

# Survey on the Needs of Elementary Education Teachers to Enhance the Use of Horticulture or Gardening in the Classroom

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**ADDITIONAL INDEX WORDS.** curriculum, education, gardening, learning center, school, teacher

**SUMMARY.** To determine if and how plant materials were used in Virginia elementary school curricula, a survey was conducted on horticulture or gardening in elementary [Kindergarten–sixth grade (K–6)] education. To do this, 10 questionnaires and cover letters were sent to each of 100 randomly chosen elementary schools throughout Virginia. Based on a 34% response rate from a self-selected group of K–6 teachers, there was a relatively high level of interest (88%) regarding using horticulture or gardening in the classroom. A major goal of this survey was to determine what would encourage or facilitate incorporating horticulture or gardening into the curriculum.

Research is increasing to document the benefits of horticulture or gardening to human-life quality, such as enjoying the aesthetics of a beautiful garden and actual physiological changes when one is near plants (Kaplan, 1990; Lewis,

1990; Relf, 1992; Ulrich and Parsons, 1990). One such area is the use of horticulture in relation to children, including school curricula (Braun et al., 1989; Eberbach, 1990). Educators and researchers are finding horticulture a useful tool not only in science, but also other curriculum areas (Monk, 1995; Pivnick, 1994; Pranis and Cohen, 1990; Stetson, 1991.) Another benefit of using horticulture or gardening in a school setting is that it gives students a break from their normal routines; however, many teachers will not take their students out of a classroom setting because they feel they do not know how to use the outdoors effectively (Simmons, 1993). Researchers are beginning to survey educators to determine what would help them integrate horticulture or gardening into their curriculum (DeMarco, 1997; DeMarco et al., 1997; Kahtz, 1997; Skelly and Zajicek, 1997; Waliczek and Zajicek, 1997), but none to date have looked exclusively at elementary education in Virginia.

## The study

In Spring 1995, a survey was conducted on the use of horticulture or gardening in K–6 classrooms throughout Virginia. Ten questionnaires and cover letters with self-addressed, stamped envelopes were sent to the principals of 100 randomly chosen elementary schools representing 1143 Virginia elementary schools and ≈45,000 teachers. Principals were asked to distribute the questionnaires randomly to teachers without concern for prior expressed interest in gardening. The surveys consisted of eight questions with yes or no responses, one ranking question, and three open-ended questions. An opportunity to

request more information and give comments or suggestions was provided. In the cover letter, only teachers expressing an interest in using horticulture in the classroom were asked to complete and return the questionnaire; those not interested in using horticulture in the classroom were simply to indicate and return the questionnaire.

Of the 1000 questionnaires sent out, 337 (34% response rate) usable responses from 48 of the 107 (45%) cities or counties were received. Of those, 42 (13%) were not interested in using horticulture in the classroom and 295 (88%) were interested. The high positive response rate with the relatively minor negative response seemed to indicate that only those teachers with a preexisting interest in using horticulture in the classroom responded to the survey, amounting to a self-selected response group of interested teachers (30% of the 1000 surveys sent out).

## Results and discussion

The idea that among respondents there was a preexisting high level of interest in using horticulture in the classroom appeared to be supported by the 87% who indicated that they gardened at home or at school and the 85% who currently used plants or seed in their classrooms (Table 1), especially when compared to the 75% of American households participating in some gardening activity as determined by the National Gardening Association in 1989 (Butterfield and Relf, 1990).

Availability of resources was limited even among teachers who used plants in the classroom. Among teachers using plants or seed in class, 64% had access to plant materials (Table 2). Most of the 42 comments received

**Table 1. Responses to various questions on gardening, plant and seed use in classroom, use of horticulture-based curriculum, teaching style, access to garden space, and additional training.**

Subject	Total responses (no.)	Positive responses	
		(no.)	(%)
Gardened at home or school	292	255	87.3
Used plants/seed in class	292	247	84.6
Used prepared horticulture-based curriculum	293	7	2.4
Used thematic approach to teach	286	259	90.6
Had access to garden space	282	155	54.9
Would take additional training	275	238	86.5

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were not related to resources; but, based on the six that were (data not presented), it could be inferred that teachers used their own funds or sought outside resources to provide plants or seed, rather than having these items provided as part of the school budget. A low level of funding for this area was also indicated by the fact that  $\leq 10\%$  of respondents using seed or plants in class had access to a greenhouse, plant grow lights, or a horticulture or gardening-based learning center and that few respondents (2%) used a prepared horticulture-based curriculum, such as GrowLab or LifeLab (Table 1). A relationship between lack of access to plant materials and nonuse of plants or seed in the classroom could be seen. Of the 43 respondents reporting no use of plants or seed in class, 30% reported access to such materials, a group size that was less than half of the 64% of teachers who used plants or seed in class and had access to plants (Table 2).

While 55% of all respondents (Table 1) had access to outdoor garden space, this did not significantly relate to the use of plants or seed in classroom education. Of the 155 reporting access, 82% (126) used plants or seed in the class. However, of the 127 who reported no access to garden space, 87% (109) also used plants or seed in their classes.

Also explored was the impact of the thematic approach to teaching on the positive use of plants and seed in classrooms. Thematic teaching is applying a main theme, such as flowers, to all the curriculum areas. For example, science would deal with a flower's life cycle, while art would deal with painting a favorite flower. Plant material use was independent of the use of the thematic approach. There was equivalent use of plants or seed in class, with 86% (219 of 259, Table 1) of those using the thematic approach and 81% (22 of 27) not using the thematic approach.

From the list supplied on the survey, what respondents considered most important (>95% positive response) to encourage or facilitate incorporating horticulture or gardening into the curriculum were materials directed to the teachers, such as horticulture-based lesson plans, activities, and posters, and a monthly newsletter for teachers to provide children's gardening activity ideas (Table 3). Next in importance

to respondents (90% to 95% positive responses) were materials to use to implement lesson plans, such as gardening videotapes and a monthly newsletter on gardening for students to use. These strong positive responses indicated that efforts to encourage horticulture curriculum in the K-6 classroom should focus on providing teachers with prepared horticulture-based materials and continuous updates, such as a newsletter. Volunteer support, such as Master Gardeners, was indicated as important by 86% of respondents, and 78% of the teachers would like additional training. Computers were used in many classrooms, as indicated by a 77% positive response for a gardening-related computer program.

The next major inquiry was to identify the type of educational program in which teachers would participate since this linked directly into the role of this horticulture department and Virginia Cooperative Extension in encouraging the use of horticulture in K-6 education. Desire for and willingness to participate in additional training were significantly related. While 78% of the respondents said additional training would encourage the use of plants or seed in classroom education (Table 3), 87% (238 of 275 total respondents) said they would take part in additional training in horticulture or gardening (Table 1). Among respondents who indicated that additional training would help them incor-

**Table 2. Responses by elementary school teachers who used plants or seed in the classroom regarding having accessibility to specific resources.**

Subject combination	Total responses <sup>a</sup>	Positive responses	
	(no.)	(no.)	(%)
Plant materials	237	152	64.1
Garden space	235	126	53.6
Plant grow lights	237	28	10.0
Greenhouse	242	20	8.3
Horticulture-based learning center	241	21	7.4

<sup>a</sup>Totals vary because blank responses were not used in the analysis.

**Table 3. Percentage of positive responses to factors that would encourage incorporating horticulture or gardening into the curriculum.**

Item	Response (%)
Horticulture-based lesson plans, activities, and posters	97.3
Monthly newsletter with children's gardening activity ideas	95.4
Audiovisual materials, such as gardening videotape	92.5
Monthly newsletter on gardening for students to use	89.9
Volunteer support, such as Master Gardeners	86.2
Additional training for teachers	78.3
Gardening adapted computer program	77.1

**Table 4. Percentage of teachers at each grade level who responded yes to whether they felt additional training would encourage or facilitate incorporating horticulture or gardening into curriculum (n = 254).**

Grade taught	Positive responses (no.)	Total teachers in each grade	Percent
K	34	46	73.9
1	46	58	79.3
2	29	39	74.4
3	31	42	73.8
4	26	30	86.7
5	25	30	83.3
6	7	9	77.8
Cumulative	198	254	77.9

**Table 5. Total hours of training acceptable to respondents.**

Percent	Hours (comparable training)
39.6	≤8 (i.e., a 1-d in-service session)
30.2	8 to 20 (i.e., continuing education credit)
19.8	≥45 (i.e., a Virginia Tech class or Master Gardener course)
11.3	20 to 40 (i.e., a community college course)

porate horticulture or gardening into the curriculum, 98% (200 of 205) said they would participate in additional training.

The high positive response toward additional training was fairly uniform across all grade levels taught (Table 4), indicating that teachers of any grade within K–6 could be an equally important target area for horticulture-based training.

The amount of time responding teachers would be willing to spend in additional training (Table 5) corresponded closely with the rank ordering of preferred educational opportunities (Table 6). The highest proportion (40% of respondents) stated ≤8 h (i.e., a 1-d in-service session), 30% stated 8 to 20 h (i.e., continuing education credit), 20% stated ≥45 h (i.e., a Virginia Tech class or Master Gardener course), and 11% stated 20 to 40 h (i.e., a community college course). Teachers' concerns about time were also seen in their written comments and could account for their interest in prepared horticulture-based materials (Table 3). The ranking of local or area in-service training as the most-preferred educational opportunity (Table 6) also seemed to reflect the amount of

time teachers were willing to spend in training.

Based on the percentage of positive responses (Table 7), the mode of additional training most acceptable to respondents would be a class offered locally. However, there was a sufficiently large audience responding positively to all options to explore offering any of them as a method for horticulture or gardening training. As a hypothetical example, given the pool of ≈45,000 K–6 teachers in Virginia and applying the percentage based on survey responses of those who were interested in using horticulture in the classroom (30%) and who would take additional training at Virginia Tech (28%), there could be potentially 3,664 students for horticulture or gardening training during a two to three week summer session—a sufficient number to attract ±30 teachers a summer for several years. This is definitely an option to be explored further.

### Conclusion

Based on responses from a self-selected group of K–6 teachers in Virginia, there was a relatively high level of interest regarding using horticulture or gardening in the classroom. To

facilitate incorporating horticulture into the curriculum for the greatest number of teachers, teaching packets containing horticulture-based lesson plans, activity ideas, posters, and audiovisual materials should be prepared. These could be presented to interested teachers at a local class or in-service where they could be reviewed and the teachers could address any concerns or needs they might have. A follow-up outreach could be done in the form of monthly newsletters: one for teachers containing new ideas on using horticulture in the classroom, and one for students with horticulture-based activities and information.

It is possible that the existing cooperative extension Master Gardeners could assist with the training at the local level as well as volunteer in the classroom, using materials prepared by Virginia Tech and the Virginia Cooperative Extension Service. Materials could be compiled from existing resources, such as the Master Gardener Handbook and 4-H publications, as well as resources currently under development, such as the *Master Gardener School Gardening Guide*. However, it is likely that using these resources alone will result in a limited amount of integration of horticulture or gardening in the classroom. More in-depth training should be provided on using horticulture-based materials and the need explored for preservice undergraduate and postservice graduate level horticulture courses for teachers offered by Virginia Tech and other universities.

**Table 6. Rank from 1st (most preferred) to 5th (least preferred) of respondent's preferred educational opportunities.**

Rank	Mean	Educational opportunity
1	1.7	Local or area teacher in-service training offered by cooperative extension.
2	2.8	Continuing education credit from Virginia Tech.
3	3.1	Class for graduate credit from Virginia Tech.
4	3.3	Community college class.
5	3.7	Cooperative extension training, such as the 100-h Master Gardener program.

**Table 7. Mode of training acceptable to respondents, based on percent of positive responses.**

Mode of training	Total responses	Positive responses	
	(no.)	(no.)	(%)
Local classes at community college, botanic garden, or extension office	246	220	89.4
Correspondence course	240	178	74.2
Satellite teleconference	226	155	68.5
Virginia Tech campus during summer (2 to 3 weeks)	228	63	27.6

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## Evaluation of Zeolite-based Soilless Root Media for Potted Chrysanthemum Production

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**ADDITIONAL INDEX WORDS.** *Dendranthema × grandiflorum*, soilless substrate, clinoptilolite, slow-release fertilizer

**SUMMARY.** Chrysanthemum [*Dendranthema × grandiflorum* (Ramat.) Kitamura] growth and nutrient leaching of three clinoptilolite-based root media—NZ, EZ1, and EZ2—were compared to the performance of control plants grown in Sunshine Mix #2 [3 peat : 1 perlite (v/v)]. The control received 210 mg·L<sup>-1</sup> N from an 18N-4P-15K soluble fertilizer at each irrigation. NZ contained untreated zeolite and received the same soluble fertilizer as the control but leached lower concentrations of NH<sub>4</sub>-N, K, and PO<sub>4</sub>-P during most of the production cycle compared to the control. EZ1 was formulated to provide N, P, and K as fertilizer nutrients and produced plants similar to the control based on ratings, height, width, and dry mass, but not fresh mass, at harvest

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