The term curriculum has many meanings, depending in part, from the various ways it is used in the formal school classroom when compared with out-of-school, nonformal education.

- The *Understanding by Design* framework defines a curriculum as “the specific blueprint for learning that is derived from desired results - that is, content and performance standards” (Wiggins & McTighe, 2005, p. 6).

- Schiro (2008) reflects on curriculum theory for the learner-centered ideology by stating “Curriculum is not thought of as subject-matter-set-out-to-be-learned but rather as environments or units in which people can make meaning” (p. 110).

- 4-H National Headquarters (2010) defines a curriculum as the “sum total of all intentional learning experiences.”

At the broadest level, the 4-H use of the term curriculum includes written facilitator’s guides, individual 4-H member project books, online enrichment or extension activities, and associated meetings, events, workshops, trainings, and other related activities planned for a 4-H learning experience.

In the 4-H Youth Development Program, curriculum is designed with a focus on the holistic growth of youth members. While formal schooling emphasizes cognitive development, 4-H programs endeavor to help youth develop socially, emotionally, physically, and intellectually. This changes the role of the curriculum designer, as the development of curriculum must be concerned with the range of activities that might bring about broad areas of growth in youth.
Elements of a High Quality 4-H Science Curriculum

Multiple components used to guide high quality curricula development have been identified and refined over the course of 4-H history and experience. The 4-H National Headquarters Curriculum Guiding Principles and Philosophical Framework and the 4-H Science Checklist incorporate these components. Individual 4-H staff or volunteer educators should consider these elements when developing their own curriculum or selecting one for adoption or adaptation. The four main elements listed below help to insure an effective curriculum.

Content
Content is based on current and accurate research in science and on the National Science Education Standards (NRC, 1996). The National Science Education Standards emphasize activities which provide opportunities for youth to develop an understanding of unifying concepts in science; engage youth in inquiry-based learning; and focus content on age-appropriate domains of physical science, life science, earth and space science, science and technology, science in personal and social perspectives, and history and nature of science (NRC, 1996).

Pedagogy (Teaching Strategies)
A high quality 4-H Science curriculum structures each activity around the five-step experiential learning model: an activity (experience) which is usually hands-on; and then allows for a period of individual or group sharing, processing, generalizing, and applying (Kolb, 1984). To complete the learning cycle, activities may also suggest broader applications.

Curriculum activities promote inquiry-based instruction (NRC, 1996). High quality 4-H Science curriculum structures activities in an open, guided, or structured inquiry format. Whichever is utilized, the key is that youth seek answers to questions rather than being given the answers. This tends to mean activities are not a “cook book” set of instructions for youth to follow, but rather, allow for exploration and manipulation in the environment (see Colburn, 2000).

In addition to improving cognitive understanding, curriculum activities also provide opportunities for youth to improve their science process skills/abilities (Horton, Gogolski, Warkentien, 2007). 4-H Science curricula need to provide opportunities for youth to practice using science abilities.

Extended and Scaffolded Learning
An effective way to stimulate learning is to offer extended experiences over time. A high quality 4-H Science curriculum intentionally sequences activities so concepts build on each other. This sequential learning experience helps youth learn more effectively. Curriculum developers, whether professional or individual 4-H educators, need to consider the frequency, duration, and intensity required to lead to the desired learning outcomes (for information on dosage related to developmental outcomes, see Chaput, Little, & Weiss, 2004; Hansen & Larson, 2007; Roth, Malone, & Brooks-Gunn, 2010).

4-H science education programs help increase youth scientific literacy in nonformal educational settings to improve attitudes, content knowledge, and science process skills.
Environment (Context)
The curriculum is anchored in a positive youth development environment (Lerner, Phelps, Forman, & Bowers, 2009). As a foundational piece for all 4-H Youth Development Programs, high quality 4-H Science curriculum not only builds on science content and skills, but provides youth with citizenship, leadership, and life skills development. Providing 4-H Science learning experiences within a positive youth development environment provides youth with: a sense of belonging, opportunities to experience mastery and independence, and supports young people in becoming active and engaged citizens.

Curriculum activities emphasize youth-adult partnerships (Zeldin, Petrokubi, & MacNeil, 2007). A hallmark of the 4-H Youth Development Program is empowering youth to serve in leadership roles in their 4-H groups and communities. In addition, trained adults should create environments in which they act as a facilitator and partner with youth members, helping to guide interests, yet allowing youth to explore and discover on their own.

The curriculum is developmentally appropriate. Youth grow and develop at different rates in their physical, mental, emotional, and social domains (see developmental psychology, or child and adolescent development). However, general characteristics for various stages of development, also called “ages and stages,” allow for the tailoring of curriculum to specific age groups.

Developing Curriculum by Identifying the Desired Outcome
The three basic steps in the Understanding by Design framework are (Wiggins & McTighe, 2005):

1. Identify the desired youth outcome. What are the learning goals? These may be deepening knowledge, enhancing skills, improving attitudes, changing behavior, and/or promoting positive youth development.

2. Determine the evidence of learning. How will educators know if students have achieved the desired outcome? This may include success indicators and other means of embedded assessment.

3. Plan the experience by designing learning activities.

This process enables designers to develop appropriate activities that lead to the desired result. Without a destination, a logical scope and sequence cannot be developed, and activities act as stand-alone experiences. A series of disconnected activities may still contain aspects of positive youth development, but lack opportunities for deeper conceptual learning.

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Promising Practices in 4-H Science Curriculum Development

4-H volunteer and staff educators know a good curriculum when they see it in action. Youth are engaged, discussing, and working together, the adult facilitator is providing guidance but is not overbearing, and there is ample evidence of learning. In this ideal case, activities build upon each other, and at the end of the project, the youth have learned about the concepts, practiced the skills, improved their attitudes around the subject matter, and have experienced opportunities for healthy psychological development (Carlson & Maxa, 1997). However, this does not usually happen by accident. Rather, by the intentional contribution of the curriculum designer in a loosely defined partnership with educators implementing the curriculum. While the educators delivering the curriculum are responsible for the majority of high quality programming, the curriculum developer has a crucial role in preparing a sequence and scope of learning activities. In 4-H, curriculum development happens in a variety of methods and three promising practices are shared here.

University of California

In California, curriculum is primarily facilitators’ guides to be used by an adult or teen in delivering a project to younger 4-H members. Curriculum tends to emphasize collaborative experiences and reflection by groups of 10 to 20 4-H members. Youth are encouraged to complete independent reflections in their 4-H Record Books. California 4-H curriculum development projects over the past decade have relied on the involvement of multi-disciplinary teams of 4-H youth development professionals, University and Extension faculty, and undergraduate students. The use of University students has brought a wealth of diverse perspectives, new ideas, and enthusiasm to the team while providing students with academic credit and experience developing experiential and inquiry-based curriculum.

The Ohio State University

In Ohio, the majority of curriculum are project books intended to be completed by individual 4-H members. Teams of Extension educators, campus faculty, and other professionals spend eight months to a year developing a project book. Approximately ten new or revised project books are published each year. The use of a standardized template helps ensure the framing of activities around the experiential learning cycle as often content experts are not familiar with youth development principles. To help facilitate application of learning, each project book requires two “learning experiences” meant to complement project activities, where youth apply their learning in real-life situations (e.g., going on field trip, hosting a workshop, presenting a demonstration). In addition, each project requires two leadership and citizenship activities to reinforce positive youth development (e.g., community service activity, teaching others).

4-H National Headquarters

The 4-H National Headquarters, in collaboration with the Curriculum Working Group, is building a curriculum development system that may be used to “create curriculum in an expeditious, efficient and quality manner that is assured to meet youth needs and engage youth” (4-H National Headquarters, 2011). The web-based system will contain a PDF builder and an interactive builder (for online learning) for curriculum authors to build activities in a variety of subject areas. Completed modules will feed directly into an online review system where certified reviewers review activities. Upon passing review, curriculum modules are then published to the 4-H Directory of Materials.

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Resources in 4-H Science Curriculum Development

4-H Resources

**National 4-H Curriculum Guiding Principles and Philosophical Framework**
4-H National Curriculum has three components: content and educational learning opportunity designs, professional development, and evaluation.

**National 4-H Science Checklist**
The National 4-H Science Checklist helps guide program staff in developing and evaluating 4-H Science programs.

**National 4-H Science Curriculum Rubric**
The National 4-H Curriculum review tool can help authors ensure their curriculum meets the standards of a 4-H Science Curriculum.

*Curriculum Development by Backwards Design*

*Comparisons in curriculum theory between ideologies of traditional scholar-academic, social efficiency, social justice, and learner-centered (the 4-H paradigm)*.

**4-H Essential Elements Program Planning Tool**
This tool will help you to examine its ability to provide opportunities related to each of the four essential elements to the young people engaged in your program.

**National Directory of 4-H Materials**
The 4-H National Directory of Materials is a searchable database of educational materials currently available throughout the Cooperative Extension System.

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