

Garden Based Learning

Considering assessment
from a learner-centered approach



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About this work

This project was begun over a year ago, when the California 4-H youth development garden based learning workgroup felt educators in school settings would benefit from a guide for assessing school garden programs and youth's educational and psychological learning outcomes. The project has evolved into an idea of assessment for a learning community, using the dynamic gardening classroom, for the ultimate purpose of our educational goals. This work does not intend to be a comprehensive collection of assessment efforts out in the field, rather; it is a guide for further discussion and action. Using a learner-centered approach for assessment of school garden programs is cultivating and harvesting the seeds of awareness for educational reform.

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About the 4-H Center for Youth Development

The 4-H Center for Youth Development is dedicated to research, both basic and applied, that furthers the field of youth development. The Center serves as a support base for youth professionals working in various counties in California in Cooperative Extension. The Center continues to support research on garden based learning within a youth developmental framework.

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Chapter 1

School garden programs: theory and practice

School gardens are gradually and surely sprouting, not only in the United States but in different parts of the world. The movement towards greening school grounds as well as incorporating them in the educational curriculum is not an isolated phenomenon, based on the philosophical interests of a select few. Rather, it represents a global shift towards educational reform and social change: and attempts to provide a meaningful education for all youth that will benefit them and their communities.

Especially in the past century, prominent educational philosophers such as Maria Montessori and John Dewey have spoken about the importance of natural settings for learning. They have stressed that the purpose of education is to serve the moral, socio-emotional, cognitive and spiritual development of an individual. While a few contemporary educational systems incorporate these notions (such as the Waldorf school started by Rudolph Steiner, or the Reggio Emilia model of elementary education) education systems at large have a long way to go before we may confidently state that they provide empowering contexts for youth, that encourage a sense of connection as well as responsibility towards their social and physical environment.

The literature on the beneficial impacts of school gardening has established the value of garden based learning (see next page). However, there has been less discussion on the ways in which school garden programs may be assessed, and how such assessment may become a learning tool. The purpose of this guide is to suggest that the assessment of school garden programs go hand in hand with the very reasons for incorporating school gardens. The guide does not intend to make simplistic the complex issues in assessment today, but aims to bring about a learner- centered assessment discourse that meets the challenges in the assessment field. The basic suggestion for the field of garden based learning is to use assessment that will help cultivate as well as harvest the seedlings already planted by these innovative programs.

What research tells us about garden based learning

Impact on Academic Achievement

In one well-evaluated study on experiential education, reported in *Closing the Achievement Gap: Using the Environment as an Integrative Context for Learning* (Lieberman & Hoody, 1998), the State Education and Environment Roundtable, consisting of 12 states' education agencies, sought to identify successful environment based educational programs and conduct evaluations in various domain areas. The documented impacts of the programs were:

- better performance on standardized achievement tests of reading, writing, math, social studies and science;
- reduced classroom management and discipline problems;
- increased attention and enthusiasm for learning; and
- greater pride and ownership of accomplishments.

Impact on Environmental Education

Garden based learning has been especially beneficial in environmental education or ecological literacy as well as in teaching scientific concepts. The Down-to-Earth Program (DTE) aims to provide this kind of learning with the help of school gardens as a knowledge building tool (Williamson & Smoak, 1999). The impact of the Down-to-Earth Program has been seen through increased knowledge of the scientific method, plants, fertilizer, and pests as well as positive attitudinal and behavioral changes, increased awareness, and facilitation of higher order thinking processes.

Impact on Children's Health and Nutrition

School gardens have been used to teach children about nutrition and how to make healthier food choices (Lineberger & Zajicek, 2000). Evaluations of students participating in the 'Nutrition in the Garden' program showed that their attitudes toward fruits and vegetables had become more favorable and they were also more likely to choose fruits or vegetables as snacks, compared to before they participated in the gardening program.

Impacts on Families and Communities

The Evergreen Elementary School in West Sacramento, California offered small garden plots to families who were non-English speaking immigrants, primarily from Hmong and Mien cultures, who rarely participated in their children's activities. A demonstration garden grew vegetables and other plants familiar to the Hmong and Mien participants, thus encouraging participation by the parents. This project raised the self-esteem of the children as well as the non-English speaking parents, who were then valued as teachers.

The theoretical roots of school gardening: a grounded framework for assessment

The school garden movement is supported and fueled by an interdisciplinary theoretical effort in the social, behavioral, developmental, ecological and agricultural sciences – all finding a dynamic interface in the school garden as a context for educational and social reform. Below is a brief summary of the key theoretical frameworks, and their applications that support the shift towards incorporating garden systems within the basic educational curriculum.

Theories of learning and learner centered principles

Psychologists and educational researchers have become interested in the processes of learning, and steering educational practices to optimize these processes (Lambert & McCombs, 1998). Learning theories have established that the learning experience for all learners incorporates metacognitive, cognitive, affective, personal, social, developmental and individual difference factors (Lambert & McCombs, 1998). There is a clear emphasis now on ‘the learner and learning’. Constructivist theories and theories of experiential and project based learning which emphasize processes of discovery, reflection and the co-construction of knowledge support the learner-centered theoretical framework and the application of its principles. School gardens serve as a natural context for learner-centered pedagogy enabling educators to develop curriculums that engage all the necessary components for meaningful learning outcomes.

Youth development theories, community youth development

Positive youth development theories state that developmental opportunities that support youth provide cumulative benefit. Positive youth development is defined as providing youth with intentional contexts that support their development, while providing them with life skills so they may become contributing and caring individuals in their community (Larson, 2000). Community youth development theories emphasize that communities develop a youth development ethic and become supportive contexts for youth to develop connections as well as serve as empowering contexts for youth to take responsibility for their communities. (Benson, et. al., 1998) The youth development movement is fast becoming an institution in itself (Russell, 2000) with community and after school programs trying to fill the gap in the developmental opportunities that are lacking in most educational systems today. School and community gardens have been one way in which educators have attempted to provide stimulating educational contexts for youth that connect them with their community, encourage cross-age teaching opportunities and providing meaningful learning environments to learn important life skills that may be otherwise inaccessible to youth.

Sustainability theory

Theory in economics and the environmental and ecological sciences have brought to the world’s attention, environmental degradation and the depletion of natural resources prevalent with our current global market system. Educators

have become interested in finding effective ways to teach about environmentally sustainable practices, ecology and environmental science. The value of youth learning in natural contexts, about their world and about each other is tied with an ecological worldview where it is important for youth to see themselves as part of the intricate web of all life on earth. By learning about ecological concepts such as the food web and their role in contributing to ecological sustainability, youth are able to feel connected to and take responsibility for their social and physical environment.

Theories in social science for social justice and social change

Critical pedagogies based on sociological theory challenge the assumptions, practices, and outcomes taken for granted in dominant culture and in conventional education (Gruenewald, 2003) whose social structures and systems tend to marginalize or even oppress those who do not have the 'power' to benefit from the social system. Among these are the 'assumptions that education should mainly support individualistic and nationalistic competition in the global economy and that an educational competition of winners and losers is in the best interest of public life in a diverse society' (Gruenewald, 2003).

School gardens support a view that all children meet success from a perspective where success may be defined as personal growth and progress in learning. Proponents of school gardens support local empowerment for communities and individuals and are interested in promoting cultural preservation, local self-sufficiency and cultural participation.

Applications of theory

The above theoretical conceptions at the individual level as well as at the societal level find applications in:

- ❖ constructivist learning
- ❖ experiential learning
- ❖ contextual learning
- ❖ problem based learning
- ❖ outdoor education
- ❖ multicultural education
- ❖ environmental and ecological education
- ❖ bioregional education
- ❖ democratic education
- ❖ community based education and place based education.

Garden based learning (GBL) specifically refers to incorporating a natural setting such as a school garden into the standard curriculum where the above content areas and types of learning might take place.

Daniel Desmond and Jim Grieshop from the University of California, Davis, conducted an international survey of a cross-section of educators regarding the applications of educational gardens in rural as well as urban areas and found diverse applications in various cultures around the world (see next page).

Applications and uses of garden-based learning

Academic skills

- To support core academic training, particularly in science and math
- Real world hands on experiences
- Enrichment of core curriculum in language arts through introduction of new learning landscapes
- To support standards based education in countries with national or regional education standards

Personal development

- To add a sense of excitement, adventure, emotional impact and aesthetic appreciation to learning
- To improve nutrition, diet and health
- To teach the art and science of cooking with fresh products from the garden or local farms
- To re-establish the celebratory nature of a shared meal

Social & Moral Development

- To teach sustainable development
- To teach ecological literacy and/or environmental education
- To teach the joy and dignity of work
- To teach respect for public and private property

Sustainable Development

- Gardens are an appropriate arena to introduce children to the interconnections that link nature to economic systems and society

Vocational Education

- Gardens represent a historic and contemporary model for developing vocational skills in agriculture, natural resource management, and science

Vocational and/or Subsistence Skills

- To teach basic skills and vocational competencies
- To produce food and other commodities for subsistence consumption and trade

Life Skills

- To teach about food and fiber production
- To engage youth in community service and environmental care.
- To engage youth in lessons of leadership and decision-making.

Community Development

- Gardens often serve as a focal point for community dialogue capacity building, and partnerships
- Gardens often organize individuals for action for water delivery, cooperatives, and transportation

Food Security

- Gardens can address hunger at the individual, family, and community levels through planning, growing, and sharing
- Gardens can be the beginning point for teaching and developing food policy

School Grounds Greening

- Gardens provides practical productive strategies to transform sterile school grounds into attractive and productive learning centers
- Hands-on activities in outdoor classrooms make learning more interesting while demonstrating other benefits such as decreased absenteeism and discipline problems

From Desmond, Grieshop, Subramaniam,2003. An FAO publication at www.fao.org

Chapter 2

Authentic assessment and evaluation for garden-based learning

'If education is not transformative, it is nothing.'

- Global Association for Transformative Education

The terms evaluation and assessment are used interchangeably but there are differences in their meaning and purposes.

Evaluation is used to make a judgment about a specific skill or program. When used with teachers and learners, evaluation provides information about whether processes, skills and concepts have been grasped in ways that make it possible to use them to complete particular tasks or solve specific problems. Evaluation assigns value to a final product or performance based on a criterion and is an end in itself.

Assessment involves monitoring and gathering information about a program, or individual's progress over time. Assessment is not an end in itself but rather a means of achieving an end. It is an ongoing process that allows teachers and learners to know, understand and articulate what they are doing and how it will help them meet their goals.

Considering how GBL serves as a dynamic interface for social, environmental as well as individual educational goals, what would be the best way to approach assessment of garden based learning outcomes and the effectiveness of a school gardening program?

Reconsidering assessment

To approach the question of how to assess school garden programs, we need to understand the general discussions in the state of the field of educational assessment. We need to determine 'why' we are assessing in the first place and why educators are getting drawn towards alternative forms of assessment. According to Kohn (1998), the 'question of motive, as opposed to method can lead us to rethink basic tenets of teaching and learning, and to evaluate what students have done in a manner more consistent with our ultimate educational objectives.' Rather than merely challenging grades, at this level, she states that we as educators need to challenge the whole enterprise of assessment.

The disconnect between testing and reality

One of the reasons for the efforts to develop alternative forms of assessment is a growing consensus among educators, researchers, and policy makers that current U.S. tests fail to measure student's' higher order cognitive abilities or to support their capacities to perform real world tasks (Darling-Hammond, 1998).

A critique of the grading rationale of sorting, motivation, and feedback

Kohn (1998) brings to the fore core criticisms of the current practices in grading that sort students based on their abilities and turn schools into “bargain basement personnel screening agencies for business”, which pulls away from the goal of helping students learn.

Extrinsic vs. intrinsic motivation

At an individual psychological level, Kohn criticizes traditional grading as cultivating an extrinsic rather than an intrinsic motivation to learn, that is, learning as a means to an end, the ‘end being to escape punishment or snag a reward’, rather than learning out of interest, for its own sake.

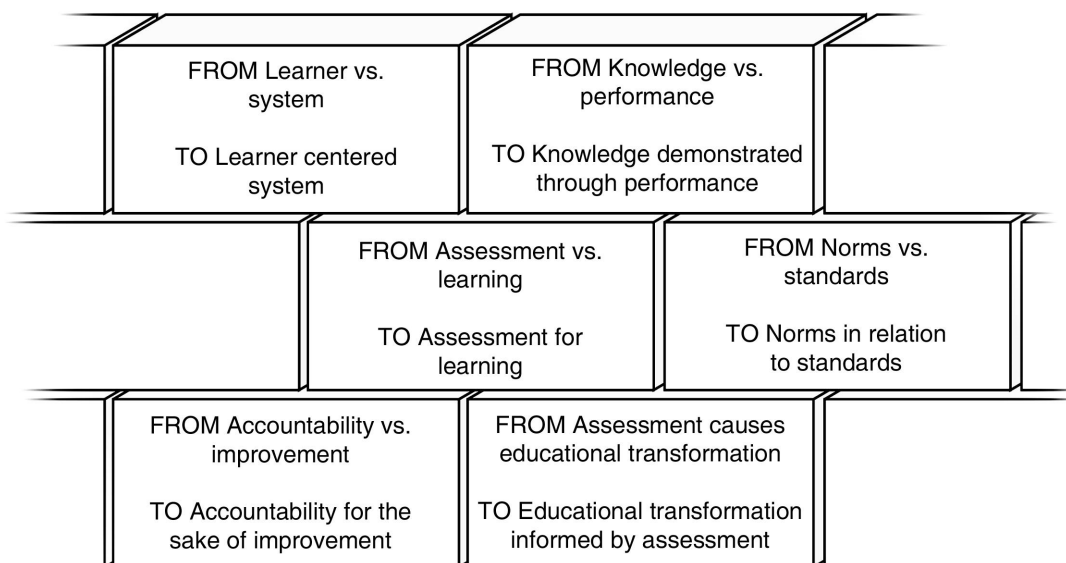
Limited feedback

Grading for feedback is a legitimate goal, but such feedback is most likely to happen when students experience success and failure, not as reward and punishment, but as information. Also, when a grade reduces students’ work to a letter, there is very little information about what was impressive about the learner’s work and what could be improved (Kohn, 1998).

Assessment for educational reform

Assessment can itself influence educational reform, if it furthers the guiding principles underlying garden based learning programs. By evaluating garden-based learning with the very guiding principles that form its basis, we will not only be strengthening its implementation, but also getting the most relevant information in terms of outcomes.

BUILDING BLOCKS OF EDUCATION REFORM



Adapted from Mentkowski (1998)

The purpose of most school garden programs (see the tables on uses and applications of school gardens) indicate that garden based learning is intended to provide meaningful and relevant learning, in a natural context. By moving away from a philosophy of assessment that is focused on accountability alone, to one that is designed to enhance learning, we will be a step further in our goals for creating a youth developmental ethic in the garden classroom.

The principles for assessment given below are based on the learner centered principles developed by the American Psychological Association, which are based upon the cognitive and meta-cognitive, motivational and affective, developmental and social, and individual difference factors influencing learners and learning. The learner centered principles apply to a community of learners, in a real world learning context and include students, teachers, administrators, parents and community members.

These 12 principles can be applied directly to assessment situations and tasks:

Learner centered principles of assessment (in Lambert & McCombs, 1998) provides guidelines for assessment reforms that support students' learning.

1. The fundamental purpose of any educational assessment of students should be to promote meaningful learning.
 2. Assessment should elicit students' genuine effort, motivation, and commitment to the assessment activity and situation.
 3. Assessment should provide credibility and legitimacy to a broad range of talents and accomplishments of students across the curriculum.
 4. Assessment should occur continuously in classrooms in order to provide longitudinal evidence of individual progress.
 5. The strategies, skills, and knowledge required to excel on academic assessments should be the same as those required to master the curriculum on a daily basis.
 6. Assessments should be based on authentic and meaningful tasks that are consistent with the regular curriculum and instruction provided in the classroom.
 7. Assessments should be fair and equitable to all students regardless of prior achievement, gender, race, language, or cultural background.
 8. Assessments should measure students' motivation, attitudes, and affective reactions about the curriculum as well as their cognitive skills, strategies, and knowledge.
 9. Assessments should include exhibits, portfolios, and performances to demonstrate a wide range of behavior and accomplishments.
 10. The design of standards of excellence and assessment systems should be negotiated by the participants – including parents teachers, administrators, and students – in districts and states in order to ensure consensus, commitments, and ownership among the primary stakeholders.
 11. The results of assessment should provide clear, comprehensible, and immediate feedback to the participants.
 12. All assessments should provide for periodic review and revision among the participants and consumers of assessment information.
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Authentic performance-based assessment

A basic aim to use a more authentic assessment method is that they indicate learner's progress through their performance on real tasks. Also, authentic performance-based assessments may be used in garden based settings to tap a more complex and rich sphere of youth learning experience that may be otherwise simplified.

Authentic performance-based assessments have four basic characteristics in common (Wiggins, 1989 in Darling-Hammond, 1998):

1) Assessment tasks are representative of performance: They are designed to be truly representative of performance in the field. For instance, a nutrition curriculum may include teams planning and/or preparing a nutritionally balanced meal with produce from the garden.

2) Criteria are well-articulated: The criteria used in assessment seek to evaluate "essentials" of performance against well articulated performance standards that are openly expressed to students and others in the learning community, rather than kept secret in the tradition of content based examinations. These criteria are usually multifaceted, representing the various aspects of a task, rather than reduced to a single grade. The criteria in this way, guide teaching, learning and evaluation and illuminate the goals of learning.

3) Self-assessment: plays an important role in authentic tasks. A major goal of authentic assessment is to help students develop the capacity to evaluate their own work against public standards; to revise, modify, and redirect their energies, taking initiative to assess their own progress.

4) Accountable to the learning community: Students are generally expected to present their work and defend themselves publicly and orally to ensure that their apparent mastery is genuine. This characteristic of authentic assessment serves other goals as well, signaling to students that their work is important enough to be a source of public learning and celebration; providing opportunities for others in the learning community, that is students, faculty and parents to continually examine, refine, learn from an appreciate shared goals and achievements.

Authentic assessment: activities, tasks and tools

In *Digging Deeper*, Kiefer & Kemple (1998) provide three basic forms of assessment: activities, tasks and tools:

1) Assessment activities: Assessment activities could be any classroom lessons or activities that engage students in a way that allows the teacher to

instruct and assess at the same time. For instance, an activity such as high school students creating a garden text book for younger children could be a class activity that can be assessed through student reflections, peer assessment and teacher impressions. The activity is authentic in its usefulness for the school as well as incorporates meaningful learning of writing and presentation skills, teamwork, cross-age teaching, creativity, as well as involvement in the garden program. Assessment activities are more meaningful when they are authentic, that is, their real purpose is not just for assessment's sake.

2) **Assessment tasks:** Assessment tasks may be incorporated within assessment activities as mentioned above. Assessment tasks include journal writing, conferencing, creating graphic organizers and charts or Venn diagrams and conceptual maps. Peer assessments may be included in this category. Assessment tasks should ideally serve a larger purpose of an activity.

3) **Assessment tools:** are formal measures against which a student's or program's progress is measured. Rubrics or checklists are used. In both, specific criteria are listed along with a continuum that reflects where the student or program stands in terms of progress toward those expected outcomes.



Chapter 3

Components of a garden program assessment

‘...of working with, rather than against, nature; of protracted and thoughtful observation rather than protracted and thoughtless action - of looking at systems in all their functions, rather than asking only one yield of them; and allowing systems to demonstrate their own evolutions.’

- Bill Mollison

Best practices in school gardening

Daniel Desmond and James Grieshop have integrated the best practices they found in their survey of garden based learning practises in different parts of the world with their past experiences in the evolution of school gardens in the last thirty years.

Administration and organization

- recognition and support of garden based learning as an appropriate or necessary element of basic education at the highest levels of the educational bureaucracy
- school/program administrative understanding and support of garden based learning goals
- a vision, mission and strategic statement of how garden based learning fits into the overall instructional strategy of the school/program
- acceptance by the community of the role of garden based learning in basic education
- commitment of a reliable funding source

Curriculum and instruction

- articulation of how garden based learning fits in to standards based education.
- identification of how garden based learning can assist educators in reaching content standards for each subject matter area at various grade levels
- well organized garden instruction plan that is flexible and not teacher dependent
- alignment of garden based learning as a important, accessible strategy within environmental education
- development of a core curriculum and eventually a discipline in garden based learning
- development of a strategy to use garden based learning for thematic instruction in all disciplines
- garden scale appropriate to curriculum or learning objectives
- students manage the garden and the products from the garden
- adult and youth garden coordinators

From Desmond, Grieshop & Subramaniam,2003. An FAO publication at www.fao.org

The Garden

- garden technology must be appropriate and sustainable
- plan for garden sustainability, both the physical site and instructional integrity

Philosophy of learning and learning activities

- learn by doing, hands-on instruction
- child centered, self (student) directed
- inquiry based learning
- real life learning (authentic learning experiences)
- utilize the experiential learning model (allow students to construct their own knowledge through research, discussion, exploration and application)
- engaging all senses, garden activities include active engagement on a daily basis
- activities include a sense of fun and adventure
- identify education about the natural world and food

Social Justice Focus

- gender equity; boys and girls working together
- inclusive (all students involved)

Youth development and Community impact

- leadership development through community service and volunteerism
- participatory democracy and consensus building; children engaged in the design, planning, management, and monitoring of the program
- combination of teamwork (garden teams) and individualized instruction

As we can see from the list of practices, some of the key features of a quality school garden program seem to be a serious commitment to the school garden vision at an organizational level, student and teacher collaboration, garden sustainability and a learner-centered model of education. If we want our evaluation and assessment of school garden outcomes to reflect the richness and depth of what students learn, we need to incorporate these very same guiding principles in our measurements of student progress and judgments of the garden program.

In other words a garden program assessment should include the following components:

- 1) Assessment of student learning outcomes.**
- 2) Assessment of garden growth and sustainability.**
- 3) Assessment of garden program impact on the entire learning community**

Portfolio assessment for school gardens

An interest in portfolio assessment evolved out of a need to measure capacities of students in areas that were not being tapped by standardized measurement (Hoepfl, 1998). Portfolios have long been a respected form of assessment for language, humanities and arts and many teachers have found that portfolios can integrate active, meaningful learning with ongoing, reflective methods.

Portfolio assessment places a great responsibility on students for their own learning, with an emphasis on self-selection, reflection, and self-monitoring. The collaborative nature of portfolio assessment allows the teacher and learner to jointly discuss the learner's achievements and it is used to improve rather than simply monitor and report student learning – in this way reflecting real work (Koch, 1998).

The student garden portfolio

A student garden portfolio is a purposeful collection of student work that tells the story of the student's knowledge, skills and attitudes in a given area or areas in the garden based learning curriculum. This collection would include:

- student participation in selection of portfolio content
- the guidelines for selection
- the criteria for judging merit
- evidence of student self-reflection.

The characteristics of a student garden portfolio

Arter and Spandel (1998) have provided useful guidelines for understanding the characteristics of portfolios as well as designing portfolios. This information has been integrated with the literature in garden based learning to provide some suggestions for designing an authentic assessment for student learning outcomes.



Determining the purpose of the student garden portfolio

A portfolio is not merely a folder of student work. Portfolios are kept with a purpose and what goes into the portfolio depends on what the purpose of the portfolio is to be. Determining the reason for the student garden portfolio will go a long way in helping educators accumulate a rich source of relevant measures of student growth and progress.

The purpose of the student portfolio may have a lot to do with the purpose of the garden itself. Most school garden programs aim to provide a multi-disciplinary or integrated learning through the garden classroom. In this case a student garden portfolio may consist of several folders, including photographs, video documentaries, journals or written work that cut across various topics.

Student self-reflection

Much of garden based learning is experiential in nature and one of the key processes in experiential learning is the process of self-reflection. This depicts

the meta-cognitive processes that went into a certain learning activity and can be included in the portfolio. Some school garden programs encourage students to use journals for observations as well as self-reflection. Students may then later include selected parts of their self-reflective journal activity that best depicts their meta cognitive processes. Any work which can show where developmental leaps were made, or insights were gained could be included (Arter & Spandel, 1998).

Criteria for garden based learning portfolios

In a best practices scenario, school gardens would serve as rich contexts for learning, with students learning scientific, mathematical and social science concepts in a dynamic setting. In order to best reflect their development, it is necessary to plan criteria for the portfolio that gives students a chance to show their best work. Criteria give us a schema for thinking about student performance. While setting criteria the teacher or educator needs to decide what it is they value in strong performance, and this helps clarify instructional goals and expectations. By involving learners in this process, they are empowered to recognize strong performance, to identify problems in weak performance, and to use the criteria to change and improve performance (Arter & Spandel, 1998).

Guidelines for selection

Educators need to convey clear guidelines about what students should include in their portfolio. Such guidelines can represent anything from an extremely structured procedure requiring students to include an essay about the food web, to a completely unstructured procedure where students can choose whatever they want for their portfolios. Categories of entries could also be specified (i.e., everyone will choose one research report, one multimedia project, one 'best' piece, one paper with rough drafts, etc.) and students would be free to select their work for assessment within these categories.

Student involvement in selection and evaluation

Students and teachers should collaborate both on the selection of content and on evaluation. The true instructional value and power of portfolios emerges when students use criteria and self-reflection to make decisions about what they want to show about themselves and why.

Designing a student garden portfolio

Arter & Spandel (1998) have discussed various issues pertinent to portfolio design. These issues have been incorporated for the purpose of application in school garden contexts.

Who should design the student garden portfolio?

The driving force of portfolio design should come from the students and teachers themselves rather than from external authorities. This grass-roots approach provides the rich information needed for a bio-regional approach to garden based assessment. This implies tying content and criteria for learning with local socio-

cultural and physical ecology of place. However, the possible advantages of a more centralized approach to portfolio development are the greater standardization of criteria. This enables students to benefit from the consistency of target description. Teachers have a clearer picture of learning targets as well, and the district/state would have common criteria that allow aggregation of garden-based learning information over time. An ideal situation would be a balanced approach where all the active stakeholders who were involved in planning and starting the school garden program (this could include students, teachers) would be involved in the portfolio design discussion so as to:

- a) preserve the instructional power of portfolios and
- b) see how the potentially rich source of information from portfolios can be summarized at higher levels to show others what students are learning.



What is the purpose of the student garden portfolio? Who are the audiences?

According to Arter & Spandel (1998), the purpose of a portfolio affects everything else including the design of the portfolio, the content, the link to instruction, and even how students feel about creating portfolios. Purposes need to be clearly defined at the outset so that other important decisions will be appropriate.

Portfolios can be used for classroom instruction assessment and large-scale assessment as well. It may be possible to impose enough standardization to ensure the equity and comparability needed for large-scale assessment, and still give enough leeway to promote the flexibility needed in the classroom. Students could include one example of strong performance on a timed test, one example

of a practical application, one example of creative problem solving and sample project linking math to another content area – say science, in the garden context. In this example the portfolio is standardized as to the types of items to be included and the criteria for assessing them, but ‘the specific samples of performance chosen for inclusion could be as creative and different as the students themselves.’ (Arter & Spandel, 1998).

Content of portfolios

After deciding on the general subject area, the types of things that go into the portfolio need to be specified. The issues for deciding on content are the following:

- i. what degree of structure or standardization do you want to impose, in order to get good evidence for what you want to show about student achievement while still keeping in mind what impact these decisions will have on primary value of the portfolio as a student owned instructional device?
- ii. there needs to be a compromise between students, teachers and stakeholders to work together to determine what will be included and to make their decisions in light of some nonrestrictive guidelines.

For example all levels of standardization could occur in the same portfolio for various topics:

- i. required entries: for example, an attitudes survey (nutritional, environmental etc.), standardized test scores, an essay on a specific topic
- ii. student /teacher selected entries falling into general categories (e.g., showing nutritional/environmental knowledge), piece of work with drafts, one multimedia piece)
- iii. open-ended entries – students or teachers could add anything they wanted.

When will work be selected for the portfolio?

Selecting student work for a portfolio can be a systematically designed assessment task in itself. Students may be asked to select a piece of work showing growth in environmental knowledge at the end of every month, depth of observations regarding garden ecology with seasonal change or records of garden activity throughout an entire growing cycle, such as from planting to saving seed. Other types of learning, for instance which involves replacing previous work with better work, may also be incorporated in the schedule for selection. Here, students may continually review portfolio content, e.g., solving a mathematical problem in a different way, improving and correcting previous work.

Criteria for assessment

Not everything in the portfolio will be assessed the same way. Criteria for writing skills might include assessing the completeness, originality, organization and insight reflected and other criteria might be defined for different activities or topics depending on the learning goals.

Criteria for the portfolio as a whole

Assessing individual pieces within a portfolio is not the same thing as assessing the portfolio itself. Criteria for judging the portfolio itself might include such things as variety in mode or format diversity of audiences addressed, and dispositions such as perseverance, flexibility, and self-confidence. Criteria will need to be generated for the portfolio as a whole.

Criteria vs. standards

Criteria are not the same as standards. Criteria state the characteristics of performance that we value. Standards state the level of performance that we expect for various ages and grades. We usually need both to know how much a student has grown.

Aggregation

Numbers may be used to depict what students learned, or the data may be illustrated with sample student performances. In a learning community, composite portfolios may be used to determine as a group what they have learned over a period of time, with student collaboration. A garden classroom may have both individual as well as a composite portfolio for groups, or for the class as a whole.

Management of the portfolio, storage and transfer, ownership and access

Decisions should be made regarding who will be managing the portfolio, where it will be stored and in what form. Teachers mention that having a portfolio folder may not be enough. A portfolio may consist of an entire box, or a locker, where students may include videotapes, tape recorders and other materials that they wish to include for their assessment.



Student garden portfolio design worksheet

(modified version from Arter & Spandel, 1998)

1. For the student garden assessment portfolio, who will be involved in planning the design of the portfolio?
 2. Which of the following purposes are important for your assessment system?
 - to show growth or change over time
 - to show the process by which work is done, as well as the final product
 - to create collections of favorite or personally important work
 - to trace the evolution of one or more projects/products
 - to review curriculum or instruction
 - large scale assessment
 - program evaluation
 - other
 3. What are the major instructional goals for your program? How will portfolios be used for instructional purposes?
 4. How will you prompt students to help them self reflect on the work they are choosing for their portfolio?
 5. What is the general curricular focus of the portfolio system you are planning?
 - Reading
 - Math
 - Science
 - Writing
 - Social studies
 - Art
 - Interdisciplinary
 - Environmental education
 - Nutrition
 - Other (specify)
- Decide what is required to be included in the student portfolio to provide evidence of student's achievement of the goals of the program.
- i. What is required to be included in all portfolios?
 - ii. List a number of categories of things to be included in the work students select for their portfolio.
 - iii. How many samples of each of these things do the students have to select?
 - iv. How many open ended choices for the portfolio will you allow, if any?
6. For the portfolio system you are developing, choose one the types of products that students will be asked to place in their portfolio. What are your criteria for judging performance?
 7. For your portfolio system, which of the following considerations do you think are likely to be important in assessing the portfolios as a whole product?
 - amount of information included
 - quality of individual pieces
 - variety in the kind of things included
 - quality and depth of self reflection
 - growth in performance
 - apparent changes in attitude or behavior, as indicated on surveys, questionnaires etc.
 - other (specify)
 8. What criteria will you use to assess student self reflection in the portfolio?
 - thoroughness
 - accuracy
 - support of statements by pointing to specific aspects of work
 - good synthesis of ideas
 - self revelation
 - other (specify)
 9. Who will help develop, select and adapt the performance criteria?
 - students
 - teachers
 - curriculum experts
 - evaluation and assessment experts
 - other
 10. Who will select specific work samples for the portfolio?
 - students only
 - teachers only
 - student and teacher

Scoring and grading GBL work

Using rubrics for garden based assessments

A rubric is a scoring tool that lists criteria for a piece of work, or “ what counts” (for example, purpose, organization, details, voice, and mechanics are often what count in a piece of writing). It also articulates gradations of quality for each criterion, from excellent to poor (Goodrich, 1998).

Why use rubrics for garden based assessments? (from Goodrich, 1998)

- i. Rubrics are powerful tools, not only for assessment but for teaching as well. Rubrics can improve student performance, as well as monitor it, by making teachers’ expectations clear and by showing students how to meet these expectations. The result is often marked improvements in the quality of student work and in learning. Rubrics help define ‘quality’.
- ii. A second reason rubrics are useful is that they help students become more thoughtful judges of the quality of their own and other’s work. When rubrics are used to guide self- and peer assessment students become increasingly able to spot and solve problems in their own and one another’s work. Repeated practice with peer assessment, and especially self-assessments increases students’ sense of responsibility for their own work and cuts down on the number of “Am I done yet?” questions.
- iii. Rubrics reduce the amount of time teachers spend evaluating student work, Teachers tend to find that by the time a piece has been self-and peer-assessed according to a rubric, they have little left to say about it. When they do have something to say, they can often circle an item in the rubric, rather than struggling to explain the flaw or strength they have noticed and figuring out what to suggest in terms of improvements. Rubrics provide students with more informative feedback about their strengths and areas in need of improvement.
- iv. The “accordion” nature of rubrics allows teachers to accommodate heterogenous classess. For instance, defining levels of different expectations lets students at different periods in their development understand where they are in terms of academic expectations, and what they need to focus on to improve.

How to design rubrics for garden curriculums

Rubrics need to be developed according to the teachers curriculum and teaching style. However these are some of the basic elements that rubrics should incorporate (from Goodrich, 1998).

- Using models – show students examples of good and not so good work.
- List criteria – use the discussion of models to begin a list of what counts in quality work.
- Articulate gradations of quality – Describe the best and worst levels of quality; then fill in the middle levels based on your knowledge of common problems and the discussion of not-so-good work.
- Practise on models – Have students use the rubrics to evaluate the models you gave them in Step 1.
- Use self and peer assessment – Give students their task. As they work, stop them occasionally for self and peer assessment.
- Revise – Always give students time to revise their work based on the feedback they get.
- Use teacher assessment – Use the same rubric students used to assess their work yourself.

Once you've created a rubric, give copies to students and ask them to assess their own progress on a task or project. Their assessment should not count toward a grade. The point is for the rubric to help students learn more and produce better final products, so including self-assignments in grades is unnecessary and can compromise student honesty. Parents can use rubrics to help their children with their homework as well.

Assessment and grading of GBL schoolwork

Teachers receive many mixed messages about assessment (Seeley, 1998). Teachers are encouraged to use a number of types of alternative assessments to guide instruction and monitor student thinking.

Classrooms should be moving from a testing culture to an 'assessment culture' – where teachers and learners collaborate in learning. Assessment takes many forms for multiple audiences and distinctions between learning and assessment are blurred. The challenge remains for teachers, with the support of their districts, their professional organizations and the educational measurement community – to devise grading systems that adequately reflect this shift (Goodrich, 1998).

An example of a student garden portfolio coversheet has been provided by Kiefer & Kemple (1998) in *Digging Deeper*. This sheet serves as an example of how a portfolio may be organized, but may be modified according to the purpose and components of the particular garden based learning program.



Student Portfolio Cover Sheet

The Student Portfolio contains all the assessments that the student creates or is given throughout the program. An Exemplar Student Portfolio may be created using the best pieces from each assessment category. These Exemplar portfolios are particularly valuable in evaluating student progress in learning and the effectiveness of the school garden program.

1. **Student assessments/ evaluations**– This category includes student assessment activities, tasks and tools and evaluations. This may include peer and self evaluations as well.
2. **Student products and performances** – student work that traces the development of knowledge, skills, and attitudes, and documents the attainment of program goals.
3. **Student affective surveys and self reflection** – surveys that student periodically fills out expressing his or her opinions, feelings, and attitudes about the assessment activities as well as evidence of their self-reflection.
4. **Teacher observations and reflections** – a diary chronicling the student’s progress through periodic reflections from the teacher.

(1) Student assessments/ evaluations	(2) Student products/ performances	(3) Student affective surveys/ self-reflection	(4) Teacher observation and reflections

Assessing the school garden

For an effective garden program, school gardens need to be sustainable contexts as well as provide rich material as a learning source. The more ecologically complex a school garden is, the more youth may get out of it. For instance a garden that attracts a wide variety of animal life would be a more stimulating living laboratory than a sparsely populated garden. A garden that incorporates ecological principles, and makes use of composting systems, etc. similarly, would have more to give in terms of an environmental ethic and education than one that mainly uses inorganic fertilizers.

Assessment of the school garden can provide vital information about curriculum material, and information for curriculum changes as the garden changes and grows. At some point, your school garden may spread, to include more community members and may develop into a school and community garden providing service-learning opportunities for high school youth. With a sustainable garden system and constant observation, the possibilities are endless and exciting.

The purposes for assessing the school garden are summarized here as follows:

- i. To provide a record of garden growth for future gardeners.
- ii. To provide rich learning activities for students – testing soil, measuring plant growth under different seasons, etc.
- iii. To constantly revise garden activities with the updated knowledge of the garden ecosystem.
- iv. To check maintenance and ensure sustainability.
- v. To provide the opportunity for students to get acquainted and interested in the functioning of the garden as well as invested in its upkeep.

Garden assessment as a learning activity

The best way to get students to intimately know their garden is for them to be involved in its assessment. Students may work in groups to gather data on different factors that are involved in garden sustainability – soil fertility, watering etc. Students may have individual projects where they can experiment with their data as well. Periodically (monthly, seasonally) the community of gardeners may come together and report on the various assessments and as a group, including any community gardeners or gardening staff, they may evaluate the garden. Another way of doing this is to allot sections of the garden to each group and then they would conduct a series of tests, experiments and observations about garden sustainability to get a holistic picture of the garden ecosystem.

The learning community could get together to discuss potential problems and their solutions. The final reports may all go into a Garden Development Portfolio which would be composite portfolio for the whole class. This activity may be coordinated across ages, with different grades focusing on different aspects of

the garden, with increasing complexity. Or it may be a part of the standard garden curriculum for the higher grades and could involve a cross-age activity, with older students planning and leading their garden assessment team.

Creating a garden observation log

A garden log consists of observations by all the students as well as teachers and garden staff (if any) on various components of the garden. For instance, a group of students could work on counting the various kinds of insects in the garden and naming them. A general class garden log may be made easily accessible so any new sightings may be recorded spontaneously by students. A log may even be placed in the garden (perhaps in a sheltered case for protection). The garden log may then be used to write a report at the end of every season, for garden sustainability as well as for any creative ideas for learning, to find their way into the garden curriculum.

The Garden development portfolio

The garden development portfolio would consist of the reports on garden sustainability (Refer to Garden Site Improvement sheet and Seed-to-Harvest Data Sheet). If the garden were divided into sections for each group of students to study, their report could be an in-depth study of the eco-system as well as garden design, coming up with any problems, or possible improvements to the particular section studied. For example, a team may discover the benefits of companion plants to facilitate growth and keep away certain pests. The assessment teams, together with staff members and teachers would then make presentations of their reports and together they could come up with a plan of action for site improvement, by understanding the complex web of issues that play a role in garden sustainability.

The Garden Site Improvement Sheet and Seed to Harvest Data Sheet (in the following pages) have been incorporated here from *Digging Deeper*, as tools to guide garden assessment.



Garden Site Improvement Plan

Based on your experience of running a school gardening program, what changes and modifications would you make to improve your garden site? Use these guidelines to come up with a site improvement plan.

Access: Is your garden fully accessible to all those who wanted to use it?

Circulation/walkways: Does your walkways allow students to move easily from one garden area to another? Are they wide enough? Are they built to last permanently with landscape fabric, bark mulch etc.?

Seating: Is there adequate and inviting multi – use, intergenerational seating?

Growing areas and the growing curriculum: What is your crop success rate? What grew well? What didn't? What would you do differently next year? Was the garden designed to produce a plentiful an continuous harvest? Is there enough diversity of garden themes and crops to provide interesting opportunities for creating learning activities throughout the growing season?

Soil care: What changes took place in your soil over the growing season? Did it dry out? Harden up? Become heavy? Moldy? Did you cover crop? Did you soil test? Do you need to use additional compost next year?

Birds, bees and butterflies: What kinds of birdbaths, birdhouses, or plantings did you install to attract and maintain a permanent home for insect – eating birds? Do you have flowering gardens for bees and butterflies? What improvements might be in order for the next season?

Pests: How did you respond to pest problems and diseases in the garden? Were any perennial beneficial habitat areas specifically designed and cultivated?

Sunlight: Did the garden site receive enough sun to grow a diversity of crops successfully? Were there enough shade devices and strategies (multi – story planting) to prevent early bolting and wilting?

Water: Was the amount of rainfall your garden site received over the season adequate? Was your watering/irrigation system effective for deep watering of the crops? How would you correct the watering problems you experienced at your site?

Compost: Do you have a well-designed, well-maintained, and effective, compost system (For instance, triple bin compost or vermicomposting system)

Weeding/mulching: Was the garden weeded regularly? What kinds of mulches, if any, did you use (grass clippings, etc., or a living mulch such as Dutch White Clover)?

Safety: What changes could be made in the garden to minimize the chance of personal injury?

Security: Were there any problems with vandalism in the garden? Did the garden have any fences, gates, locks? Was there regular adult supervision of the garden?

Bulletin board: Did you have a garden bulletin board and communication exchange area?

Central meeting area: Was there a central meeting space in the garden for classes, workshops, creative arts, and food and nutrition activities.

Tool care and storage: Did you have regular access to garden tools, watering cans, wheelbarrows etc.?

Improvements: What are the estimated costs of proposed improvements? Develop a multi-year timeline for implementation



Garden Seed-to-Harvest Data Sheet

This form is for summarizing the growth and development of the garden. The information recorded here is particularly useful for making planning improvements in garden productivity for succeeding years.

1. Seed information
 - Seed varieties
 - Date seeded or transplanted
 - Germination rate
 - Harvest date
 - Harvest amount)
 2. Location (watershed)
 3. Description (raised bed theme gardens, flat with straight rows etc.)
 4. Describe soil type: sandy, clay, silt loam or combination.
 5. Planting strategies: monoculture, polyculture, interplanting.
 6. Garden characteristics. Describe the following:
 - Compost system
 - Ecological remedies, pest control methods
 - Mulching (grass clippings, leaves, living mulch)
 - Beneficial habitats: birdhouses/feeders. List plants that attract beneficial birds and insects.
 7. Cover crops used.
 8. Unique problems: vandalism, lack of rainfall, excess weed growth, ineffective participation.
 9. Unique successes: eg., bumper bean crop, volunteer crops, food donations.
-

Assessing community impact and participation

The best way to know whether the school garden has been successful in establishing itself as a center for both the school and the community is to start keeping records of community impact. You could create a community impact scrapbook or portfolio with the students, that documents the program's impact on the community through fliers, newspaper articles, photographs or videos. Community impact may be gauged through surveys, or through participation or attendance sheets that are collected over time to check the trend of participation.

Writing about your garden program

Writing a report about the effectiveness of the garden program would be a summary of all components of the program namely, learning and other outcomes, garden sustainability and management and garden impact on community. A modified version of the Garden Program effectiveness sheet from *Digging Deeper* has been provided below for a suggested outline of the report.



Garden Program Effectiveness Sheet

The following questions help educators create a narrative summary of the assessment information collected through the course of the school year. The Program Portfolio will provide the strong evidence documenting the conclusions reached below.

Focus question: Utilizing all of the assessment and evaluation data, how well did you meet the goals and objectives of the program? You may respond in the following key areas.

Student outcomes

a) Describe how the school garden integrates different academic areas such as socio-cultural, nutritional, mathematical, scientific, horticultural and ecological education within the context of the outdoors. Describe progress in student learning outcomes in each of these areas with reference to the assessment activities, tasks and tools used.

b) What were the psychological impacts of the garden program on the students? How did the school garden influence student's attitudes and behavior?

Garden site

c) Describe the benefits and disadvantages of the garden site. For example, were theme gardens effective in maintaining the interest of the students? How has garden site assessment been incorporated into the curriculum? How is the garden being managed? How has the garden and the curriculum grown? What are some of the future plans for the garden?

Community impact

d) How effective was the program in involving community: including parents, elders, media for storytelling, meals and celebrations, food donations etc.? Were there ongoing communications, through bulletin boards, newsletter etc. with the community?

Conclusion

Once we have assumed a pedagogy that cares about its learners, and provided a context for assessment that includes learning opportunities, we may safely say we have planted the seeds for meaningful education. The garden is a space for youth to discover their physical and social environment. It can represent a small world, outside the classroom, that enables youth to learn valuable lessons to take with them for the rest of their lives. Assessment that is in line with the natural processes of development both for youth as well as their garden, will harvest the fruits of our educational endeavors.

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