Dynamic Volunteer Engagement and Impactful Educational Outreach Taking Us into the Next 50 Years of the Extension Master Gardener Program

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Abstract. **According to the 2021 Extension Master Gardener (EMG) National Summary, the EMG Volunteer Program had an estimated 84,700 volunteers throughout the United States. These volunteers helped communities garden and grow food, provided opportunities to engage in activities that improved physical and mental health, and worked on projects that addressed environmental issues. In total, these programs contributed 3.1 million hours of education to local communities and $88 million dollars in value to the public. However, the COVID-19 pandemic presented challenges for the program, with many states implementing reduced requirements and increased flexibility for volunteers. The workshop "Dynamic Volunteer Engagement and Impactful Educational Outreach Taking Us Into the Next 50 Years of the EMG Program" at the 2022 ASHS conference discussed how to engage EMG volunteers despite the limitations of limited in-person contact. The workshop featured three Extension educators and EMG coordinators who shared their experiences and strategies for engaging volunteers during the pandemic. Topics discussed included engaging volunteers in local food systems and community gardens, engaging students in horticulture at an earlier age, and digital volunteer opportunities. Overall, the workshop provided valuable insights and facilitated discussions on how to adapt and continue the EMG program during challenging times.**

It is evident that the EMG program, with its rich history spanning 5 decades, has been a valuable resource in the field of horticulture, thanks to the dedicated volunteers it has trained (Meyer 2007). These volunteers have played a pivotal role in sharing their horticultural knowledge with others, benefiting Extension associates, the volunteers themselves, and the communities they serve (Davenport-Hagen et al. 2018). However, the onset of the pandemic presented a set of unprecedented challenges, particularly concerning social distancing measures.

The pandemic forced Extension personnel and volunteers to rethink their traditional methods of engagement. Meetings, which were typically conducted in close-knit, confined spaces, had to be canceled or significantly restricted. In response to these constraints, Extension professionals and volunteers had to swiftly adapt, seeking innovative ways to continue their projects and programming effectively while maintaining social distance.

But the changes that emerged during this time were not merely short-term adjustments to crisis conditions. They represented a fundamental shift in the EMG program's focus and approach. Rather than viewing this period as a temporary setback, it became an opportunity to reevaluate priorities and embrace new directions that would better serve the needs of stakeholders.

The EMG program's response to the pandemic extended beyond merely surviving the crisis. It encompassed a reimagining of outreach strategies to connect with the underlying needs of diverse communities and the broader vision of the EMG program's future. In this workshop we highlighted emphasizing the impact of plant interaction on health, the role of plant sciences in youth education, and the integration of digital tools into Extension work. These shifts in focus were not isolated reactions; they were conscious decisions to make the programs more relevant, adaptable, and resilient in the face of future challenges.

Workshop overview

The interactive workshop held in 2022 aimed to foster collaboration among consumer horticulturists, EMGs, and coordinators, focusing on their successful programs during the COVID-19 pandemic. During this workshop, three EMG coordinators showcased their use of virtual platforms and technology to sustain their specialized programming. These coordinators presented innovative Extension outreach methods, including 1) local food systems and community gardening, 2) youth engagement programs, and 3) digital education opportunities. Through the speakers' insights, workshop participants gained valuable knowledge about the accomplishments and obstacles associated with these diverse approaches.

Dr. Heather Kirk-Ballard, Chair of the ASHS Consumer Horticulture (CH) and Master Gardener Professional Interest Group from Louisiana State University (Baton Rouge, LA, USA) and Dr. Kristine Lang, Co-Chair of the ASHS CH and Master Gardener Professional Interest Group (MG PIG) from South Dakota State University (Brookings, SD, USA) organized the workshop. The panelists invited to share their expertise were Kerry Smith, Dr. Esther McGinnis, and Dr. Lucy Bradley.

Kerry Smith, Alabama Cooperative Extension System Home Grounds team coleader and the Master Gardener Program State Coordinator in Auburn University's (Auburn, AL, USA) Department of Horticulture discussed her Extension programming and volunteer engagement, emphasizing research opportunities with Harvest for Health.

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Dr. Esther McGinnis, North Dakota State University (NDSU) (Fargo, ND, USA) Extension Horticulturist, Director of the NDSU EMG Program, and Associate Professor in the Department of Plant Sciences, focused on her Extension programming related to youth education. Dr. Lucy Bradley, North Carolina State University (Raleigh, NC, USA) Consumer and Community Horticulture Extension Specialist, Associate Head, Department Extension Leader, and Professor in the Department of Horticultural Science, shared her experiences and strategies for engaging EMG volunteers through digital programming.

Volunteers support research: harvest for health, a gardening intervention for cancer survivors. Kerry Smith began the workshop by discussing her Extension programming for cancer survivors. Gardening interventions have shown promise in improving the diet and exercise behaviors of cancer survivors, who are at a higher risk of comorbidity and physical function decline (Blair et al. 2019; Leng and Wang 2016; Miller et al. 2019; Sommerfeld et al. 2010). Kerry shared her experience with the Harvest for Health program, which provided cancer survivors with home vegetable gardens, mentorship, and research opportunities. The collaboration between the University of Alabama at Birmingham (UAB) (Birmingham, AL, USA) and the Alabama Cooperative Extension System aimed to document the effects of lifestyle behaviors on the overall health of survivors. By combining expertise in medical research, nutrition science, Extension horticulture, and volunteer management, they developed a novel research proposal.

The general methods used by the Alabama Cooperative Extension System research team included recruiting, training, and supporting EMGs as garden mentors for cancer survivors. The EMGs were matched with UAB survivors, facilitated meet and greet events, and provided the necessary garden kits. All mentors underwent gardening and mentor training, attended the meet and greet, distributed garden kits, coached survivors throughout the 12-month gardening period, and maintained regular contact. The study found that early and consistent connections between EMG mentors and survivors led to effective partnerships and greater garden success. Based on these findings, several changes were implemented, such as requiring contact before the meet and greet, recommending nursery shopping together, and monthly follow-ups by the Alabama Cooperative Extension System team to ensure protocol fidelity. In addition, EMG liaison roles were introduced to provide local support and enhance statewide communication.

However, the COVID-19 pandemic necessitated changes to the methods used in 2020 and 2021. Virtual meetings posed challenges for some EMG/survivor pairs, particularly those unfamiliar with the technology or lacking the necessary devices. Shifting face-to-face home visits to phone or video chat reduced satisfaction for some participants but was highly valued by others. A drive-thru system for picking up garden supplies was implemented, and EMGs delivered supplies to survivors without transportation. Despite these adjustments, survivor retention and recruitment were affected due to illness and altered delivery during the last 2 years of the study.

The initial pilot study, followed by two subsequent trials, yielded promising results. Survivors who participated in gardening interventions showed increased fruit and vegetable intake, weekly physical activity, improved fitness battery performance, and ongoing engagement in gardening (Bail et al. 2018; Blair et al. 2019; Demark-Wahnefried et al. 2018). Notably, 86% of survivors in one trial were still gardening independently 1 year later, with some even expanding their garden spaces. The larger 5-year study, initiated in 2016 and extending through 2022, is expected to yield further insights (results not presented here).

Throughout the years, more than 500 Alabama EMGs from 27 counties have served as mentors and liaisons in medical research, showcasing the potential for successful partnerships between the Alabama Cooperative Extension System and non–land grant institutions. The participation of EMGs in multiple cohorts of the research projects and the transition of cancer survivors to become EMGs themselves highlight the rewarding outcomes of these collaborations. The EMG programs have proven effective in supporting studies across various fields, including horticulture, environmental conservation, and medical research. The Alabama Cooperative Extension System encourages other states to explore the possibilities of pairing their EMG programs with research initiatives, as the benefits extend to all stakeholders.

Youth education: the post-pandemic role of the EMG program. The next focus of the workshop discussion pivoted from research engagement to engaging EMG volunteers with a younger audience. Esther McGinnis led a discussion on the post-pandemic role of the national EMG program in youth education, highlighting the need to address learning loss in school children, which is one of the significant impacts of the COVID-19 pandemic. The EMG program is in a unique position to tackle this issue by aiding in school classrooms and 4-H youth programs in communities.

During the pandemic, there was a shift from classroom learning to online instruction for 93% of US school children between Feb 2020 and the end of the 2020–21 school year (McClain et al. 2021). This transition posed technological challenges, such as lack of access to computers and reliable internet connections. Lower-income families and those residing in urban and rural areas faced more prominent obstacles compared with suburbs. Parents reported that their children resorted to using cell phones for schoolwork (27%), lacked access to a home computer (16%), or had unreliable internet (14%).

School schedules varied across districts and their size. In Fall 2020, more than 75% of the 50 largest US school districts implemented online learning (Dorn et al. 2020a). At the beginning of the 2020–21 school year, ~60% of students were engaged in remote learning, 20% attended in-person classes, and the remaining 20% followed a hybrid model combining distance learning and in-person instruction (Dorn et al. 2020b).

Although no studies have provided average instructional time per day during the pandemic, it was common for online middle school and high school students to have classes every other day instead of the daily meetings (McGinnis E, personal observations). In addition, a hybrid learning model in Fargo, ND, USA involved in-person classes for 2 to 3 days a week, with self-study and projects conducted

at home for the rest of the week (Davies High School 2020).

Recent studies on pandemic learning loss are starting to emerge. A study from the Netherlands, where online learning lasted for 8 weeks, revealed that students experienced learning losses equivalent to one-fifth of a school year (Engzell et al. 2021). Similarly, in the United States, the National Center for Education Statistics (2022) found an average learning loss of five points in reading and seven points in math between 2020 and 2022 for the average 9-year-old student. This translates to US students in grades 3 to 8 losing half a year of math progress and a quarter of a year of reading progress (Harvard Graduate School of Education 2022). Unfortunately, the impact of learning losses was more significant for students from impoverished backgrounds.

Considering the grim news of learning losses, it is crucial for EMG programs nationwide to reinvest in children's education. NDSU Extension serves as a model in working with school children, with the North Dakota state legislature allocating ~$25,000 per year to fund gardening project grants through the NDSU Junior Master Gardener (JMG) program. These grants, ranging from $500 to $750, are distributed to qualifying Extension agents, EMG volunteers, and 4-H volunteers across the state to support hands-on horticultural opportunities for children. Although individual grants may seem small, the projects have a significant impact because of the substantial amount of time and knowledge contributed by EMG and 4-H volunteers to ensure the success of youth projects. In 2021, the NDSU JMG program funded 54 projects, benefiting 4060 children and yielding 16,000 lb of garden produce (Kalb T, personal communication). Examples of JMG program projects include vegetable gardens in schools and head start programs, 4-H youth food pantry gardens, Girl Scout songbird gardens, and 4-H youth initiatives to enhance senior care facilities and hospitals. These projects offer interactive learning opportunities that teach life sciences while integrating math and reading skills.

The workshop discussion focused on the potential opportunities for EMG programs to have a positive impact on school children. To gain firsthand understanding of the pandemic's effects, EMG coordinators at the state and county level are encouraged to visit elementary school classrooms in impoverished areas, delivering horticultural lessons and engaging with teachers to observe the challenges firsthand.

Furthermore, it was noted during the discussion that many EMG volunteers are current or retired schoolteachers who are familiar with state curriculum standards and proficient in incorporating math, science, reading, and spelling into garden-based lessons. State EMG programs can tap into the expertise of these volunteers to assist in developing new educational projects for school outreach.

Additional ideas proposed during the discussion included reaching out to homeschool co-ops, conducting houseplant propagation workshops for teens with mental health issues, offering summer continuing education focused on plant sciences for schoolteachers, and fostering children's interest in monarch monitoring. EMG programs are urged to support schools in overcoming learning losses through a unique combination of volunteer expertise and hands-on interactive projects.

Digital opportunities during the pandemic. Regardless of volunteer project or potential partners, EMG programs have pivoted to virtual platforms to disseminate educational materials and engage volunteers. Lucy Bradley, the final speaker, led a discussion on the digital opportunities used by North Carolina State Extension programs to bridge the gap caused by the shutdown. When the world came to a standstill in 2020 to curb the spread of COVID-19, traditional volunteer training and service opportunities abruptly halted. However, the need to adapt became imperative. In North Carolina, the EMG program transitioned to online platforms. EMG training was made available through online educational and virtual meeting platforms including Moodle (West Perth, Western Australia), Top Hat (Toronto, Ontario, Canada), and Zoom (San Jose, CA, USA). Volunteer opportunities were created, focusing on projects such as the North Carolina State Extension Gardener Plant Toolbox and the second edition of the Extension Gardener Handbook. These initiatives provided volunteers with valuable learning experiences, connections, and opportunities to serve the community by creating exceptional resources.

Online learning presented several advantages, including accessibility (eliminating the need for travel), reaching a broader audience (including younger individuals and diverse participants), enabling specialized engagement (without the constraints of travel time and mileage), ensuring consistency (by providing everyone with the same information), and facilitating easy distribution. However, there were also drawbacks, such as technological challenges (hardware, software, and bandwidth requirements) for both instructors and students. Online learning sometimes hindered the development of relationships and the building of communities, and it could lead to decreased participant engagement. Despite these challenges, a successful program was offered, featuring a diverse range of online opportunities during the pandemic.

The 700-page North Carolina State Extension Gardener Handbook was made available online through the Top Hat platform. It was enhanced with interactive elements, including embedded videos, a glossary with rollover definitions, embedded questions, and links to an online plant database for each botanical name. The North Carolina State Extension Gardener Handbook (NC State 2022) also provided instructor resources, such as slide decks for each chapter, homework assignments, quizzes, and an exam. County faculty used this tool to teach fully online and hybrid formats.

In collaboration with Longwood Gardens (Kennett Square, PA, USA), 6-week online classes were offered on plant identification, covering topics such as annuals, perennials, and groundcovers; houseplants, succulents, and cacti; trees, shrubs, and conifers; vegetables, herbs, fruits, and nuts; and understanding plants. In addition, online classes on Therapeutic Horticulture were provided through a partnership with the North Carolina Botanical Garden (Chapel Hill, NC, USA).

"Plants, Pests, & Pathogens" is a monthly online seminar designed for agents and EMG volunteers. This seminar, offered in collaboration with the NC State Plant Disease and Insect Clinic, includes sections on current issues, featured plants, pest & disease identification and issues, and invasive plants and alternatives.

Digital options significantly increased accessibility, allowing professionals,

volunteers, and clients to work from anywhere, including their homes and gardens. Asynchronous opportunities enabled volunteers to participate at their convenience, eliminating the requirement to work during Extension office hours. Online options attracted a younger and more diverse participant base. Furthermore, a variety of partnership opportunities became available in the online sphere. However, online volunteering posed challenges, such as increased pressure on agents to be available outside regular work hours, necessitating a focus on work/life balance. Building relationships online proved more challenging and creating and managing online opportunities required additional effort. Volunteers and agents had to be flexible because of technological challenges, and agents needed to allocate time for technology training for volunteers while ensuring that all resources complied with the Americans with Disabilities Act and were accessible to everyone.

Since the onset of the pandemic, volunteers have been actively involved in virtual plant clinics, online help desks, webinars, and social media platforms. They have also contributed to several online digital projects. For instance, the online database plants.ces.ncsu.edu houses 4600 plants, each accompanied by 90 data fields, images, videos, and descriptions. During the pandemic, 30 volunteers from 24 counties devoted 1428 hours (equivalent to $40,748) to tasks such as proofreading, finding images, and integrating videos.

With the assistance of volunteers, the second edition of the North Carolina State Extension Gardener Handbook was released during the pandemic. This nationally acclaimed handbook consists of 728 pages divided into 21 chapters and eight appendices. Each chapter includes an integrated pest management case study and frequently asked questions with corresponding answers. Diagnostic tables, when relevant, are included among the 109 tables. The chapters are visually supported by graphics, illustrations, diagrams, and charts illustrating various processes. The North Carolina State Extension Gardener Handbook contains 1007 color images, most of which possess a creative commons license. Volunteers contributed to the editing process.

A pilot project focused on basil downy mildew (*Peronospora belbahrii*) engaged volunteers in conducting trials in their own gardens and documenting their findings online. Web meetings were organized to provide instructions, answer questions, and share results. Other volunteers participated in a study exploring how native bees overwinter in landscapes, aiming to develop landscape management recommendations to minimize the impact on overwintering bees. Volunteers received online training, submitted data through online platforms, and accessed the study results online.

The pandemic unlocked digital doors that fundamentally transformed the way volunteers are engaged and taught. Even when in-person, face-to-face opportunities become available again, many of these effective strategies will continue to be provided.

Discussion

EMG programs are not immune to the impacts of the global pandemic, as detailed by all three workshop presenters. However, these impacts created opportunities for evaluation of current as well as new, innovative, volunteer program engagement and educational activities (Dorn et al. 2021a). The pandemic resulted in an incredible increase in gardening interest, which increased the need for providing high-impact educational programming across the United States (San Fratello et al. 2022). This impact was felt heavily within the CH realm as discussed among workshop participants. Fortunately, many of these CH specialists could lean into support of EMG program volunteers to amplify impact in local communities; however, this was not without challenges as keeping communities and volunteers safe was prioritized (Dorn et al. 2021a). As discussed by workshop presenters, there were many creative solutions to keep volunteers engaged or reintroducing program activities in-person with caution.

Examples from Alabama, North Dakota, and North Carolina provided ideas for how to pivot or expand programming to reach an increasingly diverse audience of gardeners and EMG program volunteers. Diversity among gardeners and EMG program volunteers is likely to continue to increase, and CH and EMG program faculty and staff should be prepared to meet the needs of the changing program participant and audience (Dorn et al. 2021b; San Fratello et al. 2022). Workshop participants discussed, at length, ways that these ideas could be adapted to fit their state's needs. It is important to acknowledge that EMG programs vary in size, format, and administrative support from state-to-state, which means that incorporating volunteers into research, pivoting to large-scale virtual education, or engaging in community-level youth outreach will have varied levels of feasibility. There is also a need to continue to have open state-to-state communication to allow for sharing of ideas and program model adjustment and adaptation vs. re-creating entirely innovative programs.

CH program leaders need to work with EMG program volunteers to capture the increased number of gardeners, but it is also important to realize that as people shift back to in-person work the number of people engaged in garden activities may decrease before stabilizing; however, this still presents incredible opportunities get more people connected with plants (San Fratello et al. 2022). More EMG program volunteers to serve local communities would aid in increasing outreach and community impact. According to the 2020 EMG National Summary Dashboard, the number of EMG program volunteers decreased slightly as compared with 2018 with the number of volunteer hours being reduced because of changes and/or suspensions in volunteer requirements (Dorn et al. 2021a; Stokes et al. 2020). Although data from 2022 have not yet been released, there are examples from individual states of increased EMG program volunteer participation as the pandemic impacts have decreased (Herzog 2023; Wagner and Schaible 2021). This is heartening, as national research has found that increases in virtual volunteerism have been countered with decreases of in-person volunteerism (Cnaan et al. 2022). It is important to note that EMG program volunteers still prefer in-person education and engagement to virtual settings (Wagner and Schaible 2021). Regaining volunteers and supporting program activities nationally has been difficult as people have reevaluated personal priorities and where to spend their limited time. EMG programs will need to continue to diversify program delivery and maintain elevated levels of positive engagement with volunteers

to maintain and grow programs despite national trends.

As CH faculty and EMG program staff interacted during the workshop discussion, one topic that became known was the balance of pivoting programs, offering more creative programs in a post-pandemic setting, and how to balance all these demands with increasing workloads. This brings to light the caution that volunteer engagement and community engagement must not come at the expense of overloading and overburdening faculty and program staff. There is a need to examine this topic further to determine the impacts of burnout on the horticultural industry at large and the CH and EMG sector more specifically.

Conclusion

A fantastic opportunity exists for CH and EMG programs to capitalize on garden enthusiasm, training and retaining new gardeners for years to come. Recruiting, training, and retaining diverse EMG program volunteers will complement the efforts across the horticultural sector. As our program workshop demonstrated, there are multiple creative solutions for providing high-quality programs to engage volunteers in research, provide meaningful virtual education to complement in-person efforts, and provide education to the next generation of gardeners and horticulturists.

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