

Uses of Active Plant-Based Learning (APBL) in K-12 Educational Settings

A White Paper Prepared for the Partnership for Plant-Based Education

by

Scott P. Lewis, Ph.D.

Executive Summary

The purpose of this white paper is to provide a scholarly review of the relevant research literature on active plant-based learning (APBL). It establishes a foundation for educational leaders' understanding and support of the important role that APBL can play in educational settings.

Plant-based education in the United States goes back more than 100 years. It currently takes a variety of forms, and is found in a diverse array of programs for children in grades K-12, both in and out of school. In order to address the wide range of plant-based education programs that are offered in grades K-12, this paper takes a broad look at research in plant education as well as active learning.

Section 1 begins by offering three reasons for using plant-based education in grades K-12. These are (1) the vital but often overlooked importance of plants ecologically and in human history; (2) the strength and diversity of the connections between the study of plants and the core standards of a number of academic disciplines, as well as the unique suitability of plants to serve as a context for integrating these disciplines; and (3) the importance and benefits of the human connection with nature, and the critical role plants play in this connection.

Section 2 addresses research related to plant-based learning. It is divided into two parts in order to provide a larger theoretical base for thinking about this topic. The first part, **2A**, is a summary of the findings in the educational literature on plant-based learning. The research reviewed here shows that plant-based education produces positive growth for children in a number of important areas, including self-esteem, attitudes toward school and the environment, social development, physical and psychological health, creative thinking and problem solving, and effective learning of science and a variety of other academic subjects. Because these findings are based on a relatively small number of studies, in **Section 2B** the paper cites additional research that discusses potential benefits to be gained from working with plants and other materials in an active manner. It is emphasized that the active process requires not only that students do hands-on work with materials, but also that they engage in making sense of what they are doing in light of their understandings. In other words, active learning is not only "hands-on" but "minds-on" as well.

Thus, in this section, a research-based argument for the importance of active learning is developed, drawn from educational and psychological research in related areas. It begins with a discussion of the types of mistaken conceptions that children often have about plants. These incorrect understandings can lead students to interpret new information in ways very different from how teachers expect it to be understood. In response, educators

have been working on a variety of means to address prior knowledge within learning settings, and to guide students to understandings more aligned with accepted bodies of knowledge. A number of these best practice methods are based on a social constructivist approach that recognizes the importance of peers and teachers in mediating learning. In this view, it is important not only that children actively relate what they are doing to their prior knowledge, but also that they become participants in larger groups, where novices can benefit from more experienced members and where children take on roles appropriate to their level of understanding.

Section 3 outlines a model of best practices for active plant-based learning that incorporates this social constructivist framework and argues for the importance of developing integrated, meaningful knowledge and using authentic learning. This approach is built on a model recently created for science education, which has been modified to address active plant-based learning. Based on reform goals and social constructivist theory discussed in documents such as the National Science Education Standards, the model highlights five areas of practice: active engagement with phenomena, use and application of knowledge, multiple representations, use of learning communities, and authentic tasks. Each of these areas is discussed in terms of specific strategies that are relevant for plant-based learning, and examples are given of APBL approaches that show at least some of these features.

This sets the stage for **Section 4**, which reviews a sample of exemplary plant-based programs that were surveyed to allow a comparison of a variety of their features to each other and to this model. A number of the findings are summarized here. The 43 participants completing this survey (a 49% return rate) represent a wide range of geographical locations and urban/suburban/rural areas in the United States. The mean length of time these programs have existed is about 7 years, and the average number of children served weekly per program is about 80.

Respondents gave a variety of descriptions of the nature and goals of their programs. The most common goals were inquiry and solving problems, understanding specific science concepts, stewardship, life skills, encouraging high-level thinking, understanding of native habitats, health concepts, environmental awareness, lifelong love for gardening, and creating wildlife space. Several other goals that were mentioned were tailored to participants' particular sites.

A majority of those surveyed indicated that the program was designed through a participatory process, and most had mechanisms in place (e.g., grant development, committees, volunteer core) to ensure the program's sustainability.

The average annual expense of the programs was around \$1,100, but there was quite a bit of variation. These expenses were frequently paid through a combination of regular budget and external sources.

Participants reported a high integration of subjects (e.g., history, language arts, mathematics) and indicated that their program addressed their specific State standards in science and other disciplines. They reported using a variety of modes of instruction and

types of assessment, and a number of ways of adapting their program to the nature of the children served, including using hands-on strategies, making it physically accessible, addressing different modalities, simplifying it, making language adaptations, and individualizing it.

In addition to the educators who led the program, other adults were frequently involved in assisting the program. Administrators were generally seen as supportive and provided a variety of types of support.

The greatest obstacles for these exemplary programs were time, inclement weather, insufficient funding, vandalism, and lack of help.

Significantly, survey participants felt that their programs utilized many of the strategies of the social constructivist model discussed in Section 3 of the paper.

In **Section 5**, the final section of the paper, several recommendations are made, including:

1. Conducting additional research on APBL, including observations of exemplary programs to confirm high self-ratings on use of social constructivist strategies, and including interviews with exemplary educators to obtain details about how their plant-based programs were started and sustained, how they overcame obstacles, and how best to support such programs.
2. Recognizing that individual program goals are strongly influenced by local conditions such as special populations being served or partners who provide particular kinds of support, and that when Partnership members plan outreach efforts to local programs, they must take into account the impact of conditions such as these.
3. Encouraging educators to think about ties to state standards, as well as interdisciplinary connections that are possible through studying plants, thus leading to increased likelihood of using plant-based education.
4. Recognizing that many of the best programs are heavily dependent on external funding sources, and developing additional funding sources so that plant-based education can be sustained and expanded. We also recommend providing workshops and training in grant writing and grant procurement to teachers.
5. Assisting educators using APBL who work in isolation from each other and increasing the professional development of all educators using APBL, creating a community of educators through networking and Internet dialogue to provide needed support for their efforts.

To read a complete copy of this paper, click this link:

<http://garden.garden.org/PPBL>. You will be linked to the Web site for the Partnership for Plant-Based Education (formerly called the Partnership for Plant-Based Learning).