

What are the Impacts of School Gardens on Academic Success?

1. **The Child in the Garden: An Evaluative Review of the Benefits of School Gardening**

by Dorothy Blair (2010)

<http://ezproxy.library.nyu.edu:2452/doi/pdf/10.3200/JOEE.40.2.15-38>

Article Details

- Gardens are becoming more common across warmer and cooler states' schools curriculum and settings, whose purposes are particularly aimed at "academic, behavioral, recreational, social, political, and environmental remediation" (16).
- The author refers to other studies that demonstrated the positive impact gardens have on academic achievement:
 - They reference one study in which there was a reduction in poor standardized test scores across various subjects (e.g. math, science, etc.) among fourth graders in Louisiana.
 - They reference another study in which a comparison of schools with garden settings versus schools without them showed that the former experienced better attitudes toward learning and even higher GPAs in a majority of subject comparisons (e.g. in math, science, social studies).
- The author discusses the importance of gardening on developing children's understanding of food systems (how food is made, where it comes from), ecological systems (the entire process surrounding gardening and food, practices like compost and sustainability), environmental attitudes and understanding ("[putting] science into context", socialization with adults, environmental values), and experiential learning (learning through concrete, hands-on experiences, developing cognitively and strengthening empirical observation) (pgs. 18-19).
- Author argues that "an overemphasis on factual knowledge" in math and science studies "has led to weakness in processing skills and critical thinking"; hands-on learning via gardens integrates science, math, and other subjects into the gardening experience (pg. 19).

Study Outcomes

- One important outcome was measured, suggesting the positive relationship between gardening and academic success outcomes: "9 of the 12 studies revealed a positive difference in test measures between gardening students and non-gardening students. School gardening increased the science scores in all reported studies" (pg. 20).
- Out of the studies the author reviewed, she identified a few common themes relevant to analyzing the impact of school gardens on academic progression: "All seven studies found that school gardens provided a diversity of environmental stewardship, math, and science-education opportunities: measuring space, observing and experimenting with natural and plant processes..." (pg. 31).

Main Findings

- Of the studies that analyzed teachers' perceptions on utilizing school gardens for academic instructions, one indicated that teachers in one study found gardens to be "moderately to very effective" at enhancing certain subjects – 53% for science, in particular (pg. 33).

- Finally, the author concluded that “Gardens can improve the ecological complexity of the schoolyard in ways that promote effective experiential learning in many subject areas, particularly the areas of science, EE, and food education” (pg. 35).

2. Designing Nature for Learning: School Gardens for Youth and Child Education

by Sarah A. Moore, Morgan Apicella, Sallie A. Marston, Moses Thompson (2012)

<http://ezproxy.library.nyu.edu:2116/stable/pdf/10.7721/chilyoutenvi.22.1.0250.pdf?acceptTC=true&jpdConfirm=true>

Program Details

- A school garden program was developed in an elementary school in Arizona aimed at academic growth, but also community involvement and access to healthy food through the help of university interns (pg. 254).
- The program was focused in particular on science development with science communities and organizations since the school’s students are “underrepresented in the sciences.”

Program Outcomes

- Barriers encountered included (pg. 256):
 - Lack of numbers, in that having only one teacher or leader is difficult, which can be addressed through creating garden committees.
 - Funding, since grants are time-consuming.
 - Incorporating gardens into the school curriculum, which can be overcome through teachers’ and administrators acceptance of the garden as providing foundation for learning various topics.

Main Findings

- However, since research suggests that gardening has positive impacts for cognitive and social development and academic enhancement, it is necessary to determine which schools can utilize and maintain such programs and try to implement them despite the aforementioned barriers.
- The authors maintain that “school gardens are a valuable tool for experiential learning for school children in both the sciences and social sciences” (pg. 250).

3. Impact of Hands-on Science Through School Gardening in Louisiana Public Elementary Schools

By Leanne L. Smith, Carl E. Motsenbocker (2005)

<http://horttech.ashspublications.org/content/15/3/439.full.pdf>

Program Details

- A hands-on garden-based curriculum program led by volunteers was introduced to three elementary schools in Louisiana by university students and Master Gardener volunteers.
- The authors identified the purpose of a school garden as providing real-life “science” experiences to understand and match what is learned in traditional curricula and to demonstrate to students that what they learn in class can be applicable to real world situations, as they can experience through the garden program (pg. 439).
- The program consisted of 2-hour weekly lessons for 5th graders, with science achievement tests specifically designed for the program taken before and after the lessons to see whether the garden impacted science scores.
- The pre- and post-intervention tests consisted of 40 questions that the students had to complete and were compared with those of the control group students to determine whether the garden had any influence on their science scores (pg. 440).

Program Outcomes

- Students who participated in the program saw higher science scores on the post-tests when compared with the pre-tests.
- The experimental group saw an average increase in their science test scores.
- The control group did not see any significant differences between their pre- and post-test scores.
- Two of the elementary schools’ participants saw significant positive differences from their pre- and post-test scores; one school saw a negative outcome on one of the four chapters included in the garden curriculum, although the authors suggest that this might be explained by the fact that less time was spent on this chapter in this school due to class scheduling conflicts (pgs. 440-441).

Main Findings

- Some barriers that may have impacted the extent to which differences were seen between the pre- and post-garden test scores include:
 - Low sample size
 - Lack of volunteers’ experience in teaching students
 - Lack of continuity from traditional to garden curriculum (e.g. using concepts from the former in the latter)
- Regardless, the authors conclude that despite the few barriers encountered throughout the program and more research needing to be conducted in this field, “some improvement in science achievement test scores can be attained” as seen with this study and with others demonstrating positive outcomes of garden programs (pg. 442).

4. Growing Minds: The Effect of a School Gardening Program on the Science Achievement of Elementary Students

By C.D. Klemmer, T.M. Waliczek, J.M. Zajicek (2005)

<http://horttech.ashspublications.org/content/15/3/448.full.pdf>

Program Details

- The authors explain that learning science skills is necessary for children in order for them to grow into “science-literate” adults (“the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity”) (pg. 448).
- Furthermore, this “science-literacy” can be enhanced, as suggested by some studies and anecdotal evidence, through including a school garden or garden curriculum in elementary schools to help connect children to science better than with only teaching them standard, traditional science curricula.
- Thus, this study examined how school gardening activities were combined with the science curriculum in seven elementary schools in Texas in order to assess the impact on science achievement among 3rd, 4th, and 5th graders.
- The science achievement testing was created by curriculum specialists at a university specific to each grade level, based on the Texas science curriculum standards, and with the students’ reading and cognitive abilities in mind (pg. 449).
- The schools received gardening curriculum handbooks for both teachers and students and was divided according to age group; the students in this study received Level I curriculum targeted at 3rd to 5th graders.
- Students received a full-day school garden training program (focusing on orientation, curriculum, and gardening activities).

Program Outcomes

- The main difference between the experimental and control group was that the former utilized hands-on gardening activities in their scientific learning, although both received similar content material through the traditional curriculum.
- Following the program, both experimental and control groups received the grade-specific science achievement test.
 - Experimental group students scored 5.6 points higher than those in the control group, which was identified as statistically significant.
 - 5th grade experimental group students scored 14.9 points higher than those in the control group.
 - There was no significant difference in scores between males and females, indicating program benefits regardless of gender.
 - Demonstrated a positive impact of school garden program (i.e. hands-on gardening activities) on science achievement scores (pg. 450).

Main Findings

- The authors conclude that “School gardens offer one area of agriscience through which schools can provide opportunities for student-centered, experiential learning” and that

“The results of this study showed that the science achievement of students who participated in a hands-on school garden program was higher than that of students who did not participate...” (pg. 452).

5. Effects of a Gardening Program on the Academic Progress of Third, Fourth, and Fifth Grade Math and Science Students

By A.E. Pigg, T.M. Waliczek, J.M. Zajicek (2006)

<http://horttech.ashspublications.org/content/16/2/262.full.pdf>

Program Details

- This study focused on the science and math achievement scores of 3rd, 4th, and 5th graders in a Texas elementary school who participated in a school garden program in addition to their standard math and science curricula.
- Teachers in this school had already been trained in gardening curriculum by the local extension service, so experimental and control groups were determined by the teachers' experience.
- The Texas Assessment of Knowledge and Skills was used to assess students' math achievement while science achievement was measured with a previously developed test instrument, both of which were tested at the end of the program (pg. 262).
- The youth gardening program was aimed at teaching youth about horticulture, nutrition, environmental science, etc. and its curriculum was specifically targeted at teaching students in grades 3 through 5 in conjunction with the traditional curriculum teachers taught.

Program Outcomes

- The study indicated that there was no significant difference in experimental and control groups' science achievements, suggesting additional gardening curriculum did not enhance what was learned in traditional curriculum.
- Math achievement scores indicated that the control group actually scored 4.13 points higher than the experimental group, which is a different outcome from those in the previous studies.
 - The authors suggest that this outcome exists because “the subject of math was not included within the particular curriculum for Level 1 [3rd-5th graders] used for this study” and that an emphasis on math curriculum within the gardening program might be necessary to see an improvement in math achievement scores.
- Both genders seemed to benefit equally as no statistically significant outcome was observed when analyzing outcomes by gender.
- Among third graders, no significant differences were observed between the control and experimental group, although fourth graders in the experimental group performed better in their science assessments by 4.94 points than those without the garden program (pg. 263).
- Among fifth graders, those in the control group experienced better science and math achievement scores than those in the experimental group which is different from those outcomes indicated in study #4 (*Growing Minds: The Effect of a School Gardening Program on the Science Achievement of Elementary Students*).
 - The authors suggest that the differences in these studies' findings indicate that (pg. 264):

- Further research needs to be done on the relationship between garden programs/curriculum and academic achievement (particularly for math and science).
- Garden programs can be effective in enhancing *some* students' achievement and learning process, as well as in enhancing traditional curricula.
- However, garden curricula should focus more on specific subject areas (e.g. math) if they want to improve achievement scores on these particular subjects.