.8</td>
<td>8.0</td>
</tr>
<tr>
<td>Active teaching methods that engage diverse students with each other</td>
<td>5.8</td>
<td>7.8</td>
</tr>
<tr>
<td>Planning ways to make the content accessible</td>
<td>6.9</td>
<td>8.4</td>
</tr>
<tr>
<td>Giving students time to relate to the content from their cultural perspectives</td>
<td>4.8</td>
<td>7.0</td>
</tr>
<tr>
<td>Accommodating different learning styles</td>
<td>6.1</td>
<td>8.0</td>
</tr>
<tr>
<td>Providing an atmosphere in which creative value each other’s perspectives</td>
<td>5.6</td>
<td>7.5</td>
</tr>
</tbody>
</table>
**Teach listening skills explicitly**

<table>
<thead>
<tr>
<th><strong>Use of Strategies Now and in the Future</strong></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAVE STUDENTS DO CASE STUDIES</td>
<td>2.3</td>
<td>4.3</td>
<td>5.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROVIDE FEEDBACK ON CRITICAL THINKING</td>
<td>4.3</td>
<td>6.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXPECT HIGH INTELLECTUAL ENGAGEMENT</td>
<td>5.7</td>
<td>7.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USE DISCREPANT EVENTS TO PROVOKE THINKING</td>
<td>3.3</td>
<td>6.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STRUCTURE GROUP WORK TO PUSH STUDENT THINKING</td>
<td>4.4</td>
<td>6.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATMOSPHERE THAT VALUES CRITICAL THINKING IS VALUED</td>
<td>6.4</td>
<td>8.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALLOW TIME TO STRUGGLE WITH ISSUES</td>
<td>6.1</td>
<td>8.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Educators reported insights into about the importance of cultural awareness and relevant experiences.

- *It takes a lot of time! This is an ongoing learning process that's never really finished.*
- *I became aware that I don't put much thought into this--I'll be looking for ways to work things in.*
- *As a first generation American, with English being a second language, I know that my perspective and approach to things is different than most other people around me.*
- *The Dreamkeepers eight principles of culturally responsive pedagogy.*
- *This is a part of my every day job. Our student body is 90% international. But I want to take more time to learn.*
- *To explicitly move from cultural knowledge though awareness to sensitivity.*

They reported they will try some new practices as a result of Module 6.

- *Working on how to accommodate for all students- culturally* *
- *I need to include more diverse role models in my practices.*
- *I will try to include more activities that address individual learning styles.*
- *Working in culturally relevant angles to lessons.*
- *More student involvement in teaching.*
- *I want to have students talk about what respect looks like to them. Perhaps start as a Think, Ink, Pair, Share.*
- *Ask more questions about their lives at home.*
- *Incorporating opportunities to share cultures on Fridays.*
Six of the eight educators believe it is very important to have culturally relevant experiences for girls in their classrooms for the reasons listed below:

- *Reaching students where they are at, building relationships with them, and giving them a chance to teach me is so important in helping and guiding them throughout school. Especially girls, the social and relationship piece can be the most important part of learning.*
- *These practices validate girls' experiences.*
- *I think girls need to relate their learning experiences to their own personal cultures, whatever that may be, so they can expand their horizons to think in terms of possibilities.*
- *While it's important, it doesn't always fit naturally into math/computer science.*
- *We have 32 different countries represented, so it will be very hard to have each represented in a culturally relevant experience.*
- *I think it is very important for all students.*
- *Since our girls represent so many cultures it would be silly not to incorporate such experiences.*
- *I think this will make the coursework more meaningful*

### III.B. Educator Summative Questions – Outcomes

- What is the effect of professional development on the CTE faculty understanding, confidence, and intent to use the SciGirls strategies?
- To what extent and under what conditions do CTE faculty implement what they learned about how to support girls in STEM?

**What is the effect of the PD on educators’ understanding, confidence, mental models, and intent to use the SciGirls strategies?**

When asked how they would describe the effect of the professional development course on the way they think about how they teach and interact with girls, they reported effects on their mental models of what girls need to be successful in STEM CTE and how to work better with girls in the classroom or in advising situations.

- *This has helped very much with my thinking about specific aspects to use while working with girls*
- *Many of the strategies we addressed I was already familiar, so I used this time to reflect on current practices. I think that was the point and I'm thankful for the time.*
- *It opened me to many new possibilities and strategies to try in the classroom.*
- *It's made me more conscious of the strategies I currently use/do not use, and I've noticed myself becoming more mindful of the philosophies we've discussed in class and how they can fit into my lessons/units.*
- *I am a bit more aware of things to use to reach girls.*
- *I think this course has had a significant impact on my thoughts about how I teach. I plan to use role models in the classroom.*
- *I feel more motivated to encourage girls to consider careers in the STEM field. Also more informed about it myself.*
- *I am glad to have the resources to increase the efficacy of my practice.*
Each teacher created a Public Service Announcement about girls in STEM. One person interviewed his mom, another made a poster about careers, a third made a quiz about women’s accomplishments. All portrayed accurate information that might be useful to help the public understand the importance of women in STEM. Below are their reflections on their PSAs and links where they were available.

I focused mine on the need for female role models in STEM due to the tendency for women's accomplishments to be written out of history in the past: http://176.32.230.45/scigirls.com/ (web & mobile)

I "interviewed" my mom, who was 1 of 3 women in a class of 100 admitted to the University of Minnesota Dental School 1950 to 1954. One of the things that surprised both of us, was that even 1971, the number of women in dental schools in the USA was still only 1%. She wasn't too happy about being videotaped, but overall I think it was interesting to talk with her about dental school in the 1950's. <no link provided>

I spent some time on the Powtoon learning curve and created a video to attract girls to engineering. I specifically chose engineering since it is the least-represented by women in the STEM fields. I used images of girls doing things in my Aviation class. One thing I found with Powtoon is that all the cool stuff to use requires a subscription, and it's not really priced for teachers. Here's the link to the video: https://www.youtube.com/watch?v=wEVV3E2Y7zo

I created a poster for college and career purposes. Illustrations were done by a former student who is majoring in Graphic design and created the characters in an electronic format! https://drive.google.com/file/d/0B6epdEDbA9lQYVZWaHhvZFNSb2s/view

I wanted to convey a message about children being part of the world community and their potential to define realities. “Seeds are full of Potential” https://docs.google.com/presentation/d/1VrlNKHsCYqZrg13hkSz2W6SH-qzhbkuj3jP7llvnok/edit#slide=id.p3

To what extent and under what conditions do educators’ implement what they learned?

In interviews and post implementation surveys, all the educators and counselors reported they had changed their practice to incorporate things they had learned. For example, one counselor is going to focus more on a “strength finders” approach to college planning and admissions preparation. She is doing this individually and will also integrate it into her three college preparation classes in the fall. Another counselor had taken classes on culturally sensitive counseling and realized she could apply a lot of that to working with girls. She has also hosted a girls’ role model breakfast, Grit2GReat, and plans to do that every year. Girls and their moms were invited to a breakfast with a female in STEM careers panel, and a STEM challenge at each table for the girls to work on while eating and talking. Each table had 'host' female adult who led a series of discussion questions about: real life experiences and goals. We collected data at the end about the panel, information gained, future goals, and future ideas for events.
Educators were asked to describe a lesson before the course, and then again in the final course survey. Describe how you would incorporate the SciGirls Seven strategies into a project. Four educators completed before and after descriptions. One educator, who does AVID talked about how she would change what she has done next year with her College Research Project.

**Teacher 1 - Post only**

For the AVID College Research Project, students interview representatives from colleges, compare their data, and present to the class. I've done this as an individual project, but it could be good for groups of three to create more in depth research. Students choose the colleges based on their own interests so it is relevant. The first step is exploration. Rather than starting with a list of college characteristics, I might have them simply explore information and come up with their own questions to encourage their open-ended thinking. I will also allow students a wide variety of presentation methods. This year I suggested they create Google presentations, but it could really be a number of formats. The students receive a rubric for this project so they will have to think critically about what to include and then assess how they did. In the future, I might have students help create the rubric for the assessment. In addition to having students interview admissions representatives, I might include expectations about interviewing alumni, current students, etc.

**Teacher 3**

This teacher already does project-based learning in an aviation class so students are design, build, test, revise, test, and report. The observed lesson incorporated all the SciGirls strategies except using a role model. The main thing that this educator has changed is her individual encouragement of female students and “expecting” them to do all facets of the project to show confidence in their abilities. It was clear from her lesson, that she already provides clear specific feedback to all students to help them improve their ideas and understanding. Rubrics are a regular part of the class routine, including students rating their own participation and success as well as rating their team-mates. She plans to find additional ways to encourage girls and incorporate role models into projects as well as sharing her own experience since she had a commercial career before teaching.

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>We build cardboard hovercraft. Some of the students have never built anything prior to this class,</td>
<td>Maybe building some sort of launching device or flying device, possible remote control. Students would have to use the engineering design process to meet the constraints, decide how to spend their budget and reach the objective. I have a tough</td>
</tr>
</tbody>
</table>
so they start out by making easy things like kites and paper rockets. By the time they get to the hovercraft, they are learning to solder wires, follow diagrams and assemble things and operate the craft with RC controls. 

time with making things personally relevant in aviation...maybe some sort of drone device? I think having them build something without an idea will be pretty open-ended. Remind them of their strengths and how they can use them to complete the project. Students will have to think critically about their work using rubrics for each stage of the project. I will be posing 'What if...?' questions to extend their thinking. I plan to invite people into the school to talk and demonstrate their careers.

Teacher 4
This teacher already uses collaboration and projects in all her classes. As a result of SciGirls, she has focused more on making assignments personally relevant and will incorporate more role models. For example, in the AP Calculus AB class on AP exam prep that was observed, she started with asking the students what they already knew about the exam and then returned to that list when she reviewed the elements and strategies for handling each section. Then then students worked in small groups to make “cheat sheets” for one or two chapters that would then be copied for the whole class to use. To make other lessons relevant, she has picked up on current events that are of interest to the students like the Zika virus as a rate of change problem, or having them design roller coasters to be continuous (no holes) and differentiable (no ends). She also frames the subject in simple terms that removes some of the intimidation. For example, she describes calculus as “just slope and adding things.” This teacher is using all the strategies except role models. Her practice could be improved with more ideas for how to use role model videos, how to anchor the ideas with those who developed and those who use them (like the researchers studying ZIKA). She is aware of this and working on it.

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students in Intro to Programming were challenged to make a tapping game as our first project (click an icon on the screen that's moving). We first built a bare bones version together as a self-paced tutorial, with steps increasing in difficulty as they gained familiarity with the language. In the final stage, students were challenged to customize the program with their own graphics and coding features, with a list of examples (scaffolded by difficulty level) provided to encourage thought. Each smaller stage of the project required them to show me their work so I could view it and sign it off, leading to check ins/feedback with each partner pair every 10-30 minutes.</td>
<td>Design a phone app useful to their community. Group brain storm, research, idea sharing, pseudo-coding, and coding. Students would pick a project that's meaningful to them (hopefully). Students are designing their own app. I will monitor and provide formative feedback during the development process. Students will think of/justify how their app will address/solve a problem in the community. I plan to invite in a role model in IT or in a field related to their projects.</td>
</tr>
</tbody>
</table>

Teacher 5
This teacher liked some of the project ideas from the class, like creating the Fakebook pages. He started the observed lesson in Physical Science by asking students to vote for statements about gravity they believed to be true. Then he had a lecture with slides, followed by two demonstrations (golf ball vs. basketball falling rates and projectile motion with two metal disks) and videos showing projectile motion. Students were engaged (2 boys, 3 girls) and asked questions as well as taking notes throughout. This teacher is very focused on engaging the students with himself and the content rather than with each other. His practice could benefit from learning strategies to have students discuss ideas and work together to process what they are learning or seeing in a demonstration.

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>We use Arduino Uno programming in the Robotics class. It was very easy to engage and motivate them and the assessment was - did it work or not?</td>
<td>Students created a FakeBook page for one of 10 'scientists' involved in the development of the atomic model. I had three classes doing this, so they could talk with other students, who had the same scientist. They all have Facebook, so they know how to create it. The classes each came up with the rubric that I will use to grade the project (critical thinking). The creative part was they researched the person and decided how to put the FakeBook together. One of the assignments was assessing their own projects and having their host parent assess their project (identify three things they liked about the project and two suggestions to improve the project). I did not involve a role model, but encouraged them to choose someone they might see as a role model.</td>
</tr>
</tbody>
</table>

Teacher 6
This teacher does a number of design projects in class. The observed lesson introduced the four main Geologic principles while students took notes: Law of Superposition, Uniformitarianism, Original Horizontality, Cross-cutting relationship + Unconformity. Students worked with their lab desk partners to analyze the order of creation of the elements on a wooden block. As a result of SciGirls, this teacher has decided to research women involved in the concepts students are learning. For this lesson, she had not found any women specifically, but said there were women (wives) who felt these discoveries were important to the world and encourage their husbands to share them. She talked about James Hutton’s discoveries at Siccar Point. While the students worked in teams of two to determine the order, she walked around and asked most of the groups what they thought was first, then asked three students to write the order on the board. Some students volunteered their reasons for the order. Then she wrote her order on the board, asking the students to see if she was “right.” She gave her reasoning for the order. While she is very committed to projects, hands-on activities, and collaboration, her practice could be improved by understanding her role in facilitating student thinking and conversation in those situations.
We do an engineering project based on wind turbines. Students design and test turbine blades, revise the design and repeat. Students are assessed on the process not on the functionality of the designs.

The wind turbine project focusing on the engineering design loop. Students work in teams of three, they need to come to a consensus on blade designs and on modifications to be able to redesign the blades. It is relevant because we connect it to the concept of climate change, energy, and to students’ energy use. The blade designs are an open-ended investigation, there is no 'correct' answer. Students are encouraged to create unique designs for the blade designs. I am able to provide specific feedback on how to think through the design process. By asking the correct questions I guide students into thinking critically about how to redesign the blades. I will try to find a role model that works in the Wind Energy field.

Teacher 7

This teacher teaches Project Lead the Way in a technology lab. PTLW “provides a comprehensive approach to STEM Education. Through activity-, project-, and problem-based curriculum, PLTW gives students in kindergarten through high school a chance to apply what they know, identify problems, find unique solutions, and lead their own learning. For educators, our engaging, rigorous teacher professional development model provides tools to empower students and transform the classroom into a collaboration space where content comes to life” so the principles are parallel to SciGirls. This teacher felt SciGirls has given her the opportunity to focus on girls, especially the research girls (9) who she has been showing videos too and meeting with after school. Having SciGirls as the umbrella has made it special for her and the girls. She has also grouped the girls in her classes so they can work together and gain confidence in their skills and ideas and speak up more.

The observed class was Introduction to Engineering. Students were finishing up their train design projects on the computers. She walked around, checking in with students and helping them think through issues. Students spontaneously helped each other.

Before

When students were researching technologies that impact the world, I encouraged them to think about topics they are interested in. Projects came back about Coco Chanel’s Little Black Dress, sculptured fingernails, hair extensions, and Barbie as well as cell phones and medical imaging.

After

I will increase the number of think-pair share opportunities. I will also give students a choice of their investigation of Engineering Careers. The course is very hands-on since students build physical and CAD models. I allow for extension activities that let them follow up on things that interested them. I plan to use voice memo to communicate individual feedback. I will use mathematical models and spreadsheets more often. I plan to have classroom visits of FabFem Role models.
**Going Forward**
When asked what they would like or need to continue to grow their use of SciGirls strategies, they asked that the course resources continue to be available to them, that examples of exemplary lessons be provided, and that they have ways to continue to be involved with the project.

_How do the educators think the changes they made affected their female students?_

In the interviews, the teachers reported they had begun to see some changes in female student behavior. For example, one teacher grouped the girls together which seemed to increase their confidence about voicing their ideas. Another teacher reported that individually encouraging girls to build as well as write or decorate when they do projects has helped them to contribute more. One girl joined the robotics club.

### III.C. Role Model Results
Role models were recruited by TPT through the Advisory Board members and local networks. They were asked to register on the FabFems website [http://www.fabfems.org](http://www.fabfems.org). Educators were encouraged to use role models in an interactive panel or career fair event (counselors), and an interactive hands-on in-class visit rather than just a lecture/presentation. Field trips were also encouraged. Educators did not use these role models this year. One of the school counselors used local role models for a breakfast event.

In May 2016, 15 of the 25 role models completed a survey about their experience. Most (80%) of the role models had had role models themselves. Role models had a variety of prior experiences with their own role models. Note that 11 of the 15 reported having had mentors.

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informal with family or friends</td>
<td>11</td>
<td>100%</td>
</tr>
<tr>
<td>Formally through an organization</td>
<td>9</td>
<td>82%</td>
</tr>
<tr>
<td>Through FabFems</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>With girls</td>
<td>10</td>
<td>91%</td>
</tr>
<tr>
<td>With boys</td>
<td>4</td>
<td>36%</td>
</tr>
<tr>
<td>Through SciGirls</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

Other, please describe
- *SWE*
- *Through work*
- *Single day mentoring with local schools through 3M Gives*
- *Girls in Tech*

The role models described what they valued about those relationships, including encouragement, support, context, and ideas for pursuing their interests.
- *I’ve had many. I valued seeing myself in their shoes. I valued learning what's possible. I loved hearing their personal stories, whether they might match mine or be completely different.*
• I'm interested in being a role model because when I was in school there were no women in engineering!
• My mentor was in an engineering career, and I asked questions about his role and journey through his different roles in his career.
• Growing up, my mom was (and still is) a scientist at the Mayo Clinic. She always encouraged my sisters and me to explore new things, told us we could do anything that we set our minds to, and not to let anybody tell us we couldn’t do something because we were girls. It was clear that she’d had negative experiences majoring in chemistry & biology during a time when women were more encouraged to just manage their families, and she wanted us to aim as high as we wanted and not just settle for what others told us we should do.
• I have several mentors at work. These relationships help me evaluate my experiences more broadly, determine if my experiences are typical of others, and bounce ideas off of a more experienced person.
• I have had a few of these relationships along the way. Some happened in school where a teacher would notice my passion and take the extra time to support me with additional learnings beyond just what was discussed in class or how I could explore into opportunities I wouldn’t have otherwise done. The relationship needs to be a bit two-way that each learns and take aways something that energizes or empowers them or that they even learn from for their own lives - professional or personal.
• I actually had several different ladies in my life who were and still are role models to me. They support me, build me up most and importantly encourage me to do my best even if I've messed up.
• I like the 'real' discussion that I have with my mentor about work and how to navigate the company. I also really like learning from her and how to handle situations that are difficult (conflict in the work place, switching positions, etc.).
• My mentors were senior project managers in my field, who also worked for my company. The thing I most valued about my relationship with them was their perspective and encouragement in pursuit of my goals, and their active advocacy for me within the company.
• My role model relationships were not formal. My dad had a close male friend who was an architect and I expressed interest in the field when he was designing my parent’s new house when I was in 8th grade. He let me job shadow him at work one day and it then prompted me to take a drafting class my freshman year of high school. My male calculus teacher in my senior year influenced me to go into engineering based on my performance in his class.
• I've had mentors since high school and college which have provided valuable advice and direction throughout my career. They provided encouragement when I needed it, helped me discern next steps, and have helped me network with others.
• My grandma was a mentor - what I value most of course is continuing to learn about passion and compassion.
• My professor was also my mentor - what I valued most about the relationship was her willingness to lead and guide me.
• It's usually someone I reach out to depending on what help I need.
The role models were also asked to describe their motivations for signing up to be a role model. They described wanting to give back, influence more girls, and to support the SciGirls mission.

- I love to motivate others to achieve their goals.
- I know that my story and career are unique and resonate with students. I love sharing my story and being able to know I can make a difference and inspire people to think differently about what's possible. I've had girls tell me 'you're the reason why I went to school for engineering'. There's nothing cooler than that.
- I had no role models and would have loved to have had one. But, I also love working with kids and I love teaching them about joy that I derive from science and engineering.
- I fully support the mission and think I would love to have a positive impact to help young ladies be more motivated to STEM
- I wanted to reach out to students that don't necessarily have that positive scientific role model in their lives the way I did and also wanted to share my love for science.
- I did not have any STEM role models when I was in school and I want to help young people understand what a STEM career means and that it is achievable.
- I see my own daughters and realize I can impact more than just those around me.
- I love to help in any way possible and if this is the way I'm willing to do it
- I love helping and giving back to the community. If it weren't for my role models, I would not be where I am today.
- To provide students tools to work through some of their personal, emotional and academic challenges.
- I would like to see more women in my profession, and more *successful* women.
- I want to give back and ensure a diverse talent pool for the next generation. I think so many girls have their possibilities limited for them just due to lack of exposure or influence toward all the options. I was so fortunate to have supportive family who always told me I could be whatever I wanted to be.
- Our office works with students already in a variety of settings, and we're always looking for new ways to engage with students. I like the model of bringing women into classrooms, but encouraging both boys and girls to enter the field.
- The ability to reach out back to young girls and inspire them to join the STEM field.
- At the time, I was really encouraged by my place of work.

What are the components of effective PD for SciGirls role models?

Role models who accepted (25) were invited to attend a one-hour webinar based on the SciGirls Role Model strategies, along with references for further information. They could also view the webinar afterwards. Most of the role models completed the training (23/25), 16 registered on FabFems, 12 agreed to do videos, and 15 completed the survey. The webinars were highly rated and the participants reported gains in all areas.

How would you rate the webinar on a scale of 1-10, 10=highest? Average Rating

| Overview of the SciGirls Strategies | 8.2 |
| Role model strategies               | 8.2 |

27
What do you most love about your job in science, technology, engineering, or mathematics (STEM)? Even though the rewards of STEM careers are many, youth often describe these fields as nerdy, boring, or difficult. When you visit a classroom or after-school program as a role model, you can have a lasting impact on girls, affecting their futures by creating positive images of careers in STEM fields. Use the research-based strategies listed here to make the most of your role model experience—for the girls you meet and for yourself.

1. **Make a personal connection to dispel stereotypes.** *(Brickhouse, Lowery, & Schultz, 2000; Daniels & Perry, 2003; Extraordinary Women Engineers Project, 2005)*

   As a role model, you need to build rapport. When girls personally connect with you, they’ll be more interested and invested in the experience. Share personal stories about family, friends, and hobbies. This connection works both ways; invite the girls to share information about themselves and draw on their interests in your discussions and activities.

2. **Use positive messaging to show how STEM makes the world a better place.** *(Buck, Plano Clark, Leslie-Pelecky, & Cerda-Lizzarraga, 2008; Frome, Alfie, Eccles, & Barber, 2006; Marlin & Wilson, 2006; National Academy of Engineering, 2008; Plant, Baylor, Doerr, & Rosenberg-Kima, 2009)*

   Most youth, especially girls, want to make a difference. Girls are eager to know how your work impacts people and the world. Describe what you do in positive ways that girls can relate to, connecting your work to issues that young people find compelling, such as improving the environment. Highlighting the inspiring and collaborative aspects of your job dispels the idea that STEM careers aren’t for everyone and can build interest in your field.

3. **Share your passion.** *(Gibson, 2006; Kekelis & Gomes, 2009; Wolsky, 2011)*

   Share what most inspires you in your studies or career. This may have changed over time. Think back to your early interests in elementary school, important turning points in your STEM studies, or a recent work project that excited you. Reflecting on pivotal moments and sharing what motivates you will resonate with girls. Remember to have fun and be enthusiastic; when you get excited about your work, girls do too.
For future webinars, role models suggested getting together face-to-face, providing more examples of successful experiences, suggestions for hands-on activities, and more sharing from the experienced role models.

- **Something more engaging!**
- **Specific resources for hands-on activities, with information on what ages they are best suited for.** Finding/creating hands-on activities is the hardest part for me, and I need ready-made resources to be successful. It’s also really hard to know what activity to bring what age group.
- **I’d like to see examples of what people are doing.**
- **What teachers’ perspectives of what they are more interested in for classroom visits**
• I thought it was good as it was. Perhaps having the option of having a location where people could participate in it together (like a meeting room with a projector) might encourage further interaction between people.

• I was still confused on next steps at the end of the training and I think that part could be cleared up a bit.

• More time spent on examples others have used when they went into the classroom—what worked, what didn’t, how to engage, etc.

• Not sure

• A meeting in person would make it more engaging.

• Ideas for activities or tools for use in the classroom. Some of the people in the webinar had a lot of experience in the classroom, but some of us could use a few more ideas to get started.

**What is the effect of professional development on the role models’ understanding, confidence, and intent to use the SciGirls strategies with CTE students?**

Role models used a lot of the strategies reviewed in the webinar, and they reported they are more likely to use them in the future: make a personal connection (8.2 before, 9.4 after), use positive messaging about STEM (8.1, 9.2), share your passion (9.2, 9.4), make it hands-on (7.9, 8.9), offer resources and guidance (6.8, 8.3), and follow up and invite feedback (5.9, 8.3). They were already passionate and in the future they plan to do more to show the way with resources and academic resources girls can use right now, making their presentations interactive, and following up and inviting feedback.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make a personal connection to dispel stereotypes</td>
<td>8.2</td>
<td>9.4</td>
</tr>
<tr>
<td>Use positive messaging to show how STEM makes the world a better place</td>
<td>8.1</td>
<td>9.2</td>
</tr>
<tr>
<td>Share your passion</td>
<td>9.2</td>
<td>9.4</td>
</tr>
<tr>
<td>Make it hands-on and keep it interactive</td>
<td>7.9</td>
<td>8.9</td>
</tr>
<tr>
<td>Foster a growth mindset and promote perseverance</td>
<td>7.3</td>
<td>9.0</td>
</tr>
<tr>
<td>Show the way – offer resources and academic guidance for right here, right now</td>
<td>6.8</td>
<td>8.3</td>
</tr>
<tr>
<td>Follow up and invite feedback</td>
<td>5.9</td>
<td>8.3</td>
</tr>
</tbody>
</table>
What insights (if any) did you have from the webinar?

- Mostly that I've been on the right track. I've been lucky in that I've done this for many years and have worked with the same teacher for five years now and she's been great! When I'm in her classroom we kind of have a routine now that works very well for me.
- The other resources available for girls/young women in STEM.
- I struggle coming up with hands on displays relating to my job when I go into a classroom and I need to develop some kind of show and tell to relate to the students.
- The SciGirls seven was awesome to hear and utilized everyday with students.
- There are a lot of different types of role models, even within STEM, and people approach mentoring in different ways.
- I like the info on growth mindset.
- Asking for feedback from the students.

To what extent and under what conditions do role models implement what they learned about how to support CTE girls in STEM?

Role models were able to describe what they thought made an effective role model based on their own experience and the SciGirls training. They emphasized relating to students, really sparking their interest with enthusiasm, being a real person doing the job, connecting the job to their education and classes.

- To really be responsible for sparking interest and engaging students.
- Putting a face and real person/personality with a career title. Giving the kids an opportunity to hear your story and your path. Passion speaks and gets attention.
- Enthusiasm for our career, ability to relate to the kids, hands on activities that link the classroom’s lesson to the STEM career, and of course appropriate behavior. And if you asked what I most appreciate about the teacher I would say that I want them to take care
of classroom management and to work with me to design a fun and effective event. I also really appreciate feedback.

- Being relatable! And being able to bring hands on activity that keeps students engaged without too much hassle
- hearing the role model’ unique perspectives in what got them to where they are in their careers and the advice they can give to the younger set
- Emphasize the importance of education and how you have used it in your life. Sharing experiences of struggling and perseverance in both your education and career.
- That they can relate to the students, grab their attention, and help them see outside the 'box' they are in and what is possible.
- We are there to help support the teachers in what they do, not take over. We are there to show young girls that they can do whatever they put their minds too they can do.
- They should expect quality over quantity. We only have so much time to give to the students and we try our hardest to make sure it is quality information due to the fact that we can spend more time with the students.
- Time, to talk to the students and guide them through helpful advice.
- Most appreciate giving students a real-life view of what it's like work in a STEM career. Expect a role model to be down-to-earth and relatable to the students.
- I think they appreciate a connection to real STEM industry careers and examples of how women have been successful.
- Reinforce what teachers are covering in the classroom within the context of their jobs, give practical examples of how learning has helped them to achieve different accomplishments, be prompt, polite, follow the discussed plan, and engage students.
- Many young girls can't see themselves in the STEM field. They think it's either too nerdy or something they are simply not smart enough to pursue. Representation matters and when young girls are able to see more women who look like them in those fields, they'll liken themselves more to the profession in STEM.
- The fact that students can see people in the real world pursuing careers outside of the usual careers we all know of.

IV. Conclusions and Options for the Future

This project is designed to develop the awareness and capacity of teachers and counselors for recruiting and retaining girls in STEM CTE courses and careers. The teachers in this first group came from schools in which girls are under-represented in these classes. They were able to identify many of the reasons for this under representation - cultural, the ways boys treat girls, the way girls perceive themselves and these professions. They signed up because they saw the need and hoped to learned ways to address it. They all reported that taking the class was worthwhile and that they will use things that they learned. Interestingly, when asked about specific strategies in each module they reported using most of the strategies already, but also reported they will increase the use of them. Another indicator of the effects of the course was in their pre/post “successful” lessons. They all showed much more specific use of the SciGirls Seven in their post lessons.
The participants really enjoyed and felt they benefitted from the class time, but had difficulty being motivated to use the online environment because it was difficult to navigate, others weren’t using it, and it competed with their regular school obligations. Running through the observations, survey results, and interviews was the need for more examples, discussion, and planning, like taking a lesson/unit they already plan to teach and changing it to be more gender equitable. All but one of the teachers had some lecture during class with students taking notes. How does that type of lesson become more gender equitable? Seeing a model lesson, discussing it, and changing one of their own gives them a new way of doing that kind of lesson throughout the year. Those monthly webinars they suggested could include discussions of how that kind of lesson is going, hurdles, and insights into how to make it work.

The counselors felt that the course objectives, assignments, and discussions were geared toward teachers. While both counselors liked being with their teachers, they would appreciate some accommodation for their role. They reported needing more ideas for what they could do within their work activities, from advising individual students, to presenting to classes about scheduling options, to college advisement, and school wide activities. Their assignments could be enriching all those activities with gender equitable strategies, like creating a school wide plan for increasing enrollment in STEM CTE classes, talking with girls in their schools about barriers they perceive, developing new girl friendly clubs, and establishing peer and adult mentoring for girls.

Both teachers and counselors felt the advertisements for the project need to be improved to be more inviting and clearer about it being a yearlong project with follow up required. They liked being visited by TPT as well as this evaluator to keep them on track. All but one would be willing to be a guest speaker in the next class. Some even said they would serve as a mentor for upcoming teachers and counselors. Maybe having people from the advisory group mentor them would create a powerful level of support and connection.

Educators completed surveys at the end of each PD module. When asked how they would use role models, educators listed several approaches: 1) a girl/mother breakfast with role models and challenges, 2) career days, 3) videos, 4) being more explicit in talking about role models, 5) shadowing opportunities. They plan to locate female role models through; FabFems, district office listerv, personal relationships, appeals on social media, SciGirls trained role models, list from class, SciMathMN Frameworks, business contacts through the corporate sponsorships our school has developed.

Most of the educators think that it is important for girls to have a respectful classroom where they feel heard and able to take risks (7/8 educators). When asked how often they used each of the following strategies from Module 3 and how likely they are to use them in the future, the educators reported an increase in every area on a scale of 1-10 including keeping an inclusive environment (6.9 before, 8.9 after), Keeping discussion positive and constructive (7.7, 9.5), encouraging participants (7.7, 9.8), allowing participants to introduce themselves (5.0, 8.1, being clear up front about expectations (6.3, 8.9), using inclusive language (6.0, 8.6), asking for clarification (7.1, 9.1), treating participants with respect (8.4, 9.4), developing an awareness for barriers to learning (6.0, 8.6), providing sufficient time and space for participants to gather their thoughts (6.5, 9.0), and provide opportunities for pair-share (5.8, 8.8).
When asked how this module affected their use of key strategies for promoting creativity, the educators reported they already use all the strategies, but will use them more often in the future on a scale of 1-10, including having students ask the questions (6.0, 8.1), having students answer the questions (5.7, 8.3), fostering intellectual curiosity (5.4, 8.0), encouraging students to embrace messiness (6.4, 8.4), building a community of learners (7.0, 9.0), providing an atmosphere to encourage creative effort (6.3, 8.6), allowing time for students to ask questions (7.0, 9.1), teaching creative skills explicitly (4.6, 7.9), exposing students to creative work (4.5, 7.7), praising students for creative ideas and questions (7.0, 8.9), and permitting failure and helping students to learn from it (6.9, 8.7).

When asked how this module affected their use of key strategies for promoting critical thinking, the educators reported they already use most of the strategies but will use them more often in the future on a scale of 1-10, including case studies (2.3, 5.4), providing rigorous feedback (4.3, 6.6), expecting high intellectual engagement (5.7, 7.7) using discrepant events to provoke thinking (3.3, 6.1), structuring student group work so they push each other’s thinking (4.4, 6.4), providing an atmosphere in which critical thinking is valued (6.4, 8.6), allowing time for struggling with issues & doing critical thinking (6.1, 8.4), teaching critical thinking skills explicitly (4.1, 7.3), exposing students to intellectually rigorous work (5.1, 6.6), praising students for critical thinking and questioning (6.1, 8.7), encouraging students to constantly improve their thinking (5.9, 8.3), and using problem-based learning (5.7, 7.7).

When asked how this module affected their use of key strategies for making learning relevant and cultural appropriate, the educators reported they already use most of the strategies (not listening skills as much), but will use them more often in the future on a scale of 1-10, including consciously planning for diverse students to be included (5.8, 8.0), actively teaching methods that engage diverse students with each other (5.8, 7.8), planning ways to make the content accessible (6.9, 8.4), giving students time to relate to the content from their cultural perspectives (4.8, 7.0), accommodating different learning styles (6.1, 8.0) providing an atmosphere in which creative value each other’s perspectives (5.6, 7.5), and teach listening skills explicitly (4.3, 6.9).

When asked how they would describe the effect of the professional development course on the way they think about how they teach and interact with girls, they reported effects on their mental models of what girls need to be successful in STEM CTE and how to work better with girls in the classroom or in advising situations.

In interviews and post implementation surveys, all the educators and counselors reported they had changed their practice to incorporate things they had learned. For example, one counselor is going to focus more on a “strength finders” approach to college planning and admissions preparation. She is doing this individually and will also integrate it into her three college preparation classes in the fall. Another counselor had taken classes on culturally sensitive counseling and realized she could apply a lot of that to working with girls. She has also hosted a girls’ role model breakfast, Grit2Great, and plans to do that every year. Girls and their moms were invited to a breakfast with a female in STEM careers panel, and a STEM challenge at each table for the girls to work on while eating and talking. Each table had 'host' female adult who led
a series of discussion questions about: real life experiences and goals. We collected data at the end about the panel, information gained, future goals, and future ideas for events.

Educators were asked to describe a lesson before the course, and then again in the final course survey. Describe how you would incorporate the SciGirls Seven strategies into a project. Four educators completed before and after descriptions. One educator, who does AVID talked about how she would change what she has done next year with her College Research Project.

In the interviews, the teachers reported they had begun to see some changes in female student behavior. For example, one teacher grouped the girls together which seemed to increase their confidence about voicing their ideas. Another teacher reported that individually encouraging girls to build as well as write or decorate when they do projects has helped them to contribute more. One girl joined the robotics club.

Overall, this pilot year for professional development went well and provide valuable insight into the needs of the educators and options for the future.

**Role Models**
Most of the role models completed the training (23/25), 16 registered on FabFems, 12 agreed to do videos, and 15 completed the survey. The webinars were highly rated and the participants reported gains in all areas. For future webinars, role models suggested getting together face-to-face, providing more examples of successful experiences, suggestions for hands-on activities, and more sharing from the experienced role models.

Role models already used a lot of the strategies reviewed in the webinar, and they reported they are more likely to use them in the future. They were already passionate and in the future they plan to do more to show the way with resources and academic resources girls can use right now, making their presentations interactive, and following up and inviting feedback. They emphasized relating to students, really sparking their interest with enthusiasm, being a real person doing the job, connecting the job to their education and classes.

**References**


Appendix: Evaluation Measures for Educators/Counselors
The evaluator observed the professional development and collected data on faculty participation, the nature of the PD, and interviewed participants about their intent to use (what and how) what they had learned. After the professional development, faculty were surveyed about their perceived effects of the professional development on their knowledge, attitudes, skills, interests, and behavior (NSF Impact Categories, Friedman, 2008). During the year, faculty were encouraged to log into D2L and share their activities, impressions, questions, and resources via video, audio, or text. The educators did very little of this. They were intended to be used along with interviews to characterize the nature of the effects of participation in the project on the participants’ mental models and use of gender equitable teaching strategies. Only one of the counselors used role models this year in a breakfast panel. Those role models were not recruited by TPT and did not complete the post visit survey.

During the implementation, participants were observed once and interviewed about their implementation of the SciGirls strategies, and its effects on their students’ interest, attitudes and perceived sense of self-efficacy in computing and engineering studies and careers.

In the future, role models will complete a post visit survey to provide data on their training, their visit experience, how they applied what they learned from their training, what else they would like to know as a result of their visit, and if they intend to visit another class.

A. Baseline/needs assessment survey
B. Pre/post project analysis for presence of SciGirls Seven
C. Observation of professional development
D. Post module and end of PD survey
E. Observation of teachers using strategies
F. Interviews with educators
G. End of year/post project reflection survey
H. Year later follow up survey
I. Role model post PD survey
J. Role model post visit survey
K. Role model post visit educator survey
L. Comparison group surveys

A. Needs Assessment/Pre PD Survey
How do students in your school find out about CTE classes?
Is there a recruitment plan for CTE for girls? If yes, what is it?
How do they decide to take classes in CTE?
What is the enrollment of girls in each of the CTE classes offered in your school this year, and in each of the last three years?
How many girls take:
- One CTE course
- Two courses
- Three courses
- Four courses
- Five courses
- Six courses
What support is available to keep girls in CTE classes? (tutorials, after school help, advisor, etc.)
Why do you think your CTE courses would be interesting to high school girls?
When you have girls in your classes, do you do anything differently?
Describe one of your successful projects with students – how you engage them, how they work, how you give them feedback, what you expect.

On a scale of 1-10, how much do you use each of the following strategies in current your teaching? 1= not at all, 10=all the time
- Collaboration in small groups in which students talk about their ideas
- Finding ways to make projects personally meaningful to students
- Hands-on, open-ended projects and investigations
- Encourage students to approach projects in their own ways
- Providing specific, positive feedback on things students can control like effort, strategies and behaviors
- Encouraging students to think critically
- Exposing students to role models and mentors

Think about a girl who took a lot of CTE classes. How would you describe her as a student?
What successes have you had or heard about to recruit and retain girls in CTE?
Research shows that girls get the message that CTE careers are not for women. Have you seen or heard any of this kind of message to girls in your school? Yes No Please describe.
Is it more difficult for girls to succeed in CTE classes than boys? Yes No Please explain.
What do you think it takes for girls to be successful in CTE?
If you were trying to paint a picture of a successful girl in CTE to another high school girl, what would you say?
What do you think could work?
What do you need to better recruit and retain girls in CTE?

B. **Pre/post lesson analysis for presence of SciGirls strategies**
   Compare pre workshop lesson with lesson that is implemented and observed for SciGirls strategies.
C. Observation of Professional Development

Objective Analysis
Analysis for alignment with grant
Analysis of the objectives of the professional development for elements of SMART
Analysis for alignment with grant
Analysis of the lesson plans for how they incorporate the needs assessment data and also uncover additional or emerging needs and respond to them

Design
Review of the literature
How, and the extent to which the needs assessment results are reflected in the design
Analysis of the lesson plans for how the activities support accomplishment of the objectives
Interview with course instructor and designers
Analysis of PD lesson plans for how the educators’ beliefs are revealed and evolved

C. Post Module and End of PD Surveys

Module 1 Post Survey
This module introduces gender equity in STEM, focuses on the importance of role models, provides strategies for role model introduction, and shows how girls can become peer role models for one another (Blazek & Hraňová, 2012; Mistry, Bignante & Berardi, 2014).

Instructional Outcomes:
On successful completion of the module, faculty will:

1. Explain the importance of role models in engaging and maintaining girls’ interest in technology and engineering-related fields and use live and video-based role models in classrooms, through mentoring opportunities and/or in advisory settings.

Rate how much you knew before and after this module about each of the following on a scale of 1-10, 1= nothing, 10=very knowledgeable

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender equity in STEM (stereotypes, growth mindset, identity)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biases that push women out of STEM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brain differences between genders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sources for role model videos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sources for in person role models</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategies for using role models in class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How girls can be role models for each other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How often have you used role models in your classes in the past?
Not at all
Once a year
Twice year
Three-four times a year
What would say was the effect of having role models on your students?
What percentage of the role models you invited was female?
How important do you think it for girls to have female roles models in CTE?
Not at all important
Not really important that they be female; they just need to be good
Somewhat important
Very important

How likely are you to:
Use video female role models in the future
Use in person female role models in the future
Have girls be role models for each other through video in the future
Make changes to your practice to increase gender equity
Not likely
Somewhat likely
Probably will
Definitely will

What is your biggest takeaway from today’s session?
What, if anything, will you use from what you learned?
What questions do you have going forward?
Comments or suggestions?

MODULE 2 – Student-Focused Instruction
This module focuses on how educators can approach a lesson, with respect to the level of
teacher-led versus student-led responsibilities (NRC, 2012; Bonnstetter, 1998; NRC, 2000;
Volkmann & Abell, 2003) thus encouraging an environment where students take ownership of
their learning.
Instructional Outcomes: On successful completion of the module, faculty will:
1. Create a plan to maximize student-centered learning, and increase the time that they
   spend facilitating (versus directing) new learning.
2. Practice specific strategies designed to engage all students and create an environment
   where students are responsible for their own learning and share observed results and
   outcomes online with colleagues.

Rate your comfort using each of the following on a scale of 1-10, 1=not at all comfortable,
10=completely comfortable
Google Drive/Docs
Back channel
VoiceThread
Discrepant event (predict, observe, explain)
Think, Ink, Pair, Share
Student-centered learning
How to keep kids engaged in class

*How often do you use each of the following strategies from Module 2? 1-10, 1=never, 10=all the time How likely are you to use these strategies in the future? 1-10, 1=won’t, 10=definitely will*

<table>
<thead>
<tr>
<th>Student-generated learning strategies</th>
<th>Now</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start class with a mind warm up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use movement to get students focused</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teach students how to collaborate before expecting success</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use quick-writes when you want quiet time and student reflection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run a tight ship when giving instructions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use fairness cup to keep students thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use signaling to allow everyone to answer your question</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use minimal supervision tasks to squeeze dead time out of regular routines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mix up your teaching styles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create teamwork tactics that emphasize accountability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct instruction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What insights, if any, did you have into student-centered learning as a result of Module 2?

What new practices will you try as a result of Module 2?
How important do you think it is for girls to use student-centered strategies?
Not at all important
Not really important that they be female; they just need to be good
Somewhat important
Very important
Please explain
What questions do you have going forward?
Comments or suggestions?

**MODULE 3 – Thoughtful, Respectful Communication and Promoting a Growth Mindset**

This module focuses on: 1) strategies that encourage full student participation and respectful communication, and 2) enhancing teachers’ and counselors’ ability to provide specific feedback to students, thus increasing student confidence and performance (NRC, 2012; Hand, 2008; Zembal-Saul, McNeil, & Hershberger, 2013).

Instructional Outcomes: On successful completion of the module, faculty will:

1. Provide feedback in ways that encourage persistence and provide students with further opportunities to improve on their learning outcomes.
2. Implement at least one new strategy that fosters effective student communication, and analyze learning results accomplished (or problems encountered) with colleagues.

**Thoughtful, Respectful Communication and Promoting a Growth Mindset**
Where do you see the girls in your classes in terms of their mindsets? 1-10, 1=fixed, 10=growth
Intelligence is static vs. can be developed
Challenges are to be avoided vs. embraced
Obstacles – give up vs. persist
Effort – fruitless vs. path to mastery
Feedback – ignore vs. learn from
Others’ success – be threatened by vs. be inspired by

What strategies will you use to move students more toward a growth mindset?
How often do you use each of the following strategies from Module 3? 1-10, 1=never, 10=all the time
How likely are you to use these strategies in the future? 1-10, 1=won’t, 10=definitely will

| Keep an Inclusive Environment | Now | Future |
| Keep Discussion Positive and Constructive | | |
| Encouraging Participants | | |
| Allow participants to introduce themselves – you can even set up an ice breaker to have pairs of students introduce each other. | | |
| Be clear up front about expectations and intentions amongst participants and the facilitator. | | |
| Use inclusive language. | | |
| Ask for clarification if unclear about a participant’s intent or question. | | |
| Treat participants with respect and consideration. | | |
| Develop an awareness for barriers for learning (cultural; social; experiential, etc). | | |
| Provide sufficient time and space for participants to gather their thoughts and contribute to discussions. | | |
| Provide opportunities for participants to pair-share | | |

What insights, if any, did you have about how to give students feedback and help them learn how to use it as a result of Module 3?
What new practices will you try as a result of Module 3?

How important do you think it for girls to have a respective classroom where they feel heard and able to take risks?
Not at all important
Not really important that they be female; they just need to be good
Somewhat important
Very important
Please explain

What questions do you have going forward?
Comments or suggestions?
MODULE 4 – Promoting Student Creativity

This module focuses on how educators can encourage creativity in the design process (Lehrer, 2010).

Instructional Outcomes: On successful completion of the module, faculty will:

1. Design a new lesson or a develop advisory strategy that will inspire students’ creativity and motivation
2. Share examples of classroom projects and advisory strategies that focus on creativity and personal motivation and share student feedback with colleagues online.

Where do you see the girls in your classes in terms of their creativity? 1-10, 10=highest

Being curious
Asking divergent instead of convergent questions
Seeing creativity in a positive light
Embracing the messiness
Able to reflect intensely
Building on each other’s ideas

How often do you use each of the following strategies from Module 5? 1-10, 1=never, 10=all the time
How likely are you to use these strategies in the future? 1-10, 1=won’t, 10=definitely will

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Now</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have students ask the questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have students answer questions instead of you answering them</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foster intellectual curiosity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage (and giving time) for students to embrace messiness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Build a community of learners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide an atmosphere in which creative effort is valued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allow time for students to ask questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teach creative skills explicitly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expose students to creative work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Praise students for creative ideas and questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permit failure and help students learn from it</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What insights, if any, did you have about how to encourage your students to be creative as a results of Module 4?
What new practices will you try as a result of Module 4?

How important do you think it for girls to be creative in the classroom?
Not at all important
Not really important that they be female; they just need to be good
Somewhat important
Very important
Please explain
What questions do you have going forward?
Comments or suggestions?

MODULE 5 – Critical Thinking
This module focuses on expanding educators’ understanding of models and how to use them to expand students’ critical thinking skills (NRC, 2012).

Instructional Outcomes: On successful completion of the module, faculty will:

1. Discuss, compare and employ models to increase students’ critical thinking capacities to make a positive difference in their achievement levels.
2. Share student feedback about a lesson that develops critical thinking and reasoning skills (NRC, 2012) with colleagues online.

Where do you see the girls in your classes in terms of their intellectual engagement and how well they focus on critical thinking? 1-10, 10=excellent
The purpose of instruction
The question at issue
The information relevant to the question
The key concept they need to understand
Whatever inferences they are making
Whatever assumptions they are making
The implications of their thinking
The point of view within which they are thinking
Striving to make their thinking clear, accurate, precise, relevant, deep, broad, logical, fair, and significant

How often do you use each of the following strategies from Module 5? 1-10, 1=never, 10=all the time
How likely are you to use these strategies in the future? 1-10, 1=won’t, 10=definitely will

<table>
<thead>
<tr>
<th>Having students analyze case studies</th>
<th>Now</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide rigorous feedback on critical thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expect high intellectual engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use discrepant events to provoke thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure student group work so they push each other’s thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide an atmosphere in which critical thinking is valued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allow time for struggling with issues &amp; doing critical thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teach critical thinking skills explicitly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expose students to intellectually rigorous work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Praise students for critical thinking and questioning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage students to constantly improve their thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use problem-based learning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

43
What insights, if any, did you have about how to encourage your students to do critical thinking as a result of Module 5?

What new practices will you try as a result of Module 5?

How important do you think it for girls to be critical thinkers in the classroom?

Not at all important
Not really important that they be female; they just need to be good
Somewhat important
Very important
Please explain

What questions do you have going forward?
Comments or suggestions?

MODULE 6 – Cultural Awareness and Relevant Learning Experiences

This module focuses on methods for faculty to be sensitive to cultural differences among students, and to draw out students’ personal connections to STEM content to create relevant learning experiences (Gay, 2000 & 2002).

Instructional Outcomes: On successful completion of the module, faculty will:

1. Implement at least one new strategy for successfully engaging diverse students, with the goal of making the information and overall learning/advisory experience more personally relevant for all students.

2. Gather input from female students on the extent to which the girls can see a connection between the content they are learning, or CTE/STEM post-secondary opportunities they are considering and their own life interests.

How often do you use each of the following strategies from Module 6? 1-10, 1=never, 10=all the time

How likely are you to use these strategies in the future? 1-10, 1=won’t, 10=definitely will

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Now</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consciously planning for diverse students to be included</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active teaching methods that engage diverse students with each other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning ways to make the content accessible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giving students time to relate to the content from their cultural perspectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accommodating different learning styles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Providing an atmosphere in which creative value each other’s perspectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teach listening skills explicitly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What insights, if any, did you have about cultural awareness and relevant experiences?
What new practices will you try as a result of Module 6?
How beneficial to you was making the PSA?
How important do you think it to have culturally relevant experiences for girls in your classroom?
Not at all important
Not really important that they be female; they just need to be good
Somewhat important
Very important
Please explain

How do you see yourself using female role models this year?
How will you locate female role models?
How will you prepare students before using the role model?
What questions do you have to successfully implement what you have learned?
  Our evaluator, Dr. Hilarie B. Davis, will be visiting you in March to discuss the changes you have made in your practice to support girls and to observe one of your classes.
  Between now and then, what would be a good way to document the changes you make in your practice?
Comments or suggestions?

End of PD Survey Given as Part of Module 6
Describe how you would incorporate the SciGirls Seven strategies into a project or lesson.
  Brief description of project
  Collaboration in small groups in which students talk about their ideas
  Finding ways to make projects personally meaningful to students
  Hands-on, open-ended projects and investigations
  Encourage students to approach projects in their own ways
  Providing specific, positive feedback on things students can control like effort, strategies and behaviors
  Encouraging students to think critically
  Exposing students to role models and mentors
Overall, how would you describe the effect of the professional development course on the way you think about how you teach, interact with girls in your classes and plan to use role models.

Please give us your feedback on this course.
Length - 6 weeks
Consecutive sessions - 1 per week
Hybrid format - 3 hour face-to-face classes with online assignments
Topics in the course
Size of the class
Overall

What comments or suggestions do you have to improve the course?
Would you recommend this course to another educator? YES NO What would you say?

Looking Ahead
How do you see yourself using female role models this year?
How will you locate female role models?
How will you prepare students before using the role model?
What questions do you have to successfully implement what you have learned?

Our evaluator, Dr. Hilarie B. Davis, will be visiting you in March to discuss the changes you have made in your practice to support girls and to observe one of your classes. She will need a copy of a lesson plan using the SciGirls before then (you can do that any time and email it to her at hilarie@techforlearning.org.

Between now and then, you can document the changes you make in your practice in D2L. When do you think you will have written up a lesson using the SciGirls Seven?

E. Observation of Teachers
Observation for use of the SciGirls Strategies
1. Collaboration in small groups in which students talk about their ideas
2. Finding ways to make projects personally meaningful to students
3. Hands-on, open-ended projects and investigations
4. Encourage students to approach projects in their own ways
5. Providing specific, positive feedback on things students can control like effort, strategies and behaviors
6. Encouraging students to think critically
7. Exposing students to role models and mentors

F. Interview with educators
What have you changed what you do?
How have you changed how you think? Your mental model of girls in your classes?
What do you see as the biggest impact on the girls in your classes?
What did you like about the course?
How would you improve it?
What would get you to use the online space more?
Would you be willing to attend a follow up webinar each month?

G. End of year/post project reflection survey (done in survey monkey by Leah)
Name/Subject(s)
What successes have you had so far in using what you learned to increase girls’ interest and confidence in STEM?
What challenges have you had? How have you addressed them?
Which of the SciGirls Seven strategies have become part of your everyday teaching practice?
Please describe how you are using them now, how you plan to use them, or type NA for not applicable
Collaborative work
• Projects that are personally relevant
• Hands-on, open-ended projects and investigations
• Encouraging girls to approach projects in their own way and be creative
• Encouraging critical thinking
• Use of role models

Have you been able to modify or develop any lessons?
What else would you like to know about this project or other SciGirls opportunities?
What support would you need in order to implement SciGirls Strategies?

**Teacher Post Implementation Survey** – planned, not used

What changes did you make in your teaching that you felt were effective?

How did each of these changes affect the girls in your classes? The boys?

On a scale of 1-10, rate how much do you used each of the following strategies BEFORE and how much you use them NOW after professional development and applying them in your classes? 1= not at all, 10=all the time

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaboration in small groups in which students talk about their ideas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finding ways to make projects personally meaningful to students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hands-on, open-ended projects and investigations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage students to approach projects in their own ways</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Providing specific, positive feedback on things students can control like effort, strategies and behaviors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encouraging students to think critically</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposing students to role models and mentors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What support is now available to keep girls in CTE classes? (tutorials, after school help, advisor, etc.)

Why do you think your CTE courses would be interesting to high school girls now?
Do you do anything differently with the girls in your classes?
Think about a specific girl in one of your CTE classes this spring. How would you describe her as a student?
Is it more difficult for girls to succeed in CTE classes than boys? Yes No Please explain.
What do you think it takes for girls to be successful in CTE?
If you were trying to paint a picture of a successful girl in CTE to another high school girl, what would you say?
How have you changed recruitment of girls for CTE classes in your school? How successful has it been? What else do you want to try? Do you have a recruitment plan?

**H. Year later follow up survey**

**tbd**
I. Role Model Post PD survey

SciGirls Strategies Role Model Questionnaire – After Webinar Spring 2016
Thank you for participating in the Twin Cities Public Television SciGirls Strategies project as a role model. We need your feedback to improve our preparation and partnership in the future.

Your Background on Role Models
Did you have a role model? Or more than one? Yes No
If yes, what did you value most about the relationship?

What prior experience have you had as a role model? Check all that apply.
Informal with family or friends
Formally through an organization
Through FabFems
With girls
With boys
Through SciGirls
Other, please describe

Since this is a program with schools, what do you think educators most appreciate and/or expect of role models?
What do you feel makes a role model effective?
What was your motivation for becoming a role model for this project?

Professional Development - Webinar
Did you complete the online webinar? Yes No
If yes, please continue in this section?

How would you rate the webinar on a scale of 1-10, 10=highest?
Overview of the SciGirls Strategies
Role model strategies
Introduction to FabFems database
Resources
Overall

How much did you use each of the role model strategies BEFORE the webinar training, and NOW AFTER the webinar on a scale of 1-10, 10=highest (always)
Make a personal connection to dispel stereotypes
Use positive messaging to show how STEM makes the world a better place
Share your passion
Make it hands-on and keep it interactive
Foster a growth mindset and promote perseverance
Show the way – offer resources and academic guidance for right here, right now
Follow up and invite feedback

What insights (if any) did you have from the webinar?
What were you able to use from the webinar in your classroom visit? What else would you like to see in the role model webinar in the future?

**J. Role Model Post Visit Survey – Spring 2016**

*Classroom Visit*
How did you prepare for your classroom visit? Check all that apply.
Emailed with the educator
Talked with the educator about the class
Found out about the students
Developed a detailed plan for your visit on your own
Developed a detailed plan for your visit with the educator
Created your plan and ran it by the educator
Followed the educator’s plan for your visit
Plan questions to ask at the beginning to get to know the students
Plan questions that will draw them into your career

Please briefly describe your visit.

Which SciGirls Role Model Strategies were you able to use in your visit? Please describe how you used each one, or respond “not applicable.”
Make a personal connection to dispel stereotypes
Use positive messaging to show how STEM makes the world a better place
Share your passion
Make it hands-on and keep it interactive
Foster a growth mindset and promote perseverance
Show the way – offer resources and academic guidance for right here, right now
Follow up and invite feedback

What effect do you think your visit had? How do you know?
How likely are you to do classroom visits in the future? 1-10, 10=absolutely
Would you be more/less likely to do classroom visits in the future if they could be done virtually? For instance, through Skype or a Google Hangout? Please explain.
Do you have any comments/suggestions?

**K. Role model post visit educator survey**

Please tell us about your role model visit. If you had more than one, please complete this form for each one.

Your Name
School Name
Role Model Name
Date of Visit
Class Visited

Have you ever had a role model visit your classroom before? Yes No
If yes, who did you have and why?

As part of this project, you had one or more role model visit your classroom. Please answer the following questions for each role model unless it was a combined program.

What was the purpose for this role model visit?
How many role models were involved in this visit?
Who were they and what are there occupations?
How long was the role model with the students?
What is the breakdown of your class or the group who attended the visit? How many girls? How many boys? Any others (parents)?
What was the format of the visit? (e.g. hands-on, lecture, Q&A, career fair)

How did you prepare with your role model for her visit? Check all that apply.
Emailed
Talked about the class
Shared information about the students that would be helpful to the role model
Developed a detailed plan for the visit with the role model
Reviewed the plan the role model developed
Made a plan for the role model’s visit and sent it to her
Shared background on the role model with students
Had students develop questions for the role model

Which of the following strategies did your role model use? Check all that apply.
Make a personal connection to dispel stereotypes
Use positive messaging to show how STEM makes the world a better place
Share your passion
Make it hands-on and keep it interactive
Foster a growth mindset and promote perseverance
Show the way – offer resources and academic guidance for right here, right now
Follow up and invite feedback

What effect do you think the role model visit had on your students? How do you know?
To what extent were you able to use what you learned in the professional development for the role model visit? 1-10, 1-not at all, 10=extensively
Please elaborate on your response to the question above. If you didn't use the information, why not? If you did, what was useful?
How likely are you to have a role model visit to your classroom in the future? 1-10, 1=won’t do it again, 10=absolutely Please explain your rating.
Comments/suggestions?
L. Comparison group surveys (not complete yet)

SciGirls Comparison Group TEACHER Survey

Dear educator, Next year, you are signed up for the SciGirls project. This year, we would like to learn more about your current practice BEFORE taking part in the project.

1. What is your name? (for tracking completion only, all responses are confidential, known only to our external evaluator)
2. What percentage of your class enrollments are girls?
   Class     # boys #girls
3. Are these enrollments unusual or typical over the last few years? Please explain.
4. Why do you think there are fewer girls in these classes, if there are?
5. What do you think would increase the enrollment?
6. On a scale of 1-10, how much do you use each of the following strategies in your current teaching in science, technology and engineering classes? 1= not at all, 10=all the time
   — Collaboration in small groups in which students talk about their ideas
   — Finding ways to make projects personally meaningful to students
   — Hands-on, open-ended projects and investigations
   — Encourage students to approach projects in their own ways
   — Providing specific, positive feedback on things students can control like effort, strategies and behaviors
   — Encouraging students to think critically
   — Exposing students to role models and mentors
7. Describe one of your successful projects with students in a science, technology or engineering class – how you engage them, how they work, how you give them feedback, what you expect, how you use role models.
8. What successes have you had or heard about to recruit and retain girls in science, technology and engineering classes? What do you think could work to recruit and retain girls in your CTE program?
9. Research shows that girls get the message that science, technology and engineering careers are not for women. Have you seen or heard any of this kind of message to girls in your school? Yes No Please describe.
10. When you have girls in your science, technology and engineering classes, how does it change your teaching practices?
11. Do you think it is more difficult for girls to succeed in science, technology and engineering classes than boys? Yes No Please explain.
12. If you were trying to paint a picture of a successful girl in science, technology and engineering classes to a high school girl, what would you say it takes to be successful?

SciGirls Comparison Group COUNSELOR Survey

Dear counselor, Next year, you are signed up for the SciGirls project. This year, we would like to learn more about your current practice BEFORE taking part in the project.
1. What is your name? (for tracking completion only, all responses are confidential, known only to our external evaluator)
2. In your school overall, what percentage of science, technology, engineering and math (STEM) class enrollments are girls? 10-20%  21-30%  31-40%  41-50%  50-60%  61-70%
   Science
   Technology
   Engineering
   Math
3. Are these enrollments unusual or typical over the last few years? Please explain.
4. Why do you think there are fewer girls in these classes, if there are?
5. What do you think would increase the enrollment?
6. In your counselor role, what strategies are you currently using to increase enrollment of girls in STEM?
7. What successes have you had or heard about to recruit and retain girls in science, technology and engineering classes? What do you think could work to recruit and retain girls in your CTE program?
8. How much do you think each of the following would influence girls to take more STEM classes? On a scale of 1-10, 1= not at all, 10=all the time
   — Collaboration in small groups in which students talk about their ideas
   — Find ways to make projects personally meaningful to girls
   — Hands-on, open-ended projects and investigations
   — Encourage students to approach projects in their own ways
   — Provide specific, positive feedback on things girls can control like effort, strategies and behaviors
   — Encourage girls to think critically
   — Expose girls to role models and mentors
9. Research shows that girls get the message that science, technology and engineering careers are not for women. Have you seen or heard any of this kind of message to girls in your school? Yes No Please describe.
10. When you work with girls in your counseling role, how does it change your counseling practices?
11. Is it more difficult for girls to succeed in science, technology and engineering classes than boys? Yes No Please explain.
12. If you were trying to paint a picture of a successful girl in science, technology and engineering classes to a high school girl, what would you say it takes to be successful?