***Title of Program or Event***
Exploring Food, Fiber, and the Environment: A 5th Grade Agricultural Curriculum

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***Program or Event Description (4000 characters)***
In areas of environmental literacy, Americans are deficient, particularly in relation to agriculture. Science frameworks and standards recognize agriculture's importance; standardized tests include agricultural concepts; and Americans know little about it (NRC, 1988). To address this, we are proposing to develop an interdisciplinary STEM-based agricultural curriculum that is fully integrated into existing 5th grade curricula.

We intend to:

1. Review where agricultural concepts are missing in 5th grade science texts; review current 5th grade curricula/lessons from designated schools in Pennsylvania; and determine where agricultural concepts can be integrated to augment and enhance existing curricula.
2. Construct a comprehensive, integrated STEM-focused agricultural curriculum based on national K-12 science frameworks and standards infusing math, reading, engineering, and technology into instruction, which will include teleconferenced farm-based lessons, inquiry-based performance tasks, authentic, hands-on activities, and an augmented reality challenge at an agricultural education center.
3. Construct professional development training materials (both online and in-service) to provide content and technological instruction for teachers to implement curriculum to diverse student populations.
4. Train participating teachers on scientific inquiry and agricultural concepts at an agricultural education center where they can experience hands-on instruction.
5. Pretest students to gain baseline data; provide students with agricultural instruction in the selected school districts; posttest students to measure if gains were made; and make any necessary alterations to curriculum and activities based on implementation feedback.

The goals of this project are to increase agricultural literacy, to generate interest in STEM fields, and to create wiser consumers, globally competent citizens, and environmentally conscious individuals. The project will begin by addressing the needs of Pennsylvanians before those of other states but will be designed so that adaptation to states' specific requirements and agricultural characteristics is viable and manageable. Research has suggested that "[t]he earlier in life that we present information [about agriculture] to children, the more receptive they are to accepting and applying wholesome concepts about the topic for the rest of their lives" (McReynolds, 1985, p. 17).

While the idea of integration into K-12 curricula is not new (Bricker, 1911; NRC 1988; Frick, 1991), the efforts have been small, strapped for funding, and lacked the support of administration or stakeholders (Trexler, Johnson, & Heinze, 2000). And if teachers consider implementing agriculture in their classes, their own lack of knowledge or misconceptions

about agriculture may prevent it (Anderson, Thompson, & Velez, 2010). Although plenty of instructional materials are available, integration into existing curricula has yet to be presented synoptically, and lesson plans are often available *à la carte*, rather than comprehensively.

To address misconceptions and barriers to implementation, the curriculum will use STEM to explain that:

1. Agriculture is more than just farms; it includes the processing, packaging, transportation, marketing, and selling of finished products.
2. Food and fiber come from myriad plants and animals raised and harvested in different areas dependent on weather, climate, geography, natural resources, and social/cultural/political influences.
3. Agriculture and farms are connected to communities, economy, the environment, and other cultures around the world.
4. We rely on agriculture a great deal and take for granted the resources (soil, fertilization, water, energy, sanitation, fuel, roads, communications, technology, weather, and prices) involved in production.
5. The agricultural system is affected by geography, weather, climate, disasters, and social changes.
6. Humans impact the state of agriculture and ecosystems worldwide.

***Please list 3 objectives of the program event for which you are requesting funding. For each objective, please tell us the current status of the condition you are trying to change. Also, please tell us the target condition you are trying to reach (how you will know you have accomplished your objective). (200 characters each)***

1. ***Construct Curriculum***
   Review where agriculture is located in K-12 science frameworks, where it is missing in science texts, and where to integrate it into existing curricula. Design a curriculum, activities, and content.
   - ***Status/Statement of Need***
     Americans are environmentally and agriculturally illiterate. They are disconnected from farms, know little about concepts, and do not understand macro interrelationships that affect their lives.
   - ***Target***
     To construct and implement STEM-based, fully integrated agricultural curriculum to disseminate to 5$^{th}$ grade Pennsylvanians from rural, urban, and suburban schools.

2. ***Professional Development***
   Design and provide professional development for teachers to implement STEM-based agricultural curriculum to diverse student body.
   - ***Status/Statement of Need***
     Teachers and students lack knowledge of or hold stereotypical ideas about agriculture. They often lack support from administrators for programs that would address these issues.

- ***Target***
  To increase understandings of agricultural concepts, to reduce misconceptions about agriculture, and to increase cooperation between teachers and administration through successful PD sessions.

3. ***Implementation and Assessment***
   Pretest students to gain baseline data; pilot curriculum in select school districts; posttest students to measure if gains were made; and make necessary alterations based on implementation feedback.
   - ***Status/Statement of Need***
     Environmental and agricultural literacy has increased slightly with consistent intervention and lessons containing such concepts; however, most teachers are not including them in their curricula.
   - ***Target***
     To increase environmental/agricultural literacy, increase interest in STEM fields, and increase national agricultural and environmental consciousness as illustrated in surveys and assessment scores.

***Which area(s) of the region/state/counties will this request benefit:***
Beginning with four districts in Pennsylvania (located in three counties), the curriculum will be designed to include Pennsylvania's Academic Standards for Environment and Ecology, as well as each district's standards, before the curriculum is disseminated to other states.

***Please tell us more about the clients served by this program/event. If your program/event is open to the general public, please provide your best estimates in each applicable category.***
Below is a breakdown of each district's demographic information, including the total number of 5th grade students and the percentage of students eligible for free/reduced school lunches.

| | ***Allentown*** | ***Bethlehem*** | ***Nazareth*** | ***Quakertown*** |
|---|---|---|---|---|
| ***Race*** | | | | |
| Asian | 1.6% | 3.5% | 2.0% | 3.4% |
| Black | 16.8% | 10.5% | 2.0% | 1.8% |
| Hispanic | 65.1% | 37.5% | 3.0% | 5.7% |
| White | 14.8% | 49.4% | 93.0% | 89.7% |
| Other | 1.7% | <1% | <1% | <1% |
| ***School Lunches*** | 78.1% | 2.5% | 8.0% | 15.7% |
| ***Total 5th Graders*** | 1608 | 1077 | 351 | 414 |

Source: www.publicschoolsk12.com

***Statement of Need***

a. "Most Americans know very little about agriculture, its social and economic significance in the United States, and particularly, its links to human health and environmental quality" (NRC, 1988, p. 9).
b. "Few systematic educational efforts are made to teach or otherwise develop agricultural literacy in students of any age. Although children are taught something about agriculture, the material tends to be fragmented, frequently outdated, usually only farm oriented, and often negative or condescending in tone" (NRC, 1988, p. 9).
c. In 1994, Leising and Zilbert identified that nearly 90% of Americans were two or three generations removed from direct agricultural production, yet agriculture employs people not just on farms but also in processing, distribution, marketing, and sales.
d. A 1986 Kansas study reported: "Only 27.3 percent of the elementary school students knew that veal is the meat of young cattle; 25 percent of middle and junior high students knew that the sprouting of seeds is called germination; and 10 percent of senior high students knew that beef cattle production was the primary industry in Kansas in terms of gross sales" (NRC, 1988, p. 9-10).
e. A 1986 Virginia study reported: "In Virginia, students in 244 fourth-grade classrooms had only a rudimentary concept of where their food and fiber originate (Oliver, 1986). Nor are they curious to find out: teachers estimated that students asked questions about agriculture near the 'almost never' end of a five-point scale of frequency" (NRC, 1988, p. 10).
f. In a 2000 study of elementary students, Trexler found that, "[m]ost students lacked knowledge and understanding of pests and their control. Without this schema, (which agricultural and science educators suggest be held at this age) there is weak or incomplete scaffolding on which to build understandings necessary to intelligently weigh the positive and negative effects of using pesticides and other crop technologies, e. g., GMOs" (p. 99).
g. In 2003, Meischen and Trexler found that fifth grade students knew little about meat and animal byproducts; some "thought some cows produced 2% milk and some whole" (p. 49), some "thought that cattle were shaved and their fur was used to make coats rather than the hide used for leather" (p. 49), none "knew that by-products from cattle were used in pharmaceuticals or cosmetics" (p. 49), and all believed large farms were between only one and twelve acres.

***Task Analysis***

a. Review where agricultural concepts are situated in the K-12 science and agricultural frameworks
b. Review where agricultural concepts are missing in 5$^{th}$ grade science textbooks
c. Review current 5$^{th}$ grade curricula and lesson plans from four school districts in Pennsylvania
d. Determine where agricultural concepts can be integrated into established/existing curricula
e. Outline an integrated agricultural curriculum to be presented in 5$^{th}$ grade classes
f. Design related learning activities for each lesson of the unit
g. Design related content that corresponds with each lesson

h. Partner with four school districts in Pennsylvania to implement the curriculum – rural, urban, and suburban areas
i. Pretest students to gain baseline data
j. Pilot the curriculum in four districts of Pennsylvania
k. Posttest students to measure if gains were made
l. Report findings to science teacher education journal
m. Make any necessary alterations to curriculum and activities

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