Intel® Teach Elements

Inquiry in the Science Classroom

Facilitation Guide

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Contents

Overview of Course Facilitation

Course Description

This Facilitation Guide provides information to successfully facilitate face-to-face or online discussion sessions, based on participants' Action Plan work in the Intel® Teach Elements: Inquiry in the Science Classroom course. Participants taking a facilitated course may receive continuing education credit, when defined and arranged by the school, district, or education agency offering a facilitated course.

Participants in facilitated courses will participate in three ways:

- **E-learning:** Learn about scientific inquiry using interactive tutorials (approximately 5 hours of individual work)
- **Action Planning:** Apply scientific inquiry strategies to one's own classroom (4 to 12 hours of individual work based on optional activities and individual engagement in the planning exercises)
- **Facilitated Discussions:** Share ideas and give feedback on Action Plan work (4 to 8 hours, varies by format—face-to-face or online—and optional exercises)

The e-learning component of the Inquiry in the Science Classroom course has five modules plus an Orientation and Wrap-Up. Each module includes four to six lessons of interactive activities with exercises that introduce and explore concepts. Many of the activities are followed by an Action Plan task. The Action Plan tasks are designed for application of the concepts to one's own classroom. Course facilitation is structured around the Action Plan, with facilitation typically occurring after participants complete one to two Action Plan tasks.

By the end of the course, participants who complete the Action Plan will have many ideas for applying scientific inquiry in one's own classroom. The Action Plan is required for participants who are taking the course for credit by engaging in a facilitated course.

The Facilitator

Facilitators provide richer, more meaningful course experiences for participants by guiding individual work and group discussions. Before facilitating the course, facilitators should meet the following requirements.

Facilitator requirements:
- Familiarity with 21st century skills, scientific inquiry practices, data collection tools, project-based learning, and technology integration
- Prior experience with facilitating technology integration courses for teachers
- Online facilitation experience (if facilitating online, or co-facilitating with an experienced online facilitator)

- Thorough experience with the e-learning course, including:
  - Review all supporting resource files
  - Take all quizzes, intentionally trying to get correct and incorrect answers
  - Complete the Action Plan
  - Review Ken's and Jennifer's Action Plans, available in the course Resources

Facilitators set the tone for the course discussions. Facilitators can create a rewarding experience for participants by fulfilling the following responsibilities.

Facilitator responsibilities:
- Engage all participants in discussions
- Encourage participants to think critically and deeply about their own practices
- Provide and promote thoughtful and constructive feedback
- Clarify concepts and answer questions
- Promote reflective teaching
- Create a supportive learning community

Facilitation Options

Course participants complete interactive e-learning tutorials and Action Plan activities independently between facilitated sessions, where they join discussions to share and give feedback on their work and learning. Course facilitation is flexible and can be done in different settings—fully face-to-face, online, or various combinations of face-to-face and online.

Facilitated Face-to-Face

Participants may take the course from a CD or online. Discussions take place in a face-to-face setting. Facilitators can print the discussion questions or display them for participants. The discussions are flexible—choose some or all to do or create your own questions and format.

Facilitated Online

Participants take the course online and engage in online facilitated discussions. The discussions may be posted on a Web site or embedded in a learning management system (LMS). Facilitators may also choose to use other online tools to support learning and discussion.

Face-to-Face and Online Hybrid

A combination of face-to-face and online facilitation (or blended learning) is possible. For example, the discussions may begin with a face-to-face meeting, continue online, and meet again at the end for a face-to-face session.

Course Length

A course schedule is designed locally through the selection of suggested and optional activities as well as the number and length of discussions. The course completion section of this guide provides time estimates for course planning. Continuing education credit and/or certificates of completion may be given based on the length of the course and acceptable participation levels, determined by the local program and/or the facilitator.

Intel® Education Online Community

An option for any of the facilitation formats is to create a group to support your training in the Intel® Education Online Community. Facilitators can create groups to support participants with online discussions or provide opportunities to publish Action Plans for feedback. To join the community, register at http://engage.intel.com. Then, review tips on creating a group in the Teachers Engage > Intel® Teach Professional Development > Facilitate section.

Facilitators will also want to join the Elements Implementation Toolkit group in Teachers Engage. After registering for Teachers Engage, then go to groups and search for Elements Implementation Toolkit or use this link, http://engage.intel.com/groups/intel-teach-elements-implementation-toolkit.

Discussion Schedules

Course facilitation is structured around discussions and sharing of completed Action Plan tasks, with facilitation sessions typically occurring after participants complete several of the lessons in the e-learning course and one or two Action Plan activities. Participants need to complete the recommended e-learning and Action Plan activities prior to each discussion session to ensure rich conversations and beneficial experiences.

Facilitated discussion sessions are flexible. Face-to-face discussions range from 20 to 45 minutes and can be combined for longer face-to-face sessions. Online facilitation times will vary and will depend on how often and when participants visit the discussion board. Typically, online discussion time takes longer than face-to-face.

The following tables show example facilitation schedules with Action Plan activities that should be completed prior to discussions. A fully facilitated course (face-to-face or online) should take place over 5 or 6 weeks to allow sufficient time between sessions for participants to complete the Action Plan activities and possibly try new ideas in the classroom. The schedules do not include times needed for introducing the course, which will vary by the get acquainted activities you design.

Schedule Example 1: Facilitation Sessions after Each Module

Module 1	Module 2	Module 3	Module 4	Module 5	Wrap-Up
Lesson 1 Activity 4	Lesson 2 Activity 3	Lesson 2 Activity 2	Lesson 2 Activity 1	Lesson 1 Activity 4	Summary
Lesson 2 Activity 2	Lesson 3 Activity 2	Lesson 3 Activity 3	Lesson 3 Activity 2	Lesson 3 Activity 1	
Facilitation Time: 40 min	**Facilitation Time: 40 min**	**Facilitation Time: 40 min**	**Facilitation Time: 40 min**	**Facilitation Time: 40 min**	**Facilitation Time: 15 min**

Schedule Example 2: Facilitation Sessions at Beginning, Middle, and End of the Course

Module 1	Module 2	Module 3	Module 4	Module 5	Wrap-Up
Lesson 1 Activity 4	Lesson 2 Activity 3	Lesson 2 Activity 2	Lesson 2 Activity 1	Lesson 1 Activity 4	Summary
Lesson 2 Activity 2	Lesson 3 Activity 2	Lesson 3 Activity 3	Lesson 3 Activity 2	Lesson 3 Activity 1	
Facilitation Time: 40 min		**Facilitation Time: 1 hr 20 min**			**Facilitation Time: 1 hr 35 min**

Schedule Example 3: Facilitation Sessions at Middle and End of Course

Module 1	Module 2	Module 3	Module 4	Module 5	Wrap-Up
Lesson 1 Activity 4	Lesson 2 Activity 3	Lesson 2 Activity 2	Lesson 2 Activity 1	Lesson 1 Activity 4	Summary
Lesson 2 Activity 2	Lesson 3 Activity 2	Lesson 3 Activity 3	Lesson 3 Activity 2	Lesson 3 Activity 1	
		Facilitation Time: 2 hr			**Facilitation Time: 1 hr 35 min**

Facilitated Discussions

Once the facilitation format and schedule have been determined, and participants have been invited, consider group organization. Discussion formats are indicated in the Course Facilitation section of the Facilitation Guide as whole group, small groups, and pairs. Discussions help participants exchange ideas, process information, develop new ideas, and refine thinking.

For online discussions, you may want to set up your discussion boards by modules, with separate discussion for each activity. You can create different discussion strands based on whether the discussions are whole group or small group.

Whole group discussions: The intent of whole group discussions is to foster a learning community to exchange ideas to benefit from others' ideas. When conducting a whole group discussion, consider these tips:

- Establish ground rules so all participants feel safe to share their ideas
- Encourage everyone to participate
- Start with a getting to know each other activity at the first meeting or as a first online activity
- Acknowledge and respect all ideas, even if you do not agree with them

Small group discussions: Small group discussions provide a more intimate way for participants to delve deeper into topics and get crucial feedback. The ideal size for small groups is four participants. Groups can be organized by similar grade levels and subject areas, or mixed grade and subject areas. Participants can stay in their same groups for each discussion or can mix. For some discussions, remaining with the same group may be advantageous as participants become familiar with each other's Action Plans. For others, mixing groups may be advantageous to get different perspectives.

For some feedback sessions, pairs of participants within the small groups may be more productive. Working in pairs provides more time for review and feedback.

To aid discussions, the Appendix includes:

- **Discussion Suggestions:** Tips for engaging in group work
- **Discussion Checklist:** Tips on creating constructive discussions during face-to-face and online discussions

Course Completion

Course completion is based on the hours spent on e-learning, the Action Plan, and facilitated discussions. The combined time for these three components will vary depending on the delivery format, depth and length of discussions, and completion of optional exercises. These timings are defined based on local training needs and context. Approximate timing guidelines for the course are as follows:

Module	E-Learning	Action Plan Suggested	Facilitation
Orientation	15 minutes	None	30 minutes or more
Module 1	60 minutes	50 minutes	40 minutes
Module 2	60 minutes	40 minutes	40 minutes
Module 3	60 minutes	40 minutes	40 minutes
Module 4	60 minutes	55 minutes	40 minutes
Module 5	60 minutes	55 minutes	40 minutes
Wrap-Up	5 minutes	15 minutes	15 minutes
Total Hours	**5 hr 20 min**	**4 hr 15 min**	**4 hr 5 min**

Note: Completion of all Action Plan activities is estimated at 4 hours 15 minutes minimum. The Appendix provides estimated times for all activities by module.

Continuing education credits and course completion certificates are arranged by the facilitator, based on school or district guidelines. You are encouraged to issue continuing education credit and course completion certificates, according to local needs and expectations.

When your course is completed, please report the number of participants who completed the course at http://engage.intel.com/groups/intel-teach-elements-implementation-toolkit.

Course Facilitation

Each facilitation activity described in this section indicates the e-learning and Action Plan activities that participants need to complete. Before facilitation sessions, inform participants which e-learning and Action Plan activities they need to complete. An estimated time is also included for face-to-face meetings.

The discussion questions included in the activities are suggestions. Whole group, small group, and peer discussion questions are included. Please feel free to include supplemental questions or use the suggested questions as guidelines for developing your own questions. Peer Feedback indicates prompts for participants to use in giving feedback. Consider having the items listed in the Appendix printed for participants' reference during face-to-face facilitation.

Introduction: Course Orientation

Regardless of the format of your course, you will want to begin with activities for participants to get acquainted with each other and then use the Orientation e-learning module to introduce the course itself.

Orientation has five short lessons that introduce the course objectives and structure in general, the features and navigation of the e-learning environment, and the Action Plan. In a face-to-face session, you can walk through the lessons and the user interface as a group to assure everyone is familiar with the course features. If your course is online, you will want to encourage sharing any questions about the e-learning features or Action Plans in an introductory discussion. In both course formats, this is a good time to review technical requirements for the course found in the Resources tab and the FAQ document found online at the Elements site at www.intel.com/education/elements.

Facilitation Tip: Feedback from Elements course evaluations has shown that the example Action Plans are very helpful to participants. Calling attention to the Ken's and Jennifer's Action Plans during course introduction is highly recommended.

Module 1: Introduction to Scientific Inquiry

Module 1 Facilitation 1: Scientific Inquiry

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 1, Lesson 1, Activity 4.*

Face-to-Face Facilitation Time: 20 minutes

- **Large Group Discussion:** Share current experiences with scientific inquiry in your classroom or any initial ideas you have about incorporating scientific inquiry into your classroom.
- **Peer Feedback:** Provide feedback and suggestions for incorporating scientific inquiry.

Facilitation Tip: If participants have a hard time coming up with ideas, provide various topics and how scientific inquiry could be used to study those concepts.

Module 1 Facilitation 2: Scientific Inquiry in the Classroom

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 1, Lesson 2, Activity 2.*

Face-to-Face Facilitation Time: 20 minutes

- **Small Group Discussion:** Share a specific lesson, unit, or lab that you are thinking of improving with scientific inquiry. Explain how you currently teach

the lesson, unit, or lab and ideas you have for transforming it with scientific inquiry.

- **Peer Feedback:** Provide feedback and suggestions for transforming a unit, lesson, or lab.

Facilitation Tip: Provide examples from the course, and other examples, of how a lesson, unit, or lab can be transformed using scientific inquiry. Include examples of scientific inquiry at the different levels: limited, structured, guided, and open.

Module 2: Phases of Scientific Inquiry

Module 2 Facilitation 1: Skills for Scientific Inquiry

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 2, Lesson 2, Activity 3*.

Face-to-Face Facilitation Time: 20 minutes

- **Small Group Discussion:** What science process skills and habits of mind would you like your students to develop as they engage in scientific inquiry?
- **Peer Feedback:** Share your ideas and suggestions for ways to address science skills and habits of mind to help them be successful with scientific inquiry.

Facilitation Tip: Review the 16 habits of mind using the Habits of Mind resource document. Also, review science process skills using the Science Process Skills resource document.

Module 2 Facilitation 2: Scientific Inquiry Phases

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 2, Lesson 3, Activity 2*.

Face-to-Face Facilitation Time: 20 minutes

- **Small Group Discussion:** How do you see using the Scientific Inquiry Phases? Share a unit or lesson and explain how the Phases could help you improve it.
- **Peer Feedback:** Provide suggestions and feedback.

Facilitation Tip: Review examples from the course, or your own, of how the Scientific Inquiry Phases is used with science topics in different science disciplines.

Module 3: Instructional Design for Scientific Inquiry

Module 3 Facilitation 1: Inquiry Projects

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 3, Lesson 2, Activity 2*.

Face-to-Face Facilitation Time: 20 minutes

- **Small Group or Pairs Discussion:** Discuss aspects of different units that would benefit from scientific inquiry. Explain what kind of investigation(s) students might conduct and what they would be doing during the Exploration, Investigation, Interpretation, and Presentation Phases.
- **Peer Feedback:** Provide suggestions for incorporating scientific inquiry into the curriculum.

Facilitation Tip: Provide feedback to participants. Encourage participants to think of ways to engage students during Exploration; encourage students to take more control during Investigation; push students to think more deeply about their data during Interpretation; and share their findings with people outside the classroom during the Presentation Phase.

Module 3 Facilitation 2: Assessment in Inquiry-Based Science Classrooms

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 3, Lesson 3, Activity 3*.

Face-to-Face Facilitation Time: 20 minutes

- **Small Group or Pairs Discussion:** Share some of your assessment strategies and explain how they will be used during scientific inquiry. If you have an assessment timeline, share that.
- **Peer Feedback:** Give feedback and share ideas on ways to incorporate formative and summative assessment into scientific inquiry.

Facilitation Tip: Demonstrate the Intel® Education *Assessing Projects* application to show how the application can help teachers develop rubrics and checklists.

Module 4: Science Inquiry in the Classroom

Module 4 Facilitation 1: Environments that Support Inquiry

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 4, Lesson 2, Activity 3*.

Face-to-Face Facilitation Time: 20 minutes

- **Group Discussion:** How do you plan to promote a science classroom that is collaborative and supports risk-taking in a student-centered scientific inquiry classroom? Share your ideas.
- **Peer Feedback:** Provide feedback to peers, suggesting strategies for promoting collaboration and risk-taking.

Facilitation Tip: Be prepared to address challenges that participants may anticipate when moving to a student-centered learning community.

Module 4 Facilitation 2: Scientific Discourse

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 4, Lesson 3, Activity 2*.

Face-to-Face Facilitation Time: 20 minutes

- **Small Group Discussion:** What ideas do you have for incorporating more science discussions and writing in your scientific inquiry classroom?
- **Peer Feedback:** Provide additional suggestions.

Facilitation Tip: Suggest specific ways to enhance scientific discourse.

Module 5: Technology that Supports Scientific Inquiry

Module 5 Facilitation 1: Technology Tools for Exploration and Investigation

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 5, Lesson 1, Activity 4*.

Face-to-Face Facilitation Time: 20 minutes

- **Small Group Discussion:** How do you see supporting scientific inquiry with online data collection tools? Which tools are you considering?
- **Peer Feedback:** Share ideas and experiences with online data collection tools.

Facilitation Tip: Provide examples of online data collection tools, such as online simulations, virtual laboratories, online surveys, and online communication tools. Demonstrate the Intel® Education Thinking Tools.

Module 5 Facilitation 2: Technology Tools for Presentation and Collaboration

This discussion should occur after participants complete the e-learning and Action Plan activities through *Module 5, Lesson 3, Activity 1*.

Face-to-Face Facilitation Time: 20 minutes

- **Small Group Discussion:** How do you see supporting data interpretation in scientific inquiry with online tools? Which tools are you considering? What about data presentation tools?
- **Peer Feedback:** Share ideas and experiences with online data interpretation and presentation tools.

Facilitation Tip: Choose a few tools to demonstrate for data interpretation and data presentation. Familiarize yourself with *Showing Evidence* if participants have questions about the tool.

Course Wrap-Up

Wrap-Up Facilitation 1: Summary

This optional discussion should occur after participants complete the e-learning and Action Plan activity in Wrap-Up.

Face-to-Face Facilitation Time: 15 minutes

- **Whole Group Discussion:** Share some key learnings from the course, asking questions such as:
    - How will you apply some of the ideas in the course?
    - What did you find, or expect to find challenging when implementing the ideas from the course?
- **Complete Survey:** Remind participants to complete a short online survey, accessed from a link on the final screen of the course.
- **Distribute:** Hand out certificates of completion.
- **Report the number of teachers you trained:** Visit the Facilitation Registration site (*http://engage.intel.com/groups/intel-teach-elements-implementation-toolkit*), log in, and click Report Your Trainings.

Appendix

Time Estimates for Action Plan Activities

Completion of all Action Plan activities is estimated at 4 hour 15 minute minimum.

Action Plan Activity	Suggested
Module 1—Introduction to Scientific Inquiry	**50 min**
Lesson 1—Activity 2: Integrating Inquiry	10 min
Lesson 1—Activity 4: Misconceptions and Challenges of Scientific Inquiry	10 min
Lesson 2—Activity 2: Pedagogical Approaches	10 min
Lesson 2—Activity 3: Scientific Inquiry Continuum	15 min
Lesson 4—Activity 1: Module Summary	5 min
Module 2—Phases of Scientific Inquiry	**40 min**
Lesson 1—Activity 2: An Inquiry-Ready Mind	10 min
Lesson 2—Activity 3: Methodology Errors	15 min
Lesson 3—Activity 2: Examples of Scientific Inquiry	10 min
Lesson 4—Activity 1: Module Summary	5 min
Module 3—Instructional Design for Scientific Inquiry	**40 min**
Lesson 1—Activity 2: Objectives	15 min
Lesson 2—Activity 2: Project Introduction	10 min
Lesson 3—Activity 3: Summative Assessment	10 min
Lesson 4—Activity 1: Module Summary	5 min
Module 4—Science Inquiry in the Classroom	**55 min**
Lesson 1—Activity 3: Fieldwork	15 min
Lesson 2—Activity 3: Self-Direction	15 min
Lesson 3—Activity 2: Science Writing	10 min
Lesson 4—Activity 3: Feedback	10 min
Lesson 5—Activity 1: Module Summary	5 min
Module 5—Technology that Supports Scientific Inquiry	**55 min**
Lesson 1—Activity 4: Intel Education Thinking Tools	15 min
Lesson 2—Activity 2: The Right Tool for the Job	15 min
Lesson 3—Activity 1: Tools for Data Presentation	10 min
Lesson 3—Activity 2: Tools for Data Collaboration	10 min
Lesson 4—Activity 1: Module Summary	5 min
Course Wrap-Up	**15 min**
Summary	15 min
Total	**4 hr 15 min**

Discussion Suggestions

Online Group Discussions

Consider the following suggestions when engaging in an online group discussion:

- Ensure posts are substantive and advance or reframe a discussion
- Support comments with examples, experiences, or references
- To encourage responses to your entry, ask participants a question about the material you have posted or ask whether others agree or disagree with your thoughts and why
- Revisit the discussion regularly to review your entries and respond to other participants

Providing Constructive Feedback

Consider the following tips when providing feedback in an online or face-to-face discussion:

- Begin by giving positive feedback to establish a supportive tone
- Be clear and specific when providing suggestions
- Provide constructive feedback that is descriptive, rather than evaluative
- Provide examples and tips
- In an online environment, read posts out loud to make sure they are complete
- Ask for clarification to ensure that you understand what is being said
- Make neutral statements
- Focus on elements that the individual can change and that are relevant to the topic
- Provide feedback in a timely manner
- Limit feedback to two or three key comments
- For facilitators, remind participants that you are available to help them
- End with a motivational statement

Discussion Checklist

The Discussion Checklist can enhance participants' conversations. Tips for improving online interactions are included.

- My discussions reflect a deep understanding of the content through the use of detailed examples and comparisons.
- I make meaningful connections between the course content and classroom practice.
- I connect the topics I am learning about to broader issues and ideas.
- I take risks by sharing areas of confusion and concern.
- I respond to colleagues' comments and entries by asking questions, elaborating, paraphrasing, and extending their ideas.
- My writing is easy to understand.
- I follow online conventions for creating a positive and productive discussion environment.
- I respond to discussions early to encourage meaningful interaction.