

# **CIPS Getting Started Workshop Professional Development Goals**

## **Subject Matter Goals (S)**

For Unit 1, Cycles 1 & 2; Unit 2, Cycle 1-2, do a quick read through for those activities that are either simple to carry out or not difficult conceptually. Work through most of remaining activities.

## **Pedagogical Content Knowledge Goals (P)**

1. Become familiar with the CIPS pedagogy
2. Know the main CIPS themes that recur throughout the curriculum
3. Be aware that students have intuitive knowledge about science
4. Be introduced to the teachers' guide and become familiar with navigating through it
5. Know the target ideas addressed in unit 1 and the first two cycles of unit 2
6. Identify common students' ideas for unit 2 cycle 2

## **Management Skill Goals (M)**

Become familiar with strategies to:

1. Manage paper and equipment efficiently
2. Elicit ideas from variety of students in different components of pedagogy throughout one lesson
3. Foster cooperative teamwork (e.g. students have tasks, are accountable for groups' ideas, team works efficiently, etc.)
4. Develop a classroom norm that students must listen to other students ideas
5. Provide time for students to think prior to responding
6. Establish a community environment where all students' ideas are respected
7. Develop a classroom norm that students are required to base responses on evidence
8. Assess when an experiment needs to be repeated because students are unsure about the experimental conclusion

## **Beliefs About Learning Goals (BL)**

1. Be aware they have beliefs about learning
2. Be able to state the pedagogical principles CIPS is based on:
  - a. Students have ideas about science based on their previous school and life experiences.
  - b. Students make sense of new experiences based on their prior knowledge; their interpretations of these experiences may be quite different from those intended by the instructor.
  - c. Students construct knowledge gradually in a complex process in which they try to reconcile the old and the new information; some of their old ideas may be resistant to change.
  - d. Students' learning is mediated by social interactions. (Through social interaction students' ideas are articulated, refined, appreciated and made available for other students to consider.)
  - e. Interactions with tools (e.g. hands-on experiments and computer-based simulations) are critical to learning.
  - f. Complex skills must be scaffolded over time.
  - g. Understanding is evidenced by applying knowledge in a new situation.
3. Be able to recognize an instance where each of the previous principles is pertinent in observations of classroom video or where each might be supported within the curriculum.

## **Beliefs About Teacher's Role Goals (BT)**

1. Act as learning facilitators and not as knowledge providers
2. Act according to the belief that the ultimate source of knowledge are the experiments

# CIPS Getting Started Workshop Plan

## Day 1 Early Morning Session (~110 min)

1. Greetings and introduction of CIPS staff. (5 min)
2. Within groups teachers introduce each other, then in whole class discussion each teacher introduces another teacher. (20 min)
3. Sean Smith conducts beginning of workshop evaluation (30 min)
4. **Overview of CIPS:** Content overview; major themes; scaffolding; pedagogical principles (20 min)
  - a. Physical science content and nature of science ideas from Project 2061 Benchmarks for Scientific Literacy, middle school level
  - b. Content of Units:
    - a. Unit 1 – Measurements and Interactions
    - b. Unit 2 – Light Interactions and Energy
    - c. Unit 3 – Mechanical and Gravitational Interactions
    - d. Unit 4 – Interactions and Conservation
    - e. Unit 5 – Interactions and Substances
  - c. Major Themes:
    - f. Interactions
    - g. Energy
    - h. Evidence-based ideas
    - i. Explanations
    - j. (Fiction to supplement content curriculum)
  - d. Scaffolding:
    - Pedagogical structure
    - Working individually and cooperatively in teams
    - Content and skill themes
  - e. Pedagogical Principles
    - Students have ideas about science based on previous school and life experiences
    - Students make sense of new experiences based on prior knowledge
    - Students construct knowledge gradually in a complex process ...
    - Learning is mediated by social interaction
    - Interactions with tools are critical to learning
    - Learning of complex skills must be scaffolded over time
    - Understanding is evidenced by applying knowledge...
5. Introduce structure/content of Unit 1 (2 min)
  - a. Cycle 1 – Doing and analyzing science experiments
  - b. Cycle 2 – Magnetic, electric circuit and electromagnetic interactions
6. Mention the activities in U1C1 (3 min)



7. Begin working through **U1C1 Act 1: Measurements in Science** (total **60 min**, split between early morning and late morning sessions)
  - a. Read *Purpose* and *Key Question*; mention that this is common to most activities; look at Record sheet.
  - b. Read *I Think*; mention that this section provides opportunity for students to begin thinking about the issue(s) relevant to the activity. Here students do their thinking individually, then share with the whole class. In later activities they will share their ideas within their group before the whole class discussion.
  - c. Work through *Explore Your Ideas*. Each team performs the measurement **as if** they were students in their class, and posts their values on the class table.
    - **Materials: Each team needs an identical pendulum, 50-cm string knotted at the top and with a washer tied to the other end.**
  - d. Work through *Make Sense of Your Ideas*. Have whole class discussion to discuss the questions. If available, also show typical results from the web-based CIPS Teacher Resource (CTR). Decide on “best method.”
  - e. Work through *More Exploration* and post measurements in new class table. Then teachers read through *More Making Sense* and answer questions within their group. Mention that these guiding questions focus on the big issues of making and interpreting measurements: unlikely that everyone will measure the exact same value, so there are still variations in the data; idea of reporting best value as the average of several measurements; considering an outlier.
  - f. Read through *Putting it all together*; students revisit their initial ideas and decide whether they now have a different answer, based on evidence gathered in the activity. Go over *How to Make and Interpret Experimental Measurements*. The statements on these sheets support the CIPS Nature of Science Learning Goals (to be discussed in more detail later). Students should apply these ideas from now on when making and interpreting measurements.
  - g. Quick read through the *Practice* for this activity.

## Day 1 Late Morning Session (~80 min)

1. Complete working through **U1C1 Act 1: Measurements in Science** –see details above
2. Work through **U1C1 Act 2: Relationships in Science** (45 min)
  - a. Read *Purpose, Key Question* and *I Think*. (This is one of the rare times in CIPS where students will not return to this question and answer “why” the pendulum behaves this way. It is too complicated.)
  - b. Work through *Explore Your Ideas*. Each group should tape its pendulum on the class graph at the front of the room. (Best to have a “final graph” available in case you run out of time. If needed, you could just tape this to the front of the room.)
    - **Materials: Pendula of the following cm lengths: 40, 40, 50, 50, 60, 70, 80, 90, 100, 110. (Repeat only if there are enough teams.) The length is measured from the knot at the top of the string to the top of the washer tied to the other end of the string. At front of room have a “number line,” with values going from 0 to 24 seconds.**
  - c. Read *Make Sense of Your Ideas*. Discuss class graph. The trend should be obvious: the longer the pendulum the more time it takes to make 10 back-and-forth swings.
  - d. Quick read through the *Practice* for this activity.
3. **Pedagogical Focus: Introduce CIPS Skills Posters.** Focus on “Be aware of and monitor your own thinking” (Goal BL 2f) (5 min)
  - a. One of the goals of CIPS is to help students become more metacognitive, become more aware of their own thinking and learning. One way of doing this is to ask students to compare their initial and final ideas about something, which focuses on how their ideas change.

## Day 1 Early Afternoon Session (~75 min)

1. Presentation of the Questions Board. Teachers can post questions that will be addressed later in the workshop. (5 min)
2. Work through **U1C1 Act 3: Good and poor experimental designs.** Introduce second team skill – Follow Directions and Stay on Task (45 min)
  - a. Read through *Purpose, Key Question* and the *I Think* sections.
  - b. Work through *Explore Your Ideas*. Do experiment and post results on Class Data Table.
    - **Materials:** Each team needs data collection sheet; medium and large ceramic magnet; either a small ceramic magnet or a small Neodymium (silver) magnet (half the teams get one, the other half get the other).
  - c. Mention *How to Read a Ruler*. This could be assigned the evening before if teachers feel their students will have difficulty reading the ruler.
  - d. Discuss the conclusion in *Make Sense of the Experiment*. The teachers should identify some problem with the experiment.
  - e. Read through the rest of the activity. Afterwards, discuss the idea of a fair test.
  - f. Read through the *Practice* for this activity. Notice that we provide multiple-choice questions for students to practice this common type of question on formal tests. Also read through *How To ... Answer Multiple Choice Questions*.
3. **Pedagogical Focus: Introduce CIPS Team Roles Posters.** Mention that even though team roles are explicitly stated only in Unit 1, these roles must be reinforced in every Unit thereafter. (5 min) (Goal M3)
4. Work through part of **U1C1 Act 4: Evaluating Experiment Designs** (do not do corn experiment) (20 min)
  - a. Read the *Purpose* and work through the *Example*.
  - b. Quick read through of the two experiments in the *You Try It!* section, but do not discuss these. Note – if it seems the teachers are having their own difficulty with this, then have them work through the hot water/cold water experiment to determine if the design is a fair test.

- c. Read the *How to Evaluate an Experiment Design for a Fair Test*. Note—it states that the teacher will distribute this. However, it is already included in the back of the CIPS Student Workbook.
- d. Quick read through of *Practice* for this activity.

## Day 1 Late Afternoon Session (~95 min)

1. Work through **U1C1 Act 5: Evaluating Experiment Conclusions**.  
Introduce third and fourth team skills – Contribute Your Ideas and Reasons, and Respect Your Team Members and Their Ideas. Emphasize how these team skills are scaffolded throughout first Unit. (Goal BL 2f) (40 min)
  - a. Read through the *Purpose* and *Key Question*, and work through the *Explore Your Ideas* section. Participate in whole class discussion.
  - b. Read through *Putting it all together* and *You Try It!* As part of this, read *How to Evaluate an Experiment Conclusion*, which is included at the end of the CIPS Student Workbook. Review some of the answers with the teachers. Discuss how CIPS tries to help students to evaluate experiment conclusions.
  - c. Ask teachers to work through the *Practice* for this activity, either at the end of this day or during the evening.
2. **Pedagogical Focus: CIPS Nature of Science Learning Goals**. Show this list on the web-based CIPS teacher resource (CTR). (5 min)
3. Go over **U1C1 Quiz** (10 min)
  - a. Distribute it to teachers to look at. (We will connect test questions and learning goals when we review the Unit 1 test on Day 3.)
  - b. Discuss ongoing assessment opportunities in CIPS.
4. **CIPS Fiction Storyline: *Chronicles of the Wandering Star*** (5 min)
  - a. Discuss its purpose: for motivation and to help meet literacy requirements
  - b. Discuss how it can be used in the CIPS curriculum: generally assigned for reading at home, with questions to answer. The questions could be turned in for homework credit.
5. Introduce **U1C2**. Mention the activities in the Cycle. (5 min)
6. Summarize **U1C2 Act 1: Evidence of Interactions**. (30 min) (Goals P2 and M6)
  - a. Read *Purpose* and *Key Question*.
  - b. Discuss Interactions theme in CIPS. Introduce the interactions chart wall poster.

- c. This activity provides more practice for CIPS skills-- Contribute Your Ideas and Reasons, and Respect Your Team Members and Their Ideas. The latter especially helps contribute to small group norm of respecting all students' ideas.
- d. Talk/read through the rest of the activity, emphasizing how team members should be talking to each other as they invent their own interactions. Focus on how one decides and describes that two objects are interacting.
  - i. **Materials: One set of items that could be included in kit for investigating interactions: scissors, pencil, crayon, file card, ribbon, washer, flashlight, small pinball toy, etc.**
- e. Briefly look at *Practice* for this activity

## Day 2 Early Morning Session (~105 min)

1. Review the **Practice for U1C1 Act 5**. (5 min)
2. Work through **U1C2 Act 2: The magnetic interaction**. Focus on use of hands-on experiments to help students develop ideas. (Goal BL 2e) (60 min)
  - a. Read *Purpose, Key Question* and *We think...* Note that the curriculum has changed from *I think* to *We Think*, as students are now ready to share initial ideas within their group. Discuss how the Defining Characteristics enable one to know how one type of interaction differs from another type.
  - b. Work through *Explore Your Ideas*.
    - **Materials: Each team needs small Neodymium magnet, small ceramic magnet, magnetic compass, bag with four metals (steel, nickel, aluminum, copper).**
  - c. **Pedagogical focus: The Observation Discussion and Wait Time.** Following the last question in the *Explore* section, writing the experiment conclusion, conduct whole class discussion to ensure that everyone agrees on the experimental observations. If there is no agreement, perhaps repeat experiment(s). Also, discuss the importance of providing time for students to think prior to responding to teacher queries (wait time). (Goals M5 and M8)
  - d. Work through *Make Sense of Your Ideas*. Pay attention to the structure to help team members share their ideas with each other.
  - e. Distribute *Scientists' Ideas: The Magnetic Interaction* and have teachers think about which experiments in the activity supported each idea.
  - f. Look at the *Practice* for this activity. Note that we have student continue to consider how to analyze an experiment.
3. **Pedagogical Focus: Components of a CIPS Activity**. (45 min) (Goal P1)
  - a. This will be an ***Our First Ideas*** activity. The issues raised here will be revisited on Day 5 as part of the *Putting It Together* activity.
  - b. Discuss with your group what you think is the purpose of each of the components of the previous activity (U1C2 Act 2) with regard to helping students develop ideas: *Purpose, Key Question, We think, Explore Your Ideas, Make Sense of Your Ideas, Scientists' Ideas*.

- c. Whole class discussion to review the purpose of each of the components of the activity.

## Day 2 Late Morning Session (~85 min)

### 1. Pedagogical Focus: Learning Goals and Teased Out (Target) Ideas.

Describe how each activity is designed to address one or more teased-out ideas. Some ideas are developed in more than one activity. Using the CTR, show the relationship between the Benchmarks and the teased out ideas (15 min) (Goal P5)

- a. Use the web-based CIPS Teacher Resource (CTR) to show the Project 2061 Benchmark related to magnetic interaction; then show and discuss how the curriculum designers “teased out” the idea. The teased out ideas become the specific learning goals (target ideas).
- b. Give overview of some (or all) of the Benchmarks and teased out ideas relevant to all of Unit 1.

### 2. Work through **U1C2 Act 3: The Electric Current Interaction**. Introduction to the computer-based simulator as a tool to help students develop ideas. (Goal BL 2e) (70 min)

- a. *Read Purpose and Key Questions*. Mention that the variables that influence the interaction are often the ideas that are to be developed. In identifying the variables and discovering the appropriate relationships, the students will be developing the pertinent ideas.
- b. Work through *Explore Electric Circuits*, performing Experiments #1, #2 and #3. Then read *How to Use the EM Devices Simulator* and do Experiment #4. They should access the simulator from <http://cpucips.sdsu.edu/cipsindex.htm> and click on Electric and Magnetic Devices simulator.

**i. Materials: Each team needs 2 batteries, 2 battery holders, 2 bare bulbs, 2 bulb holders, switch, 5 hook-up wires**

- c. Work through *Make Sense of Electric Circuits*.
- d. Go over the answers to the experiment conclusions from the *Explore* section and some of the questions from the *Make Sense* section. Focus on how evidence is to be used to support claims.
- e. Distribute *Scientists' Ideas: the Electric Circuit Interaction* and discuss.
- f. Discuss both hands-on activities and working with the computer-based simulator as two tools that facilitate (and are important for) learning.
- g. Look over the Practice for this activity.



## Day 2 Early Afternoon Session (~85 min)

1. Work through **U1C2 Act 4: The Electromagnetic Interaction**. (60 min)
  - a. Read *Purpose* and *Key Question*
  - b. Work through *Explore Your Ideas*, including two experiments with apparatus and one experiment using the EM Devices simulator. Show *How to Read a Magnetic Compass*, which can be assigned for homework.
    - **Materials: Each team needs magnetic compass with thin wire wrapped five times around it from the north to south label, battery in battery holder, bulb in socket, switch, four hook-up wires, some pieces of tape.**
  - c. Review experiment conclusions and answers to some of the questions.
  - d. Quick review of the *Practice* for this activity.
  
2. **Pedagogical Focus: How to establish a classroom norm that students are expected to base their answers on evidence** (5 min) (Goal M7)
  - a. Responsibility for establishing this norm is shared by curriculum, teacher and students.
  - b. Should help students to differentiate between evidence (supporting observations) and inference.
  
3. Describe and demonstrate **U1C2 Act 5: Electromagnets** (20 min)
  - a. Quick read through of this activity.
  - b. Demonstrate the electromagnet experiment.
    - **Materials: One large common nail with magnet wire wrapped around, battery in holder, switch, magnetic compass (no wires wrapped around it) and two large steel washers.**
  - c. Demonstrate a large buzzer, show the video (movie) of the buzzer and briefly explain how it works.
    - **Materials: Large buzzer, three batteries in holders, 4 hook-up wires and switch, and video or movie of buzzer.**

## **Day 2 Late Afternoon Session (~90 min)**

### **1. Pedagogical Focus: The web-based CIPS Teacher Resource (CTR) (45 min)** (Goal P4)

- a. Demonstrate how to navigate through it and how we might expect teachers to make use of it during their first year of teaching CIPS, and how it might be used as they become more familiar.
- b. Discuss how it will be used in the future to help teachers with professional development.
- c. Briefly show one of the web-based tutorials accessible from the CTR.
- d. Teachers practice navigation by gathering information for the next activity (motors), including viewing video on how to set up the experiment

### **2. Pedagogical Focus: How to Foster Cooperative Teamwork.** (Lead by an experienced teacher.) (Goal BL 2d) (45 min)

- a. Discuss and demonstrate strategies to promote good cooperative teamwork.

## Day 3 Early Morning Session (~90 min)

1. Work through part of **U1C2 Act 6: Motors** (20 min)
  - a. Read Purpose and Key Question.
  - b. Work through *Explore the Motor* and *Making Sense of the Motor*.
    - **Materials: Each team needs battery in holder with two clips bent straight upward, second battery in holder with normal clips, small Nd magnet, coil of wire with ends sticking out (one-half of one end insulated, the other has insulation removed), three hook-up wires, small motor with propeller.**
  - c. Distribute *Scientists' Ideas: the Electromagnetic Interaction*. Briefly review the evidence supporting each of the ideas.
2. Discuss **Unit 1 Test**. (20 min) (Goal P5)
  - a. Distribute test and have teachers look it over.
  - b. Use the web-based CTR to discuss how each test question is aligned with the learning goals.
3. Introduce **Unit 2** (5 min)
  - a. Show the titles of the three cycles and give a very brief overview. (During this workshop we will only go through the first two cycles. The third cycle will be part of the next follow-up workshop.)
  - b. Show the titles of the activities in U2C1 and give brief overview.
4. Work through **U2C1 Act 1: Energy Description of Interactions** (45 min) (Goal P2, BL 2f)
  - a. Introduce second major CIPS theme: Energy
  - b. Read through *Cycle Purpose, Energy and Ourselves, Energy Source, Receiver and Energy Transfer* and *Using Energy Diagrams to Describe Interactions*. Briefly review the main ideas.
    - **Materials needed for demos: flashlight, black card, white card, battery in holder, bulb in holder, two hook-up wires.**
  - c. Work through *Exploring Energy Sources and Receivers*, and have teachers also use the generator and solar cell themselves. Go over the energy diagrams.
    - **Materials: Each team needs battery in holder, small buzzer, light bulb in socket, motor with fan blade attached to axle, Genecon™, solar cell (needs to be shared) and three hook-up wires.**
  - d. Quick read of the *Practice* for this activity.

## Day 3 Late Morning Session (~60 min)

1. Work through most of **U2C1 Act 2: The Fabulous Wake-up system** (25 min)  
(Goal BL 2g)
  - a. Read the *Purpose*.
  - b. Work through *Construct the Fabulous Wake-Up System*.
    - **Materials: Each team needs battery in holder, switch, buzzer, bulb in holder, motor with fan blade, five hook-up wires.**
  - c. Work through *Analyze the Fabulous Wake-Up System*. Perhaps, as a strategy to get feedback, teachers can draw their energy diagrams on presentation boards. Have each team then get together with another team to compare diagrams and discuss any differences. (If there are differences that cannot be resolved, they should approach another pair of teams.)
  - d. Discuss how this activity, especially the analysis part, might be used for assessment.
2. Introduction to U2C2. Provide very brief overview of the activities for this Cycle. Show target ideas. (5 min)
3. **Pedagogical Focus: Initial Ideas.** (30 min) (Goal P3, BL 2a)
  - a. Show *Light\_Initial.mov* of 4<sup>th</sup> grade students being interviewed about how they see a Maglite™ source. (Movie is 4.0 minutes long.) Distribute the pictures the students had drawn for teachers to use while looking at the video. Following the video, distribute the transcript of the movie.
  - b. Ask: What part or parts of the students' ideas and drawings seem to be common? Where did these common ideas come from?
  - c. Emphasize the commonality of some of the initial ideas.

## Day 3 Early Afternoon Session (~100 min)

1. Work through **U2C2 Act 1: What Can You See?** (45 min)
  - a. Discuss the purpose of the *Our First Ideas* activity.
  - b. Read *Cycle Purpose*.
  - c. Work through the *We Think* section and share answers in whole group discussion. Model how this could be done.
  - d. Work through *Explore Your Ideas, Make Sense of Your Ideas*, then *Our Class Ideas*. Ask a few groups to present their initial ideas on a presentation board. Focus on similarities and differences in the ideas. Model how this could be done.
    - **Materials:** Each team needs a black square (with embedded white and mylar™ squares) and a flashlight. Room needs to be darkened.
2. **Pedagogical Focus: How to conduct a whole class Elicitation Discussion.** Examine how this was done in U2C2 Act 1. Discuss other ways it could be done. (10 min) (Goal M2)
3. **Pedagogical Focus: Identifying Students' Ideas (thinking) in Elicitation-Making Sense Discussion.** (30 min) (Goal P6, BL 2a)
  - a. Show *U2C2A1\_Class.mov* of students making board presentations to the whole class after they have done the experiment and are trying to explain what happened. One team presents answer to question 1, another team presents their answer to question #2 and two teams present their answers to question #3. (Movie lasts 4 min 30 sec. Show whole movie.)
  - b. Ask Teachers to summarize the thinking of the four teams. Where do these students seem to be in their understanding of the ideas necessary to answer the questions? (They seem to have a good understanding of how light reflects from the mylar™ and why the opposite student is dazzled. However, their understanding of how the side student sees the mylar™ as black, and how light interacts with white paper is not so clear.)
4. Summarize **U2C2 Act 2: Light Sources and Seeing.** Emphasize that scientists' ideas are supported by experimental evidence. (15 min)
  - a. Quick read through the entire activity
  - b. Review energy diagrams for light interactions, and light ray diagrams.
  - c. Quick look at *Practice* for this activity.

## Day 3 Late Afternoon Session (~105 min)

1. Work through **U2C2 Act 3: Shiny and Clear Surfaces**. Use computer-simulator. (60 min)
  - a. Examine the web-based CTR for this activity, to see all the available information.
  - b. Read *Purpose*, and then work through *Explore Your Ideas*, including two hands-on experiments and two experiments using the computer-based Reflection simulator.
  - c. Work through *Our Consensus Ideas*, answering the questions. Have whole class discussion to agree on the Class consensus ideas that will be recorded in the record sheet.
  - d. Look at *Practice* for this activity.
2. **Pedagogical Focus: Paper and Lab Materials Management**. Lead by experienced CIPS teachers. (45 min)

## Day 4 Early Morning Session (~95 min)

### **1. Pedagogical Focus: Three types of whole class discussions – elicitation, observation and making sense. (45 min) (Goals M2, BT1 and BT2)**

- a. Within their teams, teachers discuss how the goals of the three types of whole class discussions are similar and how they are different. Try to list 2 or 3 similarities and 2 or 3 differences.
- b. In whole workshop group discussion, first summarize similarities and differences (someone should be taking notes), and then consider how teacher's role might be different with each of the three types of whole-class discussions.
- c. Talk about reasonable expectations for how teachers should be able to lead these three types of discussions during the first year of teaching CIPS. (The observation discussion is the easiest, the elicitation type is medium difficulty, and the making sense discussion is most challenging.)

### **2. Read through the beginning of U2C2 Act 4: Non-shiny white surfaces. (10 min)**

- a. Read through *Purpose* and the *We Think*.

### **3. Pedagogical Focus: Social Interactions in the We think component. (Goals M6 and P6 and BL 2a, 2d) (40 min)**

- a. Show [U2C2A4\\_We\\_Think.mov](#) of students in a lively discussion responding to the *We Think* question. (Movie lasts 6 min 53 sec).
- b. Students in the class present reasons in support of each of the three hypothetical students in the text.
- c. Teachers can try to summarize the ideas and arguments presented by the students; that is, why do they believe what they claim?
- d. Ask teachers to comment on the students' behavior that suggests there exists a class norm for listening to and respecting others' ideas.

## Day 4 Late Morning Session (~95 min)

1. Work through remainder of **U2C2 Act 4: Non-shiny white surfaces**. (35 min)
  - a. Work through *Explore Your Ideas*, then *Make Sense of Your Ideas*. Discuss how the making sense questions help guide students' thinking. (Both the teacher and the curriculum have joint responsibility for guiding students' thinking.)
    - **Materials: Each team needs flashlight, white card, small flat mirror, card with crinkled aluminum foil.**
  - b. Go over Our Consensus Ideas, including a whole class discussion.
  - c. Read *Using a Model...* Brief discussion about the purpose of models like this.
  - d. Ask teachers to print out the *Practice* for this activity from the web-based CTR and do it for homework, to be discussed on Day 5.
2. **Pedagogical Focus: Influence of Prior Knowledge on Learning**. (60 min)  
(Goals M4, BL 2a, 2b, 2c, 2d and BT1, BT2)
  - a. This is a *Development activity* focusing on how prior knowledge influences learning.
  - b. Begin with a "We Think" task: think of examples of how student' prior knowledge can influence how they interpret the results of an experiment.
  - c. View [\*Girl\\_in\\_dark.mov\*](#) and respond to making sense questions. Movie runs 6 min 35 sec.
  - d. View [\*U2C2A4\\_Make\\_Sense.mov\*](#). Describe the context and what should be focused on before starting the movie. The movie begins after the teacher reads through the arguments of the two students in the *Make Sense of Your Ideas* section. There has been some whole class discussion and the teacher is asking the class about seeing a piece of white paper. One of the students (Nick) does not understand that light is reflecting from that paper. The teacher and other students try to be helpful. (Movie lasts 3 min 51 sec).
  - e. Teachers see evidence for how difficult it is for students with strong prior knowledge to accept/believe experimental results and to generalize. Ask teachers to identify the student's difficulty and to suggest what else the teacher could have done to help him.

## Day 4 Early Afternoon Session (~120 min)

1. Work through **U2C2 Act 5: Black** (45 min)
  - a. Read through *Purpose, Key Questions* and *We Think...* Have brief whole class discussion.
  - b. Work through *Explore Your Ideas, Make Sense of Your Ideas* and *Seeing Black Objects*. Have brief whole class discussion.
2. Find examples of students answers to this activity in CTR (15 min) (Goal P4)
3. **Pedagogical Focus: Influence of Social Interaction and Prior Knowledge on Learning.** (30 min) (Goals BL 2a and 2d)
  - a. Organized as a *Development* activity.
  - b. View [\*U2C2A1\\_Group.mov\*](#) of small group making sense discussion following the experiment (shining flashlight on mylar square). They are discussing the third question (why flashlight student sees white square; get into discussion about what colors are reflected/absorbed with white, yellow, black paper). The video shows how well the group shares ideas and tries to construct an understanding. (Movie lasts 4 min 18 sec.)
  - c. Questions ask teachers to focus both on why the team seems to be functioning so well, and also on the ideas that are developed.
4. **Pedagogical Focus: What can a teacher do if a particular group is not functioning well?** (30 min) (Goal M3)
  - a. Offer a scripted “play” showing a dysfunctional group and a teacher coming over to intervene. Repeat with another teacher coming over to intervene.
  - b. Then have whole class discussion about what the teachers did.

## Day 4 Late Afternoon Session (~75 min)

1. Work through **U2C2 Act 6: Explanations involving light interactions.** (45 min) (Goal P3, BL 2f)
  - a. Distribute *Scientists' Ideas: Light Interactions* and have teachers read through *Comparing Our Consensus Ideas with Scientists' Ideas*. They do not need to take the time to find the evidence to support each idea, only to know that they could do it. Discuss the role of *Scientists' Ideas* in the CIPS Curriculum.
  - b. Read *Using Our Ideas to Construct Explanations about Light Phenomena*. Have teachers read *How to Evaluate an Explanation for Light Interactions*. Briefly review the steps for constructing and evaluating an explanation.
  - c. Work through *Problem #1*, then have brief class discussion.
  - d. Work through *Problems #2, #3 and #4*. Ask some groups to share answers (on presentation boards) for different steps in *Problems #3 and #4*. (That is, one group presents the energy diagram, another group the ray diagram, another group the explanation, etc.)
  - e. Discuss multiple strategies for sharing and critiquing explanations.
  - f. Ask teachers to print out the Practice for this activity and do it for homework, to be discussed on Day 5.
2. **Pedagogical Focus: Role of Teacher in CIPS.** (30 min) (Goals M7, BT1 and BT2)
  - a. Describe the “normal” pedagogical contract between teacher and student: teacher *feels obligation* to tell and students *expect* the teacher to tell. Mention teacher’s and student’s standard beliefs about teaching and learning.
  - b. Ask how the CIPS pedagogy might lead to a “violation” of the traditional pedagogical contract, and what kinds of problems might occur as a consequence. Ask what real constraints might lead teachers to “tell information” (not following the pedagogy) when they would rather let students construct the ideas themselves (following the pedagogy).
  - c. CIPS does provide the “answers” – Scientists’ ideas – but not at the “normal time.”

## Day 5 Early Morning Session (~85 min)

1. Go over the Practices for U2C2 Activities 4 and 6, assigned the previous day. (10 min)
2. **Pedagogical Focus: CIPS Pedagogy, Curriculum and the CIPS Learning Principles.** (75 min) (Goals BL2 and BL3)
  - a. A *Putting it all together* activity.
  - b. Groups fill in chart listing the Learning Principles driving the CIPS pedagogy and curriculum, and providing evidence from either the video observed during the week or the CIPS text. Also, they consider how it influences teachers' role.
  - c. Discussion with all teachers

## Day 5 Late Morning Session (~110 min)

1. Work through **U2C2 Act 7: Where should you place the mirror?** (60 min) (Goal BL 2g)
  - a. Discuss general purpose of Idea Power activities.
  - b. Work through the activity. Have some teams share answers with the class, perhaps using their presentation boards.
  - c. Discuss how activities like this could be used for assessment.
  - d. Quick read through of the *Practice* for this activity.
2. Show CIPS posters for all types of activities, and briefly review the purpose of each type. (5 min)
3. Quick overview of **U2C2 Act 8: How can you see when you block the light?** (15 min) (Goal BL 2g)
  - a. Teachers do a quick read through of this activity and perhaps say out loud what might be poor, if anything, about the explanations.
  - b. Emphasize (again) that the Idea Power activities provide an opportunity for students to apply the ideas they developed in new contexts.
4. Go over **Tests for U2C1 and U2C2**. Review again the general role of assessments within the CIPS curriculum – both for evaluation and for formative assessment (knowing where your students are). (20 min)
5. Show **CIPS Parents' brochure** on web-based CTR; discuss how to inform parents about what is happening in the CIPS classroom. (10 min)

## **Day 5 Early Afternoon Session (~75 min)**

1. **Pedagogical Focus: Reflections on Own Learning.** Each teacher picks one of the pedagogical principles and reflects about how his own understanding of it has changed or has been reinforced through the workshop (30 min) (Goal BL 2)
2. **General issues for teachers** (lead by experienced teachers.) (45 min)
  - a. Distribute *CIPS Resource Materials*, or show where these materials are located on the web-based CTR.
  - b. Rubrics for assessing record sheets, practices, *Idea Powers*, etc.
  - c. Resources for teachers – e.g. additional activities for substitute days, etc.
  - d. Assigning points and grades
  - e. Most experienced teacher(s) talk about the differences between teachers CIPS during the first year and in successive years.
  - f. Other issues

## **Day 5 Late Afternoon Session (~60 min)**

1. Sean Smith (or Eric) conducts end of workshop evaluation (30 min)
2. Team planning and interaction with the district (30 min) (Goal M1)