



4-H Forestry: Using Nature-Based Programming to Enhance Positive Youth Development Outcomes

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Abstract

Concerned with the ongoing youth mental crisis in the United States, researchers intentionally planned for positive youth development (PYD) practices in nature. Educators, appreciating the critical importance of youth developing relationships and a sense of belonging, may regard this model as a powerful tool to enhance existing programs. Both youth and parents report this as a high quality PYD program, resulting in thriving youth. Youth participants feel welcome, supportively challenged, and passionate about the topic; resulting in a growth mindset, hopeful purpose, and openness to challenge and discovery. The program inspired an affinity for nature in both youth participants and associated adults. 97% of youth and 95% of adult caregivers report being inspired to spend more time in nature as a result of the program. The program also inspired increased youth interest in science college and career opportunities.

Introduction: A Mental Health Crisis

For more than a decade, youth in the United States continue to experience a mental health crisis (Abrams, 2023). “National surveys show major increases in certain mental health symptoms, including depressive symptoms and suicidal ideation in youth. From 2009 to 2019, the proportion of high school students reporting persistent feelings of sadness or hopelessness increased by 40% (Children and Nature Network, 2023); the share seriously considering attempting suicide increased by 36%; and the share creating a suicide plan increased by 44%.

Between 2007 and 2018, suicide rates among youth have increased by 57%” (Office of the Surgeon General, 2021, p.8).

This mental crisis was exacerbated by the COVID-19 pandemic. Forty-two percent of high school students in 2021 reported feeling so sad or hopeless for at least two consecutive weeks in the previous year that they stopped engaging in their usual activities, an increase from 26 percent in 2009 (Stone, 2023).

In June, 2020, Czeisler et al. found...

- symptoms of anxiety disorder were approximately three times those reported in the second quarter of 2019 (25.5% versus 8.1%).
- prevalence of depression was approximately four times that reported in the second quarter of 2019 (24.3% versus 6.5%).
- suicidal ideation was approximately twice the rate seen in 2018 (10.7% versus 4.3%).

The 4-H Thriving Model: The Role of Positive Youth Development

Consistently, 4-H programs are grounded in positive youth development (PYD). This foundation perceives that youth are not problems to be solved; rather, they are powerful members of society with energy and passions that can be channeled to benefit both the youth themselves and the community at large. Youth are regarded as powerful assets. For the last century, 4-H staff has worked to develop programs that will help youth thrive.

To enhance consistent outcomes of this programming, Mary Arnold (Arnold, 2018) developed the 4-H Thriving Theoretical Model for Positive Youth Development (PYD), which outlines how PYD programs lead to thriving indicators and outcomes in youth. The key to maximizing impact lies in the quality of the program. Several ingredients constitute a high-quality youth development program including identifying and nurturing youth interests, identified as sparks in the 4-H Thriving Model; and fostering developmental relationships as well as a sense of belonging among youth participants (Arnold, 2018). As components of a high-quality PYD program, these ingredients result in thriving youth, according to Arnold. Arnold identified thriving indicators which result in PYD outcomes. Additionally, she developed evaluation tools to assess both the quality and impact of 4-H programs (Arnold & Gagnon, 2022). “The 4-H Thriving Model can be used as a lens through which 4-H educators can develop more precise goals for 4-H program activities; goals that contribute to youth thriving, and thus to enhanced PYD... the proposed model provides an “umbrella” under which local 4-H programs can be planned more intentionally to increase PYD” (Arnold, 2018, p. 154).

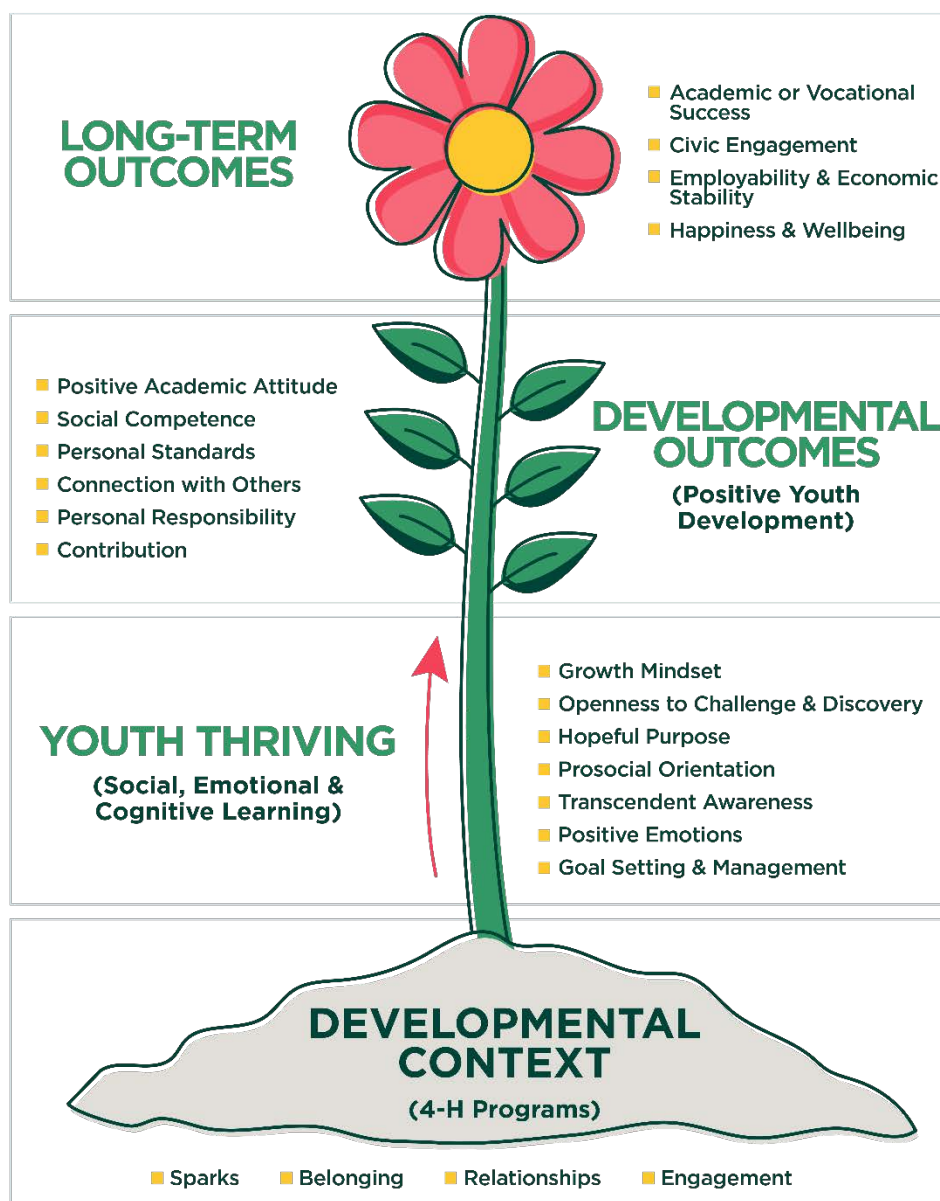


Image courtesy of 4-H Program Leaders Working Group Standing Committee on Positive Youth Development (2024), <https://helping-youth-thrive.extension.org/home/>

The Healing Power of Nature

There is a growing body of evidence touting the infinite benefits of time spent in natural settings. Time in nature results in increasing aspects related to physical activity, interest and enjoyment in learning as well as improving an individual's mood (Kondo et al., 2018). Additionally, time in nature correlates with reductions in body-mass index (Kondo et al., 2018), diastolic blood pressure, salivary cortisol (a physiological marker of stress), heart rate, and diabetes (Twohig-

Bennett & Jones, 2018). For children, time in nature consistently associates with improvements in self-discipline (Kuo et al., 2019), classroom engagement and levels of attention (Kuo et al., 2018). Access to natural greenspaces contributes to decreased symptoms of Attention Deficit Hyperactivity Disorder (ADHD) (Kuo & Faber Taylor, 2004). Time in nature moderates the impact of stressful events in children's lives (Corraliza et al., 2012) and associates with a reduction in violent and anti-social behavioral concerns; furthermore, time in nature relates with improvements in confidence and emotional well-being, social interactions, and peer relationships (McCormick, 2017).

Accessible natural areas are a critical resource for mental health in our rapidly urbanizing world where more than 450 studies in the Children and Nature Network Research Library document the mental health benefits of time in nature for young people (Children and Nature Network, 2023). In a study (Bratman et al., 2015), participants took a 90-minute walk in an urban or natural setting. The nature-walk participants showed decreases in self-reported rumination (repetitive thoughts focused on negative aspects of the self), a known risk factor for mental illness, and reduced neural activity in an area of the brain (the subgenual prefrontal cortex) linked to risk for mental illness; while urban walkers showed no such effects.

A longitudinal study (Engemann et al., 2019) explored data on all persons born in Denmark from 1985-2003 alive and still living in Denmark by the age of 10 (more than 900,000 people). Children living at the lowest levels of green space demonstrated up to a 55% higher risk of developing psychiatric disorders than children living at the highest levels of green space. These data remained consistent even after adjusting for other known risk factors, such as urbanization, socioeconomic factors, family history of mental illness and parental age. These longitudinal data suggest green spaces are critical throughout childhood as they help protect individuals from psychiatric disorders during adolescence and adulthood. According to Engemann et al. (2019), integrating natural spaces into urban planning is a promising approach to improve mental health.

PYD + Nature = The “Thrive Naturally Forestry” Program for All Response

In light of the abundant evidence underscoring the countless benefits of nature and paired with the data regarding the expanding mental health crisis among youth in America, 4-H programming continues to work to do what they do best - use university research to bring solutions to communities and help youth handle stressors, both new and old. Relevant to the current project, the Thrive Naturally Forestry Program leverages both PYD and nature-based experiences as tools to help young people flourish.

Recalling the importance of building a sense of relationship with nature and one another, regional field sessions took place in local forest and park settings in order to heighten the benefits and thriving indicators that take place in high quality positive youth development experiences. Moving portions of the program to these natural settings and providing weekly practice challenges necessitating time spent outdoors were an intentional programmatic design choice aimed at enhancing the program outcomes by leveraging the social and emotional benefits of time spent in nature.

The developmental context components of the Thrive PYD model ensure a high-quality positive youth development experience. Nature-based experiences remain a powerful motivator for many youth participants, particularly including topics of resource conservation and environmental protection. Nine out of ten teens regularly think about the environment (National 4-H Council Harris Poll, 2022). Eight of ten wish that their schools provided more outdoor experiences and learning opportunities (National 4-H Council Harris Poll, 2022). Youth in the program experienced a sense of **belonging** as they interacted with peers and adult mentors with similar interests, exploring and protecting our natural resources. Participating youth were invited to engage in virtual polling and “get to know you” activities that served as a mechanism to facilitate personal interactions and bonding. In addition, time was allotted in each virtual session for participating youth and adult mentors to share their nature experiences with the group, again providing an opportunity to connect regarding shared interests and experiences. Finally, further describing the current program intervention, participating youth experienced **developmental relationships**, as they were guided by a team of adult mentors who provided content instruction and challenged youth to act upon that instruction to practice forest evaluation skills during regional field sessions and independent practices between sessions. Participating youth were further encouraged to hone and demonstrate their forest related skills during a state forestry showcase event, with the top four participants being invited to participate in the National 4-H Forestry contest.

When program planners intentionally incorporate both positive youth development (PYD) and nature, findings indicate a deepening of both positive youth development and nature outcomes (Children and Nature Network, 2017; Sethi & Eisenberg, 2019).

Current Program Goals and Methods

The current project leverages nature-based experiences to enhance PYD youth outcomes. The program goals intend to...

- provide a positive developmental context where participating youth will thrive.
- increase time spent in nature.
- increase interest in scientific college and career opportunities, particularly in the areas of forestry and natural resources.
- instill a sense of responsibility for forest ecosystems.

Participants

Youth were recruited from across a Mid Atlantic state via state and county-based marketing efforts. Enrolled 4-H youth were recruited via 4-H Online email broadcasts, and county and state social media posts. Non-enrolled 4-H youth were recruited through partner communications. The program team reached out to scouting groups and school environmental clubs to reach non-enrolled youth who may have an interest in a forestry program.

Research Program Description

Using a hybrid approach of virtual learning sessions and hands-on field practices, youth participants learned various skills including tree identification, tree measurement, forest insect

and disease identification, and as well how to safely navigate forest environments with compass orienteering, pacing, topographic maps, and GPS units. Youth participants used these skills to evaluate the health and value of forestland by synthesizing investigations of plant and animal biodiversity, soil quality, forest pests, lichen, tree and crown condition and size, regeneration, and snags. These evaluations were used to create forest management plans for select forest plots.

Youth participants were provided with necessary program resources prior to the first session. Each participant received a tree identification guide, a Biltmore stick, and a compass. Twelve hours of content were presented via virtual sessions. These sessions were conducted weekly from 7:00 p.m.- 8:30 p.m., incorporating interactive digital activities using polls, chat, Jamboard and Kahoot to facilitate youth interactions and build a sense of belonging within the group. Each virtual session concluded with a challenge for participating youth to get out-of-doors and practice their new forestry skills and knowledge independently. Opportunities to share their individual discoveries and nature experiences took place in each session. Regional field sessions met every 3-4 weeks, providing eight hours of follow up practice for the virtual content.

Program Outline

Session	Topic (s)
Virtual 1	Program Introduction and Overview
Virtual 2	Tree Identification
Virtual 3	Tree Measurement
Virtual 4	Tree Identification (ID)/Measurement Review and Practice
Field Session 1	Field Day – Tree ID and Measurement
Virtual 5	Compass Orienteering
Virtual 6	Topographic maps
Virtual 7	Compass and Pacing
Virtual 8	Cumulative Review Session
Field Session 2	Field Day- Compass, Orienteering, Pacing, and Tree ID

Virtual 9	Forest Insects
Virtual 10	Forest Diseases
Virtual 11	Forest Evaluation
Virtual 12	Program Review
Field Session 3	Field Day – Insects, Disease, and Evaluation
Field Session 4	State-wide Field Session and Contest for National Team Placements
	National 4-H Forestry Contest

Virtual and field sessions provided opportunities for participants to engage with high caliber expert presenters. Presenters included professionals in the fields of forestry, management, veterinary science, and education. These experts shared their content expertise, but equally as important their personal career journeys and experiences. This content presentation approximated twelve hours. The program culminates in state and national contests, where participating youth are encouraged to showcase the skills and knowledge gained through the program.

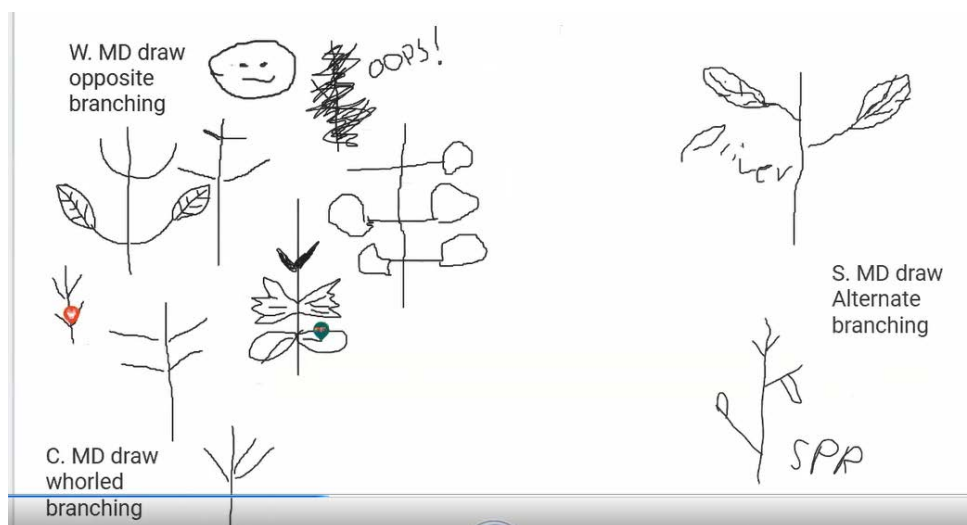
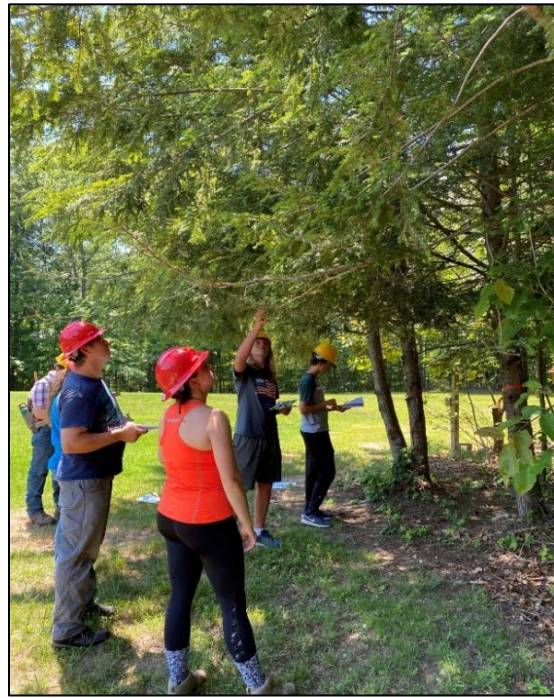


Photo Courtesy of the Author. Tools like Jamboard, Kahoot, and Zoom polls kept the virtual sessions engaging, as youth practiced new skills.



Tree Measurement with a Biltmore Stick



Tree Identification



Forest Insect Study



Photos courtesy of the author.



Fun in the Forest!

Photos courtesy of the author.

Survey Research: Program Outcomes

The Thrive Naturally 4-H Forestry Program has been successfully implemented for three seasons with 77 youth participants and 54 adult caregiver participant guides. Post program surveys were developed by selecting applicable questions from several fully vetted survey tools; the 4-H Common Measures Science Survey, the American Camping Association Affinity for Nature Scale and the 4-H Thriving Model Program Evaluation Instruments. Surveys were distributed at the State Showcase event and electronically via Qualtrics for those participants unable to attend the final session. Post surveys were completed by 33 youth and 20 caregiver participants. Data reveal positive outcomes for both youth and adult caregivers participating in the program.

2021 to 2023 Thrive Naturally Forestry Post – Survey Summary Data– 33 youth responses

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	% Agree or Strongly Agree
Nature Affinity Outcomes						
I like being in nature.				9	24	100%
I can do things to help nature.			2	12	19	94%
Nature helps me feel calm.	1	1		12	19	94%

Being in nature makes me happy.	1	1		9	22	94%
When I'm sad, I try to spend time in nature to feel better.	1	1	3	12	16	85%
Spending time in nature helps me be more active.	1	1	1	9	21	91%
I want to spend more time in nature after participating in this program.		1		6	26	97%
Science Outcomes						
I would like to study environmental science after high school.	1	1	6	9	16	76%
I would like a job that involves environmental science.	1	1	8	12	11	70%
Thriving Indicators and Outcomes						
This program gives me the opportunity to explore something I really care about.			3	11	12	88%
I feel like I matter in this 4-H program.		1	2	11	12	88%
I feel welcome in 4-H.				13	11	100%
Leaders in this program pay attention to me.				12	14	100%
Leaders in this program expect me to do something positive with my future.			1	7	18	96%
If I keep working at something I will get better at it.			1	7	18	96%
I like to try new things.		2		7	17	92%
My life will make a difference in the world.		1		7	18	96%

Content Specific Outcomes						
I want to learn more about forests.				6	21	82%
After this program, I am interested in learning more about trees and forest animals.				6	21	82%

** Note: The numbers for each item do not always add to 33 total responses, as some youth did not complete all survey questions.

**2021 to 2023 Thrive Naturally
Participant Caregiver Post Program Survey - 20 surveys**

	Strongly Disagree	Disagree	Agree	Strongly Agree	% Agree or Strongly Agree
Nature Affinity Outcomes					
I like being in nature			8	12	100%
I am comfortable in nature			8	12	100%
Spending time in nature is good for my child's health.			4	16	100%
Spending time in nature is good for my health.			6	14	100%
Spending time in nature helps me feel calm.			5	15	100%
Being in nature makes me happy			6	14	100%
I want to spend more time in nature after participating in this program.			4	16	100%
After this program, I am more likely to seek nature experiences for my child(ren).		1	4	15	95%

my child being more open to exploring nature.			9	11	100%
Thriving Indicators and Outcomes					
my child being more willing to try new challenges.			9	11	100%
my child being eager to learn new things.			8	12	100%
my child believing that he/she can have a positive influence on their community.			10	9	100%
my child seeing him/herself as a part of the larger world.			8	11	100%
my child caring more about nature.			8	12	100%
my child being more willing to help others.			9	11	100%
my child being able to use nature as a tool to manage emotions.		1	8	11	95%
my child being able to set and work toward goals.		1	8	11	95%
an improvement in my child's academic motivation		1	5	14	95%
an improvement in my child's academic achievement		1	3	16	95%
an improvement in my child's social interactions			9	11	100%
Science Outcomes					
an increased interest in science for my child.			6	14	100%

Survey Findings

Nature Affinity Outcomes

The program inspires an affinity for nature in both youth participants and associated adults.

- 100% of youth participants enjoy being in nature.
- 78% want to learn more about forest ecosystems after participating in the program.
- 97% of youth participants want to spend more time in nature after participating in the program.
- 95% of adult caregivers indicate that the program inspired both parents and children to spend more time in nature.

The program helps youth and adults identify the benefits of time spent in nature.

- 94% of youth participants indicate that nature helps them feel calm, and makes them happy.
- 91% of youth indicate that spending time in nature results in increased physical activity.
- 100% of adult caregivers recognize that time in nature is good for both youth and adult health.
- 95% of adult caregivers indicate that after the program their child can use nature as a tool to manage emotions.

Thriving Indicators and Outcomes

Respondents indicate that the Forestry program is a very high-quality developmental experience.

- 100% of youth participants feel welcome and paid attention to in the program (belonging).
- 96% believe that program leaders expect them to do something positive with their future (developmental relationships).
- 88% felt that the program helped them explore a topic they really care about (“spark”/youth interests).

The program resulted in thriving indicators in youth participants.

- 96% of youth participants express hopeful purpose.
- 92% report being open to challenge and discovery, eager to learn and try new things.
- 100% of adult caregivers indicate that the program resulted in increased openness to challenge and discovery, growth mindset, hopeful purpose, transcendent awareness, and prosocial orientation.
- 95% indicate increased positive emotionality, goal management, and academic attitudes in youth participants.

Science Outcomes

An additional benefit of the program is that youth were inspired to explore and consider science college and career outcomes.

- 76% of youth respondents indicated an interest in studying environmental science after high school.
- 100% of adult caregivers indicate that the program resulted in an increased interest in science for their child.

Qualitative Outcomes

Qualitative Outcomes were collected through post survey tools as well as post program email correspondence.

Youth Voices ...

Participants indicate the guest speakers are one of the most beneficial components of the program. Several youth expressed that hearing how the speakers moved from being a 14-year-old youth, to a Forestry professor or logger, provided valuable insight into possible next steps beyond high school.

“Hello

I hope you're doing well! I'm working an internship with Jefferson Patterson Park & Museum's Education Department, before heading off to Frostburg this Fall to study forestry. I'd like to thank you once again for hosting the 4-H Forestry program. It really gave me a wider understanding of forestry, and I hope youth continue to have that same opportunity.”

Caregiver Voices via post program survey tools...

What do you see as the longest lasting impact of this program for your child?

- “Opening up a new career path as well as interacting with others with a similar interest.”
- “Prior to this program, our son did not have a career plan. Now he would like to go to school for forestry.”
- “A better understanding of nature and an opportunity to interact with other families.”
- “Learning to appreciate nature”
- “a new found love for nature”
- “understand the importance of preserving nature”
- “appreciation for all that forests/woods do for us”
- “this was an experience that she can continue to grow in, and develop a lifelong interest in forestry, the environment, and science”
- “a deeper understanding of 4-H’s ability to lead to career choices and options for their future”
- “this program has boosted his confidence”
- “First - thank you so much for the program offering. B's dad has a degree in forestry and we had been encouraging B in a career path that way but he wasn't interested. He LOVES the club, talks about it all the time, and now considering a career in Forestry!!!!”

What do you see as the longest lasting impact of this program for you?

- “It was a great opportunity for us to continue to get our children outside, especially during the pandemic.”
- “Desire to attend college and career path”

- “Understanding our role in protecting our forests”
- “I will research more programs to catapult her to the next level of learning about forests.”
- “Learning to appreciate nature”
- “Taking short hikes can improve my health”
- “I look forward to joining him more next year.”

Please share anything else you’d like us to know about your child’s participation in this program....

- “A... and W... enjoyed meeting new people and learning so much”
- “My child enjoyed the 4-H Forestry program so much that she’s bummed that she has to wait another year to get to the next level of learning.”
- “I wish the program was longer than it was.”
- “thank you to all who work to inspire kids and teach them about the importance of forestry”
- “Our family enjoyed the program – hope to see it offered again in the future”
- “Thank you for allowing the younger ones to join this program”
- “The best part of the program was meeting new people, learning more about forestry, watching the youth become friends, and find joy.”

Conclusion

The program has resulted in positive outcomes, with strong results for each programmatic goal...

1. Both youth and parents report that this was a high quality PYD program that resulted in thriving indicators for youth participants.
 - 100% of youth participants feel welcome and paid attention to in the program (belonging). 96% believe that program leaders expect them to do something positive with their future (developmental relationships), and 88% felt that the program helped them explore a topic they really care about (spark).
 - 96% of youth participants express hopeful purpose; 92% report being open to challenge and discovery, eager to learn and try new things. 100% of adult caregivers indicate that the program resulted in increased openness to challenge and discovery, growth mindset, hopeful purpose, transcendent awareness, and prosocial orientation.
2. The program inspires an affinity for nature in both youth participants and associated adults. 97% of youth participants want to spend more time in nature after participating in the program. 95% of adult caregivers indicate that the program inspired both parents and children to spend more time in nature.
3. Youth were inspired to explore and consider science college and career outcomes. 76% of youth respondents indicated an interest in studying environmental science after high school, and 100% of adult caregivers indicate that the program resulted in an increased interest in science for their child. Several youth participants indicate future plans to work or study in forestry related fields.
4. Youth were empowered. 94% believe they can do things to help nature.

Practical Implications and Opportunities for Future Research

The current data indicate project success. Youth participants and their adult caregivers report an increase in nature affinity and evidence of thriving indicators resulting from the intentional intersection of high quality PYD practices taking place in nature-based settings. Educators may consider this model as a simple, yet powerful tool to enhance existing programs. By using the Thriving Model as a guide to design high-quality PYD programs that incorporate youth interests, or “sparks” as they are referred to in the Thrive Model, with practices to facilitate a sense of belonging and strong developmental relationships, and by setting these programs in nature, youth benefits are amplified.

Several interesting outcomes could prompt further investigation. The researcher set out to measure impact in youth participants, but one unanticipated outcome of the program was the level of adult caregiver participation. It became evident that parents/caregivers were eager to engage in the Forestry program alongside their children. Since the regional field sessions took place in local parks and natural resource areas, a bit further from shopping and convenience centers, parents tended to stay with their children for the duration of the session. This led to a positive benefit of families experiencing nature together, with youth often teaching adults the forestry skills and knowledge they previously learned during the virtual sessions. Parent surveys were developed to capture the researcher’s observations. Early data suggest an increased family bonding as parents and children experienced forest discoveries together, and positive health outcomes for parents. The researcher plans to conduct follow up surveys with parents/caregivers to determine if the initial program impacts have continued in the months following the sessions. There is a significant body of research that indicates positive outcomes when adult caregivers address their own mental health and well-being, serving as role models for their children (Office of the Surgeon General, 2021). The field could benefit from additional research around nature based PYD programming and family outcomes.

Marketing for the program has targeted the broad base of all youth, as research points to the benefits of high-quality nature-based PYD experiences for everyone. A next logical step in the research would be to refine the target audience of the program to determine if similar impacts are found across diverse segments of the youth population. Girls, LGBTQ+, and African American youth all report higher rates of depression and suicidal thoughts than the general population (Abrams, 2023; Stone, 2023). Studying the program’s impacts on these sub-groups could provide vital information on how to best serve these populations.

Finally, the program was designed with the 4-H Thriving Model in mind. Given the growing numbers of mental health challenges among youth, there are a wide variety of resources and supports for adults working with youth in formal and informal education settings. Incorporating elements from programs like Mental Health First Aid (National Council for Mental Well-being, 2023) and Classroom WISE (Well-Being Information and Strategies for Educators) (Abrams, 2023; The Mental Health Technology Transfer Center Network and the University of Maryland’s National Center for School Mental Health (NCSMH, 2021) could provide additional benefit for all youth participants, but especially those struggling with mental health challenges. The researcher plans to develop a more general nature-based program aimed at meeting the needs of youth struggling with mental health symptoms.

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