

10-28-2021

Developmental Evaluation for Extension Programs

Joseph L. Donaldson

North Carolina State University, joseph_donaldson@ncsu.edu

Karen Franck

kfranck@utk.edu



This work is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/).

Recommended Citation

Donaldson, J. L., & Franck, K. (2021). Developmental Evaluation for Extension Programs. *The Journal of Extension*, 59(4), Article 5. <https://doi.org/10.34068/joe.59.04.05>

This Feature Article is brought to you for free and open access by the Conferences at TigerPrints. It has been accepted for inclusion in The Journal of Extension by an authorized editor of TigerPrints. For more information, please contact kokeefe@clemson.edu.

Developmental Evaluation for Extension Programs

Cover Page Footnote

The authors express appreciation to the National 4-H Council and Lockheed Martin for the opportunity to collaborate in this important 4-H initiative. We acknowledge the dedicated 4-H professionals, 4-H community volunteers, and Lockheed Martin employees who strive to make a difference in the lives of youth. We have no known conflict of interest to disclose. Correspondence concerning this article should be addressed to Dr. Joseph L. Donaldson, 202 Ricks Hall, 1 Lampe Drive, Campus Box 7607, Raleigh, NC 27695-7607. Email: joseph_donaldson@ncsu.edu

Developmental Evaluation for Extension Programs

JOSEPH L. DONALDSON¹ AND KAREN FRANCK²

AUTHORS: ¹North Carolina State University. ²University of Tennessee, Knoxville.

Abstract. Logic models have garnered acclaim for their usefulness and disdain for the time required to create good ones. We argue that the orderly, analytical nature of logic models is opposed to many Extension programs, and we explain developmental evaluation, an approach that highlights ongoing development, adaptations, and rapid response. We use our recently completed evaluation of the *4-H Science: Building a 4-H Career Pathway Initiative* to demonstrate developmental evaluation's key principles. Recommendations for Extension include the need to embrace developmental evaluation for program planning and evaluation and for Extension evaluators to conduct case studies using developmental evaluation and other approaches.

INTRODUCTION

Extension evaluation has faced criticism for relying on the use of logic models while excluding other concepts (Franz et al., 2014). Here, we discuss why developmental evaluation may be better suited to many cases of Extension evaluation and present a case study that supports this idea.

LOGIC MODELS

Logic models, a driving force for program evaluation, were first used in the 1970s, and Wholey's *Evaluation: Promise and Performance* was the first published work to use the term "logic model" (McLaughlin & Jordan, 2015; Taylor-Powell & Henert, 2008; Wholey, 1979). Logic models are visual diagrams of how a program is supposed to work (Huhman et al., 2004), emphasizing program theory, logic, the working together of cause and effect, analytical thinking, planning, and communication (Julian et al., 1995; Knowlton & Phillips, 2013; Taylor-Powell & Henert, 2008). Logic models delineate combinations of and alignments among issues, inputs, outputs, and outcomes (Funnell & Rogers, 2011; Porteous et al., 2002). Scholars, evaluation experts, program planners, and practitioners espouse the value of logic models for judging a program's feasibility, developing a program, developing performance measurement and monitoring systems, and pursuing knowledge (Hernandez, 2000; McLaughlin & Jordan, 2015; Savaya & Waysman, 2008). Logic models tend to work especially well with clearly defined program goals (Wholey, 2003). The logic model has become a preeminent

program evaluation mechanism, particularly for impact evaluation (Carpenter, 2016; Renger et al., 2011).

Despite more than 40 years of acclaim, logic models have faced criticism. Gamel-McCormick (2011) conducted a case study of logic model creation with a nonprofit organization focused on community services for individuals with intellectual disabilities. The findings demonstrated many benefits of logic models, including expanding knowledge of the program among stakeholders. However, the findings also identified that the development of logic models is time-consuming, as is consistent with the findings of Gugiu and Rodríguez-Campos (2007) and Renger and Titcomb (2002). Such models require a facilitator with logic model expertise and stakeholder involvement. Gamel-McCormick (2011) concluded, "it is clear that a logic model cannot be the sole method of assessing a program" (p. 65).

Logic models may limit how much program staff think about solutions, because the logic model represents what program staff believe the funder or evaluator wants as opposed to allowing staff to continually seek creative solutions (Hill, n.d.; Taylor-Powell & Henert, 2008). Case studies by Chen (2014) illustrated how two programs (community health and campus-based diversity enhancement) did not benefit from traditional logic models as the models failed to represent "contextual factors and causal mechanisms" (p. 343). Additionally, programs that stand to benefit the most from program planning and evaluation lack the time and resources to invest in logic model creation (Kaplan & Garrett, 2005). The logic model has garnered criticism for

not representing program complexity (Renger et al., 2011). For example, Burns and Worsley state that “the problem is that solutions to problems within complex environments are constructed as if they weren’t complex” (2015, p. 18). Furthermore, logic models’ orderly nature and dialectic may not reflect typical Extension programs with competing needs, changing environments, and multiple stakeholders. These criticisms demand an answer to the question, is there a better way?

DEVELOPMENTAL EVALUATION

Developmental evaluation provides an alternative to logic models. A quintessential understanding of program evaluation is that formative evaluation is conducted to improve a program and summative evaluation is conducted to summarize the end results of a program. Developmental evaluation is neither formative nor summative. In developmental evaluation, the key is “adaptive development” or evaluating to adapt the program to changing contexts and/or clientele, learning that activates change, and/or emerging innovations for a dogged problem (Patton, 2016). Developmental evaluation is not a new approach; Patton (1994) formally introduced it over 25 years ago.

Patton presents eight developmental evaluation “essential principles:” (a) developmental purpose, (b) evaluation rigor, (c) utilization focus, (d) innovation niche, (e) complexity perspective, (f) systems thinking, (g) co-creation, and (h) timely feedback (Patton, 2016, p. 3). Not to be confused with “development evaluation”, or the practice of program evaluation in developing countries (Patton, 2016, pp. 7–8), *developmental evaluation* is also known as real-time evaluation, emergent evaluation, action research, and adaptive evaluation (Patton, 2016). Despite the negative aspects of logic model development previously mentioned, many funders require their use (Kaplan & Garrett, 2005). Notably, logic model creation can be incorporated into a developmental evaluation (Zamir & Abu Jaber, 2015) so that developmental evaluation accompanies, not replaces, an accountability-based evaluation approach (Mitchell, 2019).

Developmental evaluation is rooted in utility-focus evaluation; that is, key stakeholders such as funders, innovators, and frontline staff use the results of their evaluation to inform their work and produce actionable results (Mitchell, 2019). While a logic model approach focuses on outcome measurement and accountability demands, developmental evaluation amplifies learning and innovation (Mitchell, 2019), contributes to the development of an initiative, and aids in adapting the initiative to complex situations (Fagen et al., 2011). While developmental evaluation is not a new concept, Extension has given developmental evaluation little attention. Kelsey and Stafne (2012) used the eXtension Grape Community of Practice for a developmental evaluation case study. Their work presents a model for using developmental

evaluation to evaluate other eXtension Communities of Practice. Lane and Sanders (2019) used a developmental evaluation approach whereby local elected officials and Extension personnel collaborated on local strategic planning, budgeting, and governance issues.

PURPOSE

The purpose of this paper is to illuminate developmental evaluation for Extension programs, and we use the 4-H Science: Building a 4-H Career Pathway Initiative (referred to hereafter as the 4-H initiative) as a witness to the power of developmental evaluation. The initiative, conducted by the National 4-H Council, Lockheed Martin, and 13 state 4-H programs (referred to hereafter as state grantees), aimed to engage underserved youth in 4-H Science programs to increase education and career opportunities in the fields of science, technology, engineering, and mathematics (STEM). Extension 4-H professionals engaged 521 Lockheed Martin employees (serving as 4-H volunteers and referred to hereafter as corporate volunteers) and 3,679 4-H community volunteers to reach 89,291 youth contacts in STEM programs (Franck & Donaldson, 2020).

We conducted multiple elements of a process evaluation of the 4-H initiative concurrently from 2016 to 2018. The process evaluation included observations of 10 operative programs; interviews with 155 Extension 4-H professionals, 4-H community volunteers, corporate volunteers, youth participants, and parents; surveys of youth participants; and an extensive document review including review of monthly activity reports of participation numbers, demographics, and activities (Donaldson & Franck, 2018; Donaldson & Franck, 2020). In our work, we incorporated many of the uses and characteristics of developmental evaluation. Considering the scope of the 4-H initiative and the evaluation findings, we claim that developmental evaluation should have a more prominent role in Extension program planning and evaluation.

METHODOLOGY

This case study involved analyzing developmental evaluation literature and comparing those findings to the 4-H initiative findings. The 4-H initiative presents an interesting program for this developmental evaluation paper, as it reflects the “complex adaptive system” described by Patton (2011, p. 8) and is (a) nonlinear, (b) emergent, (c) dynamic, (d) adaptive, (e) uncertain, and (f) co-evolutionary. First, the initiative is nonlinear from many standpoints, including participation. For example, a participant may be involved in 4-H as a fourth grader, but not again until middle school. Second, the initiative was emergent as Extension professionals, community volunteers, corporate volunteers, and participants worked

Developmental Evaluation for Extension

together to create new programs and infuse STEM career education into existing programs. Third, it was both dynamic and adaptive as Extension professionals changed course with their programming by adopting new strategies. Fourth, like other youth programs, 4-H Science programs face uncertainty because experienced volunteers may change the amount of time they can spend on the initiative due to work or other demands. Fifth, the initiative was co-evolutionary as Extension professionals, parents, volunteers, and youth organized programs rather than working through lockstep curriculum. As evaluators, we were part of the project from the start, working with Extension professionals and National 4-H Council representatives — a hallmark of developmental evaluation (Gamble, 2008). Perhaps most importantly for illustrating the power of a developmental evaluation mindset, the 4-H initiative reflected the dynamic nature of a typical Extension program in regards to ongoing changes in funding and staffing, community needs and opportunities, and participants' interests.

FINDINGS

The findings are organized according to Patton's five uses of developmental evaluation:

1. "Ongoing development or adapting an intervention to new conditions;
2. Adapting effective general principles to a new context;
3. Developing a rapid response to a major change;
4. Preformative development of a potentially scalable innovation, or getting an intervention ready for summative evaluation; and
5. Major systems change and cross-scale evaluation to provide feedback about how the intervention is unfolding and how it may need to be adapted for broader application." (Patton, 2011, pp. 21–22).

ONGOING DEVELOPMENT OR ADAPTING AN INTERVENTION TO NEW CONDITIONS

The existing National 4-H Science logic model (National 4-H Council, 2010) did not fully articulate the 4-H initiative's complexity. A developmental mindset for evaluating the 4-H initiative allowed us to discern the following insights rather than simply use broad labels from the logic model:

- 4-H traditionally has functioned well by engaging 4-H professionals and volunteers who are experts in agriculture, family and consumer sciences, and youth development. 4-H Science represents new audiences (Donaldson & Franck, 2018), and it is challenging for experienced community 4-H volunteers to fully embrace STEM projects.

- Likewise, experienced 4-H professionals were challenged to provide guidance and support to community 4-H volunteers in STEM topics.
- The 4-H initiative represented a different system. For the system to work, corporate volunteers with expertise in science and engineering had to be drawn into 4-H at both the professional level and the volunteer level. Additionally, these corporate volunteers were needed for direct teaching of youth and professional development of 4-H professionals and community volunteers.
- Youth with committed STEM interests may lack awareness of 4-H.
- To show how the 4-H initiative was working in diverse communities, we shared program profiles with state grantees. We did this to illustrate how the 4-H initiative performed successfully in different contexts and supported replication. The program profiles in Appendix A and B demonstrate how the 4-H initiative was adapted into existing programs.

ADAPTING EFFECTIVE GENERAL PRINCIPLES TO A NEW CONTEXT

The 4-H initiative request for applications discussed the different volunteer roles that corporate volunteers would fulfill, specifically: 4-H champion, STEM program manager, community relations lead, and leaders for leadership development clubs, employee affinity groups, and volunteer clubs. In our interviews, 4-H professionals described how these roles did not exist. In fact, we identified only one state with a corporate volunteer whom 4-H professionals and corporate employees identified as their "4-H champion."

States implementing only short-term, introductory STEM programming were expected to have 10 corporate volunteers involved in the 4-H initiative. These states had 16.1 corporate volunteers on average, or a total of 161 corporate volunteers across 10 states. However, Arkansas had 70 corporate volunteers. We visited the University of Arkansas Cooperative Extension Service's office in Ouachita County and observed 4-H programming with the Camden Fairview School District. Our research demonstrated how corporate volunteers were engaged; specifically, the high school technology classes used the Project Lead The Way curricula supplemented with 4-H curricula to create an interactive and immersive learning environment.

If we had evaluated from a traditional logic model approach, we would have assumed that Arkansas's success came from following the volunteer roles described in the request for applications. Notably, we would not have invested additional time and energy in understanding Arkansas's success. See Appendix B for the program profile describing the Arkansas approach.

DEVELOPING A RAPID RESPONSE TO A MAJOR CHANGE

During the project's first year, our evaluation identified a lack of professional development and 4-H curricula covering STEM careers. The National 4-H Council responded by contracting with Click2SciencePD and Couragion. Click2SciencePD is an online, targeted approach to professional development created specifically for out-of-school-time programs. Couragion is an online curriculum that uses videos, games, and self-reflection quizzes to help youth explore STEM careers. The National 4-H Council also promoted the Build Your Future curriculum to state grantees for college and career readiness. This adaptation could have contributed to exceeding overall benchmarks for youth reach, community volunteerism, and corporate volunteer engagement.

We believe that greater usage of developmental evaluation would have improved the program outcomes. In developmental evaluation, the measures and performance goals evolve as the program unfolds. In the case of the 4-H initiative, we noted that several 4-H professionals were preoccupied with achieving the benchmark numbers, but they may have missed the mark on deeper and more meaningful youth engagement, especially with girls and minorities. As an illustration, California 4-H professionals arranged internships for three participants. One of the youth presented her internship experience to her 4-H STEM Club's members and parents. While the internships were few in number, they provided a more impactful experience than other, large group experiences that had high turnout but limited effect. During the 4-H initiative, it would have been instructive to reframe the benchmarks from the number of girls, minorities, and total youth engaged to the number of girls and minorities engaged in projects that lasted 6 months or longer. Looking back, face-to-face annual meetings among state grantees would have improved professional learning, especially peer-to-peer learning and goal-setting for the coming year. This also could have informed the evaluation, allowing us to pinpoint state grantees' priorities and how best to track and measure those while identifying opportunities for innovation and learning.

PREFORMATIVE DEVELOPMENT OF A POTENTIALLY SCALABLE INNOVATION, OR GETTING AN INTERVENTION READY FOR SUMMATIVE EVALUATION

Typically, a program's logic model guides the program evaluation by documenting the number of outputs and measuring the achievement of outcomes. This has critical implications, including an acceptance of the assumptions stated on the logic model. In the case of the National 4-H Science logic model (National 4-H Council, 2010), the assumptions are: "4-H reaches diverse population; and increased awareness of science skills, content, and career possibilities increases engagement of youth in a science

career." By taking a developmental mindset, we tested these assumptions. On a monthly basis, state grantees completed activity reports that showed participation numbers for youth, community volunteers, and corporate volunteers.

However, this focus on numbers rather than quality tended to mask innovative ideas that needed time to implement before outcomes could be achieved. For example, several states spent time building relationships with volunteers, volunteer organizations that targeted underrepresented groups of scientists, and other agencies to build their 4-H STEM programs. These relationships were effective methods for building strong programs, but because of the time investment, these efforts often were overlooked in reporting because they did not result in immediate youth engagement. Furthermore, other states who did not meet outcome benchmarks often expressed feelings of disengagement from program goals and their ability to meet those goals in a meaningful way.

MAJOR SYSTEMS CHANGE AND CROSS-SCALE EVALUATION TO PROVIDE FEEDBACK ABOUT HOW THE INTERVENTION IS UNFOLDING AND HOW IT MAY NEED TO BE ADAPTED FOR BROADER APPLICATION

The National 4-H Council provided the 4-H STEM Career Pathway (Figure 1) to state grantees as an overall visual of the 4-H initiative. This scheme outlined 4-H youth activities and Lockheed Martin employee contributions.

Yet, 4-H professionals reported that the 4-H STEM Career Pathway needed greater development; representative comments included:

- "I would love to see the pathway a little more developed and articulated. We spent a lot of time talking about what's the difference between learn and practice." (California 4-H professional)
- "I think semantics or definitions need to be clearer." (Texas 4-H professional)

To make the 4-H initiative suitable for broader application, we proposed to the National 4-H Council to convene a working group, a committee of five professionals representing three land grant universities and the National 4-H Council in addition to ourselves (the two evaluators). Of the seven working group members, five had been involved in the initiative and two had not. These different perspectives provided valuable counsel on enhancing the career pathway as a tool to positively impact the entire 4-H movement. From this group, the enhanced 4-H STEM Career Pathway was co-created and informed by the evaluation's key findings. Like other 4-H initiative course corrections described herein, the enhanced 4-H STEM Career Pathway represents a product of a developmental evaluation mindset (Figure 2).

Developmental Evaluation for Extension

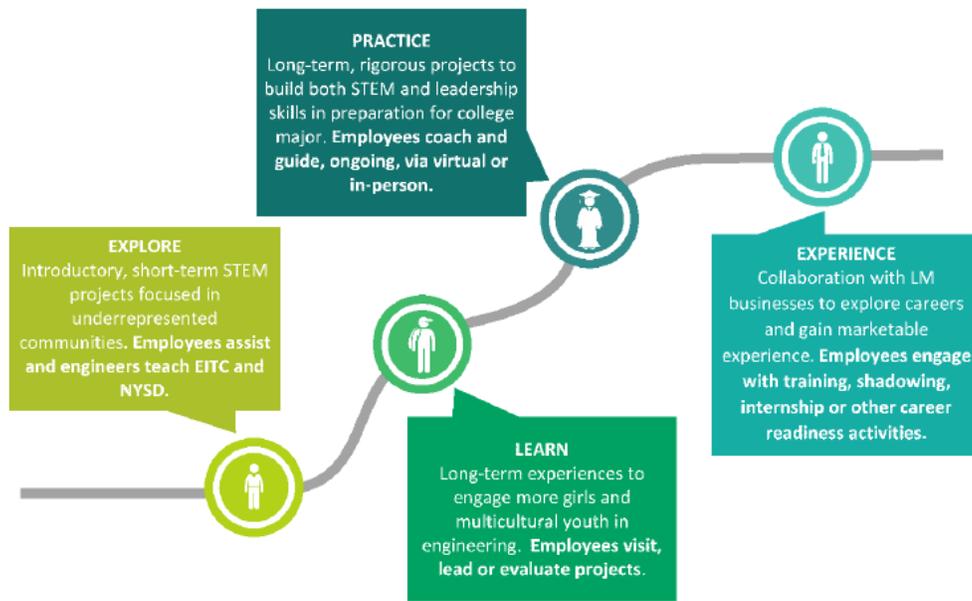


Figure 1. 4-H STEM career pathway at project initiation. Source: From “4-H Science: Building a 4-H Career Pathway Initiative – Final Evaluation Report,” by J.L. Donaldson and K.L. Franck, 2018, Publication No. W668, University of Tennessee Extension. Reprinted with permission.

4-H STEM Career Pathway for Youth Success

Growing a Generation Prepared to Succeed in Life & Career

	Explore	Learn	Practice	Career Experience
Youth Grade in School	All Grades		8-12 th Grades	
Milestones	Youth explore concepts to develop awareness in STEM, college and career readiness for 21 st Century success.	Youth learn skills and abilities in STEM, college and career readiness for 21 st Century success.	Youth practice and apply real world skills and abilities in STEM, college and career readiness for 21 st Century success.	Youth gain career experience in STEM that informs their college and career decisions for 21 st Century success.
Outcomes	Youth will: <ul style="list-style-type: none"> Express interest and be engaged in science related activities. Express positive attitudes about science. 	Youth will: <ul style="list-style-type: none"> Demonstrate a capacity for science process skills. See science in their futures and recognize the relevance of science. Express positive attitudes about engineering. Demonstrate a capacity for engineering skills. 	Youth will: <ul style="list-style-type: none"> Draw connections to real-world concepts and situations.² Discuss STEM careers and their educational pathways.² Apply science skills to issues in their community. Make contributions to their peers, families, and communities. 	Youth will: <ul style="list-style-type: none"> Demonstrate professional communication appropriate to the academic and workplace context. Demonstrate the social, emotional, character, and leadership skills necessary for academic or workplace success. Make informed decisions about college aspirations that are personally meaningful. Make informed decisions about career aspirations that are personally meaningful.

² These outcomes are from: Pechman, E.M., Mielke, M.B., Russell, C.A., White, R.N., Cooc, N. (2008). *Out-of-School time (OST) observation instrument: Report of the Validation Study*. Washington, DC: Policy Studies Associates. All other outcomes are from National 4-H Council Common Measures (2017)

Figure 2. 4-H STEM career pathway at project conclusion. Source: From “4-H Science: Building a 4-H Career Pathway Initiative – Final Evaluation Report,” by J.L. Donaldson and K.L. Franck, 2018, Publication No. W668, University of Tennessee Extension. Reprinted with permission.

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

As pointed out by Franz et al. (2014), Extension does need to embrace new evaluation approaches. We believe developmental evaluation is important for Extension because it aligns well with the evaluation needs of Extension programs and professionals as demonstrated by this 4-H initiative case study. A developmental evaluation mindset helped us be responsive in this large-scale, 13-state 4-H initiative. Likewise, we believe developmental evaluation would be advantageous for Extension programming given the changing contexts driven by demographic, technological, and social changes. As a case in point, consider 4-H. The contexts for all 4-H programming are in flux from transformations caused by the COVID-19 pandemic (Arnold & Rennekamp, 2020) and modern youth movements such as #blacklivesmatter (Webster, 2016).

To be sure, we are both experienced program evaluators who have used and continue to use program logic models to guide Extension program planning and evaluation. Logic models are advantageous when accountability is a paramount need. However, developmental evaluation has an important role in adaptive situations to improve a “work in progress” (Brinkerhoff, 2002). Key questions Extension professionals should consider include:

- Are Extension clientele changing?
- Are the contexts for Extension programs changing such as shifting from in-person to virtual formats?
- Do Extension programs produce learning and innovations for persistent community issues?

If the answer to any of these questions is yes, then experts and practitioners should invest in developmental evaluation. Extension evaluators need to conduct more case studies of logic model creation, logic model usage and non-usage, and developmental evaluations. Likewise, we recommend user guides and other Extension publications to expound on how to use developmental evaluation at the local level. This will improve responsiveness and help Extension professionals and communities hammer out evaluation processes and practices (Dunkley & Franklin, 2017). Local Extension agents and other practitioners, Extension evaluation specialists, faculty, and Extension stakeholders need to collaborate in using developmental evaluation for local and state Extension initiatives. A preponderance of evaluation work in Extension aims to show program impact. Developmental evaluation could be the key to improving programs in order to consistently achieve impactful results. Developmental evaluation, with its systems thinking and co-creation, is a mechanism for improving Extension programs for individuals and communities.

REFERENCES

- Arnold, M. E., & Rennekamp, R. A. (2020). A time like no other: 4-H youth development and COVID-19. *Journal of Extension*, 58(1). <https://archives.joe.org/joe/2020june/comm1.php>
- Brinkerhoff, J. M. (2002). Assessing and improving partnership relationships and outcomes: A proposed framework. *Evaluation and Program Planning*, 25(3), 215–231. [https://doi.org/10.1016/S0149-7189\(02\)00017-4](https://doi.org/10.1016/S0149-7189(02)00017-4)
- Burns, D., & Worsley, S. (2015). *Navigating complexity in international development: Facilitating sustainable change at scale*. Rugby: Practice Action Publishing, Ltd.
- Carpenter, S. (2017). ‘Modeling’ youth work: logic models, neoliberalism, and community praxis. *International Studies in Sociology of Education*, 26(2), 105–120. <https://doi.org/10.1080/09620214.2016.1191963>
- Chen, H. T. (2014). *Practical program evaluation: Theory-driven evaluation and the integrated evaluation perspective*. SAGE Publications, Inc.
- Donaldson, J. L., & Franck, K. L. (2018). 4-H Science: Building a 4-H Career Pathway Initiative (Report No. W668) University of Tennessee Extension. <https://extension.tennessee.edu/publications/Documents/W668.pdf>
- Donaldson, J. L., & Franck, K. L. (2020). A Mixed Methods Evaluation to Measure 4-H STEM Program Quality. *Journal of Youth Development*, 15(5), 203–319. <https://doi.org/10.5195/jyd.2020.835>
- Dunkley, R. A., & Franklin, A. (2017). Failing better: The stochastic art of evaluating community-led environmental action programs. *Evaluation and Program Planning*, 60, 112–122. <https://doi.org/10.1016/j.evalprogplan.2016.11.005>
- Franck, K. L., & Donaldson, J. L. (2020). Volunteer training needs for successful 4-H STEM programs. *Journal of Youth Development*, 15(4), 97–109. <https://doi.org/10.5195/jyd.2020.856>
- Franz, N., Arnold, M., & Baughman, S. (2014). The role of evaluation in determining the public value of extension. *Journal of Extension*, 54(4). <https://archives.joe.org/joe/2014august/comm3.php>
- Gamel-McCormick, C. A. (2011). *A critical look at the creation and utilization process of logic models* [Unpublished master’s thesis]. University of Delaware. <http://udspace.udel.edu/handle/19716/10095>
- Gugiu, P. C., & Rodriguez-Campos, L. (2007). Semi-structured interview protocol for constructing logic models. *Evaluation and Program Planning*, 30(4), 339–350. <https://doi.org/10.1016/j.evalprogplan.2007.08.004>
- Hernandez, M. (2000). Using logic models and program theory to build outcome accountability. *Education and*

Developmental Evaluation for Extension

- Treatment of Children*, 23(1), 24–40. www.jstor.org/stable/42899601
- Huhman, M., Heitzler, C., & Wong, F. (2004). The VERB campaign logic model: a tool for planning and evaluation. *Preventing chronic disease*, 1(3), A11. <https://pubmed.ncbi.nlm.nih.gov/15670432>
- Julian, D. A., Jones, A., & Deyo, D. (1995). Open systems evaluation and the logic model: program planning and evaluation tools. *Evaluation and Program Planning*, 18(4), 333–341. [https://doi.org/10.1016/0149-7189\(95\)00034-8](https://doi.org/10.1016/0149-7189(95)00034-8)
- Kaplan, S. A., & Garrett, K. E. (2005). The use of logic models by community-based initiatives. *Evaluation and Program Planning*, 28(2), 167–172. <https://doi.org/10.1016/j.evalprogplan.2004.09.002>
- Knowlton, L. W., & Phillips, C. C. (2012). *The logic model guidebook: Better strategies for great results*. SAGE Publications.
- Lane, T. C. & Sanders, C. (2019). Leveraging utilization-focused evaluations to engage elected officials and county personnel. *Journal of Extension*, 57(4). <https://tigerprints.clemson.edu/joe/vol57/iss4/24>
- Lee, P. L. (n.d.). What's wrong with logic models? LSCA Occasional Paper No. 1. Local Community Services Association. <https://1r65612jvqxn8fcup46pve6b-wpengine.netdna-ssl.com/wp-content/uploads/2013/03/Whats-wrong-with-logic-models.pdf>
- McLaughlin, J. A. & Jordan, G. B. (2015). Using logic models. In K. E. Newcomer, H. P. Hatry, & J. S. Wholey (Eds.), *Handbook of practical program evaluation* (4th ed.). Wiley.
- Mitchell, A. (2019). *Second-order learning in developmental evaluation: New methods for complex conditions*. Palgrave Macmillan.
- National 4-H Council. (2010, November 1). National 4-H Science logic model. <https://4-h.org/wp-content/uploads/2016/02/4-H-Science-Logic-Model.pdf>
- Patton, M. Q. (1994). Developmental evaluation. *Evaluation Practice*, 15(3), 311–319. [https://doi.org/10.1016/0886-1633\(94\)90026-4](https://doi.org/10.1016/0886-1633(94)90026-4)
- Patton, M. Q. (2011). *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use*. Guilford Press.
- Patton, M. Q. (2016). State of the art and practice of developmental evaluation: Answers to common and recurring questions. In M.Q. Patton, K. McKegg, & N. Wehipeihana (Eds.), *Developmental evaluation exemplars: Principles in practice*. Guilford Press.
- Porteous, N. L., Sheldrick, B. J., & Stewart, P. J. (2002). Introducing program teams to logic models: Facilitating the learning process. *The Canadian Journal of Program Evaluation*, 17(3), 113–141. http://med-fom-family-med-research.sites.olt.ubc.ca/files/2012/03/faciliter_modele_logiques_CJPE-2002_f.pdf
- Renger, R., & Titcomb, A. (2002). A three-step approach to teaching logic models. *The American Journal of Evaluation*, 23(4), 493–503. <https://doi.org/10.1177/109821400202300409>
- Renger, R., Wood, S., Williamson, S., & Krapp, S. (2011). Systemic evaluation, impact evaluation and logic models. *Evaluation Journal of Australasia*, 11(2), 24–30. <https://doi.org/10.1177/1035719X1101100204>
- Rey, L., Tremblay, M. -C., & Brousselle, A. (2014). Managing tensions between evaluation and research: Illustrative cases of developmental evaluation in the context of research. *American Journal of Evaluation*, 35(1), 45–60. <https://doi.org/10.1177/1098214013503698>
- Rogers, P. J., & Funnell, S. C. (2011). *Purposeful program theory: Effective use of theories of change and logic models*. Wiley.
- Savaya, R., & Waysman, M. (2005). The logic model: A tool for incorporating theory in development and evaluation of programs. *Administration in Social Work*, 29:2, 85–103. https://doi.org/10.1300/J147v29n02_06
- Taylor-Powell, E., & Henert, E. (2008). *Developing a logic model: Teaching and training guide*. Madison, WI: University of Wisconsin-Extension, Cooperative Extension, Program Development and Evaluation. <https://fyi.extension.wisc.edu/programdevelopment/files/2016/03/lmguidcomplete.pdf>
- Webster, N. (2016). 4-H and its relevance in the era of #moments in urban communities. *Journal of Extension*, 54(1). <https://archives.joe.org/joe/2016february/comm1.php>
- Wholey, J. S. (1979). *Evaluation: Promise and performance*. Washington, D.C.: Urban Institute Press.
- Wholey, J. S. (2003). Using policy evaluation to support decision making and improve program performance. *Japanese Journal of Evaluation Studies*, 3(2), 6–22. https://doi.org/10.11278/jjoes2001.3.2_6
- Zamir, J., & Abu Jaber, S. (2015). Promoting social justice through a new teacher training program for the Bedouin population in Negev: An evaluation case study. In B. Rosenstein & H. Desivilya Syna (Eds.), *Evaluation and social justice in complex sociopolitical contexts*. *New Directions for Evaluation*, 146, 71–82.

APPENDIX A. ADVENTURES IN SCIENCE

LOCATION

Montgomery County, Maryland

PROGRAM CONTEXT

Target audience	Youth in the Washington DC suburbs
Age range of participants	8 to 15 years
Curricula	Numerous – varies by presenter
Lead partners	Lockheed Martin, National Institutes of Health (NIH), National Institute of Standards & Technology (NIST)

PROGRAM DESCRIPTION

Adventure in Science (AIS) is a hands-on science education activity for children ages 8–15 running on Saturday mornings from late October to March. Since the early 1990's the Montgomery County 4-H Program has provided an administrative framework for Adventures in Science, using 4-H University of Maryland Extension (UME) volunteers as site managers. Each Saturday, youth gather at one of four locations to learn a new topic from a STEM professional.

AIS teachers and site managers are all volunteers who share a passion for science and working with students to share that fun and excitement. Volunteers are recruited from staff of our host science institutions (NIH, NIST, Lockheed-Martin, etc.), from local universities and science corporations, and from parents of the AIS students. Most teachers volunteer for only one Saturday, but some return for several sessions or teach a particular class at different AIS locations.

This program has been very popular, with a waiting list for participation. A particular success of this initiative has been the appeal to a diverse group of youth not involved with other 4-H programming efforts.

EXPECTED PROGRAM OUTCOMES

Explore

- Express interest and be engaged in science-related activities.
- Express positive attitudes about science.

Learn

- Demonstrate a capacity for science process skills.
- See science in their futures and recognize the relevance of science.
- Express positive attitudes about engineering.
- Demonstrate a capacity for engineering skills.

OTHER PROGRAM INFORMATION

For more information visit <http://www.adventureinscience.org>

Program Contact

Alganesh Piechocinski, Senior Agent, Educator
 University of Maryland Extension, Montgomery County, MD
 18410 Muncaster Road, Derwood MD 20855
 301-590-2804
algapie@umd.edu

APPENDIX B. PROJECT LEAD THE WAY AND 4-H STEM PARTNERSHIP

LOCATION

Arkansas

PROGRAM CONTEXT

Target audience	High school youth
Age range of participants	14 to 18 years
Curricula	Project Lead The Way curricula and numerous 4-H Science curricula including Lego® Mindstorms® and Junk Drawer Robotics
Lead partners	Lockheed Martin Corporation and Camden Fairview School District

PROGRAM DESCRIPTION

The high school technology classes in the Camden Fairview (Arkansas) School District use the Project Lead The Way (PLTW) curricula supplemented with 4-H curricula to create an interactive, experiential learning environment. PLTW provides both professional development for teachers and real-world learning for students. In the words of one technology faculty member, PLTW represents the “...best class I have ever taught in my life. It offers the students direction for going into different areas of engineering. It provides them with knowledge that they really need for the outside world. It helps prepare them for college or for a job.”

EXPECTED PROGRAM OUTCOMES

This in-school partnership provides a range of experiences for youth. The PLTW focus is on activity-, project-, and problem-based instruction which pairs well with 4-H. This program supports these 4-H Science Career Pathway outcomes:

Explore

- Express interest and be engaged in science-related activities.
- Express positive attitudes about science.

Learn

- Demonstrate a capacity for science process skills.
- See science in their futures and recognize the relevance of science.
- Demonstrate a capacity for engineering skills.

Practice

- Draw connections to real-world concepts and situations.
- Discuss STEM careers and their educational pathways.

Experience

- Demonstrate professional communication appropriate to the academic and workplace contexts.
- Make informed decisions about college aspirations that are personally meaningful.
- Make informed decisions about career aspirations that are personally meaningful.

MORE INFORMATION

The following resources are provided for additional information.

- Project Lead The Way: <https://www.pltw.org/>
- Junk Drawer Robotics: <https://4-h.org/parents/curriculum/robotics/>
- University of Arkansas Cooperative Extension Service in Quachita County: <https://www.uaex.edu/counties/ouachita/>

Program Contacts

- Dr. Angie Blacklaw-Freel, Interim Associate Department Head, 4-H & Youth Development, University of Arkansas, afreel@uark.edu
- Keri Weatherford, County Extension Agent and Staff Chair, University of Arkansas Cooperative Extension Service, kweatherford@uaex.edu