

Reflection Phase of the “Meaningful Watershed Educational Experience”

According to the definition of a “Meaningful Watershed Educational Experience,” the reflection phase should refocus on the question, problem or issue; analyze the conclusions reached; evaluate the results; and assess the activity and student learning. The MWEE should be considered in its entirety, as opposed to focusing on the field investigation exclusively.

Reflective thinking is considered to be part of the critical thinking process, specifically the process of analyzing and making judgments about what has happened. Through reflective thinking, learners may assess what they know, what they need to know and how to bridge the gap. Potentially, reflection on the Meaningful Watershed Education Experience can occur at two levels, instructor and student.

Reflection by Instructors

Educators, including classroom teachers and natural resource personnel can reflect on the impact of the educational experience by analyzing specific components and responding to such questions as:

- * Was material from previous (classroom) lessons incorporated into this experience?
- * Was there sufficient probing of the students’ knowledge and abilities?
- * Were the students encouraged to listen and respond to remarks made by instructors and peers?
- * Was the experience at the right level for the students? Were they challenged but not lost confused?
- * Was there an appropriate amount of activity or work for the length of time allotted?
- * Was there room for intellectual risk-taking and discovery?
- * Were the students encouraged to rethink, reorganize or refine their ideas?
- * Which component of this experience engaged the students’ interest and attention to the highest degree?
- * Were the learning objectives achieved? How do you know?
- * Were there any unexpected outcomes?
- * Is there anything you would change or eliminate?
- * What was your role in this experience?

- * Did you adequately prepare others for participation in this experience?
- * What did you personally learn from this experience and how can you apply in to your teaching?
- * How will you help students synthesize what they learned during the field experience and the rest of the unit of study?

(Questions adapted in part from Science Instruction Reflection, M. Allushuski, 2009)

Student Reflection

Reflective thinking in middle school students is recognized as being particularly valuable as it can support them in their transition between childhood and adulthood. It is considered an ideal time to develop thinking, learning and metacognitive strategies. Reflective thinking can provide middle school students with the skills to mentally process learning experiences, identify what they learned, modify their understanding of the topic based on new information and experiences and transfer their learning to other situations. The following strategies help students develop their ability to reflect on their own learning:

- Teachers model reflective thinking by explaining how they have learned from their own experiences
- Reflection activities are included in classroom study guides so that student know in advance this is a standard part of the learning process
- Questioning is used to prompt reflective thinking, specifically getting students to respond to why, how and what.....?
- Social learning through collaborative work with peers, teachers and experts
- Learning activities should be relevant to real-world situations
- Possible causes and solutions to problems are researched and discussed
- Results and findings are monitored and reevaluated throughout the entire unit

(Excerpted from Reflective Thinking, University of Hawaii)

Reflection activities with students may include more general interpretations of the experience as well as summarizing and presenting the field data that was generated. Debriefing exercises are a traditional component of outdoor adventure education. Challenge course participants who successfully move their team from one side of a high wall to another will often discuss how that experience relates to something else in their lives. Reflection can be integral to learning because it helps build self-awareness, strengthen personal and team growth and can improve performance in the future. Since students groups are typically diverse, reflection activities should mirror the differences in the group and accommodate a variety of learning styles. Reflection activities to consider include:

Rap and Rhyme:

Give groups about 10-15 minutes to write a rap or rhyme about their experience. All group members should be incorporated into the production.

Sculpture:

Each small group creates a sculpture around a work, phrase or other aspect of the experience using props. Other groups attempt to interpret the work. One quick option is to have the group members become "statues" or living sculpture.

Skits:

Ask each small group to portray their experience through a skit. After each presentation, have the whole class provide responses, ideas and suggestions.

Group Poem Writing:

Circulate a piece of paper around the class with the topic written across the top. Encourage each student to write a line in response to the previous one until everyone has contributed. Volunteers can read the entire work to the group and discuss it.

Imagining the Future:

Ask students to imagine the site in the year 2020. Small groups reflect on the changes that have occurred.

Graffiti Museum:

Glue a wide variety of photos taken on the day of the field work on sturdy paper and post throughout the classroom. Have students choose one that represents their impression of the experience and add a personalized caption. Teachers may need to give examples of what would or would not be appropriate.

Group Banners:

Using large pieces of banner paper and markers, ask student groups to depict their experience using a combination of words and pictures. When completed ask each small group to share their banner with the class.

Data Analysis and Sharing

For science teachers and students, data analysis begins with the investigative question around which the field work revolves. The investigative question needs to be specific enough to be researched and answered with qualitative or quantitative observations or measurements taken at a certain places and times. Information is record systematically on a data collection sheet.

Results are organized into categories in tables, charts, graphs, maps or other written forms and appropriate calculations are made as needed. Students then analyze data to look for patterns and trends. A clear conclusive statement that answers the investigative question or states whether the

hypothesis or prediction was correct is made. The data should be used to support the conclusion, description or model.

During group discussions, the data should be compared to that obtained during similar research projects or some type of standard result. Factors that may have affected the outcome of the investigation should be identified. Students may note how procedures may be improved. The group should discuss how the results relate to the essential question, list any new questions that emerge and make recommendations for future action.

(Summarized from Field Investigations: Using Outdoor Environments to Foster Student Learning of Scientific Processes by the Association of Fish and Wildlife Agencies)

Virginia teachers and students have designed and participated in a creative assortment of reflection activities. Many school systems incorporate the use of student journals or science notebooks before, during and after the main field experience. Elementary students have made posters, compiled portfolios and assembled bulletin boards to share what they learned with the rest of the school. Older students have presented data using electronic graphing and mapping programs, and created PowerPoint presentations and photo journals. Research results have been shared with classmates, as well as school administrators and community decision makers. High school students have entered water quality data on-line through a variety of monitoring networks which include opportunities for additional communication through chats, blogs and other mechanisms.