Session 5: Designing an Activity

Overview

This is the second of two *Designing to Support Learning* sessions where students think critically about designing learning experiences. In this session, participants focus on applying some of the insights and understandings they've gained in the course so far to the development of their activity with their partner. Participants are guided in the development of their designed activity using a *COSIA Activity Design Starter*, in an environment of support from their peers and instructors. This activity and design template helps them understand the complexity of designing activities to effectively address a science concept. They are guided to incorporate the pedagogy presented in previous sessions, including the learning cycle and effective teaching approaches, while designing their activity, to help learners come to some level of understanding of a science concept.

Session Objectives

In this session, students:

– Work as a class to develop an ongoing list of *Key Characteristics of Exemplar Activities*
– Critically review exemplar activities based on the *Key Characteristics of Exemplar Activities*
– Apply what students have learned in the course so far to the task of designing an activity to address a specific ocean science concept
– Work with their partner to brainstorm, discuss ideas, and start designing activities

Background Information for the Presenter

Designing activities for the museum floor is challenging and requires different skills than teaching. The goal of this session is not to create activity developers or even great activities, but to engage participants in considering the important elements that effective activities embody and to start them on this process. Few participants, even if they become educators, will engage in full-scale materials design during their careers, but all who interact with the public, or become educators of some sort (faculty, science educator, teacher) will need to plan activities, and to adapt and modify experiences according to feedback about the learners' level of understanding.

In designing the *Communicating Ocean Sciences to Informal Audiences* course as a whole we have tried to "practice what we preach." The course seeks to exemplify a flexible model of how people learn. In that sense, this session's main emphasis can be seen as the *application* phase in the course, as participants apply what they've learned about learning and teaching to the design of an activity. They will have multiple

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opportunities to revisit, revise, and add to their activity as the course proceeds and additional teaching strategies and pedagogies are presented.

One experience, no matter how compelling, memorable, or surprising (as in a discrepant event) is not necessarily sufficient to enable learners to revise previously held ideas or reach deep conceptual understanding. People often come up with quite ingenious and clever ways to retain their old ideas while at the same time adapting some aspects of more accurate conceptions. Monitoring learners' changing ideas and engagement through repeated experience, over time, is part of the path to building true understanding.

We have included a chart of "Key Characteristics of Exemplary Activities & Facilitation" garnered from numerous educators in diverse informal learning environments. The key characteristics can be organized into (1) characteristics of the activity design and (2) characteristics of the facilitation of the activities. Although it may be quite difficult to separate the two categories, in general the characteristics of activity design may include some or all of the following:

Characteristics for Design of Activity

- – Incorporates the Learning Cycle;
- – Focuses on nature and practices of science and on goals and concepts explicitly;
- – Offers opportunities to engage with and manipulate objects,
- – Allows for inquiry, including exploration and investigation, but also in making explanations and application;
- – Interactive, fun, and visitors do something;
- – Allows for multiple entry and exit points;
- – Inclusive of all learners; and
- – Presents science content accurately.

Characteristics of Facilitation

- – Encourages and provides opportunities for discussion and other social interactions between visitors or family and other group members;
- – Encourages learners to make meaning individually, with peers, and with someone more knowledgeable;
- – Offers experiences and conversations in a social setting;
- – Uses diverse teaching approaches;
- – Makes connections to current/prior knowledge;
- – Accommodates needs and interests of diverse learners; and
- – Presents science content accurately.

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Session at a Glance

Task	Description	Estimated Time (in minutes)
Quick Write	Students respond to two prompts about the reading assigned for homework.	5
Sharing: *Activity Presentations*	Students have presented an activity at the museum/aquarium sometime over the past week; they discuss their experiences.	10
Introduce: *Designing an Activity*	Students are introduced to the idea of activity design, and how a well-designed activity affects their presentations.	2
TPS: *Characteristics of Exemplary Activities*	Students do a Think-Pair-Share about what they think are some key characteristics of an exemplary activity.	20
Activity: *Critical Review of Exemplary Activities*	Students identify how the key characteristics they just determined occur in activities as they rotate through the COSIA Exemplary Activities that they have been practicing.	45
Science Briefing: *Adaptation*	This presentation focuses on the deep-sea ecosystem and organism adaptations for this environment.	30
Task: *Using the Activity Design Starter*	Students work with their partners to use the COSIA Activity Design Starter to start to design their own activity and specifically focus on five "Questions to Consider."	40
Task: *Peer review of Activity ideas*	Students give each other advice about their activity ideas as they look for the presence or absence of components listed on the "Key Characteristics of Exemplary Activities" chart.	15
Homework	Reading & tasks due next week.	3
	TOTAL: 2 hrs 50 minutes	**170**

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Materials Needed

For the class:
  – Digital/data projector
  – PowerPoint slides for Session 5
  – Activities and materials for presenting exemplar activities in class
  – Chart paper and pens

For each participant:
  – COSIA Activity Design Starter

Preparation of Materials

1. Duplicate handouts, 1 per student:
  – 1 copy of COSIA Activity Design Starter

2. Collect materials for exemplar activities you plan to highlight in class.

3. Create a chart with two columns.
  – "Key Characteristics of Exemplar Activities & Facilitation" with two columns: "Key Characteristics of Activities" and "Key Characteristics of Facilitator's Implementation" to record results of the Think Pair Share about exemplary activities.

4. *Deep Sea* Science Content
  – Download the *Deep Sea Science Content* PowerPoint presentation in the Index of Science Briefs from http://cos-rop.net/cos.
  – This presentation is focused on the deep-sea ecosystem and adaptations for this environment. We chose to use this presentation because course participants are often interested in designing activities about the deep sea.
  – Feel free to substitute a different science content presentation based on your and your participants' interests.

Note to Instructor: *If you choose not to do either of these presentations, you'll have more time for the participants to discuss the reading assigned for homework, engage in the exemplary activities, work on designing their own activities or prepare to present in class next week.*

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Session Details

Quick Write

1. Participants do Quick Write. Display the Quick Write prompt regarding the reading they were assigned for homework. Give participants about 5 minutes to respond.

2. (Optional) Share highlights of quick write. After about 5 minutes, have participants share their ideas with a partner. Then have the partners share the highlights with the entire class.

Sharing: Presenting Activities

1. Participants share presentation experiences. Over the past week, the students presented activities on the museum floor. Many students will choose to present activities that they saw during Session 1. Ask for volunteers to share some of their experiences from presenting for the first time. Use the discussion map below to help facilitate the discussion using the following prompts.
– Describe an interaction with a visitor that you feel went well. What did you do and what was your evidence that it went well?
– What is something that you feel did not go well and what makes you think that?
– What questions or concerns do you have that you would like some feedback from the class about?

Remember the following:
▪ Listen to their responses
▪ Ask participants to provide explanations, evidence, or clarifications to elaborate on their thinking. Suggested probing questions:
   o What makes you think that?
   o Please give an example from your experience.
   o What do you mean?
▪ Invite others to react and respond to the ideas shared. Suggested probing questions:
   o Can anyone add something to that comment?
   o Who would like to share an alternative opinion?
   o Does anyone disagree with that comment?
▪ Reference and cross-reference their comments as you facilitate the discussion to encourage participants to think about and respond to one another's ideas.

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Introduce: Designing an Activity Session

1. Set context for session. Let participants know that today partners will have the chance to work together to start designing their activity. They'll use an activity template to help organize their ideas, have the opportunity to share ideas with their peers and the instructors, and receive feedback on their initial activity design.

2. Introduce key characteristics of exemplar activities & facilitation. Share with participants that an important part of this session will be the opportunity to engage in exemplar activities. These experiences will then be used to determine what are the *key characteristics* of (a) the design of the activities and (b) the facilitation that makes them exemplar. Participants will be given the opportunity to incorporate these key characteristics into their activity design.

Think-Pair-Share: Key Characteristics of Exemplar Activities

1. Think-Pair-Share about key characteristics. Use the following prompts and have participants do a Think-Pair-Share to develop a set of key characteristics that students think would be present in an exemplar activity.
   – What are some characteristics for designing activities that you feel would make them exemplar activities?
   – What are some characteristics of facilitation that would make an experience with a well-designed activity exemplary?

2. Record ideas from group debrief. Record participant's ideas on chart paper in two columns: "Key Characteristics of Activities" and "Key Characteristics of Facilitation." Say that they will return to this chart later in the session and possibly add more characteristics after engaging in the exemplar activities. They will also revisit this chart in each session as additional learning theory and pedagogy about teaching and learning are introduced. [Some likely characteristics participants may suggest based on learning strategies and pedagogy presented so far include: the learning cycle, opportunities to engage in different kinds of teaching approaches, and the nature and processes of science. Participants are also likely to mention the importance of focusing on ocean sciences concepts.]

Note to Instructor: A more extensive list of possible ideas for making a list of "Key Characteristics of Exemplar Activities & Facilitation" is included in this write-up based on educational strategies and pedagogy presented in the entire course. At this point your participants are not likely to mention everything listed here since all of these ideas have not yet been addressed or presented. We suggest that you do not show this complete list to your participants yet, but instead make time in subsequent sessions to have participants add to their initial brainstorm, as new ideas arise and

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as they do activities. This list is mainly for you to have all of the key characteristics listed in one place. You may decide at some point to distribute this list to your participants as an overview of what they've learned in the course related to exemplar activities.

Activity: Critical Review of Exemplar Activities

1. Introduce activity. Tell participants that they will rotate among the four activities from the first session. By now, they should have experienced presenting at least one of them on the museum floor. In this activity, they will have the opportunity to examine the design of the activities more closely and determine how some of the key characteristics that the class just identified are addressed in the activity. These elements can be useful for thinking about what to include in their own activity.

2. Rotate through activities. Ask participants to work with their partner to rotate to at least two activities and encourage them to jot down notes about how the activity addressed the key characteristics. For each activity they review, ask students to think about and discuss the following prompts:
  – What is the goal of the activity and science concepts addressed?
  – What are learners able to do with the activities? How does exploration with materials help learners construct understanding?
  – What are facilitators able to talk about with the learners? How does the conversation help learners construct understanding?
  – What particular aspects of the activity made it effective?

3. Small group discussion of reviews. After students have rotated to at least two activities, ask them to form small groups of two to three pairs. The groups should compare their notes with the *Key Characteristics of Exemplary Activities & Facilitation* list that the class generated. They should focus on the extent to which the activity's design and facilitation addressed the key characteristics, and then identify the strategies and methods in the design and facilitation that students can use when they design their own activities.

4. Whole group debrief. Invite each group to share a few ideas that their group generated. Remind them give examples from the activities for the strategies and methods that they share.

Remember the following:
  ▪ Listen to their responses
  ▪ Ask participants to provide explanations, evidence, or clarifications to elaborate on their thinking. Suggested probing questions:
    o What makes you think that?
    o Please give an example from your experience.

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o   What do you mean?
- Invite others to react and respond to the ideas shared.
  Suggested probing questions:
  - o   Can anyone add something to that comment?
  - o   Who would like to share an alternative opinion?
  - o   Does anyone disagree with that comment?
- Reference and cross-reference their comments as you facilitate the discussion to encourage participants to think about and respond to one another's ideas.

5. Revisiting key characteristics. Share with the participants that we will revisit and add to the list of key characteristics as the course progresses, and they will also add these additional activity or facilitation strategies to the design of their activity.

Deep Sea Science Content Presentation (optional)

This presentation focuses on the deep-sea ecosystem and organism adaptations for this environment. We chose to use this presentation because course participants are often interested in designing activities about the deep sea. (See index of Science Presentations on the web site if you are interested in obtaining the PowerPoint for this presentation.)

Note: If you choose not to do these presentations, you will have more time for the students to either discuss the reading assigned for homework, engage in the exemplary activities, work on designing their own activities or prepare to present in class next week.

Task: Using the Activity Design Starter

1. Introduce designing an activity. Tell participants that they will work with their partner to start designing their activity around the specific science concept they have chosen. This activity will provide them time to discuss their activity with their partner and to receive peer and instructor feedback on their activity.

2. Project slide, "Activity Design Starter." Point out that these five questions are what they should ask themselves as they think about designing an activity. Display the five questions and then ask them to think about how these same questions might fall out into different parts of the learning cycle.
- What do you want the visitors to learn and experience? (i.e., your goals and concepts)
- How will you get learners interested in participating in your activity?
- How will you find out what the learners already know?

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- What kinds of things will the learners actually do while engaging in the activity?
- What will you do as a facilitator to help them come to an understanding of the concept?

3. Distribute the *Activity Design Starter* worksheet. Tell students that this form will help them design and record their activity.

4. Discuss activity components on "Activity Design Starter." Discuss each of the components participants will complete, and answer questions they might have. Remind them to keep in mind which aspects of their activity are accessible for pre-schoolers and their parents, and how they could make it interesting for high schoolers. Emphasize that the whole activity does not have to be appropriate for all audiences, but they should think about providing at least some portion of the activity that all audiences can engage in at some level. They are not expected to finish their activity design today—this is an opportunity to brainstorm, become familiar with portions of the COSIA activity write-up, and further refine their own activity.

6. Remember the Learning Cycle. Remind students to use the Learning Cycle as a model for their design.

7. Design around concepts, not facts. Tell students that it is important for them to design their activity around concepts rather than facts. Display the "Facts vs Concepts" slide, and ask them what difference they notice between the two lists.

8. Circulate. Circulate around the room, asking questions, listening, and giving advice if asked.

Task: Peer Review of Activity Ideas

1. Participants share activity with another pair. Tell participants that they will now have the opportunity to share their activities with another pair. Have participants take turns listening and then giving each other advice about their plans. Remind them to keep in mind the *Key Characteristics* and to note which ones they each have incorporated into their activities.

2. Partners review own activity again. Have each set of partners review their own activities again using the input given by their peers. Encourage frank assessment of their activity, including pros and cons. Have each pair focus on how they might change and improve their activity to include more of the *Key Characteristics*.

3. Circulate. Circulate around the room, asking questions, listening and giving advice where necessary.

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4. **Debrief the experience**. Lead a discussion with the large group, asking the following questions:
   - What was difficult about this?
   - What caused you to think the hardest?
   - What did you need more information about?
   - Are there any areas of confusion or concern?
   - Was this helpful? In what ways?

5. Completing Activity Idea Proposals. Tell participants they will use their work in class today as the basis for the homework assignment—to complete and upload the *Activity Design Starter*.

Homework

Reading
   - Fenichel, M. & Schweingruber, H.A. (2009). *Surrounded by Science: Learning Science in Informal Environments*. National Academies Press: Washington, D.C.
     - o   Ch. 4, Learning with and from Others, pg. 63-80.
   - Paper. Michaels, S., Shouse, A. W., & Schweingruber, H.A. (2007). *Ready, Set, Science!: Putting Research to Work in K-8 Science Classrooms*. National Academies Press: Washington, D.C.
     - o   Ch. 5, Making thinking visible: Talk & argument, pg. 87-108.
   - Castro, P & Huber, M.E. (2008). *Marine Biology*, 8th ed. McGraw-Hill Higher Education.
     - o   The Ocean Depths, pg. 361-382.

Activity Development
   - *Activity Design Starter & Science Content Paper* due in two weeks.

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COSIA Activity Design Starter

Upload this assignment to bspace. Each pair of partners will submit the same document.

(1) What do you want the visitors to learn and experience? (concepts and goals)

      a. ***Concepts:*** What concepts are you interested in helping learners understand? *(Write out each concept in a complete sentence, rather than listing them as topics, e.g., There is only one ocean that circulates around all the continents.)*

      b. ***Learning Goals:*** What are your learning goals for this activity? (These might include things like "Opportunity to interact with animals," "Investigate using hands-on inquiry," "Promote a deeper appreciation for _____")

(2) How will you get the learners interested in participating in your activity? *(What is your "invitation"? Will you have a big poster, exciting objects displayed, an interesting challenge to solve, etc.?)*

(3) How will you find out what the learners already know?

(4) What kinds of things will the learners actually **do** while engaging in the activity? *(e.g., talk with you &/or other learners, touch the animals, do an investigation, make something, etc.)*

(5) Briefly describe the general flow of the activity. *(e.g., how does it start, what will the learners do, what will you talk about with the learners, and how does it end?)*

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Key Characteristics of Exemplar Activities

1. Learner Driven
  – Encourages questions from visitors and follows the interests of the learner
  – Is sensitive to the visitors' prior ideas and knowledge about this topic
  – Evokes "metacognition" (thinking about one's own knowledge/ideas) and reflection
  – Gives visitors a sense of authority/ownership of their own learning
  – Has relevance to visitors' lives or can show explicit connections to their lives

2. Focus on Goals and Concepts
  – Has a specific purpose and focuses on important ideas, concepts or objectives

3. Based on how people learn
  – Uncovers/makes connections with visitors' current/prior understanding of the content
  – Encourages and provides opportunities for discussion/discourse and other social interactions between visitors or family/group members
  – Includes opportunities for learners to engage in various teaching approaches including some or all of the following: free exploration, guided and open inquiry and problem solving
  – Includes visual, verbal and/or physical interactions
  – Includes opportunities for visitors to make meaning individually, with peers and with someone more knowledgeable (e.g. facilitator/knowledgeable visitor)
  – Uses the "specialness" of objects to elicit conversations that support learning
  – Includes opportunities that explicitly address nature and processes of science
  – Allow opportunities for visitors to engage in inquiry including exploration and investigation, but also in making explanations and application
  – Includes opportunities to engage with and manipulate objects, experiences and conversations in a social setting

4. Accurate
  – Presents the science content accurately

5. Engaging
  – Is "minds-on" (not just hands-on), interactive, fun, and contains a "hook"
  – Visitors *do* something

6. Multiple Entry and Exit Points
  – Visitors could walk up or leave, at almost any time, and still have a significant learning experience without needing to see the Activity from beginning to end.

7. Inclusive
  – Is "developmentally appropriate," meaning the vocabulary and activities are appropriate for the knowledge level and physical abilities of the visitor
  – Considers cultural and social aspects of interactions

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