Title: What Do Professional Curriculum Developers Do?

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Abstract
Professional science curriculum developers and interpreters may have a convergence of goals. Typically, curriculum developers focus on issues that pertain to classroom science instruction. Occasionally, however, the focus diverts to issues of natural history where the products and methods of curriculum development may enrich and enhance the efforts of the interpreter.

Keywords
curriculum, environmental instruction, instructional materials

Introduction
Interpretation is a diverse enterprise. On occasion, school children take field trips to natural history sites for an experience that augments the formal instruction provided at school. If those providing the site interpretation are aware of the content and methods used in the classroom curriculum, they may be prepared to provide a more effective site-visit experience. Professional curriculum developers can also turn their attention toward the development of learning activities designed to engage site visitors in meaningful experiences associated with the site. The advantage of having access to professionally designed and developed learning experiences is that the "lesson" has been tested thoroughly in a variety of contexts by experienced curriculum designers.

Curriculum Development
Linda De Lucchi and Larry Malone have been engaged in curriculum development projects at the Lawrence Hall of Science at the University of California in Berkeley, for several decades. In the 1970s they participated in the development of a project to create a collection of outdoor activities designed for use in a wide variety of environments from urban to substantially natural. That project, Outdoor Biology Instructional Strategies (OBIS), resulted in nearly 100 quality activities designed to be used by informal educators, including naturalist/interpreters with varied audiences, groups of classroom students on field trips, family groups, or groups of young people associated with community and youth organizations. More recently, Malone and De Lucchi have been developing an active learning science program, the Full Option Science System (FOSS), a carefully crafted classroom curriculum. The design of the curriculum includes outdoor experiences associated with every key concept introduced in the curriculum. In situations where

students visit natural-history sites where the site interpretive staff has knowledge of the classroom curriculum, the site experience can be tailored to maximize the effectiveness of the visit. One FOSS resource available free to educators from FOSSweb.com is a chapter called "Taking FOSS Outdoors" which provides strategies for working with elementary students in the outdoors.

What do curriculum developers do? The curriculum development process is both creative and technical. The creative part involves envisioning the goals and objectives of an instructional episode; basically, figuring out what to teach and what you want the learner to carry way from the experience—the level of intellectual engagement—sensitivity, awareness, knowledge, understanding, or application/action. The technical aspect of the process involves the crafting of the sequence of experiences, an effective progression of pedagogical engagements.

Levels of engagement for an experience may include:
Sensitivity—sensory/emotional exposure
Awareness—rudimentary information and sensory input
Knowledge—discovery, information communication/collaboration
Understanding—meaning, context, perception of application
Action/application—advocacy, restoration, political action

The functional unit of a curriculum is the activity. The activity developer has to imagine (the creative part) the purpose of the activity—the goals and objectives (level of intellectual engagement). The next part is to imagine the pedagogies that will led to the successful acquisition of the objectives and goals of the activities—start with an inventory of the organisms in the area; make a map of the distribution of the organisms, investigate the associations between and among the organisms, or the correlation between organisms and a particular environmental variable (e.g. light exposure). The goals and objectives of a curriculum are grander and more inclusive. Curriculum design is a process of sequencing an integration of activities to achieve larger, more imposing goals. Instructional materials can be developed to respond specifically to natural history and environmental goals and objectives, or specific natural history and environmental activities can be crafted to complement and enhance prior knowledge brought to the interpretive experience by the participants.

Conclusion
Professional curriculum developers and nature interpreters can form an alliance to improve the nature interpretation experience of the public. Interpreters can benefit from application of curriculum design and development processes, and curriculum developers can benefit by taking advantage of the network of natural history interpreters in the wide spectrum of interpretation providers nationally to provide access from their environmental instructional materials.

Websites for resources include:
http://www.fossweb.com/
http://www.outdoorbiology.com/
http://www.lawrencehallofscience.org/